



**Graduate School
of Management**
St. Petersburg University



**GSOM
EMC**

OCTOBER 4-12
St. Petersburg, Russia

CONFERENCE BOOK

[gsom.spbu.ru/research/
conferences/emc/](http://gsom.spbu.ru/research/conferences/emc/)

**ANNUAL GSOM EMERGING
MARKETS CONFERENCE 2021**



Editors: Yury E. Blagov, Karina A. Bogatyreva, Dmitry G. Kucherov, Andrei Yu. Panibratov, Marina O. Latukha, Maria M. Smirnova, Tatiana A. Gavrilova, Dmitry V. Kudryavtsev, Nikolay A. Zenkevich, Svetlana V. Maslova, Evgenii V. Gilenko, Ekaterina V. Sokolova, Andrey E. Ivanov, Tamara M. Kuropatkina.

International Research Conference
“GSOM Emerging Markets Conference-2021”

**St. Petersburg State University Graduate School of Management
October 4-12th, 2021 St. Petersburg, Russia**

©Authors of Papers, 2021

Abstracts by tracks

Business in Society: New Reality and the Implementation of Corporate Sustainability Strategies		
Name & Surname	Affiliation	Paper
<p>Anush Egian</p> <p>Anastasia Petrova-Savchenko</p>	<p>St. Petersburg State University's Graduate School of Management, Katholieke Universiteit Leuven</p> <p>St. Petersburg State University's Graduate School of Management</p>	<p>Civil Society as a Driver of Corporate Social Performance in Russia: State-of-the-art and Industrial Peculiarities</p>
<p>Patrícia Nunes Costa Reis</p> <p>Annibal Scavarda</p> <p>Flávio Machado</p>	<p>Universitary Center of Volta Redonda - UniFOA</p> <p>Federal University of Rio de Janeiro (UNIRIO)</p> <p>Federal University of Rio de Janeiro (UNIRIO)</p>	<p>The Reverse Logistics Contributions and Lessons in order to Provide Green Supply Chain Competitive Advantages</p>
<p>José G. Vargas-Hernández</p> <p>Omar C. Vargas-González</p>	<p>Instituto Tecnológico José Mario Molina Pasquel y Henríquez</p> <p>Instituto Tecnológico de México-Campus cd. Guzmán</p>	<p>Entrepreneurial Inclusive Civil Culture Model in Parque Agroecológico de Zapopan</p>
<p>July Alexandra Villalba Rodríguez</p>	<p>Politécnico Grancolombiano</p>	<p>From the Scientific Method to Business Innovation: A Reflection on Transdisciplinary</p>
Entrepreneurship and Small Business Management: New Opportunities and Challenges		
<p>Suha Bilquis</p>	<p>Aligarh Muslim Universit</p>	<p>Technological Drivers and Entrepreneurship Challenges of Manufacturing Sector in Industry 4.0: Identification of Critical Factors through Total Interpretive Structural Modeling (TISM)</p>
<p>Elena Sharko</p> <p>Lilia Valitova</p>	<p>Lomonosov Moscow State University</p>	<p>Identifying Business Relationships in Textile</p>

Marina Sheresheva Junzhi Deng		Cluster: The case of the Ivanovo Region
Rafik Smara Karina Bogatyreva Anastasia Laskovaia	St. Petersburg State University's Graduate School of Management	Balancing in Crisis? Exploring the Impact of Innovative Ambidexterity on SMEs' Performance During COVID-19 Pandemic
José G. Vargas-Hernández Dr. César Omar Mora Pérez Dr. Miguel Angel Esparza Íñiguez	University Center for economic and Managerial sciences, Universidad de Guadalajara	Green Innovation Business (GIB) as a Comprehensive Entrepreneurship Model for the Internationalization. The case of BIO-FOM in the Urban Area of Guadalajara
Tatyana Zimnyakova Ivan Drobyshev	Siberian Federal University	Knowledge and Technology Transfer in Organic Farming in Russia: Results of Patent Analysis
Human Resource Development in a New Reality		
Carina da Conceição Rodrigues Ferreira Annibal Scavarda Augusto Reis Amedeo Rizzo Philani Nduna Zincume	Federal Center for Technological Education Celso Suckow da Fonseca Federal University of the State of Rio de Janeiro Federal Center for Technological Education Celso Suckow da Fonseca Bocconi University Stellenbosch University	The COVID-19 Influence in the Environment, the Society, and the Economy: the Educational and Social Human Resource Development Framework for the New Reality
Marina Iskhakova Sofia Kosheleva	Australian National University St. Petersburg State University's Graduate School of Management	Short-term and Long-term Local vs Global Career Intentions: The role of Cultural Intelligence (CQ) and the Closed Borders

Olga Mondrus Veronica Parolini	National Research University Higher School of Economics	Team Resilience Framework: the Case of an International Company
International Business and Emerging Markets		
Nayil Ismailov	National Research University Higher School of Economics	Business Models of Energy Companies in the Markets of Isolated and Remote energy Supply
Sergei Kladko	Innopolis University	Business Leadership in Pandemic: When the East meets the West or..?
Yuliya Tyulkina	National Research University Higher School of Economics	Global Trends and its Impact on Strategies of Oil and Gas Companies
Managing Diverse Talent in a Divided World		
Aleksandra Bordunos Sofia Kosheleva Anna Zyryanova	National Research University Higher School of Economics St. Petersburg State University's Graduate School of Management SelfMama	To be or not to be: New Perspective on Retention of Female Employees
Petr Fedorov	RANEPA	Comparative Research of Platform Work Legal Risks
Marketing: Current Trends & Challenges		
Megi Gogua	St. Petersburg State University's Graduate School of Management	Costs and Benefits of Personalised Marketing Communication in Online Retail: the Comparison of Customer and Business Perspectives
Olga Konnikova Oksana Yuldasheva Julia Solovjova	Saint-Petersburg University of Economics	Measuring Sustainable Consumption: the Results of Empirical Study of Russian Consumers

Operations Management and Business Informatics		
Evgeny Blagov Dmitry Eroshkin	St. Petersburg State University's Graduate School of Management Forward Creative Agency	Platform Solution Project for Interdisciplinary Project Teams Building on Cognitive Style Basis
Artemii Gibalov Dmitry Kudryavtsev Tatiana Gavrilova	St. Petersburg State University's Graduate School of Management	Using Ontology Framework for Consumer Knowledge Audit: Electric Vehicle Charging Stations Case
Anna Levchenko Dmitry Ovsyanko Pavel Sharakhin	St. Petersburg State University's Graduate School of Management	Using the Kano Model in Operational Management to (Re)build a Package Service Offering
Cristiane Madeira Souza Cristiane Souza Anne Freire Thais Feitosa Zaila Oliveira	Fametro University Centre Fametro U Wesley Farias, Fametro University Centre Ceara State University Fametro University Centre Center for Organizational and Social Studies of the Polytechnic of Porto (CEOS.PP)	E-sports no Brazil: a Mais Nova Paixão Nacional
Andrey Zyatchin Maria Kozlova	St. Petersburg State University's Graduate School of Management	Factors Affecting Digital Transformation of Manufacturing Companies

Public Sector Issues		
<p>Daria Bakalets</p> <p>Anastasia Golubeva</p> <p>Evgenii V. Gilenko</p>	<p>St. Petersburg State University's Graduate School of Management</p>	<p>Factors of Citizens' Involvement in Electronic Participatory Budgeting on Municipal Level (the case of St. Petersburg)</p>
<p>Cornelia Ebadi</p> <p>Andreas Glas</p>	<p>Bundeswehr University München</p>	<p>Innovation vs. Administration: Researching Implementation in the Public Sector</p>
<p>Evgenii Gilenko</p> <p>Danil Andreev</p>	<p>St. Petersburg State University's Graduate School of Management</p>	<p>Dependence between Sovereign Debt and Bank Non-performing Loans before and during the COVID-19 Pandemic: a Copula-based Approach</p>
<p>Kazimir Iablonskii</p> <p>Yuri Fedotov</p> <p>Petr Yablonskiy</p> <p>Olga Sokolova</p>	<p>ANO "Moscow Centre for Innovative Healthcare Technologies"</p> <p>St. Petersburg State University's Graduate School of Management</p> <p>St. Petersburg State University</p> <p>St. Petersburg State Research Institute of Phthisiopulmonology</p>	<p>Measuring Organizational Performance of Saint-Petersburg Public Hospitals in Providing Medical Care to Patients with a Novel Coronavirus Infection (COVID-19)</p>
<p>Elena Kalabina</p> <p>Svetlana Begicheva</p>	<p>Ural State University of Economics</p>	<p>Analytical Assessment of the Availability of Medicines for the Treatment of Cardiovascular Diseases in the Region (Based on the Materials of the Sverdlovsk Region)</p>
<p>Tatyana Sklyar</p>	<p>St. Petersburg State University's Graduate School</p>	<p>The Sphere of Donor Blood Circulation Before & During</p>

Mariia Kotlyarova	of Management	Covid-19
Elena Taraskina Evguenii Zazdravnykh	National Research University Higher School of Economics	The Relationship between Socio-demographic Characteristics and Reasons for not Seeking Medical Care in Russia
Olga Trunova Igor Khodachek Aleksandr Khodachek	University of Bologna Russian Academy of National Economy and Public Administration National Research University Higher School of Economics	Dialogue on Smart City Strategy: Case of Saint Petersburg
Georgia Aimilia Voulgari	National and Kapodistrian University of Athens	Third countries and the EU: Recent Developments in the field of Public Procurement

**Business in Society:
New Reality and the
Implementation of Corporate
Sustainability Strategies**

Civil Society as a Driver of Corporate Social Performance in Russia: State-of-the-art and Industrial Peculiarities

Anush Egjian, St. Petersburg State University's Graduate School of Management, Katholieke Universiteit Leuven (st064528@gsom.spbu.ru), Anastasia Petrova-Savchenko, St. Petersburg State University's Graduate School of Management (savchenko@gsom.spbu.ru)

Abstract:

Corporate social performance (CSP) is influenced both by companies' strategic intentions and institutional settings of the particular society they operate in. Civil society, known as all forms of social action carried out by individuals or groups not connected to or managed by the State (Cooper, 2018), plays an important role in shaping different stakeholders' expectations as well as governmental policies. However, in most academic studies devoted to Russian companies' CSP, civil society is characterized as weak and almost unable to carry out its functions (Fifka and Pobizhan, 2014; Bataeva, 2010, Shumilova, 2013). Arguments against this include increasing protest activity (e.g. the protests in Khabarovsk, 2020-2021), engagement in law-making (e.g. a law that allows businesses to transfer up to 1% of revenue to philanthropy without income tax), civil support for NGOs influencing corporate philanthropy policies, etc. This study is designed to analyze Russian civil society, its maturity, strengths and weaknesses, and determine a role civil society plays in shaping CSP including some industrial peculiarities. The study is based on semi-structured interviews with Russian companies and NGO representatives, and a sociology expert. It has been found that civil society in Russia, being on the nascent stage of development, is in process of shaping its basic political rights, economic and social influence. But Russian civil society cannot be called deficient: it successfully carries out collaborative institution functions. Companies characterize Russian civil society as unable to boycott or protest, unless in a political context. Some civil institutions, such as labour unions and consumer organizations, are either weak or non-existent. This current state-of-the-art promotes extended freedom of managerial decisions as well as limited consequences of failed communication with stakeholders. Still B2C and/or producing companies are more prone to societal pressure than B2B/B2G and/or service companies which is coherent with previous studies.

Keywords: *Corporate social performance, Institutional systems, Russian civil society*

1. Introduction

Institutions are addressed differently in different social sciences. In economic science institutions are known to affect businesses primarily through transaction costs and business effectiveness and efficiency (Williamson, 1998), while in political science they are seen as a legitimacy-granting entity (Kuznetsov, Kuznetsova and Warren, 2009), and in sociology are used to explain the homogeneous behaviour of individuals and organizations (DiMaggio and Powell, 1983). Civil society has been introduced in political sciences as a filter of public demands and support for the political system (Easton, 1965), but in managerial context political systems are replaced by businesses. Institutions in Russia are of special research interest due to institutional voids, weaknesses in institutional arrangements, affecting social processes (Khanna and Palepu, 1997), and

therefore, the scale and effects of these voids are to be defined for Russia.

The role and characteristics of civil society as well as its influence on business have been addressed in recent studies. According to Fifka and Pobizhan (2014), civil society in Russia has formed with a “without me attitude”, which restrains Russian society from affecting business. Bataeva (2010), Shumilova (2013) and other researchers propose similar findings. There is recent evidence that it is not entirely so. Some prominent cases (such as political protests in Russia of 2019-2021, or online boycotts in social networks against Yves Rocher after the arrest of Alexey Navalny in 2021, due to company intervention in the process) show qualitative changes in Russian institutional environment, indicating demands for increased transparency and morality. These changes need to be analyzed from the standpoint of effects on business functioning. They indicate that business external environment is getting more sophisticated, driving corresponding changes in Russian companies’ CSP.

2. Methodology and data

The study relies on both secondary and primary data. The secondary data involves a set of academic and empirical sources related to CSP, Russian institutions and civil society specifically (Reznik, 1994; Matten and Moon, 2008; Wood, 1991; Hegel, 1991; Fifka and Pobizhan, 2014; Burenko and Zhuravlev, Khanna and Palepu, 1998; Web et al., 2019; World Giving Index, 2010; 2018; Schulmann, 2018, etc.). This data allows to define Russian civil society as being at the nascent stage of development, as well as indicate such trends as increasing protest engagement and volunteering activity. However, even though secondary data allows for a comprehensive understanding of the general context of civil society influence on CSP, the specified national and industrial contexts were still left unrevealed. In order to fill this gap, the primary data was collected, which included: a survey and semi-structured interviews with 6 companies from various industries, interviews with 2 NGOs solving social, environmental and economic issues, and an interview with an expert in sociology.

The sample of companies was designed in order to cover 1) both monopolistic and competitive industries; 2) B2B, B2C and B2G segments; and 3) production of tangible products as well as services. It involved companies in FMCG sector, retail, B2B consulting and metallurgy which put the principles of corporate sustainability at the core of their CSP. Half of the companies operate all over Russia, meaning that the sample covers all federal regions except for the North-Caucasian. The survey and interviews touched upon the role of relevant institutions in shaping their CSP.

The semi-structured interviews with NGOs were aimed at understanding the factors in Russian institutional environment that inhibit and support their activities. The set of NGOs had been chosen basing on two criteria: 1) both large and small scale of NGOs; 2) different areas of social activity. Both NGOs consider businesses as their key stakeholders.

Finally, since secondary data analysis provides evidence that culture shapes CSP and civil society through affecting societal behavior, the cultural peculiarities of the Russian society are separately addressed through the interview with an expert in sociology. Empirical results and conclusions

2.1. Russian civil society is on the nascent stage of development, and is in process of shaping its basic political rights, economic and social influence

The Russian civil society maturity was analyzed using the framework proposed by Reznik (1994), who introduced three stages of civil society development: competitive, coherent and pluralist. Russian civil society proved to be at the very first, nascent, stage of development, which is characterized by the beginning separation of the state and society, as well as establishment of the

basic political processes, such as just referendums, elections, etc. To justify this statement, several arguments can be provided. First, civil society grows on market economy and capitalism (Burenko and Zhuravlev, 2004), which in Russia exist for only 30 years and this period is not enough for systematic institutional change. Second, there are no historical predispositions for developed civil society. According to Hegel (1991), the necessary elements for civil society development are transparency, property rights protection, freedom of thought, etc., which have been limited with autocratic regimes throughout the whole Russian history. Moreover, according to an interview with a sociologist, the historical predispositions have caused lack of trust, transparency and collectivist culture, as well as high degree of power distance, - the cultural traits that are considered informal institutional voids (Webb et al., 2019) weakening the social collaboration and civil society development.

However, there are several arguments for the positive trends in the Russian civil society development, which are largely overlooked in the literature. Below, the major criteria for civil society assessment are given, and their application in the Russian context is provided.

- Citizen involvement in volunteering activities is an indicator for a strong civil society (Freitag, 2006)

According to the HSE Civil Society Research Laboratory, the number of NGOs in Russia increased by more than 30% in just 7 years. According to Schulmann (2020), the breakeven point in the Russian civil society development has been 2010, the year of big fires in Russia, which resulted in an unprecedented interference of civil initiatives. Russians also seem to increasingly engage in charitable giving: according to the World Giving Index, in 2010 Russia has been on the 138th place (CAF, 2010), while in 2018 it was already on the 100th place (CAF, 2018).

- Protest activity (Bernhard and Karakoç, 2007)

Similar to the volunteering activity, protest activity in Russia seems to have changed in the 2010s. One of the milestone events in this sense is the protests of 2011-2013, which had an unprecedented scale for Russia (Zhavoronkov, 2018). The trend is seen in recent years with such cases as the Khabarovsk protests against the arrest of Sergey Furgal, protests in support of Ivan Golunov, right movements against domestic abuse, etc. These instances prove that despite the nascent stage of development, civil society shows protest activity, and hence, roots for functioning.

These two arguments drive to a conclusion that civil society in Russia is weak, but not deficient and is fighting for its basic political rights and separation from the state. Companies and NGOs support this argument. NGOs note that their main issue is their political independence and ability to function without state intervention. Companies, on the other hand, note that the rare conflicts with society take place on the grounds of political injustice. However, they state that social and environmental agenda does not bother Russian society yet. As a response to these specifics, respondent companies mentioned they strictly avoid any political contexts and situations.

2.2. Despite the nascent stage of development, Russian civil society performs its functions as a collaborative institution

Civil society organizations, such as social activists, charities, social enterprises and others, successfully collaborate and provide feedback to businesses. They raise awareness of social, environmental and economic issues and make attempts to participate in respective policy development. An example of such has been provided by PwC, which in collaboration with the “Rus” Fund have pushed a draft law concerning the collaboration of the business and NGO. As a result, the State Duma adopted a law allowing businesses to transfer up to 1% of revenue without taxing income (PwC, 2020).

However, the specifics of the civil society functioning are seen in gaps and failures. To begin with,

some civil society functions seem to not be performed. For example, despite the increasing protest activity in Russia, no companies mentioned any civil organization to pressure, boycott or generate conflict with them, unless it concerns political contexts. This can be explained by the tough regulations for protest activities (Zhavoronkov, 2018) that affected the social mindset. Second, some institutions seem to be almost or fully non-existent in Russia. Most companies mentioned to formally have labour unions, however, only two of them characterized them as active. What is more, there are no external labour unions that tend to be active. No company reported to have collaborated with or even “met” consumer organizations, even though in the 2000s they existed and allegedly were active in Russia (Knyazeva, 2011).

2.3. B2C and producing industries are much more prone to civil society pressure, than B2B/B2G and/or service industries

B2C companies noted that environmental and social activists, independent media and other civil initiatives are attentive towards them, however, the boycotts and conflicts are still a rare case. On the contrary, the representatives of the B2B and B2G sectors highlighted that there is almost no pressure from civil organizations even though social enterprises and NGOs tend to regularly collaborate. This is consistent with the previous studies in marketing noting that companies in B2C segments tend to deal with lower loyalty and higher attention from their customers (Saini et al., 2009) and can be explained by the fact that B2C companies are “closer” to end consumers that are prone to boycott. Besides, the producing companies noted a much higher degree of pressure than those in service industries, which is also coherent with earlier research (Wood, 1991) and can be justified by much larger harms to society and environment. Finally, the companies from the stigmatized industries (tobacco and alcohol covered by the sample) noted a very high degree of attention from the societal actors, however, with a very superficial degree of awareness on the topic. The summarization of the findings on industrial peculiarities is given below.

Industrial peculiarities concern not only societal orientation towards business, but also business orientation towards society. A metallurgy company stated that its communication with civil society is rather formal and is carried out to minimize costs and risks, which is consistent with corporate sustainability 1.0 approach. At the same time, international FMCG, B2B consulting and retail companies do not only collaborate with civil society to minimize risks, but also aim to create new value, and describe this as an industrial trait, which is consistent with corporate sustainability 2.0-3.0. This can be explained by either company belonging to a specific segment, or the country of origin (Russian vs. international companies). Larger sample could help to bring certainty to this question.

3. Limitations and further discussion

Limitations of the study include secondary data-related biases, such as publication bias. As for the primary data-related limitations, sampling bias must be noted: 5 out of 6 companies adopt the principles of sustainable development, the specifics of which could have affected the set of relevant actors that engage in communications with the companies. The sample has got limited number of participants and industries. In the process of the interview taking, confirmation bias could take place as the interviewees could consider the interview as a public relations tool. Besides, the findings may be limited by personal perceptions of the company representatives.

Further research could be conducted with a bigger sample of companies and industries. Second, to best reveal the nature of civil society in Russia, future studies could address such an indicator of civil society development as associational membership (Howard, 2003). This indicator could not be addressed in the study due to the absence of corresponding data in Russia and therefore, the gap

could be filled in collaboration with sociologists and political scientists. Finally, a much more detailed analysis of institutional voids in Russia would benefit the research field.

References

- Bataeva B. S (2010). Directions of formation of the Russian model of Corporate Social Responsibility. *Izvestiya Sankt Peterburgskogo Gosudarstvennogo Universiteta*, pp. 67-72 (in Russian)
- Bernhard, M., & Karakoç, E. (2007). Civil Society and the Legacies of Dictatorship. *World Politics*, 59(4), 539–567. <https://doi.org/10.1353/wp.2008.0001>
- Burenko, V. & Zhuravlev, V. (2004). *Politology*. [online] Moscow, Russia: Ekzamen, pp.105–108. Available at: http://library.zsmu.edu.ua/cgi/irbis64r_14/fulltext/Politologija/BurenkoVI04_Polit.pdf. (In Russian)
- Charities Aid Foundation. (2010). *The World Giving Index 2010*. <https://www.cafonline.org/docs/default-source/about-us-publications/worldgivingindex28092010print.pdf>
- Charities Aid Foundation. (2018). *Charities Aid Foundation World Giving Index 2018: A global view of giving trends*. https://www.cafonline.org/docs/default-source/about-us-publications/caf_wgi2018_report_webnopw_2379a_261018.pdf
- Cooper, R. (2018). *What is Civil Society, its role and value in 2018?* . https://assets.publishing.service.gov.uk/media/5c6c2e74e5274a72bc45240e/488_What_is_Civil_Society.pdf
- DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147. <https://doi.org/10.2307/2095101>
- Fifka, M. S., & Pobizhan, M. (2014). An institutional approach to corporate social responsibility in Russia. *Journal of Cleaner Production*, 82(1), 192–201. <https://doi.org/10.1016/j.jclepro.2014.06.091>
- Freitag, M. (2006). Bowling the state back in: Political institutions and the creation of social capital. *European Journal of Political Research*, 45(1), 123–152. <https://doi.org/10.1111/j.1475-6765.2005.00293.x>
- Hegel, G. W. F. (1991). *Hegel: Elements of the philosophy of right*. Cambridge University Press.
- Khanna, T. and Palepu, K. G. (1997). Why Focused Strategies May Be Wrong for Emerging
- Knyazeva, M. (2011). *The functioning of non-profit organizations in the Russian Federation at the present stage and their impact on socio-economic processes*. Cyberleninka.ru. <https://cyberleninka.ru/article/n/funktsionirovanie-nekommercheskih-organizatsiy-v-rossiyskoy-federatsii-na-sovremennom-etape-i-ih-vliyanie-na-sotsialno-ekonomicheskie/viewer> (In Russian)
- Kuznetsov, A., Kuznetsova, O., & Warren, R. (2009). CSR and the legitimacy of business in transition economies: The case of Russia. *Scandinavian Journal of Management*, 25(1), 37–45. <https://doi.org/10.1016/j.scaman.2008.11.008>
- Matten, D., & Moon, J. (2008). “Implicit” and “Explicit” CSR: A Conceptual Framework for a Comparative Understanding of Corporate Social Responsibility. *Academy of Management Review*, 33(2), 404–424. <https://doi.org/10.5465/amr.2008.31193458>
- PricewaterhouseCoopers. (2020). *Совместная инициатива РвС и Фонда продовольствия “Русь” вышла на новый этап*. РвС. <https://www.pwc.ru/ru/press-center/2020/pwc-fondprodovolstviya-rus.html>
- Saini, A., Grewal, R., & Johnson, J. L. (2010). Putting market-facing technology to work: Organizational drivers of CRM performance. *Marketing Letters*, 21(4), 365–383. <https://doi.org/10.1007/s11002-009-9096-z>
- Schulmann, E. (2020a). *Political History of the 2000s: Lecture 22. Parallel to the State: the birth of*

- a civil society*. Wwww.youtube.com. <https://www.youtube.com/watch?v=o-YMaZGIP7g&t=756s> (In Russian)
- Shumilova A. A. (2013). Russian Institutional Model of Corporate Social Responsibility: Communal Ground. *American Journal of Economics and Control Systems Management*, 2
- Webb, J. W., Khoury, T. A., & Hitt, M. A. (2019). The Influence of Formal and Informal Institutional Voids on Entrepreneurship. *Entrepreneurship Theory and Practice*, 44(3), 104225871983031. <https://doi.org/10.1177/1042258719830310>
- Williamson, O. E. (1998). Transaction Cost Economics: How It Works; Where It Is Headed. *De Economist*, 146(1), 23–58.
- Wood, D. J. (1991). Corporate Social Performance Revisited. *The Academy of Management Review*, 16(4), 691-718. <https://doi.org/10.2307/258977>
- Yakobson, L.I. (2008). *Factors of civil society development and mechanisms of its interaction with the state*. [online] *HSE.ru*, p.242. Available at: https://www.hse.ru/data/2010/12/03/1209579576/Sanovich_Nekommercheskiy%20sector.pdf (In Russian)
- Zhavoronkov, S. (2018). *A brief history of rallies in modern Russia*. RIDDLE Russia. <https://www.ridl.io/ru/kratkaja-istorija-mitingov-v-sovremenn-2/> (In Russian)

The Reverse Logistics Contributions and Lessons in order to Provide Green Supply Chain Competitive Advantages

Patrícia Nunes Costa Reis, University Center of Volta Redonda - UniFOA (patricia.nunes@foa.org.br), **Annibal Scavarda**, Federal University of Rio de Janeiro (UNIRIO) (annibal.scavarda@unirio.br), **Flávio Machado**, Federal University of Rio de Janeiro (UNIRIO)

Abstract:

The study aims to analyze the role of Reverse Logistics in the green supply chain and highlight the contributions and lessons for the effective management of the green supply chain. This is a literature review whose data were collected through a survey of scientific productions on the themes: industrial revolutions, circular economy, sustainability, Reverse Logistics, green logistics and green supply chain, in order to support the research into the contributions and lessons of Reverse Logistics in order to provide competitive advantages to the green supply chain and product lifecycle through the sustainable management of operations in order to generate market differentiation.

Keywords: *Green Supply Chain. Organizations. Reverse Logistics.*

1. Introduction

Changes in the economy increasingly affect the production process, especially with the advent of technology. The transformations were significant in that they led society to progress that was, to a certain extent, questionable. The fact is that the first three industrial revolutions (I1.0; I2.0; and I3.0) brought countless advances to humanity. However, they contributed greatly to the destruction of the ozone layer, the emission of greenhouse gases and the deterioration of work. The 4th. Industrial Revolution (I4.0) stands out for the considerable use of information technology (IT), responsible for changes in the way of living, working and relating, quite different from anything that man has experienced previously (Schwab, 2018).

Data from the United Nations (UN) show that the global use of materials has tripled in the last 50 years, and effective actions are essential in order to prevent the numbers from doubling by 2050 in order to minimize environmental impacts, a result of the process of extracting, producing and to discard.

Another aspect to be taken into account is that society 4.0 is still tied to the linear economic model that is based on the manufacture of products from raw materials and waste discarded after use - take-make-use- dispose - (Jawahir; Bradley, 2016; Sørensen, 2018). In turn, Sauv e, Bernard and Sloan (2016) ratify that the linear economy, in fact, prioritizes economic objectives and is based on a simple process, where it withdraws, produces, consumes and discards, without taking into account the environmental and social aspects.

MacArthur (2012), in turn, emphasizes that the linear economy process points to two neuralgic factors: (I) structural waste and economic damage: the phenomenon of waste is at the base of production chains; and, (II) the degradation of natural systems: the fact that the linear model is centered on aspects that involve environmental degradation, whether by the use of natural resources or by the pollution caused by constant disposal.

In the search for new market trends, business organizations have been increasingly pressured by society to develop management models aligned with Sustainable Development Goals (SDGs),

understood as a development “that meets the needs of the present, without compromising the possibility of future generations to meet their own needs” (Comum, 1991, p. 46).

In this aspect, the model that is being used throughout Europe emerges, the circular economy that supports and motivates sustainable business innovation to close cycles (Bocken et al., 2016), increasing efficiency and environmental performance in different levels, including industrial areas (Wen; Meng, 2015). Circular economy is a concept based on the functioning of nature, which is opposed to the linear production process, so the inputs and residues that are used in the previous production of a product are reused in a subsequent one. In order to make this concept tangible, we can relate it to the cycle of nature in which the remains of decaying fruit become fertilizer in the soil for plants. And because of this relationship of zero residue in which there is the transformation of "nutrient" into "raw material" during the cycle, this system is also called "Cradle to Cradle", in free translation "from cradle to cradle".

Circular economy is more than a trend or plea for sustainability. In recent years, this dynamic has been gaining ground in several industrial projects. This took place after leaders and authorities became aware of the importance of reducing waste disposal and the dispersion of pollutants. Otherwise, the damage will be with the next generations, who will have to work hard to obtain natural resources that allow them to live in a dignified manner. Hence the importance of cyclical thinking about production and consumption, building processes focused on reuse, transformation and recycling.

Circular economy is a concept that sees manufacturing and consumption within a cyclical logic, extending the useful life of products. This dynamic is closely linked to sustainability, as it creates ways to make production more sustainable, that is, less dependent on natural resources to be carried out successfully.

In Europe, the policies related to the matter of circular economy do not stop growing and stand out across the continent. The result of this growth is credited to the European Commission, which, in 2015, approved an action plan to promote the transition from the linear to the circular economy. The plan comprised 54 measures to 'close the circle' in the life cycle of products and focused on 5 main sectors, including construction and demolition (Lerner, 2018).

In December 2019, the European Ecological Pact drew up a roadmap to transform the European economy into a modern, resource-efficient and competitive economy. In the meantime, the Dutch government has developed a bold project, which aims to turn the country 100% into a circular economy by the year 2050, by bringing together strategic actions to manage raw materials, products and services more efficiently, especially in terms of sustainable energy.

France, on the other hand, drew up a law against waste, approved in February 2020, which promotes the management and prevention of waste production, the improvement of consumer information, the fight against waste and the reuse of resources.

In this same aspect, Italy performs through the Italian Foundation for Sustainable Development, together with the NCCRRPP (National Consortium for the Collection, Recycling and Recovery of Plastic Packaging), Italy, for example, is in the top positions of the Europe, in the circular economy, despite requiring structural changes that can facilitate the transition to a green economy through the efficient use of resources.

Germany leads the way in waste management and rigorously develops the concept of circular economy. In Luxembourg, public administrations are working hard to implement remedial measures within the 6 main sectors: food, industry, construction, energy, mobility and finance. Belgium, Portugal and Spain follow the same line and have the full support of governments in promoting awareness in relation to resource management.

In Brazil, influential businessmen and politicians express support for the implementation of the circular economy. However, the development of sustainable public policies in order to effect the transition from the linear to the circular system has been postponed due to divergent interests, which

imply new challenges in the areas of research and development, design, eco-innovation, in production processes and modes of consumption (Lemos; Teixeira; Bento, 2018). As a result, data extracted from Macarthur (2017) show that in Brazil, the unrestrained consumption in recent years has led to an increase in the linearity of the entire productive sector, and in 2012 24.2 million tons of equipment were introduced in the Brazilian market. electronics, which caused 1.4 million tons of electronic waste, which is equivalent to 7 kg of waste per individual.

It is known that production and logistics are closely linked, so much so that as production has increased over the years, logistics has also evolved. From this perspective, Supply Chain Management, also known as Green Supply Chain Management or Sustainable Supply Chain Management, has also received greater attention from researchers and professionals active in the supply chain, as it integrates environmental issues into manufacturing operations in order to reduce operating costs in the product life cycle, waste generation and pollutant emission.

At first, the supply chain has in its scope to seek to mitigate health problems and use resources in a more sustainable way, such as the remanufacturing of operations, recycling, reuse, as established in the eco-model. circular economy. Reverse Logistics (RL), on the other hand, deals with recycling via the return of previously consumed materials, exchange of products, reuse of products, orderly distribution of waste and remanufacturing of returned goods, being essential in the process of the circular economy.

2. Industry 4.0 and Circular Economy

Industry 1.0 (I1.0) introduced the use of the steam engine in production processes. This episode brought an enormous productivity gain and enabled the formation of large-scale industries (Schwab, 2018).

In the mid-1850s, Industry 2.0 (I2.0) emerged, which coincided with the beginning of mass production and assembly lines with the aid of electricity and the advancement of means and communication, the development of the chemical industry and others. sectors (Schwab and Davis, 2018).

Industry 3.0 (I3.0) emerged in the second half of the 20th century, with information as the main raw material. At that time, the computer emerged and advances in practically all areas of knowledge, atomic manipulation and space technology, oil exploration, biotechnology, fine chemistry, in addition to nanotechnology (Boucherat, 2016)

Industry 4.0 (I4.0) highlights the strong use of information technology (IT) in industry, an intense technological revolution responsible for changes in the way of living, working and relating, quite different from anything that man has experienced before. Furthermore, it brings together the concept of intelligent factory, aggregating nanotechnology, robotics, artificial intelligence, internet of things, cloud computing, among others. In summary, I4.0 unites automation, information technology and other innovations applied in manufacturing, generating value-added products, with a more intense substitution of man for machine. According to some authors, it is the path to Industry 5.0 (I5.0), connecting man, machine and the world in the era of intelligence.

In fact, Industry 4.0 has opened up a range of opportunities with the advent of technology where materials processing and data tracking can emerge. At the same time that scalable possibilities are created, technological development with socio-environmental impact is reconciled. Consequently, I4.0 has taken into account the environment as a strategic factor in the context of business management, due to the need to protect finite natural resources and prevent pollution. The dynamic has been shared with stakeholders, in order to establish a new economic model that guarantees productivity, considering the externalities of all processes (Stahel, 1982).

The fact is that the dynamics used around Industry 4.0 drive the transition towards a circular economy. The Internet of Things, for example, allows the company to track a material throughout its

life, from initial production, use by users and its destination for a new life cycle. In other words, the connectivity and tracking of materials allow this circularity much more efficiently and at lower costs, boosting the generation of business models that are viable and more efficient.

It is corroborated that technological development achieves the optimization of productive processes with production acceleration, raises capacity gains and greater productivity, however the exploitation of natural resources is very high, hence the need to migrate to an economic system based on the circular economy.

For the authors Bocken et al (2014); Boons and Lüdekefreund (2013); and, Wells, (2013) the circular economy deals with an economic system based on business models that replace the concept of 'end of life' of the product through the reduction, reuse and recycling of materials in the production, distribution and consumption. In this way, circular economy goes beyond the concepts of the aforementioned 3Rs, re-reduction, reuse and recycling of waste to maximize resource.

The concept of circular economy appears in opposition to the conventional perception that economic systems are linear. This new model is restorative and can increase the life cycle of products through sustainable operations that generate market differentiation, in addition to enhancing a solution to minimize the human impact on the environment, and came with the purpose of re-signifying the way as the companies design products and deal with waste, which can be a great ally in reducing the marine waste generated (De Assunção, 2019).

The circular economy proposal cultivates the thought of seeking to prolong the useful life of products and materials, keeping them at all times at their highest level of utility and value, and for that, it aims to change the way of thinking about the production and consumption relationship.

Taking advantage of the circularity of products, it is important to emphasize that the theme "sustainability" is another indispensable pillar in this new industrial era, since the debate on cleaner production is under the spotlight of the market and has been a differentiating factor, including, in the consumer's purchase decision.

3. Sustainability: Connection between Circular Economy and Reverse Logistics

Currently, economies considered unsustainable lose space in the market (Pérez, 2013). Sustainability is an organizational issue, as environmental legislation, such as the National Solid Waste Law and the Forest Code, among others, guide organizations to be more responsible for environmental damage resulting from their production processes (Barbieri, 2008). According to Rome (2109), sustainability corresponds to an instrument of social and ecological transformation with an emphasis on development, growth in a renewed way, different from the current one.

In the literature, there is a variety of definitions on the theme of sustainable development (Lindsey, 2011). However, the meanings of these terms vary in the literature due to the number of perspectives and links to the context and field of action (Stepanyan, Littlejohn and Margaryan, 2013).

In favor of sustainable development, the United Nations Conference, in 2012, in Rio de Janeiro constituted 17 SDGs identified in Figure 1, which can meet the most urgent environmental, political and economic challenges, by fact that it needs a short-term solution. It is noteworthy that the SDGs replace the Millennium Development Goals (MDG), initiated in 2000 with the intention of combating the indignity of poverty. Thus, the goals of the SDGs come from a universal UN recourse to action to eradicate poverty, protect the planet and ensure that all people have peace and prosperity.

Figure 1: The 17 SDGs



Source: United Nation (2015).

The 17 goals built on the achievements of the MDGs also include new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. Objectives are interconnected – often the key to the success of one will involve addressing issues most commonly associated with the other (De Queiroz, 2021).

RL, on the other hand, refers to any and all operations related to the reuse of materials and products. It is defined as the process of planning, implementing and controlling the efficient and economic flow of raw materials, as well as in-process inventory, finished products and information from the beginning of the supply chain to the end (Stock, 1998).

The term sustainability was first used in the context of development in 1974 in a series of conferences on forest issues (Kidd, 1992). Sustainable development, on the other hand, corresponds, according to Barter and Russell (2012), to the internalization of strategies, thus adding new resources to enable economic growth and prosperity shared by all.

RL opens up a range of opportunities both in academia and among supply chain professionals, as it is an instrument for the practice of sustainability and also because it plays a strategic role in many economic segments.

According to the term RL, it refers to the role of logistics in product return, source reduction, recycling, material replacement, material reuse, waste disposal, refurbishment, repair and remanufacturing.

Leite (2009) considers RL to be the area of business logistics that is concerned with the logistical aspects of returning to the business and/or production cycle of after-sales and post-consumer goods.

The Council of Supply Chain Management Professionals – CSCMP (2010) conceptualizes RL as a specialized segment of logistics that focuses on the movement and management of the reverse flow of products and materials after sale and delivery to the consumer, covering the processes of returned products for repair and/or financial reimbursement.

The fact is that logistics focuses on various processes with the objective of moving materials and/or products, from production to the final consumer, taking into account quantity and time

(Carvalho, 2016). Production and logistics are closely linked, that is, as production has increased over the years, logistics has also evolved, both due to the demand for greater production and the development and application of information technology in logistics, comment Cavalcanti et al. (2019).

Population growth and the intense use of technology in production have generated a need to extract natural resources faster, causing environmental imbalance capable of putting the ecosystem at risk, considered a system formed by the interrelationship of living beings with the environment (Peña et al., 2017).

Due to this dynamic, the extended responsibility of manufacturers and importers in relation to products after their useful life and packaging has become increasingly common, due to the strictness of environmental legislation, which in a way raises actions to implement the Systems of RL

Ballou (2006) clarifies that logistics deals with all handling and storage activities that favor the flow of products/services, from the acquisition of raw materials to final consumption, without omitting the information flows that they place. moving products in an attempt to provide adequate levels of customer satisfaction at a reasonable cost.

The advent of information technology enabled dynamic integration, which streamlined the supply chain. Currently, there is a strategic integration of logistical processes. Companies are looking for new solutions, using logistics to gain competitiveness and new business. Logistics became a differentiator, a strategic brand in the search for greater market share. The causes of this advent are globalization and increasingly fierce competition between organizations (Novaes, 2007).

When organizations are constituted in geographic proximity, as in the various types of industrial clusters, then negative environmental impacts arise in the region. However, this configuration also enhances several advantages such as logistical issues, establishment of joint actions, greater investments in knowledge and technology, among others.

With regard to product development, the process involves the steps, activities, tasks, stages and decisions of a new product or service, or even the improvement of an existing one throughout its life cycle (Salgado et al., 2010).

4. The role of Reverse Logistics for the Green Supply Chain

In the industrial field, RL is often used for heavy machinery, in the electronics and plastics sectors. It should be noted at this point that RL can replace defective parts, repair used or damaged products, in addition to restoring returned items and issuing "call-back" or recall for a series of harmful or defective products (Calado, 2016).

In the meantime, a new environmental sustainability mechanism appears in the operating system of companies, Green Logistics, originating from Logistics and considered viable solutions for the environment with regard to reducing the environmental impact, favoring the preservation of health, space and the environment (Silva; D'andréa, 2009).

Reasoning about Supply Chain Management is talking about business intelligence, with a systemic approach and relationship networks that it focuses on, according to Lazzarini et al. (2008), the creation of value through the optimization of production and operations, the reduction of transaction costs and the appropriation of property rights.

Green Supply Chain Management (GSCM) is the integration between all members of the chain and its partners, with the aim of improving environmental performance, reducing waste, and thus obtaining cost savings, improving the company's image. The GSCM focuses on environmental issues between companies, and covers the industrial ecosystem, industrial ecology, product lifecycle analysis, supplier responsibility and product management.

Lambert et al. (1998, p. 504) define supply chain as the "alignment of firms to bring products to market". In the international arena, the GSCM has been studied from different methodologies,

industry sectors and approaches (Srivastava, 2007), however, Brazil has weaknesses regarding the mapping of studies on GSCM that address all articles published in congresses of the area in a given period.

The nomenclature of green supply chain management emerged from the connection between concern for the environment and the development of the supply chain. Another important aspect was the incorporation of environmental criteria in the entire process, such as purchases, storage, disposal and management of the products' life cycle.

Furthermore, a green supply chain suggests the organization to spend less on transport and optimize routes, automate the transport planning process, simplify automation and mobility solutions, reduce the expense of natural resources by having a paperless process, and effectively use collaborative forecast planning to save time and energy.

In a way, RL contributes to the green supply chain in an attempt to increase good results in production, company revenue, reduce raw material consumption, decrease energy and water resources, invested capital, and reduce residues that are produced during production (Silva, 2018).

Cheng et al. (2011) consider that the existence of a strategic planning, implementation and efficiency control of the raw materials used in production, so that value recovery can be achieved, can also contribute to the maintenance of Reverse Logistic for GSCM.

5. Method

This is a literature review whose data were collected through the survey of scientific productions on the themes: industrial revolutions, circular economy, sustainability, RL, green logistics and green supply chain, in order to support the research on the contributions and lessons of RL, in order to provide competitive advantages to the green supply chain and the product life cycle through the sustainable management of operations, in order to generate market differentiation.

6. Results and Discussion

The bibliographical review carried out allowed us to realize that changes in the economy are increasingly affecting the production process, especially with the advent of technology. It was confirmed that society 4.0 is still linked to the linear economic model that is based on the manufacture of products from raw materials and waste discarded after their use, even in the face of UN indicators where it is found that the global use of materials has tripled in the last 50 years, and effective actions are essential in order to prevent the numbers from doubling by 2050 in order to minimize environmental impacts, a result of the process of extracting, producing and discarding.

It so happens that in Europe, policies related to the matter of circular economy do not stop growing and stand out across the continent. However, in Brazil, the development of sustainable public policies in order to effect the transition from the linear to the circular system has been postponed due to divergent interests, which imply new challenges in the area of research and development, from design, eco-innovation, production processes and modes of consumption. Parallel to I4.0, the circular economy appears in opposition to the conventional perception that economic systems are linear.

It is important to emphasize that the theme "sustainability" is another indispensable pillar in this new industrial era, since the debate on cleaner production is under the market spotlight and has been a differentiating factor, even in the consumer's purchase decision. In the meantime, a new environmental sustainability mechanism appears in the operating system of the companies, the Green Logistics, originating from Logistics and considered viable solutions for the environment with regard to the reduction of the environmental impact, favoring the preservation of the health, space and the environment.

Consequently, the correlation of the circular economy and sustainability must also be considered in the processes of territorial and sectorial increment that force limitations of

the economic scale to the capacity of natural capital, to the rates of use and recovery of natural resources, to proportional exploitation, to creation of renewable substitutes for non-renewable resources, the emission of gases and waste and compliance with environmental requirements and regulations.

7. Conclusion

This study developed a literature review with the intention of analyzing the role of RL in the green supply chain. After investigation, it was possible to identify the contributions of RL to provide competitive advantages. Europe has its own legislation and strict control.

Sustainable development, as a reconciliation of economic, social and environmental aspects, has become a guide for organizations in their processes of production, operation and commercialization of goods and services. However, sustainability is a cultural and behavior change issue.

It is concluded that both RL and sustainability correspond to a new business management model, in which organizations have to be systematically concerned with social and environmental impacts, as well as economic issues. It is suggested to continue the studies to discuss the need to align the proposals of Industry 4.0 with the circular economy system and reverse and green logistics, in the search for intelligent, efficient and environmentally planned processes as responses to new legal and to more conscious consumption behaviors. It is ratified that, given the current global scenario, RL contributes to the return of post-consumer materials (after being used by consumers), to a safe destination or to the revaluation of the production chain through recycling.

References

- Barbieri, J. C., 2008. *Gestão ambiental empresarial*. 2.ed. atual. E ampl. São Paulo: Saraiva.
- Barter, N., Russell, S., 2012. *Desenvolvimento Sustentável: 1987 a 2012 - Não seja ingênuo, não se trata de meio ambiente*.
- Bocken, N. M. P. et al., 2014. A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, pp.42–56. Available at: <http://dx.doi.org/10.1016/j.jclepro.2013.11.039>.
- Ballou, R. H. 2006. *Gerenciamento da cadeia de suprimentos/logística empresarial*. 5. ed. Bookman, Porto Alegre.
- BARTER, N., RUSSELL, S., 2012. Sustainable Development: 1987 to 2012 – Don't Be Naive, it's not about the Environment. In: 11th australasian conference on social and environmental accounting research (a-csear). Pro-ceedings. University of Wollongong, pp. 1-18.
- Boons, F. & Lüdeke-Freund, F., 2013. Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. *Journal of Cleaner Production*, 45, pp.9–19. Available at: <http://dx.doi.org/10.1016/j.jclepro.2012.07.007>.
- Boucherat, X., 2016. Industry 4.0 e a ascensão da manufatura inteligente. *Revista Automotiva Megatrends*, pp. 59-61.
- De Queiroz, J. N., da Silva et al., 2021. Ações Adotadas Pelas Empresas Da B3 Alinhadas Com Os 17 Objetivos De Desenvolvimento Sustentável (ODS): Uma análise dos relatórios de sustentabilidade. *Revista Mineira de Contabilidade*, 22(2), pp.37–50. Available at: <http://dx.doi.org/10.51320/rmc.v22i2.1217>.
- Calado, I.A. et al., 2016. Design e logística reversa na empresa de móveis planejados AIAM. *Blucher Design Proceedings*. Available at: <http://dx.doi.org/10.5151/despro-ped2016-0470>.
- Campello, M., 2019. Uma breve análise sobre a evolução da logística. Resende: XVI SEGeT - Simpósio de Excelência em Gestão e Tecnologia – AEDB, Resende.

- Carvalho, D.F., Barata, A.J.S.S. & Alves, R.R., 2016. Logística reversa de lixo eletrônico nas organizações públicas. *Ciência e Natura*, 38(2), p.862. Available at: <http://dx.doi.org/10.5902/2179460x21874>.
- Cavalcanti, H. S.; Gomes, J. S. O.; Lopes, K. K. J.; Souza, N. A.; Campello, M., 2019. Uma breve análise sobre a evolução da logística. Resende: XVI SEGeT - Simpósio de Excelência em Gestão e Tecnologia – AEDB, Resende.
- Cheng, T.C.E., Gao, C. & Shen, H., 2011. Production planning and inventory allocation of a single-product assemble-to-order system with failure-prone machines. *International Journal of Production Economics*, 131(2), pp.604–617. Available at: <http://dx.doi.org/10.1016/j.ijpe.2011.02.005>.
- Comum, N. F., 1991. Comissão mundial sobre meio ambiente e desenvolvimento. Rio de Janeiro: FGV.
- Council of Supply Chain Management Professional - CSCMP., 2010. Glossary of terms. CSCMP, 2010.
- De Assunção, G.M., 2019. A gestão ambiental rumo à economia circular: como o Brasil se apresenta nessa discussão. *Sistemas & Gestão*, 14(2), pp.223–231. Available at: <http://dx.doi.org/10.20985/1980-5160.2019.v14n2.1543>.
- Jawahir, I.S. & Bradley, R., 2016. Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing. *Procedia CIRP*, 40, pp.103–108. Available at: <http://dx.doi.org/10.1016/j.procir.2016.01.067>.
- Kidd, C.V., 1992. The evolution of sustainability. *Journal of Agricultural and Environmental Ethics*, 5(1), pp.1–26. Available at: <http://dx.doi.org/10.1007/bf01965413>.
- Lambert, D. M., Stock, J. R., & Ellram, L. M., 1998. *Fundamentals of logistics management*. New York: McGraw-Hill, 1998.
- Lerner, D.A., Hunt, R.A. & Dimov, D., 2018. Action! Moving beyond the intendedly-rational logics of entrepreneurship. *Journal of Business Venturing*, 33(1), pp.52–69. Available at: <http://dx.doi.org/10.1016/j.jbusvent.2017.10.002>.
- Lindsey, T.C., 2011. Sustainable principles: common values for achieving sustainability. *Journal of Cleaner Production*, 19(5), pp.561–565. Available at: <http://dx.doi.org/10.1016/j.jclepro.2010.10.014>.
- Macarthur, E. et al., 2013. Towards the circular economy. *Journal of Industrial Ecology*, pp. 23-44.
- Novaes, A. G., 2007. *Logística e Gerenciamento da Cadeia de Distribuição*. 3ª Edição. ed. Rio de Janeiro: Campus Elsevier.
- Peña, B. K., Azevedo, E., Reis, G. O., Mori, H., Lima, I. X., Meleiro, M. V., & Campello, M., 2017. Logística reversa da empresa Natura Cosméticos S/A. Resende: XIV SEGeT-Simpósio de Excelência em Gestão e Tecnologia–AEDB, Resende.
- Pérez B. V. Qué es el crecimiento verde? 2013. Resumen especial sobre la Jornada ISO 14001:2015. Available at: <http://revoluciontrespuntocero.com/que-es-el-crecimiento-verde/>
- Roma, J.C., 2019. Os objetivos de desenvolvimento do milênio e sua transição para os objetivos de desenvolvimento sustentável. *Ciência e Cultura*, 71(1), pp.33–39. Available at: <http://dx.doi.org/10.21800/2317-66602019000100011>.
- Salgado, E.G. et al., 2010. Modelos de referência para desenvolvimento de produtos: classificação, análise e sugestões para pesquisas futuras. *Revista Produção Online*, 10(4), p.886. Available at: <http://dx.doi.org/10.14488/1676-1901.v10i4.520>.
- Sauvé, S., Bernard, S., & Sloan, P., 2016. Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. *Environmental Development*, 17, 48-56.
- SI SILVA, F.C.D. et al., 2018. Barreiras à gestão da cadeia de suprimentos verde na indústria automotiva. *Revista de Administração de Empresas*, 58(2), pp.149–162. Available at: <http://dx.doi.org/10.1590/s0034-759020180204>.

- Sørensen, P.B., 2018. From the Linear Economy to the Circular Economy: A Basic Model. *FinanzArchiv*, 74(1), p.71. Available at: <http://dx.doi.org/10.1628/001522118x15097191506475>.
- Stahel, W. R., 1982. The product life factor. An Inquiry into the Nature of Sustainable Societies: The Role of the Private Sector (Series: 1982 Mitchell Prize Papers), NARC.
- Shibao, F. Y., 2011. Cadeia de suprimentos verde: um estudo nas indústrias químicas no Brasil. 308 f. Tese (Doutorado em Administração de Empresas) - Universidade Presbiteriana Mackenzie, São Paulo.
- Schwab, K. M., 2018. A quarta revolução industrial. EDIPRO, São Paulo.
- Schwab, K., & Davis, N., 2018. Shaping the future of the fourth industrial revolution. Currency.
- rivastava, S.K., 2007. Green supply-chain management: A state-of-the-art literature review. *International Journal of Management Reviews*, 9(1), pp.53–80. Available at: <http://dx.doi.org/10.1111/j.1468-2370.2007.00202.x>.
- Stepanyan, K., Littlejohn, A., & Margaryan, A., 2013. Sustainable e-learning: Toward a coherent body of knowledge. *Journal of Educational Technology & Society*, 16(2), 91-102.
- Stock, J. R. (1998). Development and implementation of reverse logistics programs. In Annual conference proceedings, council of logistics management.-
- wells, P. E. Business models for sustainability. Cheltenham: Edward Elgar Publishing Limited, 2013.
- Wen, Z., & Meng, X., 2015. Quantitative assessment of industrial symbiosis for the promotion of circular economy: a case study of the printed circuit boards industry in China's Suzhou New District. *Journal of Cleaner Production*, 90, 211-219.

Entrepreneurial Inclusive Civil Culture Model in Parque Agroecológico de Zapopan

José G. Vargas-Hernández, Instituto Tecnológico José Mario Molina Pasquel y Henríquez (jvargas2006@gmail.com), Omar C. Vargas-González, Instituto Tecnológico de México-Campus cd. Guzmán (ocvargas@itcg.edu.mx)

Abstract:

This research aims to analyze the model of entrepreneurial inclusive civic culture created and developed in the Agro ecological Park of Zapopan (PAZ). Based on the need to rescue vacant urban land use with the participation of residents residing in the surrounding colonies, social movements, civil society, and local government, they have designed and implemented actions to create PAZ (PEACE) as an area of green innovation. In addition to the cultivation of vegetables, medicinal plants, and decoration under relations of cooperation, trust and community support, the formation of social capital that sustains a culture of peace based on environmental sustainability activities. The results of the implementation of this project, born from bottom of the social and power structures, constitute a significant experience in the regeneration of public spaces and green areas that provides greater economic efficiency in terms of family income, a greater relevance of equity, inclusion and social justice and improvement of environmental sustainability.

Keywords: *Inclusive civic culture, agro ecological park, environmental sustainability, Zapopan.*

Introduction

There is an increasing number of urban inhabitants that have migrated from their rural locations and have no other means of generating income which have contributed to have all added to high levels of poverty, especially among the households headed by women. Moreover, poor households in urban communities protect themselves from income risks by seeking and diversifying their sources of income such as formal employment and some informal small scale entrepreneurial activities, which only provide the necessary for subsistence and is not secure.

It has been historically evident the restrictions on creating and developing an entrepreneurial inclusive civic culture because the poor support from public, governmental, private, or social organizations and institutions in terms of providing access to scarce resources and skill training.

The motivation to conduct this study springs from these needs and have different intentions. One is the global struggle for urban community development to address the main issues of global sustainable development goals in areas such as food, health, security, etc. The emerging sanitary, economic, social, political, and cultural crisis intersecting access to resources and skills with social inclusiveness, inequality and justice, economic growth and efficiency, and environmental sustainability.

The motivation of this study emerges from the question How do actor with diverse and compiling interests work out their differences to work on a community project? The rationale for undertaking this analysis is to identify to what extent community changes and transformations into a more oriented entrepreneurial inclusive culture can contribute economic, social, and environmental development.

Attached to this question are other important motivations: There is misleading wide-spread assumption based on the argument that community development is linear and continuous. This study intends to demonstrate the reality based on the assumption that community development in one domain may coexist with inequality in others. However, the study goes beyond to demonstrate that community development can be more harmonious in all domains if all the stakeholders involved have the intentions to overcome the determinants that are the obstacle by promoting changes toward a more entrepreneurial inclusive civic culture.

This study analyses the factors that successfully contribute to social transformation of a community through the creation and development of an entrepreneurial inclusive civic culture based on agro ecology and green practices in an urban space. The analysis highlights the empowerment of disadvantaged inhabitants to gain access to natural resources and skills to enable and sustain the implementation of an entrepreneurial inclusive civic culture in a community that allow them to gain economic growth, social inclusiveness and justice, and environmental sustainability.

This study has an impact on design and implementation of public policy and local governance, research, and practice. It can be a guide to replicate the study and achieve the social and community benefits.

Location as a determinant factor

The Zapopan agro ecological Park is in “Cerrada Santa Laura” within Santa Margaritas colony in the municipality of Zapopan, State of Jalisco. The located zones will be defined within the municipality of Zapopan. The population of Zapopan in 2015 according to Inter Census Survey was 1,332,272 people: 48.8 percent of men and 51.2 percent of women. The municipality of Zapopan registered the highest education levels in 2012 with 10.4 years as the average. Zapopan also has the lowest education gap (28.6%) and follows Guadalajara in concentration of the enrollment with 27.0% (Plan Estatal de Desarrollo Jalisco, 2013).

Natural resources and economics

The natural wealth of the municipality is represented by 11,400 hectares of forest, where pine, encino, creton, jonote, madroño, oak, oyamel and tepame predominate. Its mineral resources are deposits of marble, kaolin, feldspar, agate, tezontle, gravel and sand (clay). The vegetation of the municipality is conformed mostly by pine and encino; both species are in the forests of the municipality: “El bosque de la primavera”, “Bosque de Nixticuil” and “Bosque del Centinela”. Local crops include vegetables, fruits and seeds like corn, sorghum, zucchini, tomato, chickpea, avocado, mango and plum. Poultry, beef cattle, pig, sheep, goat meat and hives are also raised. A great industrial activity is developed. Companies like: Motorola and Coca-Cola, among others. According to (DENU), the municipality of Zapopan by 2015 had 49,543 economic units and its sectors showed a predominance of economic service units, representing 47.3% of the total companies within the municipality (IEEG, 2016). The number of insured workers also increased this year, where IMSS reported a total of 327,641 workers newly registered, representing in 55,025 more insured workers compared to the same month in 2012 (IEEG, 2016).

Gross Domestic Product in 2015 was 889,703 pesos at 2008 prices. The per capita gross domestic product was 146,746 pesos (INEGI, 2015). The participation of Zapopan in the Gross Domestic Product in 2000 was 10630.2 (adjusted million dollars), which represented 31.9%, placing it in the

second municipality in Jalisco, only after Guadalajara with 43.6% (Ayuntamiento de Tlajomulco de Zúñiga, Jalisco, 2015). GDP of Guadalajara and Zapopan as a percentage of the GDP of Jalisco 2000-2009 at current prices were 10.22. From the analysis of these data, it can be observed that there was a reduction in Zapopan for the GDP.

Zapopan is also one with highest index of wealth and income in the GDP of the State of Jalisco. Its urban panorama is made up of modern buildings and luxurious shopping centers, residential housing, and green areas, that show the highest level in the metropolitan area (Zona Guadalajara, 2017).

The Agro ecological Park has a community garden where the citizens can grow and harvest organic food, a classroom, built with natural materials, a module of dry ecological baths, a nursery area for plant production, a compost area for fertilizer processing and recycling nutrients, an edible forest, a rainwater harvesting and distribution system and an ecological market area. The surface it's occupied by the project which has 1.8 hectares, a neighborhood with about 40 thousand inhabitants, near the Pedagogical Water Forest in the Colomos III Forest. Both parks are connected as part of a network of agro ecological parks in the Guadalajara Metropolitan Area.

What used to be a rubble and rubbish dump, is now the first Agro ecological Park in Zapopan, thanks to the work of the neighbors, the Teocintle Collective and with government support. It was inaugurated on March 27, 2015, by the Mayor Héctor Robles Peiro. The "Pedagogical Forest of Water" has local and national connection to roads, ports, railways and walking accessibility to markets & customers.

Environmental and territorial conditions

The Municipal Urban Development Program of Zapopan aims to establish urban and environmental policies based on the determinations of the current programs and plans of the State Planning System, adequate and adjusted to the local needs and considering the established by the applicable environmental instruments in the municipal territory. The nature and characteristics of the Zapopan's ecosystem, within the environmental regionalization of the state is characterized by the environmental impact of new human settlements, agricultural, industrial, and commercial and service works or activities. The presence of more than half of the total population of the State in the Metropolitan Area of Guadalajara, being the municipalities of Guadalajara and Zapopan that shelter the greater part of this, generates a series of environmental and mobility problems.

The Agroecological Park was all constructed with natural materials. It counts with a main building, a classroom, an office, a small room that has domestic technologies, dry bath module and a community garden fenced with 47 beds of cultivation (10m2 each) plotted by Tierra Cruda but excavated in the rubble by Collective Teocintle Agro ecological and volunteers; Bamboo structure for composting and nursery of nurseries. It also has a winery that was built by Farid Morales in collaboration with DIF Zapopan, Collective Teocintle Agro ecological and other volunteers, while the bamboo structures were given and placed by Fernando Partida of BambuXal also with the help of collective.

Theoretical approach: entrepreneurial inclusive civic culture

Entrepreneurship, inclusiveness, civil and culture are variables that have complex but straightforward linkages and processes among them, and much is still unknown. The last few years have witnessed the generation of extensive theoretical and empirical literature on entrepreneurship and its impact at the levels of regional and firm economic performance (Holmes and Schmitz, 1990;

Evans and Leighton, 1990). However, when linking entrepreneurship to the variables of inclusiveness and civic culture, the literatures is inexistent. There is a relative void, despite some recent efforts to study the relationship between entrepreneurship in some other related fields beyond economic growth, which may be attributable to the lack of theoretical frameworks.

However, studies in economic development have shown reversed causality influencing entrepreneurial activities. Entrepreneurial activities tend to be overestimated in regions where there are start-ups playing a relevant role while entrepreneurship activities tend to be underestimated in regions where there is a new entrepreneurial formation and the startups are relatively few (Baptista, Escária, and Madruga, 2017).

The role of entrepreneurship in economic development has received some attention by researchers that have the intuition that there is an impact of entrepreneurship on employment and social development. Entrepreneurial intentions promote entrepreneurial behaviors (Krueger et al., 2000; Veciana et al., 2005; Souitaris et al., 2007). Entrepreneurship activity can be associated with human necessity providing an opportunity to earn money for living, until better alternative opportunities are found on the labor market (Carree and Thurik, 2010).

The concept of entrepreneurship is multidimensional and related to individual willingness, abilities, and activities on their own, in teams and in organizations to make decisions facing obstacles and uncertainty on the use of institutions and resources to create and develop new opportunities (Wennekers and Thurik, 1999). Entrepreneurial opportunities are the result of unemployment the influences start-up activity, the effect of a thriving economy and experience in entrepreneurial activities (Lin, Manser and Picot, 1998; Pfeiffer and Reize, 2000).

Entrepreneurship is the recognition and exploitation of opportunities leading to the creation and development of a firm (Aragon-Sanchez, Baixauli-Soler, Carrasco-Hernandez, 2017). Moreover, entrepreneurial intentions predict entrepreneurial behaviors, according to the theory of planned behavior (Ajzen, 1991). Entrepreneurial activity creates opportunities to influence economic performance (van Stel, Carree and Thurik, 2005) such as entering the markets with new production processes and products (Acs and Audretsch, 2003). Among the entrepreneurial models there is evidence that the entrepreneurial intentional models (Krueger et al., 2000) supports the theory of planned behavior.

The theory of planned behavior has been used in the analysis of entrepreneurial intentions (Shook et al. 2003). The determinants have significant positive relationships with behavior intention (Armitage and Conner 2001). Do Paço et al. (2011) found a positive and significant influence between entrepreneurial intentions, attitudes, and perceived behavior control. However, subjective norms have an indirect impact on entrepreneurial intentions.

The determinants of entrepreneurial intentions are linked by the access to financial, natural, human, and cultural capital and resources through the influence of attitudes, individual subjective norms, perceived social control and self-efficacy. The attitude is the individual favorable evaluation to start a new opportunity. Individual subjective norms are the perceived social pressure to start a new opportunity and perceived social control and self-efficacy is the perceived ease to start a new opportunity.

Based on the Shapero and Sokol (1982) model, attitudes and subjective norms are linked to desirability and perceived behavioral control or self-efficacy with feasibility (Krueger et al., 2000).

It is suggested in this analysis that these determinants of entrepreneurial intentions may lead to inclusive civic culture behaviors influenced by access to resources.

Inclusiveness is an all-embracing societal ideology embedding the policy and practice of including all individuals who might otherwise be excluded or marginalized due to its personal conditions such as being member of minority groups, having physical and mental disabilities, etc. As a social determinant, social inclusiveness is the improvement of conditions in which the individuals and groups participate in society, communities and organizations improving their dignity, abilities, and opportunities of being disadvantaged on their basis of personal and group conditions such as their identity.

An inclusive community project is one that has not restrictions to membership due to age, gender, sex, ethnic origin, race, religion, etc. Therefore, nobody is excluded from the program and enables all the inhabitants for economic, social, political, and cultural participation. Participation of all urban inhabitants without any restriction in a community agro ecological project based on relationships of trust and cooperation to create an entrepreneurial inclusive civic culture and social capital as the major achievements, demands economic efficiency, social justice, political democratic participation, and cultural dispensations.

Cultural relativism and postmodernism have received critical attention in the literature of inclusion (Villa & Thousand, 2000). The social constructivist model of inclusiveness is advocated by the alternative post-modern paradigm that treat human disabilities as being inclusion (Zaretsky, 2005) beyond the functionalist paradigm that considers the disability to be a pathology.

Civic culture is an issue much discussed in the 1960s and since then has become an important determinant of entrepreneurial intentions and opportunities with the study of Putman (2002, 2000, 1993, Putnam et al. 2000) on democracy and social capital. Civic culture is an awareness of political behavior embedding individual attitudes, habits, emotions, and sentiments related to the functioning of democratic societies, institutions and organizations that have implications in the democratic rights and decision-making processes. Civil culture assumes the attitudes and values related to norms of civility and good citizenship, strengthening relationships of cooperation and trust, increased level of tolerance and good society, supportive behaviors of engagement, commitment, and involvement in democratic processes.

Civic culture from the theoretical perspective of Almond and Verba (1965) in civic culture; Almond and Verba (1989) in their classic work, "Civic culture revisited" consider it to be a balanced mix of orientations in which political activity, involvement and rationality are balanced by passivity, tradition, and commitment. with parochial values (Almond and Verba, 2001). Civic culture goes beyond the activist rationality model that justifies political participation, information and decision-making guided by reason and not by emotions.

The interest of this study is to identify some of the key intersections among the determinants of the stakeholder's intentions that leads to entrepreneurial in terms of their interests and access to opportunities in an inclusive civic culture in an urban community. Stakeholders are heterogeneous, distributed, and may be dependent, independent and inter dependent, and their interrelationships are complex.

Methods

The research questions: In seeking to understand the role that the entrepreneurial inclusive civic culture plays in promoting socio-economic transformations in urban communities, some of the questions that this study addresses are:

- 1) How do actors embedded in different and disparate logics create and develop a new logic that builds an entrepreneurial inclusive civic culture, trust between each other's, shared understandings and governs interactions across different fields of interest interests?
- 2) What are the main success determinant factors that have contributed to the development of entrepreneurial inclusive civic culture intentions have led to the achievement of socio-economic and environmental transformation of an urban community?
- 3) What are some of the main obstacles and challenges as determinant factors that hamper the entrepreneurial inclusive civic culture of an urban community?
- 4) How can this transformative intervention be implemented in other urban communities with more efficiency and effectiveness to ensure economic, social, and environmental sustainability?

To address and answer these questions, it was conducted a qualitative analysis of a multi-stakeholder based on a case study. Methodology employed through grounded multi-stakeholder social and community constructions in action.

For data gathering the instruments employed were:

- 1) Formal and informal interviews, informal and formal conversations, meetings, conferences, and social gaps.
- 2) Nonparticipant observation of behavioral intentions, attitudes, individual subjective norms, perceived social control and self-efficacy.
- 3) Archival data: Documental, minute meetings, journaling and media articles, web site data and information, presentations, workshop reports, end note reports, video presentations.

However, some challenges and obstacles have been met and overcome at the beginning of the research, among others, the access to the community because de stigma and fear to strangers, using the voice, language and terms of the different stakeholders and actors involved and the capture of the contextual determinants and their impacts on the formation of the entrepreneurial inclusive civic culture.

Data analysis: Grounded theory construct coding based on processual analysis: temporal bracketing, visual mapping.

Identifying causal effects is very hard in this type of study based on empirical evidence on the long-term results.

It is assumed that determinants of entrepreneurial intentions may lead to inclusive civic culture behaviors influenced by access to resources (Figure 1).

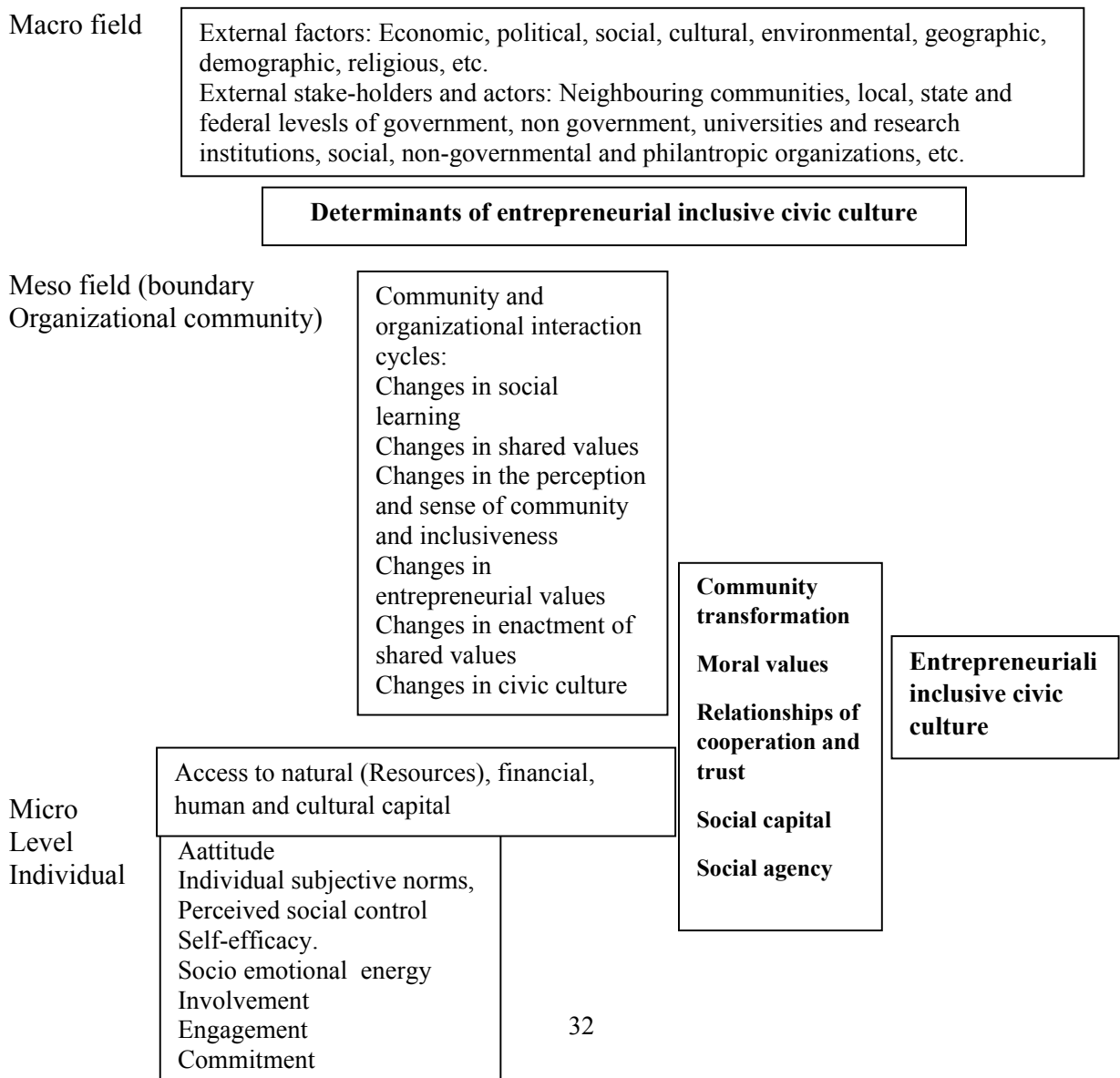
To conduct this study, it was spent eight months attending the Zapopan Agro ecological Park and observing the individual activities of the members of the community and the collective Teocintle

organization, social gatherings, training sessions and cultural festivals, learning about their plans and issues. The individual and collective emotions were very strong during the interviews, formal and informal conversations with members of the community. During this period of eight months, it was created and developed some very strong relationships of trust and cooperation.

Also, for the general analysis of the study, the methodology principles of RRBM are applied in general terms:

- 1) Service to community and society at large.
- 2) Basic and applied emotions, embeddedness, and governance.
- 3) Pluralistic and multidisciplinary processes.
- 4) Methodology employed through grounded multi-stakeholder social and community constructions in action.
- 5) Involvement of stakeholders and actors at every stages.
- 6) Impact of stakeholders, better understanding of what works and what does not.
- 7) Broad implementation and dissemination to all internal and external involved stakeholders.

Figure 1- Process model of shared entrepreneurial inclusive civic culture



Source: Own development.

Parque Agroecológico de Zapopan, a space of entrepreneurial inclusive civic culture

The Zapopan Agro ecological Park is in the bio-economy field of agro ecology food, health, and energy. It is an innovative public space that combines the direct participation of the community of an urban farm project that practices that support of the sustainability culture (such as the recollection of organic waste to produce compost) as well as training workshops on different agro ecological themes to generate a unique space in the city open to all citizens. Within the programs of the Public Space Authority of the municipality, Zapopan focused on the needs of the community, to generate job opportunities and entrepreneurship in the agro ecological Park. The kids connect with the eco technicians, which can give them the opportunity to improve their own housing, generate construction projects and self-construction (Martínez, 2016).

The Zapopan Agro ecological Park is a space open to all the public where, through workshops, practice and coexistence, there is a collective learning on issues related to agro ecology, self-sufficiency, environmental knowledge, and social awareness (Traffic ZMG, 2016). This center of inclusion is a space that generate and promote opportunities for the local people. (Martínez, 2016). Citizens are also able to have access to areas such as: An educational center built with natural materials, a boardroom/ library, a classroom, and an urban garden that is an important part of the project so the people can relate. The Park has a nursery for the reproduction of plants, a compound area to produce fertilizers, a main square, the first West Edible Forest, ecological baths, a rainwater collection, and distribution system to make the park self-sustainable. In addition, several ecological workshops, cultural and sports activities are being held within the areas (Gobierno de Zapopan, 2015).

In this space it has been found that it had a fertile ground to grow radish, chard, cabbage, lettuce, parsley, corn, beans, arugula, basil, chayote, broccoli, chili, potato, chives, sunflower, etc., are some of the more than eighty species of edible consumption, medicinal plants, etc. In the orchard you can find crops of various vegetables such as chard, lettuce, lavender, squash, arugula, onion, cilantro, parsley, pineapple, bean, celery, cabbage, chayote, tomato, green tomato, and African cucumber, among others (Rocha, 2016). The main goal of this project is to continue fostering social cohesion and work for a better health through orchards and urban agriculture. Zapopan Government has an agro ecological network of parks in strategic areas of the municipality. An agro ecological park is the perfect project for public space, an environmental sustainability component where people of the community can produce their own food (El Informador, 2017). See figure 2 below.

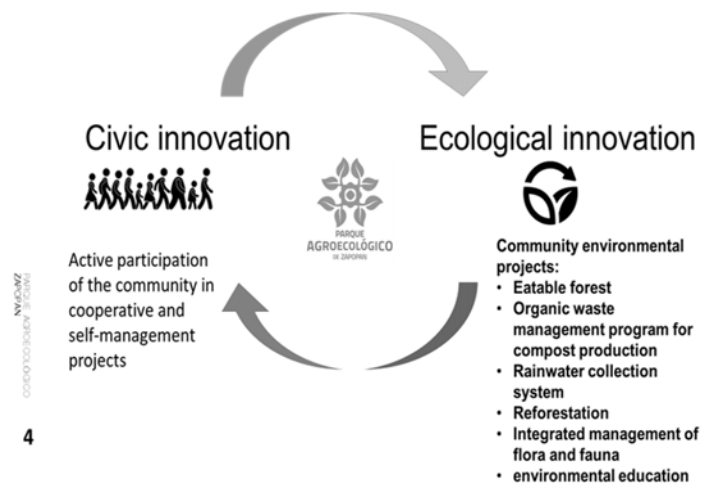


Figure 2. Civic innovation and ecological innovation cycle.
Source: (Medina, 2017).

The Zapopan Agro ecological Park it's a space that became a meeting and a development space for the community in an urban environment which is committed to sustainability and to organize events such as the "Teocintle" fest, which is celebrated to raise awareness about the existence of the capacity of the human beings to generate his own resources, this, to allow them to subsist (food, utensils) and to connect the community, land, work and practice their traditions. The events celebrated and organized in the park, offer different activities such as: workshops of urban gardens, rally, craft market, food area, barter, dance, music, conversation and networking, outdoor cinema, among others (Trafico ZMG, 2016). César Medina in collaboration with the Municipal Government of Zapopan and the University Center of Biological and Agricultural Sciences (CUCBA) of Universidad de Guadalajara keep working in this and other projects (Gobierno de Zapopan, 2016).

As the matter of time spend starting with "Tierra Crudas" work, began with the drafting of the project to manage the funds in the month of June 2013. Many people have collaborated in the construction of this park, specifically "Tierra Cruda". The municipal government of Zapopan oversaw the design and the general master plan of the park, construction of the classroom-office complex, the module of dry baths and the perimeter fence of the orchard. The local authorities also oversaw design and build the social aspect of the park, which means it generate the social-neighborhood appropriation for the project and train them in agro ecological sowing. From this social process, the Collective Agro ecological Teocintle (CAT) was emerged (Gobierno de Zapopan, 2015).

The people that work and participate in the park always produce their own compost, build beds, seek to improve, and make innovations in environmental terms, seek the common good, and make decisions. (El Informador, 2017). The community garden is designed in a circular form for a better use. Currently there are 47 beds of cultivation available for anyone with knowledge in bio intensive crops and meets the requirements of the collective. In the social matter it can be said that the park was appropriated through its community gardening where 32 families are working organized by the Collective Teocintle Agro ecological. In addition, this space offers several workshops to the neighbors of the park as the rest of the inhabitants of the Metropolitan Area of Guadalajara.

The municipality of Zapopan catapults this project with collaboration of other civil organizations and universities, to promote self-consumption and environmental education. With the collaboration of the Collective Teocintle Agro ecological, Farid Morales, who became the coordinator of the park employed by DIF in Zapopan, officials of the institution, with help of Carlos Bauche and Fernando Partida BambuXal, as well as the consultants for the general design of the park, the orchard, and the edible forest by Máshumus and the Cooperative “Las Cañadas” (Gobierno de Zapopan, 2015). The Teocintle Collective helps those who come and teach them how to grow their own food, which makes citizens feel productive and healthier.

Local Authorities from the municipality of Zapopan want to empower them, increase capacities with projects and workshops that are specialized in urban agriculture and has knowledge in seed production and compost. All this focused-on community organization. The municipality oversees coordinating and managing the workshops and activities of the collective and community. Once a month, the local authority of the municipal government and the city Council, organize a tour to different orchards, including this park that is open to the community and is a public space meaning that anyone can be part of it.

Is important to say that the proper authority of this public space is responsible for the park, which includes the orchard and the edible forest. It is managed by the collective Teocintle and is a project belonging to these local space’s authorities from the municipal administration of Zapopan, Jalisco. This is also impelled through the Direction of Public Spaces. Teocintle Agro ecological Collective is an organization that works in the management of the orchard of the park. The chief of the Public Spaces in Zapopan among César Lepe Medina, coordinator of this project and manager of the Special projects of public spaces office in the city, are now in charge of this park. The collective is divided into commissions involved in gardening activities. New people can decide if they want to be members. Currently, there are about 40 families from the community, represented by one person, that are part of the park.

Strategic Management of Parque Agroecológico de Zapopan

Speaking of the financial part, the Zapopan Agro ecological Park had an investment of approximately 5 million pesos and has an important impact in 110 direct beneficiaries, in addition to the communities surrounding the park and people interested in participating in this project (Gobierno de Zapopan, 2015). The budget of the park has an income that comes from several sources of financing and contributions. See table 1 below.

Table 1. Financing

Zapopan Strategic Projects (PEZ) / Metropolitan Fund approximate figure, for a fund for the forest district of 10 million pesos out of which are allocated to Zapopan city of all	\$ 3, 000, 000.00.
The National Program for the Prevention of Crime (PRONAPRED) contributes with	1, 100, 000.00.
DIF Zapopan- Donations Area with	950, 000.00
and Program Temporary Employment PET / SEMADET with	120, 000.00

Source: Own elaboration with data from César Lepe Medina, coordinator of the project and public servant of the Office of Special Projects of Public Space of the City.

The Agro ecological park is in a farm with almost two hectares in the Metropolitan area of Guadalajara (ZMG) that has the highest rate of violence and criminality. This space used to be a ravine and that was filled with rubble. The first intervention took place with the construction of a board and with the installation of urban furniture and public lighting by the Special Projects of Zapopan Office. (Gobierno de Zapopan, 2015). This sustainable project also includes the creation of classrooms made from bamboo, a waste separation and recycling system of plastic, paper, glass, metal, organic waste, and PET.

The Park has a central classroom that was built with materials such as wood and straw. This building is contemplating its use to be a meeting point, a conference place, and a market display, this, to give an opportunity to those who collaborate in the management of the ecological garden, giving them this space to offer their products. The Park has a dry bath system that is used to reuse the generated waste as a compost, and it also counts rainwater raining dam with capacity of 750-thousand-liter rainwater harvesting board and 20-thousand-liter storage tank that will provide water to the orchard and forest during the dry season which was also constructed by Agro ecological Zapopan Park.

As a result, the Local Authority of the Public Space of Zapopan, through the Zapopan Agro ecological Park, offers a space for community building and collaborative work, where one of its priorities is the orchard where 25 to 35 kilos of food are produced and harvested weekly (Gobierno de Zapopan, 2016). The production has several types of vegetables, fruits, medicinal plants, and ornament plants. There are more than 50 species as pumpkin, beet, sesame, strawberry, lettuce, Swiss chard, bean that are grown in this park. Other products are elaborated with these harvests such natural slurries or milks made from seeds such as almond or canary seed. The Solar dehydrators was created to dehydrate foods such as tomatoes, traditional footwear based on pre-Hispanic roots and even the elaboration of biocosmetics made with plants such as lavender and lemon.

The public perception is positive, nowadays, there are a lot of people who finds comfort and relief in this orchard, they like being part of something, connecting with people who feels the same way and are working hard to stay productive, to have a decent income and to live a better and healthier life. The environmental education also has a very important impact in the activities and people working in this park to make a sustainable lifestyle.

Conclusion

Parque Agroecologista de Zapopan is a model of entrepreneurial inclusive civil culture. This Park marks a milestone in the regeneration of public spaces with a project of social and environmental relevance. It is important to mention that the park was a wasteland and a place of total disuse. A total of 1.8 hectares, on Santa Laura Street, in the colony Santa Margarita (colony with more than 33 thousand inhabitants), now live-in peace. This place has now recovered from being abandoned, and today is the reflection of hard work and creativity of citizens and authorities that are a model for this public space with pedagogical purposes and for the constant neighborhood participation.

The entrepreneurial intentions of the stakeholders and actors involved in the project have predicted the entrepreneurial behaviors, confirming the theory of planned behavior and their entrepreneurial activities to create opportunities to influence economic performance. Moreover, the implemented

model of entrepreneurial inclusive civic culture has demonstrated that entrepreneurial intentions and activities are beyond the increasing economic growth and efficiency, to have influence in social development, inclusiveness, equality, and justice. Moreover, in the field of environmental sustainability, the model clearly has impacts on the improvement of the socio-ecosystem and biodiversity.

The study analyses the determinant factors that successfully have contributed to create and develop an entrepreneurial inclusive culture leading to social transformation of a community based on agro ecology and green practices in an urban space. Changes at the meso level related to community and organizational interaction cycles of the Zapopan Agro ecological Park have been introduced to create and develop an entrepreneurial inclusive civic culture in social learning, shared values, the perception and sense of community and inclusiveness, entrepreneurial values, enactment of shared values and civic culture. All these changes have been possible due to the access to natural resources, financial, human, and cultural capital through contributions of the main actors and stakeholders. At the micro level, the participation of these actors and stakeholders are related to their involvement in the individual attitudes, personal subjective norms, perceived social control, self-efficacy, socio emotional energy, involvement, engagement, and commitment.

All these determinants at both levels of analysis have led to community transformation, formation of moral values, creation of relationships of cooperation and trust, social capital, and social agency. All these determinants have contributed to the creation and development of an entrepreneurial inclusive civic culture model of community development. The results of the implementation of this project have contributed to increase the economic income of families, collectivities and communities participating, while reducing the gaps of social inequality, inclusiveness, and justice. Moreover, the results of the analysis clearly show an improvement in biodiversity, socio-eco-ecosystem, and environmental sustainability.

Other important contributions derived of the analysis of results, it should be mentioned some important issues such as fair commerce, food security and sovereignty, participative democracy, innovation in urban green areas, and so on. All these topics and issues should be treated in future research.

References

- Acs, Z. J., and Audretsch, D. B. (2003), *Innovation and Technological Change*, in: Z.J. Acs and D.B. Audretsch (eds.), *Handbook of Entrepreneurship Research*, Boston/Dordrecht: Kluwer Academic Publishers, 55-79.
- Ajzen, I. (1991), The theory of planned behavior, *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 1-63.
- Almond, G. y Verba, S. (2001), La cultura política, en Albert Batlle (ed.), *Diez textos básicos de ciencia política*, España, Ariel, pp. 171-201.
- Almond, G., y Verba, S. (Eds.) (1989), *The Civic Culture revisited. Political Attitudes and Democracy in Five Nations*, California, Sage Publications Inc.
- Almond, G. y Verba, S. (1965) *The civic culture*. Little, Brown, and Company (Inc.), Boston: MASS, 1965.
- Aragon-Sanchez, A., Baixauli-Soler, S., Carrasco-Hernandez, A. J. (2017). A missing link: the behavioral mediators between resources and entrepreneurial intentions, *International Journal of Entrepreneurial Behavior & Research*, <https://doi.org/10.1108/IJEBR-06-2016-0172>

Armitage, C.J. and Conner, M. (2001), Efficacy of the theory of planned behavior: a meta-analytic review, *British Journal of Social Psychology*, Vol. 40 No. 4, pp. 471-499.

Ayuntamiento de Tlajomulco de Zúñiga, Jalisco (2015). *Caracterización del subsistema social*. Retrieved from https://tlajomulco.gob.mx/sites/default/files/documentos/poel/poet_tlj_1.3_caracterizacion_subsistema_social.pdf

Baptista, R., Escária, V. and Madruga, P. (2017). Entrepreneurship, regional development, and job creation: The case of Portugal. Discussion papers on entrepreneurship, growth, and public policy. Max Planck Institute for Research in Economic Systems.

Carree, M. A. and Thurik, A. R. 2010. The impact of entrepreneurship on economic growth. In: Zoltan, J. and Audretsch, D. (Eds.) *Handbook of entrepreneurship research*. New York: Springer

CONAPO (2017). *Estimación de la mortalidad infantil para México, las entidades federativas y los municipios 2005*. Retrieved from http://www.conapo.gob.mx/es/CONAPO/Base_de_datos

Do Paço, F., Arminda, M., Ferreira, J.M., Raposo, M., Gouveia, R. and Dinis, A. (2011), Behaviours and entrepreneurial intention: empirical findings about secondary students, *Journal of International Entrepreneurship*, Vol. 9 No. 1, pp. 20-38.

Evans, D.S., and L.S. Leighton (1989), Some empirical aspects of entrepreneurship, *American Economic Review* 79, 519-535.

Gobierno de Zapopan (2016). *Proyecto de presupuesto 2016. Diagnóstico del municipio para la elaboración del proyecto de presupuesto para el ejercicio fiscal 2016*. Retrieved from http://www.zapopan.gob.mx/wp-content/uploads/2016/01/Anexo4de12_DiagnosticoDelMunicipio.pdf

Gobierno de Zapopan (2016). *Parque Agroecológico de Zapopan: Un modelo de Agricultura Urbana Sustentable*. Retrieved from: <http://www.zapopan.gob.mx/parque-agroecologico-de-zapopan-un-modelo-de-agricultura-urbana-sustentable/>

Gobierno de Zapopan (2015). *Zapopan estrena parque agroecológico*. Retrieved from: <http://www.zapopan.gob.mx/zapopan-estrena-parque-agroecologico/>

Holmes, T.J., and J.A. Schmitz Jr. (1990), A theory of entrepreneurship and its application to the study of business transfers, *Journal of Political Economy* 98, 265-294.

IIEG (2015). *Nota Técnica Jalisco registra 7.8 millones de pobladores al inicio de 2015*. Instituto de Información Estadística y Geográfica Guadalajara.

IIEG (2016). *Diagnóstico municipal Septiembre 2016*. Instituto de Información Estadística y Geografía.

IIEG (2016a). *Instituto de Información Estadística y Geográfica del Estado de Jalisco con base en INEGI, censos y conteos nacionales, 2010-2015*.

IIEG (2016b). *Instituto de Información Estadística y Geográfica del Estado de Jalisco; con información de INEGI, DENUÉ*.

INEGI (2011). Censo General de Población y Vivienda 2010. Retrieved from <http://www.inegi.org.mx>

Krueger, N.F., Reilly, M.D. and Carsrud, A.L. (2000), Competing models of entrepreneurial intentions, *Journal of Business Venturing*, Vol. 15 Nos 5-6, pp. 411-432.

Lin, Z., Manser, M.E. and Picot, G. (1998), The Role of Self-Employment in Job Creation in Canada and the U.S., OECD-CERF-CILN International Conference on Self-Employment, Burlington, Ontario, Canada.

Medina, C. (2016). The role of innovation in green areas for the revitalization of German and Mexican Cities.

Martínez, I. (2016). *Zapopan busca ser Ciudad Amiga de la Infancia*. Retrieved from <http://www.informador.com.mx/jalisco/2016/693500/6/zapopan-busca-ser-ciudad-amiga-de-la->

infancia.htm

Pfeiffer, F. and Reize, F., (2000), Business Start-ups by the Unemployed - an Econometric Analysis Based on Firm Data, *Labour Economics* 7 (5), 629-663.

Putnam, R. (Ed.) (2002). *Democracies in flux*. Oxford: Oxford University Press.

Putnam, R. (2000). *Bowling alone*. New York: Simon & Schuster.

Putnam, R. (1993). *Making democracy work*. Princeton, NJ: Princeton University Press

Putnam, D., Pharr, S. J., & Dalton, R. J. (2000). Introduction: What's troubling the trilateral democracies. In S. J. Pharr & R. D. Putnam (Eds.), *Disaffected democracies* (pp. 3–27). Princeton, NJ: Princeton University Press.

Rocha, A. (2016). *El Espejo: Parque Agroecológico Zapopan, zona de cultivo en la metrópoli*. Retrieved from <http://www.cronicajalisco.com/notas/2016/60254.html>

Shapiro, A. and Sokol, L. (1982), The social dimensions of entrepreneurship, in Kent, C.A., Sexton, D.L. and Vesper, K.H. (Eds), *Encyclopedia of Entrepreneurship*, Prentice Hall, Englewood Cliffs, NJ, pp. 72-90.

Shook, C.L., Priem, R.L. and McGee, J.E. (2003), Venture creation and the enterprising individual: a review and synthesis, *Journal of Management*, Vol. 29 No. 3, pp. 379-399.

Souitaris, V., Zerbinatib, S. and Al-Lahamc, A. (2007), Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources, *Journal of Business Venturing*, Vol. 22 No. 4, pp. 566-591.

Trafico ZMG (2016). *El Parque Agroecológico de Zapopan celebra la autosustentabilidad*. Retrieved from <http://traficozmg.com/parque-agroecologico-zapopan-celebra-la-autosustentabilidad/>

Van Stel, A., and Suddle, K. (2007), The Impact of New Firm Formation on Regional Development in the Netherlands, *Small Business Economics*.

Veciana, J.M., Aponte, M. and Urbano, D. (2005), University students' attitudes towards entrepreneurship: a two countries comparison, *The International Entrepreneurship and Management Journal*, Vol. 1 No. 2, pp. 165-182.

Villa, R.A., & Thousand, J.S. (2000). Collaborative teaming: A powerful tool in school restructuring. In R.A. Villa & J.S. Thousand (Eds.), *Restructuring for caring and effective education: Piecing the puzzle together* (2nd ed.), Baltimore: Paul H. Brookes Publishing Co.

Wennekers, A.R.M. and A.R. Thurik (1999), Linking entrepreneurship and economic growth, *Small Business Economics* 13, 27-55.

Wennekers, A.R.M., A.R. Thurik and L. Uhlaner (2002), Conditions, entrepreneurship, and economic performance: the macro view, *International Journal for Entrepreneurship Education* 1.

Zona Guadalajara (2017). *Zapopan*. Retrieved from <http://zonaguadalajara.com/zapopan/>

Zaretsky, L. (2005). From Practice to Theory: Inclusive Models Require Inclusive Theories. *American Secondary Education*, Summer 2005, Vol. 33, No. 3 (Summer 2005), pp. 65-86

From the Scientific Method to Business Innovation: A Reflection on Transdisciplinary

July Alexandra Villalba Rodriguez, Politécnico Grancolombiano (jvillalba@poligran.edu.co)

Abstract:

This article presents a reflection that relates the scientific method traditionally applied in the sciences with interdisciplinarity and innovation, i.e., how from the sciences, new ideas can be generated that applied to the business context open the door to innovation generating economic development, for this, a contextualization is presented on the historical evolution of the disciplinary conception that frames the complex thinking starting from the scientific method proposed by René Descartes, the falsificationism through the approaches of Karl Popper, and the paradigms of Thomas Kuhn. First, the importance of Descartes' rationalism and the ontological consequences of the Cartesian method are mentioned. Secondly, the dilemmas that emerged in each of the scientific revolutions that were forged during the twentieth century and that had to restructure the foundations of determinism and classical science are described. Finally, we will articulate the seven principles of complexity and how they act in transdisciplinarity in business innovation

Keywords: *Transdisciplinary research, complex thinking, scientific method, Enterprise, innovation trends.*

1. Introduction

The following document presents a reflection that relates the scientific method with business innovation, as a result of a transdisciplinary adaptation of the sciences, and shows how the evolved application of this method can facilitate the generation of new ideas, which could open the door to business innovation. For this, the contributions and discussions generated around the conception of the scientific method during the 17th century are considered, and in which, "the steps to formulate, test, and modify hypotheses are established, through observation, measurement and experimentation" (Oxford Dictionary, 2021), and by means of which, knowledge is created, or from the business and entrepreneurial perspective: innovation.

Currently, the scientific method, is understood as "a series of steps applied to a research process, leading to the construction of scientific knowledge, because without method, science cannot be built" (Bunge, 2014, p. 18); Thus, from this method, whose theoretical framework is found in the criticism raised by René Descartes (1637), by the falsification of Karl Popper (1934), and the work under paradigms raised by Thomas Khun (1986) these same invite the search to find a relationship between the scientific method applied to the sciences, with processes of generation of ideas that facilitate business innovation, using at this point the transdisciplinarity of the sciences, as established by Louis Wirtz (1937), where the relationship between the disciplines is relevant.

In this sense, this paper presents a discussion on the scientific method, transdisciplinarity and innovation, to generate a reflection on how through science a different perception can be formed for the incubation and development of ideas within the company that encourages the economy and the development of nations.

2. Conceptual framework

The three pillars that framed the research are related to the concept of innovation, business innovation and transdisciplinarity, which will be developed below.

Innovation: changes based on innovation are made through the appropriation of technology that, together with new knowledge, generate highly productive developments; in turn, the manual describes the activities as... "the scientific, technological, organizational, financial and commercial actions that lead to innovation. Activities that have produced success are considered as well as those that are in progress or those carried out within projects cancelled due to lack of feasibility" (OECD, 2005, p. 50).

Schumpeter (2004) describes innovation as "the fundamental element that explains economic development, which does not occur spontaneously, but is actively promoted, within the capitalist system, by the so-called innovative entrepreneur". (Schumpeter, 2004, p. 120).

Business innovation: in the paper by Calvo, Peña, Culebras, & Gómez, (2013) Dr. Álvaro Gómez, who explores the factors that affect the development of R&D&I (Research, Development and Innovation), in this opportunity analyzes innovation from a structural equation model that allowed establishing relationships between the factors that affect innovation, and with which, they consider the multicorrelation between the factors.

In the work called "The Relationship between innovation strategies: Coexistence or complementarity" Vega, Gutiérrez, & Fernández (2009) analyze the existing relationships between the generation and external acquisition of knowledge as innovation strategies from the absorptive capacity. In this work, data from the 2004 Survey on Technological Innovation (Spain) are considered, using a coexistence analysis which consists of calculating correlation coefficients as proposed by Aurora and Gambardella (1990).

Transdisciplinarity: after the above, it is time to talk about transdisciplinarity, which is established in the same word, "Trans" which means -between disciplines- and -through- disciplines, beyond any discipline, it aims to understand the world and its units, as well as the knowledge that conforms it.

Transdiscipline questions the existence of something extra that lies between disciplines and that classical thought has forgotten in its eagerness to keep knowledge structured as in a crystal ball; this generates that there is no interaction with other disciplinary environments; It is here when the epistemological vacuum that classical thought brings with it is forged, managing to affirm that "transdisciplinarity is an absurdity without an object"; on the contrary, for transdisciplinarity, classical thought is not absurd, on the contrary, it is a recognized and restricted world of knowledge from which it bases its information to go through and understand.

With respect to the theoretical similarities, the relationship found (Nicolescu, 1994) with the work "the letter of transdisciplinarity" was found when stating that "transdisciplinarity comes with the exception of -through and beyond- disciplines" (p. 19). This poses an open rationality, an approach, a relative look, a definition and objectivity in the transdisciplinary concept.

3. Methodology

This article applies a descriptive methodology through the review of the literature related to the scientific method, transdisciplinarity and innovation, carrying out an analysis matrix with more than fifty-two documents among which are articles, books, doctoral theses and memoirs that when purified, the pillars that support the research are identified as can be summarized in the following table,

Table 1 Authors and research topics

Tema	Autor	Título Relacionado
Scientific Method	René Descartes	(Descartes, El Discurso del Método, 2010) (Descartes, El Discurso del método , 1641)
	Karl Popper	(Popper, 2008)
	Thomas Kuhn	(Kuhn, 1971)
Transdisciplinarity	Louis Wirtz	(Organización de Estados Iberoamericanos , 2020)
	Edgar Morin	(Edgar Morin, 2020) (Multiversidad Edgar Morin , 2020) (Morin, Sobre la interdisciplinarietà, 2015)
	Manfred A. Max-Neef	(Max-Neef, 2004)
	International congresses	(Anonimo, 1994)
	Rigoberto Lanz	(Lanz, 2010)
	Barsab Nicolescu	(Nicolescu, 1994)
Innovation	Manual de Oslo	(OECD, 2018)
	Manual de Frascati	(OECD, 2015)
	Manual de Bogotá	(RICYT / OEA / CYTED, 2001)
	Joseph Schumpeter	(Schumpeter, 2004)

After the documentary review through the exploratory and analytical research, we inquired about the reality of the method as a phenomenon and its performance in innovation and transdisciplinarity in companies. The objective of this type of applied research allowed the identification of aspects to determine the conditions of innovation within the companies.

The research methodology was developed in three phases; first, a laborious search was carried out in the process of bibliographic collection, then the documentary matrix was applied as structured instruments that was conformed by the author, document, concept, similarity, theoretical differences, contributions; in the third phase, interviews were conducted with primary sources through the use of semi-structured scripts validated by sworn peers and thus finally collect as much information as possible with respect to the subject and make the respective analysis.

During the exploratory process, disciplinary experts in innovation, transdiscipline and research were interviewed, as well as Colombian businessmen from different economic sectors who consider carrying out innovation in each of their industries; these interviewees will be referred to as informants in the transcription and writing of this document.

4. Results

The Scientific Method

René Descartes in his work *The Discourse of Method* (Descartes, *The Discourse of Method*, 2010), presents the meditations that underlie the scientific method; in this, it can be stated that he sought to find the truth of things and to reason logically about the existence of God, in addition, to study the nature "between man, thought and body. In his meditations, elements such as doubt, objectivity and ideas acquire great importance. First, Descartes outlines "methodical doubt" as the intuitive basis of knowledge from the view "cogito, ergo sum (I think, therefore I am)" (Descartes, *The Discourse on Method*, 1641, p. 35), where he argues that "man is a thinking, immaterial substance, and this knowledge is a clear and distinct unalterable idea, independent of the sensible" (Descartes, *The Discourse on Method*, 1641, p. 5); and secondly, Descartes, *The Discourse on Method*, 1641, p. 5); and secondly, he argues that "man is a thinking, immaterial substance, and this knowledge is a clear and distinct unalterable idea, independent of the sensible" (Descartes, *The Discourse on Method*, 1641, p. 5). 5); and secondly, the objectivity of ideas is raised, where he also presents considerations about the senses and judgment of human beings, and how these, from thought, facilitate the creation of sciences as long as they are not permeated by feelings or value judgments. In this way, Descartes seeks the irrefutable truth, the truth of which it is not possible to doubt; he seeks to obtain a knowledge that does not generate any trait of uncertainty, a real, true, existing knowledge; that evidences the reality of beings and elements without prejudice, generating new knowledge that through time becomes science.

Through the rationalism proposed by Descartes, a "new" method of thinking is created, and when we speak of thinking, it can be understood as everything that happens in being; in addition to redefining the concepts related to the construction of human knowledge; the "Cartesian model" is based on the principle of generating knowledge, and that this cannot be affected by external or subjective factors that alter the certainty of this. It is precisely in this postulate that the first question arises, since Descartes outlines that "such certainty could be obtained through a distancing of the subject from the object of knowledge. The greater the distance from the object, the greater the certainty of knowledge" (Descartes, *The Discourse of the Method*, 1641), being so, it requires questioning whether the subject should forget all the previous knowledge he has acquired throughout his life, whether apprehended, by habit or inherent in his development as a being; now also, the subject must detach himself from the tastes, sounds or experiences that are part of his knowledge. The knowledge that Descartes intended to achieve is based on the recognition of the environment and only the cogito would fulfill its objective of pure thought without being contaminated, therefore the following question arises: how to relate Descartes' logic with business innovation, that is, how to generate pure knowledge, resulting in innovation, without the contamination of the subject, that is, the entrepreneur? This goes hand in hand with the results obtained in the research methodology, since informant number 4 indicates "...the real business conditions act without knowing the methodology or the academic way to execute a task, it is a great challenge to create knowledge for entrepreneurs, since we are dedicated to doing business without thinking about the need to base it".

Thus, the need to rethink knowledge arises, creating experiences through a distant and mathematical language; proposing the separation of subject and object of knowledge. In making this analysis, it is required to start from the idea that "the subject is by its nature a self-organized living organism, a conscious part of an organization" (Campero, 2017, p. 2) the subject must place itself in a state of observation that allows it to identify all other forms of producing knowledge. The producers of knowledge separate the observer from the observed, so as to achieve "objectivity", guaranteeing a neutral observation, otherwise, the derived knowledge cannot be a valid knowledge; so as to subsequently start with the "analysis" by dividing the object of knowledge into small parts, and in this way, try to have a perception of knowledge in its totality. However, there cannot be knowledge of the whole but only of the parts. This corresponds to the fact that knowledge does not determine that knowledge belongs to any field of science, and sciences as they are known today simply respond to a classification assigned to the accumulation of knowledge in different topics, i.e. a way of ordering knowledge; through the interviews conducted in this research we inquired with expert researchers who perform their work in the technological-business field and determined that "it is time to create disruptive mechanisms that build knowledge, but not through classical models of research or thinking, times change and the ways of creating as well".

Consequently, to the above, it can be inferred that scientific knowledge becomes a set of deviations that are not related to the life and practice of who originates them; since, this new science divides knowledge and spirituality, that is, that all people have the ability to perform in any discipline or science, without their environment being affected by the knowledge it produces; since the Cartesian method is a generator of separations: "between subject and object; between the parts and the whole; and, between life and knowledge" (Castro-Gómez, 2011), leading us to what is known today as interdisciplinarity, and in conclusion, the particular experience of the subject, in this place the entrepreneur, should not affect the generation of ideas that lead him to innovation processes.

Falsification

For his part, Karl Popper presents the falsificationism that determines that "science is a set of hypotheses that are proposed as a test with the purpose of accurately describing or explaining the behavior of some aspect of nature" (Popper, 2008). This is currently understood as hypothesis testing from statistics, econometrics and research methodology; and although it is not possible for all the hypotheses proposed to be proven, the non-falsification of the hypothesis opens the possibility of being considered as a scientific theory. In conclusion, since falsificationism, the construction of science is structured in empiricism, under deductive logic, in this sense, falsificationism, empiricism and deductive logic are tools to be used in the business environment to encourage innovation.

Dogmas and paradigms

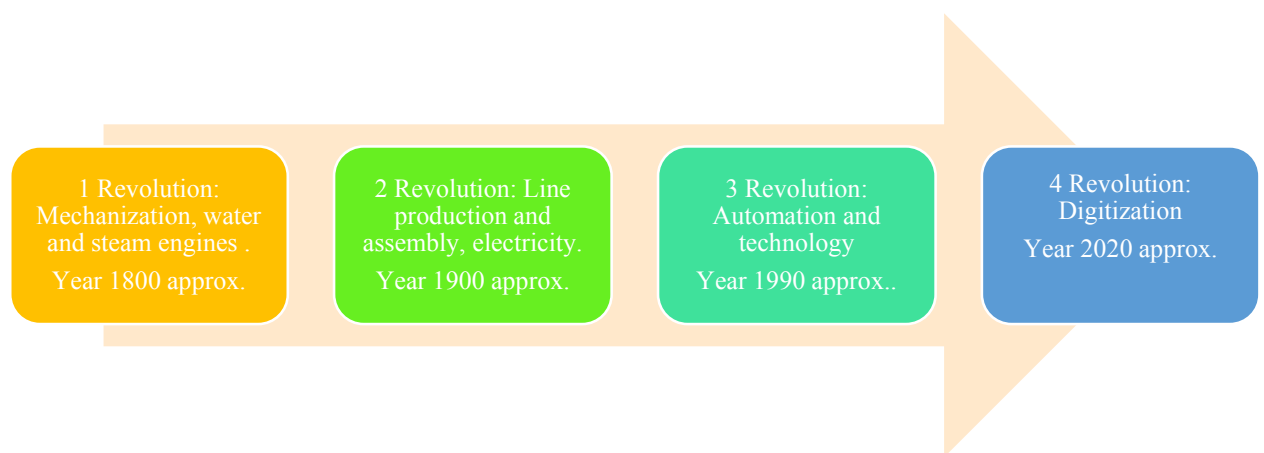
For his part, Thomas Kuhn focuses on the generation of scientific dogmas, classifying science into two types: normal and paradigmatic; the first is executed every day and practiced with great regularity, based on traditionalist ideas that are held strictly for a time and generates "solid" structures within the framework of knowledge, however, paradigmatic science is considered revolutionary, because it allows breaking or rethinking paradigms, and it is here where the concept of paradigm is fundamental to understand each definition of science, because under Kuhn's thinking this is called "the change in the scientific revolution", where the paradigm implies a conglomerate of ideas and methods that practically base science and the vision of a world in constant change and transformations, as evidenced with the first, second, third, and now fourth revolution (El País, 2014).

The methods of scientific changes that Kuhn calls revolutionary are very different from those described in normal science, this because scientific revolutions create a gap between order and dogmas that in classical science present disbelief in the rules of the game used so far, in addition that new conceptual structures are built; but how can you know if you are living a scientific revolution? Kuhn considers that the scientific revolution occurs at the moment of scientists' break, since it is the stagnation of knowledge that produces a flame of the discipline, as well as the appearance of a candidate for a new paradigm.

In coherence with the above, there is an approach between relativism and postmodernity to interpret the paradigms, this arises as a result of identifying an existing anomaly and generates a doubt of the certainty of the same, distrusting that absolute truth with which it was raised; otherwise, many of the scientific advances lived in the world could not have come to light; For, being against all traditionalist actions, allowed that little by little scientists were induced to consider the refutation of a great theory or paradigm; in spite of fearing the statement "how to falsify a theory without having another one that is more appropriate" and how this one can be applicable and moldable to replace the previous one.

Therefore, when reflecting on the way of doing science, it should be taken into account that the minimum parameter is to explore all possible fields, based on classical theories, but also, pretending that a change or advance in the scientific process can be generated, of course, and it is not intended to enter into conflicts of violating or discarding the previous visions, but instead, to design tools or instruments that allow giving line to new knowledge, new thoughts and visions over time. Kuhn's proposal allows us to relate the industrial revolutions as a change in the business world, establishing new paradigms on social relations and profits.

Illustration 1 Revolutions in the history



Source: Author, adapted from (El País, 2014).

For the researchers called informants 2 and 3 in the research methodology there is the dilemma of the appropriation and application of the method in their work; because while for informant number 3 "the way of doing science is already described and studied and must be followed by the method and the way to execute it" for informant number 3 "the new thoughts and the evolution of knowledge anchored with the needs of an interconnected world and that goes to the rhythm 4.0 requires rethinking the investigative passes and the square structures that exist in each one of them".

Futurism

Another of the current thinkers is Ray Kurzweil, who is one of the main futurists with greater remembrance in the world, his ideas have stood out for rethinking the scientific revolution and raise a technological revolution, in addition, to restructure the concept of singularity and the transcendence of the human of biology, because, He envisions the precise moment when machines will want consciousness, something that in the year 2021 is still considered unthinkable and when that point is reached, there will be no reason to stop the process and rethink the way of doing science, because humanity and the machine will have to coexist in a real space, with conditions in knowledge of information completely unequal. All the above shows that the union of the scientific advances presented throughout history, each one breaking paradigms and theories to recreate knowledge, allow revolutionizing and reevaluating determinism and the way of doing science.

5. Discussion

Reflection on the scientific method as a research tool

One of the great dichotomies that are presented at present corresponds to the application of the scientific method in research processes depending on the area of knowledge in which it will be implemented; it is necessary to rethink whether this method is still able to cover all the knowledge that can be abstracted in the object of study; human reality being even more complex than what can be subtracted in each of its dimensions, where the great applicability of the scientific method in medicine and biology, and its adaptation in the social sciences and engineering is rescued. In addition to this, for years an "organized" structure of knowledge has been created, which are studied within the framework of different methods depending on their discipline; transferring, introducing and creating justifications that aim to expand the frontier of discoveries; in this way, new sciences such as robotics, chemistry, technology, etc., have been structured. However, it is these features that have biased knowledge, dividing and creating a dividing line that separates knowledge. For this reason, it is necessary to rethink the basic approaches that make up knowledge and knowledge as autopoiesis works; recreating from complex thinking the way to articulate and reconstruct the disciplines or fields of knowledge in order to delve into the specific aspects of reality, as well as to deepen knowledge and cover the multiple aspects that may arise.

The disciplines forged by history as independent worlds, have not allowed the total interpretation of the world, unfortunately a culture of construction of disciplines has been forged, based on dogmas and separatist doctrines, which trigger a crisis of knowledge, that starts from simple views of the scientific disciplines that delimit the objects of study fractioning the global knowledge, while the Cartesian paradigm, which bases its studies on reason and ratifies the ability to know and analyze nature in each of its parts, this makes it identify from the experience, the basis of science; science as a whole divided into parts, but that each one complements the other, articulates and functions as a system. From this conception, achieving this articulation between knowledge would open the door to business innovation, which rather than generating innovation resulting from research and

development processes, would serve to generate production processes in line with the needs of today's world.

Transdisciplinarity in the company

Now, by integrating the seven necessary knowledges proposed by Edgar Morin, emphasizing transdisciplinarity, they allow to relate the environment with the individual's what-doing, at the same time it relates the pertinent knowledge in the reflective exercise of the whole and the part, with the identification of the relationships between the elements that constitute a system, that is, the company with the entrepreneur; from a visualization of knowledge in order to generate awareness in "the limitations of the human being to adequately conceive and interpret not only the object of study, but its relationship with the subject and the influences between one and the other" (Edgar Morin, 2020, p. 36).

For example, if we relate the interaction that influences the interrelationship between companies and their environment, we can infer that these affect their organizational system, which is determined by the following elements: In the first instance, the disorder, as the constructed model that acts as a watchdog, both of external and internal events and changes, in the development of the system's own interactions. The organization, in a second instance, acts as the model that should guide the organization in each of the activities of the nature of the company, determining the needs of adaptation to the change that represents the consumer to the company. On the other hand, the order pretends to correspond to the adoption and allocation of resources and the necessary controls to guarantee the priorities indicated in the immediately previous step, it is here where the strategic planning of the organization is experienced. Finally, the interaction creates a model for the operational activities within the environment, as well as the execution of the proposed internal elements, in order to implement the system plan. On the other hand, to link the whole of the company and the other aspects of its function, one must speak of transdisciplinarity, and demonstrate the evolutionary process of the concept, starting with the discipline or disciplinarity:

"the advance of scientific disciplines was accompanied by processes of differentiation and integration, which covered certain areas relatively close, either by their objects of study, or by the demands of human activities that integrated them in the task. Thus, some intermediate forms appeared that partially exceeded the limits of disciplinary knowledge, although they did not do so completely. They are the Interdiscipline and the Multidiscipline" (Multiversity Edgar Morin, 2020).

Disciplinarity is considered as mono - discipline, since it is in charge of specializing and isolating knowledge at the same level of study. Subsequently, interdisciplinarity was defined by Louis Wirtz in 1937 as "the study in an integral way, which promotes relationships between disciplines that encourage the development of new methodological approaches to problem solving, acquisition of new knowledge and the improvement of many processes to achieve it".

To focus the development of this essay, the concept of transdisciplinarity is addressed, being this a way to organize the knowledge that has transcended disciplines, crossing each and every one of them; also being recognized as a research strategy that seeks to integrate the knowledge obtained between two or more disciplines, analyzing the object of study as a whole, from a complete perspective, examining each of the parts that compose it.

"Transdisciplinarity represents the aspiration for the most complete knowledge possible, which is capable of dialoguing with the diversity of human knowledge" (Multiversity Edgar Morin , 2020).

The concept of transdisciplinarity is developed in order to understand the complexity of the world through a more concrete form, allowing to create a dialogue and complete images of reality; it seeks to leave aside the division of disciplines, which biases the connections of the world and its multiplicity in this way to achieve answers to new problems through a global knowledge.

"With transdiscipline we aspire to a relational, complex knowledge, which will never be finished, but aspires to permanent dialogue and revision. Perhaps this last principle is largely due to the fact that we know with our sense organs, to our perception" (Multiversity Edgar Morin , 2020).

There are many definitions of transdisciplinary research and innovation and how to do it, but to consolidate the information it is stated that it has the following characteristics; "firstly it is action-oriented and focused on addressing complex real-world problems, it is fully participatory, it considers not only scientific or academic knowledge, but also practical, local and personal forms of knowledge, it is constantly evolving in search of a common system, it strives for transformation and transcends individualistic disciplines, it also builds holistic understanding of whole systems and the complexity of systems" (University of Technology Sydney, 2020); hence it questions the deep purpose of the Self, as a social being, within the framework of values and norms.

Consequently, transdisciplinarity takes this integration of disciplines one step further, it is not only about interactions between specialized fields, but about locating these interactions in a total system with a social purpose, which may mean that transdisciplinarity for individual practitioners and academics depends on the area of training. For scientists, for example, it means that their work is integrated into the real world and that they respect "stakeholders outside the research". This participatory approach is somewhat obvious for design practice, where it has become very common to involve all kinds of stakeholders in collaborative approaches.

However, for many designers, the focus on systems, complexity, and purpose may be new. Interesting transdisciplinary developments in design practice are being explored, for example, by the systems design community that integrates systems thinking with design, and by the many designers seeking systemic ways to address sustainability issues.

It should be noted that the relationship that exists between the so-called multidisciplinary, interdisciplinary and transdisciplinarity are completely relevant and of great urgency in the Colombian and international business context; because it will allow you to move forward through tools, strategies or models, in order to solve the multiple problems that companies present daily and overflow the basic terms of the disciplines, which work abruptly in opposite directions, pointing to what they call the same goal.

Innovation in the company

The Oslo Manual defines innovation as "the conception and implementation of significant changes in the company's product, process, marketing or organization with the purpose of improving results" (OECD, 2005, p. 48) considering that changes based on innovation are made through the appropriation of technology that together with new knowledge generate highly productive developments; in turn, the manual describes activities as... "the scientific, technological, organizational, financial and commercial actions that lead to innovation. Activities that have produced success are considered as well as those that are in progress or those carried out within projects cancelled due to lack of feasibility" (OECD, 2005, p. 50).

Schumpeter (2004) describes innovation as "the fundamental element that explains economic development, which does not occur spontaneously, but is actively promoted, within the capitalist system, by the so-called innovative entrepreneur".

And is that the innovation process is conceived from different perspectives, the neoclassical school considers that innovation is an exclusive task of the centers of thought and research which excludes the business environment, in a context oriented to maximization,

"the school establishes that information is a public good, therefore, it is possible to access it for free therefore knowledge transfer costs are minimal for society; while for the evolutionary theory it considers innovation as a private good, which appropriates technological developments" (FREIRE, 2012, p. 15).

This historical evolution of theories triggered the approach towards innovation systems (Nelson, 2001, p. 23), which provided a structure based on the stages: Research; invention, application of innovation, diffusion and transfer of knowledge, comprising research in universities, companies and think tanks; invention as a synonym of novelty, application of innovation as a triggering axis that materializes the invention; diffusion and transfer of knowledge.

6. Conclusions

It could be affirmed that a transdisciplinary perspective is a cognitive strategy that sets in motion its own theoretical pivots, according to the scenario under study, and represents a clear challenge to the traditional Aristotelian binary and linear logic; since it presents cognitive schemes that can cross disciplines, sometimes with such virulence that it places them in complex difficulties the interdisciplinary, multidisciplinary or transdisciplinary issues that have operated and have played a fruitful role in the history of the Sciences.

It should be oriented to the clear notions that are implicit in them, that is to say, the cooperation and the best articulation to the common object and better project in common; now, innovation is intertwined with the competitive process of the companies, making a transversal axis since innovation has become one of the fundamental instruments within the companies that want to be competitive in an increasingly challenging, complex and changing environment.

According to (Teece, 1997, pp. 509-533), which is based on Schumpeter's theory, argues that the determinant that underlies competitiveness in companies and development in innovation is the understanding that strategic management planning determines how companies base their relationship between price and performance to increase their profits and create economic development based on business innovation; It is at this precise moment where it is necessary to reflect on how transdisciplinarity contributes to the innovative development of the organization, because in this context, there are several paradigms that frame the strategic business analysis, among them the integration of the different knowledge of the resources of the companies to allow to forge specific actions with strategic purposes within the framework of the systems; therefore, the approach from the perspective indicates the optimization of the resources of the companies, considering them as heterogeneous teams.

Companies must appropriate transdisciplinary practices "characterized by learning or research that transgresses disciplinary practice and creates new synergies, with participants from different

disciplines collaborating to generate innovative and novel approaches to complex applied problems" (University of Technology Sydney, 2020).

Then companies must innovate in including transdisciplinary projects, which integrate data, information, tools, techniques, perspectives, concepts and/or theories from two or more disciplines to address socially relevant problems in collaboration with other stakeholders (real or simulated) depending on their nature; they also require aligning knowledge with the combination between digital literacy, problem-solving skills and creativity; these factors complement discipline-based roles and provide greater depth in specific areas of the company.

Recognizing that in this rapidly changing, hyper-connected world, where society is facing increasingly complex and dynamic issues such as mass migration, youth radicalization, political polarization, mental health issues caused by social media pressure and increasing work pressure, and climate change, it is important to recognize that in a rapidly changing, hyper-connected world, where society is facing increasingly complex and dynamic issues such as mass migration, youth radicalization, political polarization, mental health issues caused by social media pressure and increasing work pressure, and climate change; an optimistic light can be seen through the application of innovation, which offers endless opportunities that contribute to the issues outlined above; to see the fruits of these opportunities companies must appropriate business innovation in both concept and perception and the various opportunities behind the global chaos must be intentionally and systematically analyzed.

Furthermore, the future must be seen as an extension of all the revolutionary processes that were unleashed in the past and maintain a clear vision of what the future can offer; companies, organizations and society must implement constant creativity and innovation processes and continuously question existing paradigms in order to understand the approaches and value systems of others.

On the other hand, and closely linked to the concept of innovation, transdisciplinarity requires the transfer of knowledge and the removal of the comfort zone provided by the experience of disciplines, so that companies can face the challenges and manage to work in a transdisciplinary context through learning about systems thinking, complexity and, in general, how we can make the most of the challenges of the world.

In summary, transdisciplinarity as a methodology in business innovation can be adapted to the model that integrates management, planning and execution, based on the similarity between a system, seen from the complexity proposed by Edgar Morin, and an organization, conceived as a social system.

Finally, through the scientific revolutions, man has focused on different paradigms, however, to understand how science has been transformed it is necessary to outline the postulates of Thomas Kuhn, Ray Kurzweil, Karl Popper, and in Colombia Carlos Eduardo Maldonado; each one contributes to the debate on the scientific method from his perspective.

References

- Acosta, J. C. (2012). Liderazgo y emprendimiento innovador en nuevas empresas de base tecnológica. un estudio de casos basado en un enfoque de gestión del conocimiento. *Real*, 5-13.
- Apostel, L. (1972). *Interdisciplinarity Problems of Teaching and Research in Universities*.
- Bunge, M. (2014). *La Ciencia. Su Método y su Filosofía*. Buenos Aires: Penguin Random House Grupo Editorial Argentina.
- Campero, M. B. (2017). Descartes y la construcción de un sujeto a partir de la negación de la vida. *Centro de Investigaciones filosóficas-CONICET*, 10. Obtenido de http://www.revistafactotum.com/revista/f_17/articulos/Factotum_17_3_Campero.pdf
- Castro-Gómez, S. (2011). Desafíos de la interdisciplinariedad. *Pedagogía y Saberes*, 10.
- Descartes, R. (1641). *El Discurso del método*.
- Descartes, R. (2010). *El Discurso del Método*. Guayaquil: Editorialjg.blogspot.com.
- Diez, S. (2014). *La Actitud Conductual en las Intenciones Emprendedoras*. 2.
- Echeverria-King, L. F., & Pinto, J. (2021). nversión en actividades de ciencia, tecnología e innovación: el caso de Colombia y Ecuador. *CEA*, 27. doi:<https://doi.org/10.22430/24223182.1672>
- Edgar Morin. (2020). *Los siete saberes necesarios para la educación del futuro*. Venezuela: UNESCO.
- El País. (17 de Octubre de 2014). *El País*. (El País) Recuperado el 24 de Septiembre de 2020, de https://elpais.com/elpais/2014/10/17/media/1413577081_550723.html
- Freeman, C. (2008). *Sistemas de Innovación: Ensayos Seleccionados en Economía Evolutiva*. Edward Elgar.
- FREIRE, P. (2012). *RSE Educación Social y Trabajo con la Comunidad*.
- Kuhn, T. (1971). *La Estructura de Las Revoluciones Científicas*. México: Fondo de Cultura Económica.
- Mendes, L., & Santos, M. (2014). Factores que influyen en el uso del contenido generado por el usuario en eninternet. *redalyc*, 607-625.
- Montoya Suarez, O. (2004). Schumpeter, Innovación y Determinismo Tecnológico. *Scientia Et Technica*, 212.
- Moreno, J. (2013). Analisis de los factores que influyen en la intención emprendedora de los estudiantes universitarioS. *Reista digital de investigación en docencia*, 7.
- Multiversidad Edgar Morin . (05 de 08 de 2020). *Multiversidad Edgar Morin* . Obtenido de <https://edgarmorinmultiversidad.org/index.php/que-es-transdisciplinariedad.html>
- Nelson, R. (2001). *National Innovation Systems*.
- OECD. (2015). *Manual de Frascati*. OECD.
- OECD. (2018). *Oslo Manual*. OCDE.
- OECD, E. C. (2005). *OECD*. (G. trasga, Editor) Recuperado el 05 de 06 de 2017, de <http://www.itq.edu.mx/convocatorias/manualdeoslo.pdf>
- Organización de Estados Iberoamericanos . (22 de 05 de 2020). *Iberoamerica divulga*. Obtenido de <https://www.oei.es/historico/divulgacioncientifica/?Interdisciplinariedad-Dos-o-mas-son-mejor-que-una>
- Pineda Serna, L. (2009). *Enfoques Alrededor de la Gestión Estratégica de la Innovación*. Bogotá: Universidad del Rosario.
- Popper, K. (2008). *La Lógica de la Investigación Científica*. Tecnos.
- RICYT / OEA / CYTED. (2001). *Normalización de Indicadores de Innovación Tecnológica en América Latina y el Caribe*. Bogotá: RICYT / OEA / CYTED.
- Rodríguez , A. (2009). *Nuevas perspectivas para entender el emprendimiento empresarial*.
- Ruiz, M., Sanz, I., & Fuentes, M. (2015). *Investigaciones Europeas de Dirección y Economía de la Empresa*. ScienceDirect, 47-54.

Sagasti, F. (2011). Ciencia, tecnología el para el desarrollo. Mexico: fondo de Cultura Economica.

Schumpeter. (24 de Agosto de 2004). Capitalismo, socialismo y democracia.

Teece, D. J. (1997). Dynamic capabilities and strategic management. Strategic management journal. University of Technology Sydney. (14 de 09 de 2020). University of Technology Sydney. Obtenido de <https://www.uts.edu.au/>

Valencia, A., Montoya, I., & Montoya, A. (2016). Intención emprendedora en estudiantes universitarios: Un estudio bibliométrico. OmniaScience, 883.

**Entrepreneurship and Small
Business Management:
New Opportunities and
Challenges**

Technological Drivers and Entrepreneurship Challenges of Manufacturing Sector in Industry 4.0: Identification of Critical Factors through Total Interpretive Structural Modeling (TISM)

Suha Bilquis, Aligarh Muslim University (sohabilquis@gmail.com)

Abstract:

Purpose: The fourth industrial revolution involves industry development practices to attain more intelligent, automated, data-driven ventures, providing a new set of challenges for entrepreneurs. Entrepreneurship aids in economic development and its focus in the 4th industrial revolution has been on opportunity development and identification, attracting resources and managing challenges in start-ups. This innovative scenario has changed entrepreneurship's future completely. Hence, the need to understand the implications of the 4th Industrial Revolution on Entrepreneurship has become inevitable. In India, there have been several initiatives to promote entrepreneurship in both large scale and small industries sector by the government and non- government organizations.

Methodology: This research paper attempts to identify the key variables or factors for 'Technological Drivers of Industry 4.0' and 'Challenges to Entrepreneurship in Industry 4.0' in context of the Indian manufacturing industry through SLR using PRISMA and accordingly develop a suitable model for enhancing entrepreneurship in India using Total Interpretive Structural Modeling (TISM) and check the dependencies of the factors on each other. Therefore, this study examines these drivers and *challenges and provides a comprehensive framework for enhancing entrepreneurship in India.*

Findings: The findings of the research state that big data, the internet of things, industrial internet and cloud, artificial intelligence, and augmented reality are the driving forces of industry 4.0. TISM modelling of technological drivers enabling the conception of industry 4.0 provides a clear picture of how these different technologies are interconnected. It is also evident from the model that one variable affects another variable and in which manner (directly or indirectly). Whereas, among entrepreneurial challenges, education proves to be the driving challenge restricting efficient entrepreneurship. Education is the basis for innovation and up- gradation not just in business but also in every domain. The primary problem of education and lack of skill training programme leads to entrepreneurial incapacity, which directly or indirectly causes other challenges such as risk aversion behaviour, reluctance to invest more in the business, eventually leading to a lack of standardization and inefficient business models.

Implications: The models provided in the study hold importance for both academia and management as the study provides a vivid framework of technological drivers and entrepreneurial challenges significant to industry

4.0. The hierarchical relationships depict the key driving and dependent factors. For the broader acceptance of the industry 4.0 concepts in developing countries, more studies are required to be conducted showing the challenges inhibit the implementation of industry 4.0 in developing countries like India.

Keywords: *Entrepreneurship, Industry 4.0, TISM, Drivers, Challenge, SLR, PRISMA, India*

1. Introduction

The concept of industry 4.0 has brought a revolution in the business world due to its widespread applicability and strong potential of bringing innovation. Industry 4.0 is the result of continuous innovation through digitalization and the effective deployment of artificial intelligence. Industry 4.0 comprises properties of cyber-physical system (CPS) and internet or intranet of things (IoT) which again assimilate the heterogeneous data and knowledge base of different fields significant to the business environment (Sony & Naik, 2020). The continuous effort of humans and technology led the business world from the first industrial revolution to the fourth industrial revolution. From the increased use of hydropower, steam power, development of machine tools, electricity, mass production (assembly lines), accelerated automation and information technology eventually derived business to now following CPS technology integrating the real world with the information age for future industrial development (Zhou et al., 2016). Industry 4.0 was originated through the German initiative, which provides a cross-section among different technologies rooted in mechanical engineering. There are no standardized rules or designs which restrict the evolution of Industry 4.0 (Bonaccorsi et al., 2020). Integration of digitalized technologies such as Internet of Things and Services (IoTS) for delivering industrial value creation gave rise to this evolutionary paradigm referred to as “Industry 4.0” or “Industrial Internet of Things” (IoT) (Müller et al., 2018). Industry 4.0 came into existence because of continuous efficient efforts for eradicating problems of increasing customization, shortened technology and innovation cycles, improved demand volatility (Vinodh et al., 2021).

Industry 4.0 resolves manufacturing challenges: Features of industry 4.0 resolve the challenges of 'e- operations', which refers to collective integration and management of all the business operations, which can be done now with the help of enterprise resource planning (ERP) and IoT. Also, assessing data and making meaning out of it for smooth business operation (commonly known as big data analytics) poses a significant challenge. Implementing the right software for analyzing massive quantifiable data and, out of that, what to measure, how to measure and control resource usage is again a big challenge for manufacturing companies (Chiarini et al., 2020b). Other technologies of industry 4.0, such as IoT and cyber-physical systems, involve synchronization within a business system as a whole and among different business plants to make the entire manufacturing process efficient with the least maintenance and breakdowns (Varghese & Tandur, 2014).

Barriers of Industry 4.0 in the developing countries: lack of awareness among businesses related to the different technologies comprised by industry 4.0, inadequate investment and infrastructure facilities such as wireless requirements, Wi-Fi chipsets and lack of skilled competence are some of the major challenges restricting the scope of industry 4.0 in developing country like India (Stentoft et al., 2020)(Varghese & Tandur, 2014).

Entrepreneurship in the Age of Industry 4.0

Practising entrepreneurship in the age of industry 4.0 is not an easy task, especially in the developing countries as most of the entrepreneurs are nascent in these emerging economies, and there happens a misalignment between their thinking of utilizing and technology and what technology demands in terms of skills and capital (Zhou et al., 2016). Also, deployment of technology and digital transformation within the business is a hurdle as sustainable issues came into the picture. New technologies and more capital intensive techniques mean higher energy consumption which ultimately increases the carbon footprints (Vuong, 2020).

However, entrepreneurial capacity is by and large central to all technological innovation as only the right minds only support experimentation and R&D investments, creative thinking, and technological leadership. Specifically, evidence suggests that entrepreneurship is a precursor to product, technology, and market innovation. Economies that invest in promoting entrepreneurial

practices and developing a pro-innovation cultural background are more likely to innovate and be at the centre of industrial revolutions (Ferreira & Lisboa,2019).

This research paper aims to answer following research questions:

What are the Technological drivers of Industry 4.0 in the manufacturing sector?

What are the challenges of entrepreneurship in the manufacturing industries in context of Industry 4.0? To find the hierarchy and relationship among the identified drivers and challenges respectively

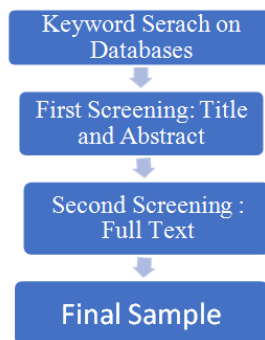
This paper is divided into two sections the first section answers the first two research questions and identifies drivers/challenges of entrepreneurship in industry 4.0 through SLR using PRISMA. In the second section the third question is answered by finding the hierarchy and relationship among variables by TISM (Total interpretive structural modelling).

2. Literature review

To achieve the first two objectives proposed in this research paper, a systematic literature review (SLR) was carried out using PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) 2020 flow diagram. The SLR methodology was adopted because it summarizes the available literature in orderly manner in response to specific research questions. The literature review began by defining the research axes, being defined by: Industry 4.0; Entrepreneurship; Technological drivers, entrepreneurship challenges. Then, to search the articles related to these topics in the databases, keyword combinations were performed.

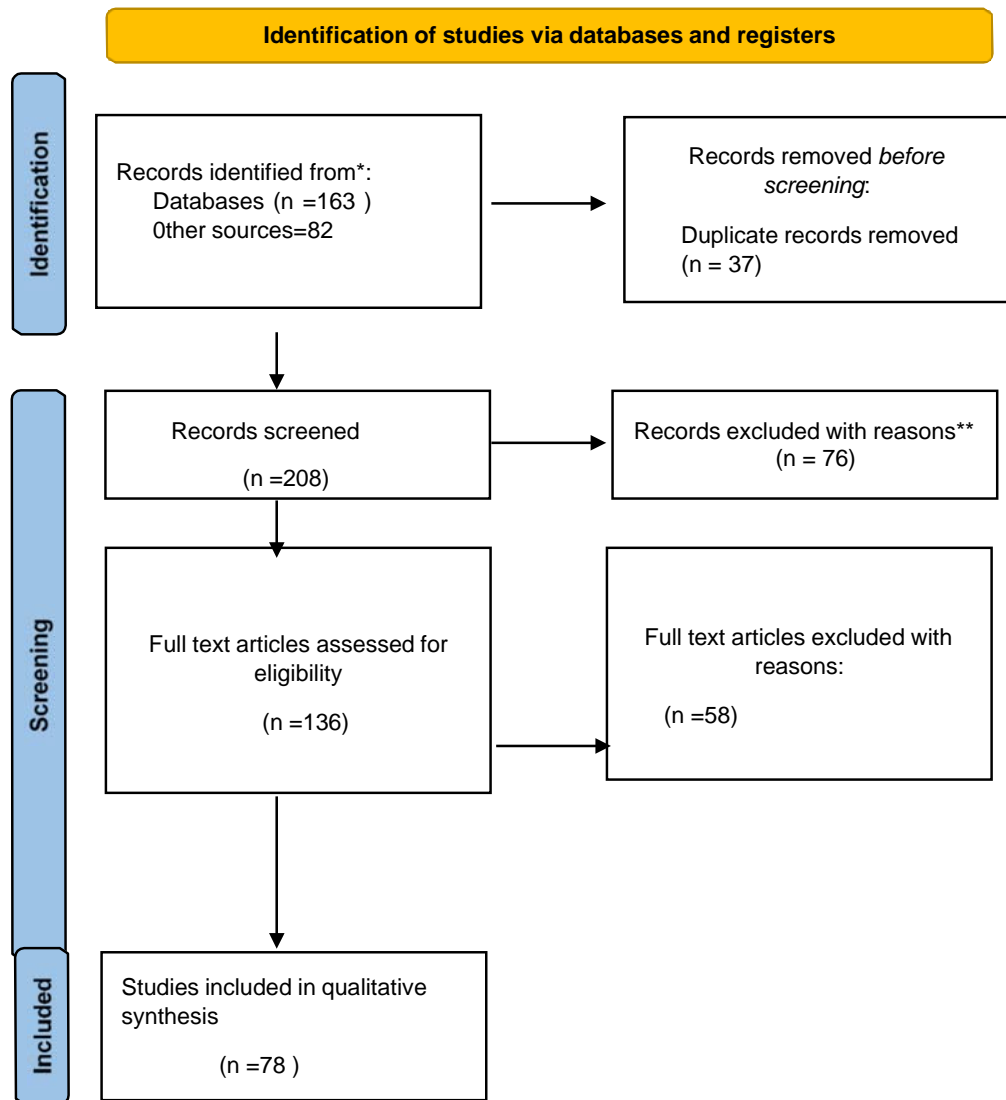
After defining the keywords and their combinations, they were put in selected databases namely Scopus, Web of Science, Science Direct, Springer, and Emerald. These databases were selected on the basis of availability of access to the author on the Open Athens portal, other sources included search engines like Google scholar, Research gate and sci hub to further exploring the literature.

Figure 1 Screening Process



The scanning of existing literature on the topics related to Industry 4.0 challenges and drivers after searching on several databases and search engines, led to 78 articles, with timeline spanning from 2015 to May 2021

FIGURE 2 PRISMA FLOW DIAGRAM



Source: <http://www.prisma-statement.org/>

The scanning of existing literature on the topics related to Industry 4.0 challenges and drivers after searching on several databases and search engines, led to 54 articles, with timeline spanning from 2015 to May2021. There were various search keywords used, as shown in Table 1 and the inclusion and exclusion criteria is shown in Table 2. There were three criteria used for inclusion and exclusion: literature type, language and timeline. There were two elimination rounds conducted following PRISMA approach, which led to the targeted 54 articles which constitute this review results and discussion.

Table 1 search boundaries and keywords

Search boundaries (Databases and search engines)	Google Scholar, Scopus, Emerald, Web of science, Research Gate, Science Direct, Springer, Industry Reports, Sci-hub
Keywords	Industry 4.0, Fourth Industrial revolution, Industry 4.0 Challenges, Entrepreneurship challenges, technological drivers, smart manufacturing, digitalization, automation, Cyber physical systems.

Table 2 Inclusion and exclusion criteria.

Criteria	Inclusion	Exclusion
Literature type	Indexed journals, book chapters, conference proceeding, industry reports	Non-indexed journals, magazine articles
Text	Full text	Not Full text
Language	English	Non-English
Timeline	2015-2021	Before 2015

A total of 9 drivers and 10 challenges have been identified through comprehensive review of literature. Further, these barriers were discussed with a panel of experts to ensure their suitability and finally, 19 mutually exclusive technological drivers and challenges have been chosen for the research. The relationship among the selected drivers and challenges has been identified and TISM methodology is used to prepare the structural model.

Table 3 Thematic representation of reviewed papers

Themes	Sub Themes	Literature Source
Industry 4.0 (Strategy and implementation)	i4.0implementation,readiness models,i4.0 readiness in organizations, sustainability framework in i4.0,operational ambidexterity, development of local entrepreneurship in i4.0,approach of i4.0,Industry leadership, continuous improvement strategies, Holistic	(Karadayi-usta, 2019)(Hizam-Hanafiah et al., 2020)(Sony & Naik, 2020)(Kamble et al., 2018)(Sahi et al., 2020)(Klobukowski & Pasieczny, 2020)(Grenčíková et al., 2019)(Mkwanazi & Mbohwa, 2018)(Bonaccorsi et al., 2020)(Vinodh et al.,

	<p>approach to HRM, regional innovation strategies, financial literacy of entrepreneurs, entrepreneurial competencies, entrepreneurial finance, strategic humanity in I4.0, hyper connected society, sustainable development in i4.0, Future of manufacturing industries, conceptual model of i4.0, knowledge based entrepreneurial ecosystems</p>	<p>2021)(Chiarini et al., 2020a)(Li, 2018)(Miskiewicz & Kwilinski, 2020)(Gentner, 2016)(Ślusarczyk, 2018)(Hecklau et al., 2016)(Lepore & Spigarelli, 2020)(Hatammimi & Krisnawati, 2018)(Kruger & Steyn, 2020a)(Vuong, 2020)(Malik, 2019)(Bauer et al., 2015)(Batkovskiy et al., 2019)(<i>FORMATION OF GLOBAL COMPETITIVE</i>, 2020)(Noerhartati et al., 2019)(Ghobakhloo, 2018)(Beltrami et al., 2021)(Liao et al., 2017)(Piccarozzi et al., 2018)(Karacay, 2018)(Entezari, 2015)(Kandil, 2018)</p>
<p>Technological Drivers (in I4.0)</p>	<p>Operational drivers, Technological development, digital transformation, entrepreneurial development, manufacturing innovation, AI and entrepreneurship, big data challenges, i4.0 technologies, maintenance transformation, application of i4.0 technologies in manufacturing, innovative solutions in logistics, innovation and entrepreneurship, business model innovation, drivers and barriers, digital trust, human capital and AI</p>	<p>(Stentoft et al., 2020)(Chiarini et al., 2020b)(Cantú-Ortiz et al., 2020)(Kruger & Steyn, 2020b)(Dean et al., 2021)(Chalmers et al., 2020)(Lee & Lim, 2021)(M. Khan et al., 2017)(da Silveira et al., 2019)(Silvestri et al., 2020)(Zheng et al., 2021)(Witkowski, 2017)(Ferreira & Lisboa, 2019)(Müller, 2019)(Stentoft et al., 2021)(Mubarak & Petraite, 2020)(Popkova & Sergi, 2020)(Africa et al., 2020)(Dalmarco et al., 2019)</p>
<p>Challenges of Entrepreneurship (in I4.0)</p>	<p>challenges of sustainability, challenges of labour market in i4.0, challenges in production system in i4.0, managerial challenges, future industrial challenges, wireless requirement and challenges, youth entrepreneurship challenges, new</p>	<p>(Ghobakhloo, 2020)(Kergroach, 2017)(A. Khan & Turowski, 2016)(A. Khan & Turowski, 2016)(Schneider, 2018)(Zhou et al., 2016)(Varghese & Tandur, 2014)(Müller et al., 2018)(Bakator et al., 2018)(Whysall et al.,</p>

	talent management ,supply chain sustainability, challenges of i4.0 technology, challenges of quality management, challenges in manufacturing SME's, cyber security challenges, implementation challenges	2019)(Luthra & Mangla, 2018)(Prause, 2019)(Prause, 2019)(Loveder, 2017)(Foidl & Felderer, 2016)(Schröder, 2016)(Culot et al., 2019)(Bakhtari et al., 2020)(Bondar, 2018)(Bakhtari et al., 2020)(Raeesi et al., 2016)(Koleva, 2018)(Abdul-Hamid et al., 2020)(Mian et al., 2020)
--	--	---

2.1 Industry 4.0 in Indian Context

The concept of industry 4.0 originated in Germany in 2011 as German government's initiative to enhance the growth of German manufacturing industry(Hizam-Hanafiah et al., 2020). The fourth industrial revolution focuses on automation, digitalization and replacement of old analogue production systems with new automated data driven tools.(Zhou et al., 2016).The foundation of industry 4.0 is based on cyber- physical systems(CPS) which lead to the integration of information and communication technologies and helps in building an intelligent and digital factory(Karadayi- usta, 2019). Such factories bring a revolution in the manufacturing industry and have made the processes more digital, information-led, customized, and sustainable (Schneider, 2018). I4.0 uses technologies like Big Data, Artificial intelligence, augmented reality, the Internet of Things (IoT), Cyber Physical Systems (CPS), etc. to improve the productivity of manufacturing industrial systemsand increases their efficiency. (Kruger & Steyn, 2020b)

Industry 4.0 is still a relatively new concept for developing countries, including India and requires a thorough understanding and practice for its implementation and acceptance in business(Luthra & Mangla, 2018). Indian manufacturing industry contributes 16-17% to GDP and provides employment to around 12% of the workforce(IBEF_Annual_Report_2019-20.Pdf, n.d.). To further enhance the growth of the manufacturing sector the government of India launched an initiative called“Make in India” and several other projects like ‘Digital India’ and Smart City to provide opportunity for automation and technological advancement in the manufacturing sector. (Luthra & Mangla, 2018)

In 2020, India's ranked 88th out of 134 countries in the Network Readiness Index (NRI).The score for technological pillar was 76 which means there is rapid technological growth in the country which will increase in coming years.(Soumitra, Dutta; Bruno, 2020) Still India is comparatively slow in adopting modern information technologies as compared to other developing economies like Malaysia and China which have much lower NRI score. The industrial automation level in manufacturing sector is also comparatively lower in India. From entrepreneurial point of view, the implementation and adoption of Industry 4.0 based concepts in manufacturing sector is in its emerging stage in India as compared to other sectors like Fmcg, automobile, service management, energy and power sector. (Soumitra, Dutta; Bruno, 2020)

Mechanization, electrification and computerization are, the three keywords of previous industrial revolutions. The technological evolution that came about has developed the current standard of manufacturing processes. The keywords for the 4th industrial revolution is digitalization.

2.2 Technological drivers of Industry 4.0

The concept of i4.0 is relatively new in a developing country like India. Table 3 contains a list of technological drivers or enablers responsible for the advent of i4.0 in India.

Table 4 Technological Drivers of industry 4.0

No.	Technological Driver	Description	Source
D1	Big Data	Big Data refers to the huge amount of data available and constantly growing databases. It uses advanced processing ways to extract valuable information swiftly from numerous data sources required for accurate decision making. It allows the separation of important information from less important one.	(Zhou et al., 2016)(M. Khan et al., 2017)(Mubarak & Petraite, 2020)
D2	Cyber physical systems	A CPS is an interconnection of physical components and a cyber-twin, where a cyber-twin is a simulation model representative of the physical things such as a computer program. Internet of Things (IoT), on the other hand, allows different CPS to be connected together for information transfer. This means that IoT acts as a connection bridge between them.	(Karacay, 2018)(Karadayi-usta, 2019)(K et al., 2020)(Stentoft et al., 2021)
D3	Internet of Things (IoT)	IoT also referred to as internet of everything is a system in which the physical world exchanges data with computers through sensors, laser scanners and other similar devices. Three features that characterize IoT are optimization, context and omnipresence. IoT plays a very crucial role in I4.0,	(Zhou et al., 2016),(Lampropoulos et al., 2019)(Cantú-Ortiz et al., 2020),(Varghese & Tandur, 2014)
D4	Operational Efficiency	A technologically updated production system comprising of industry 4.0 technologies like Visual computing, cyber physical systems Artificial intelligence etc. is more intelligent than any other traditional factory. However,	(Zhou et al., 2016)(Karacay, 2018)(Prause, 2019)(Witkowski, 2017)(Sahi et al., 2020)

		technological up gradation requires both time and money for its implementation.	
D5	Industrial internet and cloud	It has emerged from virtualization technology and involves multifaceted communication between products and its production process and all the machine data is organized into a cloud for future reference.	(Zhou et al., 2016),(Varghese & Tandur, 2014)
D6	Digital supplychain	It is a customer-driven, agile platform model which uses real time-data from various sources and analysis it to predict demand, stimulation and matching to optimize performance and eliminate risk.	(Agrawal et al.,2020), (Zheng et al., 2021)
D7	Artificial intelligence	Artificial intelligence is defined as a system's capability to understand external data properly, and to learn from such data. This data further uses algorithms to accurately predict a phenomenon. Such datasets and algorithms can further be turned towards entrepreneurial opportunity identification and exploitation.	(Cantú-Ortiz et al., 2020),(Chalmers et al., 2020),(Lee & Lim,2021)
D8	Advanced manufacturing solutions	Re-thinking old business models by implementing smarter ways of operation using high-tech machinery and digital devices. Software platforms enabled by internet and cloud computing have made the exchange of data simpler and has increased the interconnectedness among various levels in a company.	(Cantú-Ortiz et al., 2020),(Chalmers et al., 2020)(Karacay, 2018)
D9	Augmented reality	Augmented reality-based system that can support different services, such as choosing parts in a warehouse and sending out orders over mobile devices	(Chalmers et al., 2020)(Witkowski ,2017)

Table 5 Challenges of entrepreneurship in Industry 4.0

No.		Description	Source
C1	High initial cost of infrastructure	One of the most significant barriers to entrepreneurship in I4.0 is high investment cost associated with the	(Agrawal et al., 2020)
		installation of new digital technologies, resources and skilled workforce for making their efforts profitable.	(Bakhtari et al., 2020)
C2	Lack of education and skills training programme	The education system in India is not skill based specially in terms of technological operations thus the workforce lacks the skill and training required for operation of smart factories. Therefore, the manufacturing industries need to develop education and skill training programs so that their employees can align their skills with the newest technologies used in Industry 4.0.	(Bakhtari et al., 2020)(Cantú-Ortiz et al., 2020)(Mian et al., 2020)(Karacay, 2018)
C3	Lack of technological integration and compatibility	The Integration of technological tools (eg. AI, IoT, etc.) with the infrastructure of manufacturing industries is essential for establishment of smart factories and is the major requirement for their compatibility with advance tools and techniques.	(Raeesi et al., 2016)(Bakhtari et al., 2020)
C4	Lack of skilled workforce	Lack of skilled workforce poses as a hindrance in the implementation of I4.0. Advance production processes require workers with new set of skills and competencies required to overcome challenges that arise due to digital transformation. Without technologically friendly workforce the benefits associated with digitization cannot be brought to use.	(Cantú-Ortiz et al., 2020),(Agrawal et al., 2020)
C5	Lack of sustainable business models	Sustainable business models contribute to environmental and social sustainability through efficient resource usage and reduction in waste. The integration of i4.0 and sustainability is defined through concepts like green cloud computing, sustainable supply chains etc.	(Bakhtari et al., 2020)(Beltrami et al., 2021)(Batkovskiy et al., 2019)

C6	Aversion to risk	It is defined as lack of willingness to undertake risk. This is a psychological barrier or challenge for entrepreneurship and has a negative effect on it. Tolerance of risk is a desired attitude for entrepreneurs.	(Raeesi et al., 2016)(Ghobakhloo, 2018)(Kruger & Steyn, 2020a)
C7	Lack of entrepreneurial capacity	Entrepreneurial capacity is the degree to which an individual is motivated to realize entrepreneurial opportunities and has the capacity, skill, and willingness to exploit entrepreneurial activities.	(Raeesi et al., 2016)(Kruger & Steyn, 2020a)
C8	Organisational Constraint	Traditional business processes do not fit in digital business models and must be optimized to meet the requirements of global value chains. Flexibility is essential to overcome the challenge of Increasing product portfolio and customer demands.	(Raeesi et al., 2016)(Kruger & Steyn, 2020a) (Zheng et al., 2021)
C9	Lack of standardization	The emergence of Industry 4.0 has enabled inter-company networking and integration, thus standardization is required for information exchange and integration processes of cyber physical systems with traditional business models. In I4.0 these standards are mentioned as the reference architecture, which provides a framework to structure, develop, integrate and operate the technological systems.	(Raeesi et al., 2016)(Bakhtari et al., 2020)
C10	Digital security(Digital trust)	With the application of technology there will be immense interconnectedness and data flow this data may include confidential information related to organization, its customers and products. Thus, the companies need to ensure that this data and information is saved from unauthorized accesses, hackings, and damage. Security is a critical issue as digitalization and distribution of company information with third parties increase data exposure risk.	(Agrawal et al., 2020) (Bakhtari et al., 2020)

3. Research Methodology

3.1 The method

TISM is an upgraded qualitative modeling technique of the traditional ISM (Interpretive Structure Modelling). ISM was initially developed by J. Warfield in 1973. TISM is ascertained as a decision modeling approach and has been used by numerous researchers (Sushil, 2013; Yadav, 2014; Dubey et al., 2017).

The process of TISM is presented in the following steps:

1. The primary step is to identify and define the variables or factors whose relations are to be modelled. In this research paper, the identification of factors is done by reviewing the existing literature.
2. Next, contextual relations are determined by examining the relationships among the identified variables.
3. This is the step towards the TISM that is required to further interpret the traditional ISM. Here, how will one variable influence or enhance the other variable is mentioned. For pair-wise comparisons, each factor is individually linked with all the other factors in the form of reachability matrix. Total number of pair-wise comparison for 'n' identified variables will be $n \times (n-1)$. The paired comparisons in the interpretive logic-knowledge base are described in the form of reachability matrix by making entry 1 in i-j cell if the corresponding entry in knowledge is "Y"
i.e. Yes which is further interpreted and by making entry as 0 for the corresponding entry "N"
i.e. No in the knowledge base.
4. This reachability matrix is checked for transitivity. The knowledge base is updated as "Y" and 1 is entered for each new transitive link and transitive is entered in the interpretation column. If the transitive link is significant in nature, its reason is also stated.
5. The next step is to ascertain and establish the reachability and antecedent sets for all the identified variables. The intersection of the reachability set and the antecedent set will be the same as the reachability set in case of the variable in a particular level. The top-level variable satisfying the condition should be removed from the variable set, and this will be repeated to determine all the levels.
6. Finally, the structural model is developed by arranging the variables graphically level-wise and the directed links are drawn as per the relations in the reachability matrix. Only those transitive relationships are retained in the digraph whose interpretation is crucial. (Jena et al., 2017)

3.2 Sample and Data Collection

Data was collected from both secondary and primary sources. Existing literature on entrepreneurship, industry 4.0 and related topics was reviewed to identify the variables or factors. For the qualitative modelling, primary data has been collected from 2 industry experts and one from academia through 2 structured templates, one each for technological drivers and challenges for drawing relationships between the identified variables. Their responses were sought as "yes" or "no" along with interpretation for determining relationships among factors and the majority view opinion

i.e. 2 out of 3 were taken in the making of TISM.

4 Results, Analysis and Discussion

4.1 Technological Drivers

The responses of the experts obtained through the template are arranged in the reachability matrix.

Table 6 : Initial Reachability Matrix									
	D1	D2	D3	D4	D5	D6	D7	D8	D9
D1	1	1	0	0	1	1	1	0	1
D2	0	1	1	0	0	1	0	1	0
D3	1	1	1	1	1	1	1	1	1
D4	0	1	0	1	0	1	0	0	0
D5	1	1	1	1	1	1	1	1	1
D6	0	0	0	1	0	1	0	1	0
D7	1	1	1	1	1	1	1	1	1
D8	0	1	0	1	0	1	0	1	0
D9	0	1	1	1	0	1	0	1	1

Table7 : Final Reachability Matrix									
	D1	D2	D3	D4	D5	D6	D7	D8	D9
D1	1	1	1*	1*	1	1	1	1*	1
D2	1*	1	1	1*	1*	1	1*	1	1*
D3	1	1	1	1	1	1	1	1	1
D4	0	1	1*	1	0	1	0	1*	0
D5	1	1	1	1	1	1	1	1	1
D6	0	1*	0	1	0	1	0	1	0
D7	1	1	1	1	1	1	1	1	1
D8	1*	1	1*	1	0	1	0	1	0
D9	1*	1	1	1	1*	1	1*	1	1

*Value after applying transitivity

Table 8 : Iteration-1				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
D1	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 5, 7, 8, 9	1, 2, 3, 5, 7, 8, 9	
D2	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	I
D3	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9	
D4	2, 3, 4, 6, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	2, 3, 4, 6, 8	I
D5	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 5, 7, 9	1, 2, 3, 5, 7, 9	
D6	2, 4, 6, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	2, 4, 6, 8	I
D7	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 5, 7, 9	1, 2, 3, 5, 7, 9	
D8	1, 2, 3, 4, 6, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 6, 8	I
D9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 5, 7, 9	1, 2, 3, 5, 7, 9	

Table 9 : Iteration-2				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
D1	1, 3, 5, 7, 9	1, 3, 5, 7, 9	1, 3, 5, 7, 9	II
D3	1, 3, 5, 7, 9	1, 3, 5, 7, 9	1, 3, 5, 7, 9	II
D5	1, 3, 5, 7, 9	1, 3, 5, 7, 9	1, 3, 5, 7, 9	II
D7	1, 3, 5, 7, 9	1, 3, 5, 7, 9	1, 3, 5, 7, 9	II
D9	1, 3, 5, 7, 9	1, 3, 5, 7, 9	1, 3, 5, 7, 9	II

Table 10: List of variables and their levels in TISM			
S.No.	Variable No.	Variables	Level in TISM
1.	D1	Big Data	II
2.	D2	Cyber Physical Systems (CPS)	I
3.	D3	Internet of Things (IoT)	II
4.	D4	Operational Efficiency (OE)	I
5.	D5	Industrial Internet & Cloud	II
6.	D6	Digital Supply Chain (DSC)	I
7.	D7	Artificial Intelligence (AI)	II

8.	D8	Advanced Manufacturing Solutions	I
9.	D9	Augmented Reality	II

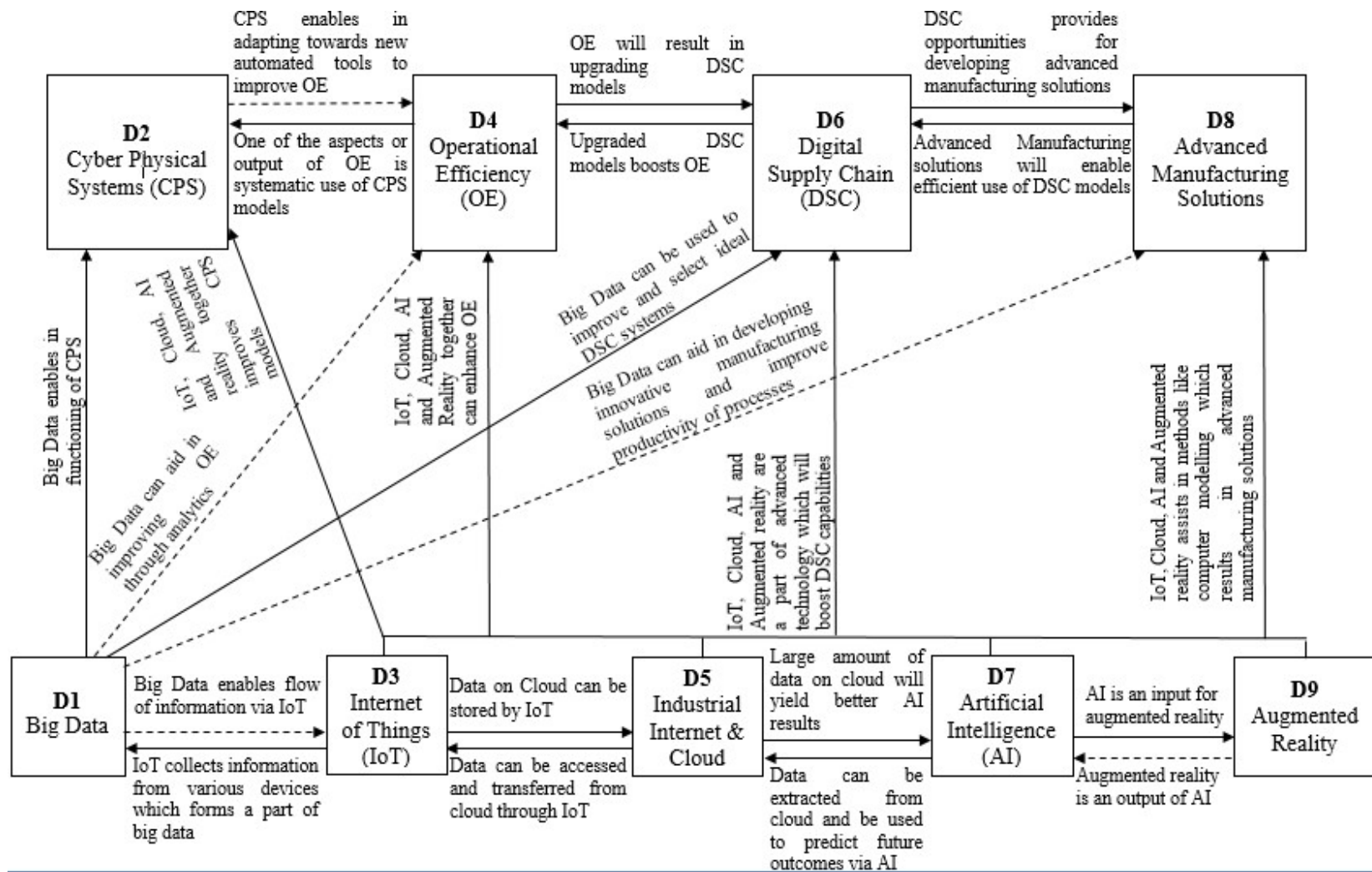


Figure 3: Hierarchical TISM of Technological Drivers of Industry 4.0

As per figure 2, the nine identified Drivers have been apportioned into two levels. Big Data, Internet of Things (IoT), Industrial Internet & Cloud, Artificial Intelligence (AI) and Augmented Reality are on Level 2 and Cyber Physical Systems (CPS), Operational Efficiency, Digital Supply Chain and Advanced Manufacturing Solutions are on Level 1. The factors on Level 2 are driving factors whereas factors on Level 1 are emerging factors.

Big Data consists of large amount of data sets and information. Big Data Analytics is used to extract valuable information, bring about logical understanding of it and helps in making informed decisions by various stakeholders. The flow of information of the data is done through Internet of Things (IoT). IoT are physical objects like laptops, mobiles, smart security cameras etc. which provide internet connectivity through different software applications and sensors built in them. It can be used as controllers for other gadgets and appliances. IoT also enables storage and access of data on cloud. Cloud facilitates the storage of data on servers via internet by acting as a database and allows remote access of the data through IoT. Data on cloud is used by AI models for analysis and predicting future outcomes to aid organizations in taking strategic decisions. AI also helps in automation of various processes. It is also adding value to the existing system of cloud computing which has led to an integration of AI and cloud. This has led to formation of Augmented Reality. Augmented Reality is an extension of Virtual Reality. It brings about the virtual objects in real environment and provides reality-based experience.

Big Data also provides input to CPS. CPS encompasses physical components and digital components and are interconnected. CPS models helps in monitoring, controlling and automation of processes. It is also known as intelligent systems. These systems use IoT, Cloud, AI and Augmented Reality for successful running of its models. In terms of manufacturing sector in Industry 4.0, digital transformation has aided in Operational Efficiency by making the industrial production processes cost effective and improving the quality of the output of each processes. Digital transformation has also assisted in better inventory control of raw materials, quality control of products and processes and reducing of defects of materials which has positively impacted Operational Efficiency. Big Data has facilitation of upgradation of the existing Supply Chain systems to Digital Supply Chain by enlarging the existing datasets for analysis and enabled the application of its analytic tools in selecting ideal Digital Supply Chain models. All of these developments has led to development of advanced manufacturing solutions which includes flexible plant and production lines, optimum utilization of available resources and supporting intelligent manufacturing.

In 2018, the World Economic Forum established its hub to promote Fourth Industrial Revolution in India in collaboration with the Government of India. The National Institute for Transforming India (NITI) Aayog has been assigned to work along the World Economic Forum for expanding the new policy frameworks for upcoming digital technologies. (Kulshreshtha, 2021)

The Indian Institute of Science in India launched smart factory platform for manufacturing in 2014. This platform aims to design an industrial environment of intelligent technology and supporting automation intensive factory like 3D printers, automated guided vehicles etc. (*Overview – Industry 4.0: I4.0@IISc*, n.d.)

4.2 Challenges

The same steps of technological drivers were performed for analysis and interpretation, the initial reachability matrix of challenges (Table 11) is as follows:

Table 11 : Initial Reachability Matrix										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	0	1	0	1	0	0	0	1	0
C2	0	1	0	1	1	0	1	1	0	0
C3	0	0	1	0	1	0	0	1	1	0
C4	0	0	1	1	1	0	0	1	0	0
C5	0	0	1	0	1	0	0	0	0	0
C6	0	0	0	0	0	1	0	1	1	0
C7	0	0	0	0	1	1	1	1	1	0
C8	1	0	0	0	1	0	0	1	1	0
C9	0	0	1	0	0	0	0	0	1	0
C10	0	0	0	0	0	0	0	0	0	1

Table 12 : Final Reachability Matrix										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	0	1	0	1	0	0	1*	1	0
C2	1*	1	1*	1	1	1*	1	1	1*	0
C3	1*	0	1	0	1	0	0	1	1	0
C4	1*	0	1	1	1	0	0	1	1*	0
C5	0	0	1	0	1	0	0	1*	1*	0
C6	1*	0	1*	0	1*	1	0	1	1	0
C7	1*	0	1*	0	1	1	1	1	1	0
C8	1	0	1*	0	1	0	0	1	1	0
C9	0	0	1	0	1*	0	0	1*	1	0
C10	0	0	0	0	0	0	0	0	0	1

*Value after applying transitivity

Partitioning of the Final Reachability Matrix into Different Levels

Table 13 : Iteration-1				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
C1	1, 3, 5, 8, 9	1, 2, 3, 4, 6, 7, 8	1, 3, 8	
C2	1, 2, 3, 4, 5, 6, 7, 8, 9	2	2	
C3	1, 3, 5, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 3, 5, 8, 9	I
C4	1, 3, 4, 5, 8, 9	2, 4	4	
C5	3, 5, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	3, 5, 8, 9	I
C6	1, 3, 5, 6, 8, 9	2, 6, 7	6	
C7	1, 3, 5, 6, 7, 8, 9	2, 6, 7	6, 7	
C8	1, 3, 5, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 3, 5, 8, 9	I
C9	3, 5, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	3, 5, 8, 9	I
C10	10	10	10	I

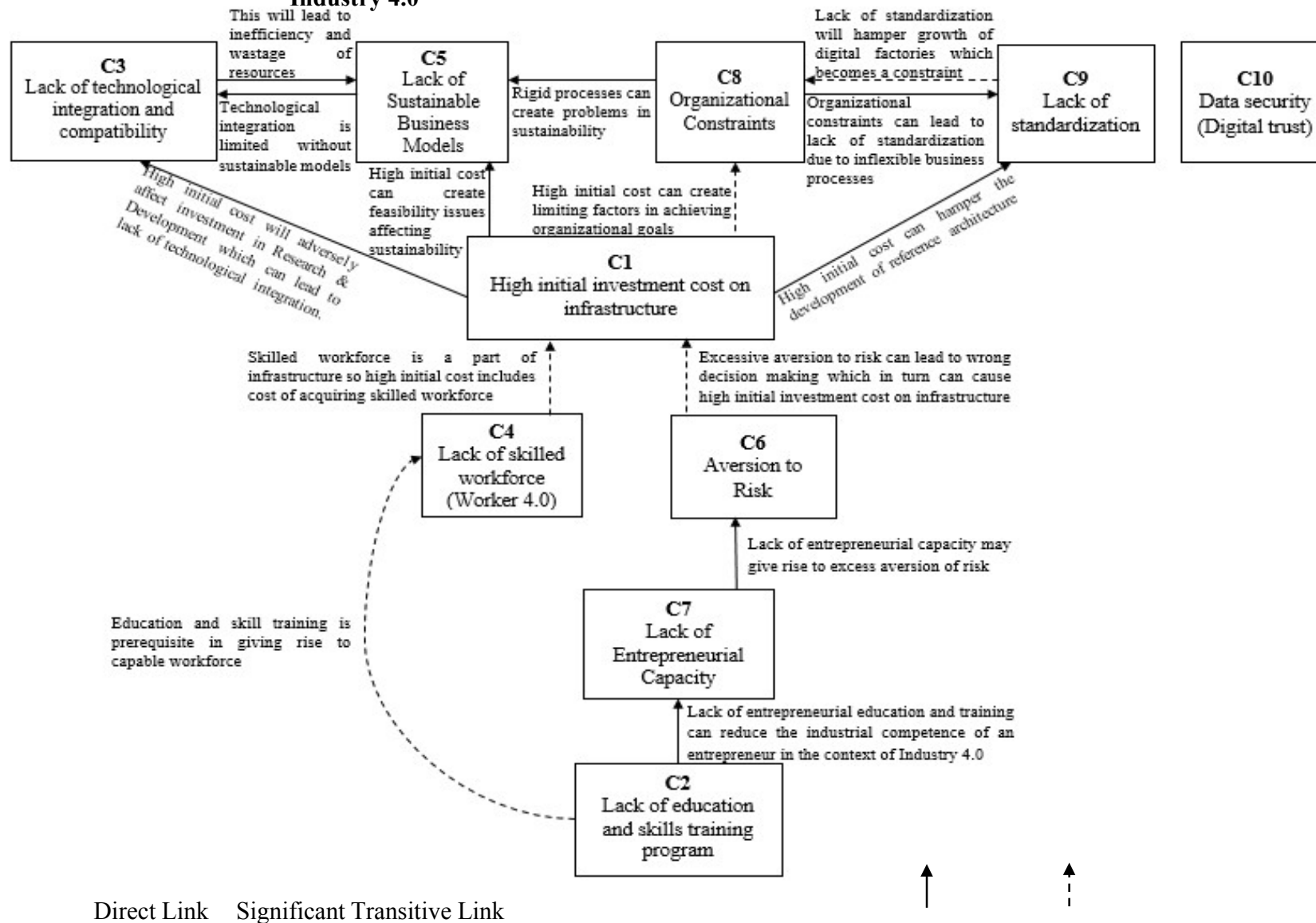
Table 14 : Iteration-2				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
C1	1	1, 2, 4, 6, 7	1	II
C2	1, 2, 4, 6, 7	2	2	
C4	1, 4	2, 4	4	
C6	1, 6	2, 6, 7	6	
C7	1, 6, 7	2, 6, 7	6, 7	

Table 15 : Iteration-3				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
C2	2, 4, 6, 7	2	2	
C4	4	2, 4	4	III
C6	6	2, 6, 7	6	III
C7	6, 7	2, 6, 7	6, 7	

Table 16 : Iteration-4				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
C2	2, 7	2	2	V
C7	7	2, 7	7	IV

Table 17:List of variables and their levels in TISM			
S.No.	Variable No.	Variables	Level in TISM
1.	C1	High initial investment cost on infrastructure	II
2.	C2	Lack of education and skills training program	V
3.	C3	Lack of technological integration and compatibility	I
4.	C4	Lack of skilled workforce (Worker 4.0)	III
5.	C5	Lack of Sustainable Business Models	I
6.	C6	Aversion to Risk	III
7.	C7	Lack of Entrepreneurial Capacity	IV
8.	C8	Organizational Constraints	I
9.	C9	Lack of standardization	I
10.	C10	Data security (Digital trust)	I

Figure 4: Hierarchical TISM of Challenges to Entrepreneurship in Industry 4.0



As per figure 1, the ten identified challenges have been apportioned into five levels. Lack of education and skills training program is on level 5 and is the most independent and driving factor. Lack of entrepreneurial capacity is on level 4. Level 3 consists of Lack of Skilled Workforce (Workers 4.0) and Aversion to risk. High initial investment cost of infrastructure is on Level 2. Lack of technological integration and compatibility, Lack of Sustainable Business Models, Organizational constraints, Lack of Standardization and Digital Security (Digital Trust) are consequences of the higher levels and therefore they are placed on Level 1.

Education and skills training program in context of Industry 4.0 is the backbone of successful entrepreneurship ventures. The era of industry 4.0 is new and still evolving. It becomes very important for entrepreneurs to acquire knowledge about new developments especially digital transformations and receive hands on training of these applications. Lack of it will create shortage of skilled workers in this industry and also limit entrepreneurial competence.

In India, an important initiative has been undertaken by the Department of Heavy Industries (Ministry of Heavy Industries & Public Enterprises), Government of India known as “SAMARTH Udyog Bharat 4.0” to facilitate 4.0 manufacturing projects. It attempts to overcome the challenge of Lack of education and training programs. (*About I4.0 | SAMARTH Udyog*, n.d.)

The lack of entrepreneurial capacity will give rise excessive aversion of risk behavior by the entrepreneurs. This can result in the wrong decision making leading to high initial investment cost of infrastructure. This in turn will become a hindrance to technological integration and compatibility which will cause inefficiency and wastage of resources. This wastage will work against the development of sustainable business models. Organizational constraints like traditional business models, inflexible business processes can also hamper the development of sustainable business models. It also leads to lack of standardization. Standardization refers to the systematic process of information exchange and adaptable technology which can be used by all departments of an organization.

The factor digital security (digital trust) does not have any relationships with the identified challenges. However, it is important to recognize the cyber security issues, loopholes in the system, unauthorized access and use of data and cyber-attacks so that it may instill trust among people to shift their business operations and the relevant processes to online platforms.

Conclusion

The study concludes with a comprehensive analysis of the enablers of industry 4.0, how they are interlinked, and the critical driving technologies that are triggering the implementation of industry

4.0 within the manufacturing industry of India. The research study enhances the basic understanding of the industry 4.0 concept and the technologies driving it. The full interpretive structural modelling exhibits how technologies like big data, internet of things, artificial intelligence, and augmented reality considerably derive the inception of cyber physical system, which is now essential for efficient operations in the manufacturing industry. Operational efficiency, digital supply chain, and advanced manufacturing solutions are only possible when the basic framework of driving technological enablers is appropriately executed.

However, after analyzing the total interpretive structural modelling, it became clear how different entrepreneurial challenges hinder the acceptance of industry 4.0 and its technologies in developing countries like India. Therefore, the research study vividly describes how these entrepreneurial barriers restrict the implementation of the significant technologies central to industry 4.0. There are several government initiatives up and running in India to equip the workforce with the required skills and expertise essential within industry 4.0. However, there must be more such initiatives demanded by the manufacturing industry to operate their best and contribute significantly to the country's gross domestic product.

Future Research Directions

This study suggests nine technological drivers of industry 4.0 and ten challenges of entrepreneurship in context of manufacturing industry of India. For further research some of the other challenges in different country or context or non-technological drivers may be included. This work has been conducted in Indian context it could be extended to other developing nations with certain modifications. Further, the drivers and challenges of entrepreneurship in different developing nations can be compared in future studies. Also, more number of responses can be collected in order to make the TISM more accurate. There is scope for doing similar type of research with ISM or TISM technique with emphasis on other developing countries.

References

- Abdul-Hamid, A. Q., Ali, M. H., Tseng, M. L., Lan, S., & Kumar, M. (2020). Impeding challenges on industry 4.0 in circular economy: Palm oil industry in Malaysia. *Computers and Operations Research*, 123, 105052. <https://doi.org/10.1016/j.cor.2020.105052> *About I4.0 | SAMARTH Udyog*. (n.d.).
- Africa, S., Faculty, B. M., Sciences, M., & Africa, S. (2020). *PREDICTORS OF INDUSTRY 4 .0 TECHNOLOGIES AFFECTING LOGISTIC ENTERPRISES ' PERFORMANCE :INTERNATIONAL*. 26(6), 1263–1283.
- Agrawal, P., Narain, R., & Ullah, I. (2020). *Analysis of barriers in implementation of digital transformation of supply chain using interpretive structural modelling approach*. 15(1), 297–317. <https://doi.org/10.1108/JM2-03-2019-0066>
- Bakator, M., Đorđević, D., Čočkalović, D., Nikolić, M., & Vorkapić, M. (2018). Lean startups with industry 4.0 technologies: Overcoming the challenges of youth entrepreneurship in Serbia. *Journal of Engineering Management and Competitiveness*, 8(2), 89–101. <https://doi.org/10.5937/jemc1802089b>
- Bakhtari, A. R., Kumar, V., Waris, M. M., Sanin, C., & Szczerbicki, E. (2020). ScienceDirectScienceDirect Industry 4 . 0 Implementation Challenges in Manufacturing Industry Implementation Challenges in Manufacturing Industries : an Interpretive Structural Modelling Approach Industries : an Interpretive Structural Modelling Approach. *Procedia Computer Science*, 176, 2384–2393. <https://doi.org/10.1016/j.procs.2020.09.306>
- Batkovskiy, A. M., Leonov, A. V., Pronin, A. Y., Semenova, E. G., Fomina, A. V., & Balashov, V. M. (2019). *Entrepreneurship and Sustainability Issues Sustainable Development of Industry 4.0: the Case of High-Tech Products System Design * Entrepreneurship and Sustainability Issues*. 6(4), 1823–1838.
- Bauer, W., Hämmerle, M., Schlund, S., & Vocke, C. (2015). Transforming to a hyper-connected society and economy – towards an “ Industry 4 . 0 .” *Procedia Manufacturing*, 3(Ahfe), 417424. <https://doi.org/10.1016/j.promfg.2015.07.200>
- Beltrami, M., Orzes, G., Sarkis, J., & Sartor, M. (2021). Industry 4.0 and sustainability: Towards conceptualization and theory. *Journal of Cleaner Production*, 312, 127733. <https://doi.org/10.1016/j.jclepro.2021.127733>
- Bonaccorsi, A., Chiarello, F., Fantoni, G., & Kammering, H. (2020). Emerging technologies and industrial leadership.A Wikipedia-based strategic analysis of Industry 4.0. *Expert Systems With Applications*, 113645. <https://doi.org/10.1016/j.eswa.2020.113645>
- Bondar, K. (2018). Challenges and Opportunities of Industry 4.0 – Spanish Experience. *International Journal of Innovation, Management and Technology*, 9(5), 202–208. <https://doi.org/10.18178/ijimt.2018.9.5.814>
- Cantú-Ortiz, F. J., Galeano Sánchez, N., Garrido, L., Terashima-Marin, H., & Brena, R. F. (2020). An artificial intelligence educational strategy for the digital transformation. *International Journal on Interactive Design and Manufacturing*, 14(4), 1195–1209.

<https://doi.org/10.1007/s12008-020-00702-8>

Chalmers, D., MacKenzie, N. G., & Carter, S. (2020). Artificial Intelligence and Entrepreneurship: Implications for Venture Creation in the Fourth Industrial Revolution. *Entrepreneurship: Theory and Practice*, 1–26. <https://doi.org/10.1177/1042258720934581>

Chiarini, A., Belvedere, V., & Grando, A. (2020a). Industry 4.0 strategies and technological developments. An exploratory research from Italian manufacturing companies. *Production Planning and Control*, 31(16), 1385–1398. <https://doi.org/10.1080/09537287.2019.1710304>

Chiarini, A., Belvedere, V., & Grando, A. (2020b). The Management of Operations Industry 4 .0 strategies and technological developments . An exploratory research from Italian manufacturing companies. *Production Planning & Control*, 0(0), 1–14. <https://doi.org/10.1080/09537287.2019.1710304>

Culot, G., Fattori, F., Podrecca, M., & Sartor, M. (2019). Addressing Industry 4.0 Cybersecurity Challenges. *IEEE Engineering Management Review*, 47(3), 79–86. <https://doi.org/10.1109/EMR.2019.2927559>

da Silveira, F., Neto, I. R., Machado, F. M., da Silva, M. P., & Amaral, F. G. (2019). Analysis of industry 4.0 technologies applied to the health sector: Systematic literature review. *Studies in Systems, Decision and Control*, 202, 701–709. https://doi.org/10.1007/978-3-030-14730-3_73

Dalmarco, G., Ramalho, F. R., Barros, A. C., & Soares, A. L. (2019). Providing industry 4.0 technologies: The case of a production technology cluster. *Journal of High Technology Management Research*, 30(2), 100355. <https://doi.org/10.1016/j.hitech.2019.100355>

Dean, M., Rainnie, A., Stanford, J., & Nahum, D. (2021). Industrial policy-making after COVID-19: Manufacturing, innovation and sustainability. *Economic and Labour Relations Review*, 32(2), 283–303. <https://doi.org/10.1177/10353046211014755>

Entezari, Y. (2015). Building Knowledge- Based Entrepreneurship Ecosystems : Case of. *Procedia - Social and Behavioral Sciences*, 195, 1206–1215. <https://doi.org/10.1016/j.sbspro.2015.06.242>

Ferreira, V., & Lisboa, A. (2019). *Innovation and Entrepreneurship : From Schumpeter to Industry 4 . 0*. 890, 174–180. <https://doi.org/10.4028/www.scientific.net/AMM.890.174>

Foidl, H., & Felderer, M. (2016). Research challenges of industry 4.0 for quality management. *Lecture Notes in Business Information Processing*, 245, 121–137. https://doi.org/10.1007/978-3-319-32799-0_10

Formation of global competitive. (2020). 24(1), 4675.

Gentner, S. (2016). *Industry 4 . 0 : Reality , Future or just Science Fiction ? How to Convince Today ' s Management to Invest in Tomorrow ' s Future ! Successful Strategies for Industry4 . 0 and Manufacturing IT*. 70(9), 628–633. <https://doi.org/10.2533/chimia.2016.628>

Ghobakhloo, M. (2018). The future of manufacturing industry: a strategic roadmap toward Industry 4.0. *Journal of Manufacturing Technology Management*, 29(6), 910–936. <https://doi.org/10.1108/JMTM-02-2018-0057>

Ghobakhloo, M. (2020). Industry 4.0, digitization, and opportunities for sustainability. *Journal of Cleaner Production*, 252, 119869. <https://doi.org/10.1016/j.jclepro.2019.119869>

Grenčíková, A., Kordoš, M., & Sokol, J. (2019). The approach to industry 4.0 within the Slovak business environment. *Social Sciences*, 8(4). <https://doi.org/10.3390/socsci8040104>

Hatammimi, J., & Krisnawati, A. (2018). Financial literacy for entrepreneur in the industry 4.0 era: A conceptual framework in Indonesia. *ACM International Conference Proceeding Series*, 183–187. <https://doi.org/10.1145/3285957.3285985>

Hecklau, F., Galeitzke, M., Flachs, S., & Kohl, H. (2016). Holistic Approach for Human Resource Management in Industry 4.0. *Procedia CIRP*, 54, 1–6. <https://doi.org/10.1016/j.procir.2016.05.102>

Hizam-Hanafiah, M., Soomro, M. A., & Abdullah, N. L. (2020). Industry 4.0 readiness models: A systematic literature review of model dimensions. *Information (Switzerland)*, 11(7),

- 1–13. <https://doi.org/10.3390/info11070364>
IBEF Annual Report 2019-20.pdf. (n.d.).
- Jena, J., Sidharth, S., Thakur, L. S., Kumar Pathak, D., & Pandey, V. C. (2017). Total Interpretive Structural Modeling (TISM): approach and application. *Journal of Advances in Management Research*, 14(2), 162–181. <https://doi.org/10.1108/JAMR-10-2016-0087>
- K, S. D., Paranitharan, K. P., & A, I. A. (2020). Total Quality Management & Business Excellence Interpretive framework by analyzing the enablers for implementation of Industry 4.0: an ISM approach. *Total Quality Management*, 0(0), 1–21. <https://doi.org/10.1080/14783363.2020.1735933>
- Kamble, S. S., Gunasekaran, A., & Gawankar, S. A. (2018). Sustainable Industry 4.0 framework: A systematic literature review identifying the current trends and future perspectives. *Process Safety and Environmental Protection*, 117, 408–425. <https://doi.org/10.1016/j.psep.2018.05.009>
- Kandil, M. (2018). 기사 (Article) 와 안내문 (Information) [. *The Eletronic Library*, 34(1), 1–5. Karacay, G. (2018). *Talent Development for Industry 4.0*. https://doi.org/10.1007/978-3-319-57870-5_7
- Karadayi-usta, S. (2019). An Interpretive Structural Analysis for Industry 4.0. *IEEE Transactions on Engineering Management*, PP, 1–6. <https://doi.org/10.1109/TEM.2018.2890443>
- Kergroach, S. (2017). Industry 4.0: New challenges and opportunities for the labour market. *Foresight and STI Governance*, 11(4), 6–8. <https://doi.org/10.17323/2500-2597.2017.4.6.8>
- Khan, A., & Turowski, K. (2016). A perspective on industry 4.0: From challenges to opportunities in production systems. *IoTBD 2016 - Proceedings of the International Conference on Internet of Things and Big Data*, IoTBD, 441–448. <https://doi.org/10.5220/0005929704410448>
- Khan, M., Wu, X., Xu, X., & Dou, W. (2017). Big data challenges and opportunities in the hype of Industry 4.0. *IEEE International Conference on Communications*, 0–5. <https://doi.org/10.1109/ICC.2017.7996801>
- Kłobukowski, P., & Pasieczny, J. (2020). *Impact of Resources on the Development of Local Entrepreneurship in Industry 4.0*.
- Koleva, N. (2018). Industry 4.0's opportunities and challenges for production engineering and management възможностите и предизвикателствата, които industry 4.0 поставя пред производствения инженеринг и мениджмънт. *International Scientific Journals Innovations*, 6(1), 17–18.
- Kruger, S., & Steyn, A. A. (2020a). *A conceptual model of entrepreneurial competencies needed to utilize technologies of Industry 4.0*. <https://doi.org/10.1177/1465750320927359>
- Kruger, S., & Steyn, A. A. (2020b). Enhancing technology transfer through entrepreneurial development: practices from innovation spaces. In *Journal of Technology Transfer* (Vol. 45, Issue 6). Springer US. <https://doi.org/10.1007/s10961-019-09769-2>
- Kulshreshtha, M. (2021). *Industry 4.0 Technology: The key game changer for Indian Manufacturing Sector* (pp. 1–9).
- Lampropoulos, G., Siakas, K., & Anastasiadis, T. (2019). Internet of Things in the Context of Industry 4.0: An Overview. *International Journal of Entrepreneurial Knowledge*, 7(1), 4–19. <https://doi.org/10.2478/ijek-2019-0001>
- Lee, C., & Lim, C. (2021). From technological development to social advance: A review of Industry 4.0 through machine learning. *Technological Forecasting and Social Change*, 167(January), 120653. <https://doi.org/10.1016/j.techfore.2021.120653>
- Lepore, D., & Spigarelli, F. (2020). *Integrating Industry 4.0 plans into regional innovation strategies*. <https://doi.org/10.1177/0269094220937452>

- Li, L. (2018). China's manufacturing locus in 2025: With a comparison of "Made-in-China 2025" and "Industry 4.0." *Technological Forecasting and Social Change*, 135(May 2017), 66–74. <https://doi.org/10.1016/j.techfore.2017.05.028>
- Liao, Y., Deschamps, F., Loures, E. de F. R., & Ramos, L. F. P. (2017). Past, present and future of Industry 4.0 - a systematic literature review and research agenda proposal. *International Journal of Production Research*, 55(12), 3609–3629. <https://doi.org/10.1080/00207543.2017.1308576>
- Loveder, P. (2017). *Australian apprenticeship: trends, challenges and future opportunities for dealing with Industry 4.0.*
- Luthra, S., & Mangla, S. K. (2018). Evaluating challenges to Industry 4.0 initiatives for supply chain sustainability in emerging economies. *Process Safety and Environmental Protection*. <https://doi.org/10.1016/j.psep.2018.04.018>
- Malik, A. (2019). *Creating Competitive Advantage through Source Basic Capital Strategic Humanity in the Industrial Age 4.0*. 4(1), 209–215.
- Mian, S. H., Salah, B., Ameen, W., Moiduddin, K., & Alkhalefah, H. (2020). Adapting universities for sustainability education in industry 4.0: Channel of challenges and opportunities. *Sustainability (Switzerland)*, 12(15). <https://doi.org/10.3390/su12156100>
- Miskiewicz, R., & Kwilinski, A. (2020). <http://jssidoi.org/esc/home>. 7(4), 2630–2645.
- Mkwanazi, S., & Mbohwa, C. (2018). Implications of the 4th industrial revolution on entrepreneurship education. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 2018(SEP), 318–328.
- Mubarak, M. F., & Petraite, M. (2020). Technological Forecasting & Social Change Industry 4.0 technologies, digital trust and technological orientation: What matters in open innovation? *Technological Forecasting & Social Change*, 161(July), 120332. <https://doi.org/10.1016/j.techfore.2020.120332>
- Müller, J. M. (2019). *Business model innovation in enterprises Strategies for industry 4.0 providers and users*. 30(8), 1127–1142. <https://doi.org/10.1108/JMTM-01-2018-0008>
- Müller, J. M., Kiel, D., & Voigt, K. I. (2018). What drives the implementation of Industry 4.0? The role of opportunities and challenges in the context of sustainability. *Sustainability (Switzerland)*, 10(1). <https://doi.org/10.3390/su10010247>
- Noerhartati, E., Karyati, P. D., Soepriyono, S., & Yunarko, B. (2019). *Entrepreneurship Sorghum towards Industry 4.0. January*. <https://doi.org/10.2991/iciir-18.2019.2> *Overview – Industry 4.0: I4.0@IISc*. (n.d.).
- Piccarozzi, M., Aquilani, B., & Gatti, C. (2018). Industry 4.0 in management studies: A systematic literature review. *Sustainability (Switzerland)*, 10(10), 1–24. <https://doi.org/10.3390/su10103821>
- Popkova, E. G., & Sergi, B. S. (2020). *Human capital and AI in industry 4.0. Convergence and divergence in social entrepreneurship in Russia*. 21(18), 565–581. <https://doi.org/10.1108/JIC-09-2019-0224>
- Prause, M. (2019). *Challenges of Industry 4.0 Technology Adoption for SMEs: The Case of Japan*.
- Raeesi, R., Dastranj, M., Mohammadi, S., & Rasouli, E. (2016). *Understanding the Interactions among the Barriers to Entrepreneurship Using Interpretive Structural Modeling Understanding the Interactions among the Barriers to Entrepreneurship Using Interpretive Structural Modeling*. June 2013. <https://doi.org/10.5539/ijbm.v8n13p56>
- Sahi, G. K., Gupta, M. C., & Cheng, T. C. E. (2020). The effects of strategic orientation on operational ambidexterity: A study of Indian SMEs in the industry 4.0 era. *International Journal of Production Economics*, 220(August 2018), 107395. <https://doi.org/10.1016/j.ijpe.2019.05.014>
- Schneider, P. (2018). Managerial challenges of Industry 4.0: an empirically backed research agenda for a nascent field. In *Review of Managerial Science* (Vol. 12, Issue 3). Springer Berlin Heidelberg. <https://doi.org/10.1007/s11846-018-0283-2>

- Schröder, C. (2016). The Challenges of Industry 4.0 for Small and Medium-sized Enterprises agood society – social democracy # 2017 plus. *The Friedrich-Ebert-Stiftung*, 28.
- Silvestri, L., Forcina, A., Introna, V., Santolamazza, A., & Cesarotti, V. (2020). Maintenance transformation through Industry 4.0 technologies: A systematic literature review. *Computers in Industry*, 123, 103335. <https://doi.org/10.1016/j.compind.2020.103335>
- Ślusarczyk, B. (2018). Industry 4.0 – Are we ready? *Polish Journal of Management Studies*, 17(1), 232–248. <https://doi.org/10.17512/pjms.2018.17.1.19>
- Sony, M., & Naik, S. (2020). Key ingredients for evaluating Industry 4.0 readiness for organizations: a literature review. *Benchmarking*, 27(7), 2213–2232. <https://doi.org/10.1108/BIJ-09-2018-0284>
- Soumitra, Dutta; Bruno, L. (2020). *the Network Readiness Index 2020*. 2020(Figure 2), 1–6.
- Stentoft, J., Aadsbøll Wickstrøm, K., Philipsen, K., & Haug, A. (2021). Drivers and barriers for Industry 4.0 readiness and practice: empirical evidence from small and medium-sized manufacturers. *Production Planning and Control*, 32(10), 811–828. <https://doi.org/10.1080/09537287.2020.1768318>
- Stentoft, J., Wickstrøm, K. A., Philipsen, K., Haug, A., Stentoft, J., Wickstrøm, K. A., Philipsen, K., Stentoft, J., Wickstrøm, K. A., Philipsen, K., & Haug, A. (2020). The Management of Operations Drivers and barriers for Industry 4 . 0 readiness and practice : empirical evidence from small and medium-sized manufacturers from small and medium-sized manufacturers. *Production Planning & Control*, 0(0), 1–18. <https://doi.org/10.1080/09537287.2020.1768318>
- Varghese, A., & Tandur, D. (2014). *Wireless requirements and challenges in Industry 4.0*. 634–638.
- Vinodh, S., Antony, J., Agrawal, R., & Douglas, J. A. (2021). Integration of continuous improvement strategies with Industry 4.0: a systematic review and agenda for further research. *TQM Journal*, 33(2), 441–472. <https://doi.org/10.1108/TQM-07-2020-0157>
- Vuong, Q. (2020). *An Unprecedented Time for Entrepreneurial Finance upon the Arrival of Industry 4 . 0*.
- Whysall, Z., Owtram, M., & Brittain, S. (2019). The new talent management challenges of Industry 4.0. *Journal of Management Development*, 38(2), 118–129. <https://doi.org/10.1108/JMD-06-2018-0181>
- Witkowski, K. (2017). Internet of Things , Big Data , Industry 4 . 0 – Innovative Solutions in Logistics and Supply Chains Management. *Procedia Engineering*, 182, 763–769. <https://doi.org/10.1016/j.proeng.2017.03.197>
- Zheng, T., Ardolino, M., Bacchetti, A., & Perona, M. (2021). The applications of Industry 4.0 technologies in manufacturing context: a systematic literature review. *International Journal of Production Research*, 59(6), 1922–1954. <https://doi.org/10.1080/00207543.2020.1824085>
- Zhou, K., Liu, T., & Zhou, L. (2016). Industry 4.0: Towards future industrial opportunities and challenges. *2015 12th International Conference on Fuzzy Systems and Knowledge Discovery, FSKD 2015*, 2147–2152. <https://doi.org/10.1109/FSKD.2015.7382284>

Identifying Business Relationships in Textile Cluster: The case of the Ivanovo Region

Elena Sharko, Lomonosov Moscow State University (ersharko@yandex.ru), Lilia Valitova, Lomonosov Moscow State University, Marina Sheresheva, Lomonosov Moscow State University, Junzhi Deng, Lomonosov Moscow State University

Abstract:

The study presented in the paper focuses on identifying relationships of textile cluster actors, with the aim to further developing recommendations for increasing their effectiveness. The identification of formal and informal ties in industrial clusters remains an urgent research task. The paper outlines the limitations of existing approaches, including the method for identifying vertically organized structures based on technological links and the territorial proximity of enterprises that potentially make up a cluster. The authors propose a method for identifying industrial clusters based on the analysis of business links, testing this method on the case of the Ivanovo region textile cluster. A list of interlinked enterprises is determined, and their vertical and horizontal relationships identified using information about actors. This serves as the basis for studying drivers and barriers to cluster participation, specific features of cluster management and coordination of joint activities, as opportunities to gain positive synergy effects for cluster.

Keywords: *industrial clusters, textile clusters, cluster identification, industrial ties, relationships, coopetition, cluster sustainability.*

1. Introduction

One of the most important trends in the latest decades is the transformation of transactional business relations in supply chains into complex interconnected production networks of actors involved in joint value creation (Prause, 2015; Chen, 2019). Another broadly recognized trend is digitalization that additionally pushes the development of numerous business ecosystems (Leviäkangas, Öörni, 2020).

With the COVID-19 pandemic, a time of serious challenges began for all participants in well-established value chains (Bénassy-Quéré et al., 2020; Nikolopoulos et al., 2021; Sheresheva et al., 2021). At the same time, the pandemic has dramatically increased the use of digital technologies, boosted practices of real-time collaboration (Kamal, 2020; Vargo et al., 2021). Adaptability, resource efficiency, deep integration of information and production technologies, supply and demand processes have acquired an additional new sound and have become even more relevant (Belhadi et al., 2021; Dartnell, Kaitlin, 2021; Ivanov, 2021). The pandemic has not only significantly changed the conditions in which all sectors of the world economy operate, but also substantially raised the attention towards "real" industries, emphasizing their importance in ensuring sustainable economic development.

Industrial clusters can act as "poles of competitiveness", which allow better use of local resources to accelerate growth and strengthen competitiveness. However, the positive externalities of clustering are only achievable if collaborating actors localized within some territory have clear common goals and tasks, as well as incentives and tools to combine resources and competencies (Mueller, Jungwirth, 2016). Additionally, a favorable institutional environment is important to support those enterprises that have started to collaborate or have initial incentives to build a cluster. In this regard, cluster identification can help local authorities to choose the right support measures in terms of strengthening the regional economy by improving the cluster members' joint competitive advantages.

This study focuses on identifying relationships of cluster actors, with the aim to further developing recommendations for increasing their effectiveness. presents the author's approach to the allocation of industrial clusters on the example of the Ivanovo region textile enterprises. The ultimate goal of the study, which started in March 2021, is to identify textile clusters that have developed on the territory of a number of Russian regions, determine the composition of participants and ties between them, and develop recommendations for improving the institutional environment for increasing their effectiveness.

The rest of the paper has the following structure. In the second section, a brief review of relevant literature on the industry clusters phenomenon is presented. The third section discusses approaches to identifying industrial clusters. The next part of the paper is devoted to discussion of empirical results, gained on the example of a potential textile cluster in the Ivanovo region. Finally, the conclusions and the directions of further research are presented.

2. The phenomenon of industry clusters

Currently, there is a large number of definitions and clarifications of the industrial cluster concept. Most of them are based on the Michael Porter's definition of clusters as 'Geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate' (Porter, 1998, p. 197).

In general, according to most definitions, the specific features of industry clusters are geographical localization; the "core" of manufacturing companies in a certain industry; complementarity of resources and competencies; coopetition; network externalities¹ (Brandenburger, Neilbaff, 2012; Felzensztein, Gimmo, Deans, 2018). Some researchers underline and empirically confirm the long-term and stable relationships of cluster members (Bode et al., 2010; Breznitz, 2013).

Sustainability of successful cluster is ensured by the presence of a sufficient number of independent, innovatively active, competitive local suppliers, a system of norms and rules that is clear to all members, and the long-term joint goal, which does not exclude the presence of individual firm goals. The system of norms and rules inside cluster is partly determined by institutions external to it. Thus, Albino, Carbonara and Giannoccaro (2007) note that in many Italian industrial areas the intermediary role belongs to an association of firms, or a chamber of commerce engaged in the distribution of products.

A real industry cluster in the modern interpretation provides a competitive advantage not only through cooperation in the production and marketing of products, but also through the implementation of joint strategies in the field of technological innovations (Peeters, Tiri, Berwert, 2001; Yim et al., 2020). At the same time, the individual potential of the cluster participants is equally important, as are the system resources that are provided by the presence of a single knowledge network and relationships with intelligent business services (Knowledge Intensive Business Services) as agents that connect the cluster to external networks (Expósito-Langa, Tomás-Miquel, Molina-Morales, 2015).

Accordingly, a full-fledged cluster is not just a collection of enterprises but an inter-organizational network structure (Bergenholtz, Waldstrøm, 2011; Martínez, Belso-Martínez, Más-Verdú, 2012; Wang, Shao, Pang, 2019) a kind of ecosystem². Combining into a cluster allows achieving a synergy effect through the joint use of resources, a single infrastructure and coordination of strategies (Akhmadovich, 2019). At the same time, there is a need for a mechanism coordinating the interests and actions of participants. This means the growing complexity of the organizational structure and may reduce flexibility and the ability to innovate.

So, we support the localized and supply-side concept of clusters as strategic inter-organizational networks combining the resources and key competencies of firms and other organizations.

3. Approaches to identifying industrial clusters

The problem of identifying industry clusters is still a subject of discussion, both in scientific circles and in practice. In general, we can say that there are several relatively widely used approaches (Valitova, Sharko, Sheresheva, 2021). In Russia, most approaches are focused on identifying vertically organized structures. Less attention is paid to the explicit and implicit horizontal relationships. The horizontal ties between cluster members are most diverse and at the same time poorly formalized, based on mutual trust, greater openness of communications, savings on information search, internal mutual control.

When we are identifying clusters, a "top-down" approach is possible that aims to search spatial localizations (concentrations) of production and focuses on specific types of economic activity, and "bottom-up" approaches, looking for clusters in a specific territory based on the presence of previously known enterprises and leading industries.

The definition of industrial clusters "top-down" reveals vertically integrated territorial complexes. As a rule, this is done using the analysis of intersectoral balance sheets – "input-output" tables containing coefficients of direct costs of related industries' products. Despite the lack of practice of drawing up inter-industry balance sheets at the regional level, the input-output tables give a general idea of the possible relationship of enterprises in different industries.

There is an algorithm for detecting clusters proposed by Michael Porter (Porter, 2003). At the first stage, the spatial localization of industries or enterprises (territorial industry specialization) is determined based on an estimate of the number of employees in the relevant industries³. When analyzing industries, Porter considers potential clusters only in 2 types of industries: raw materials and basic or traded. According to this methodology, local industries focused on meeting the needs of local residents (for example, retail trade) are not included in the cluster.

After identifying the industries in which employment is concentrated, M. Porter defines enterprises that are located in spatial (geographical) proximity to each other. Further, the composition of clusters is clarified by excluding those enterprises whose performance indicators (employment and output) are poorly correlated with each other. It is assumed that the firms located in the cluster realize a competitive advantage due to the achieved synergy effect, which is an additional factor of sustainability.

In the work (Markov, Markova, 2012), a method for identifying "reference" industrial clusters is proposed and implemented in practice: at the first step, the supplier and consumer industries are distinguished from the matrix of intersectoral balance coefficients (ISB), whose connections (direct cost coefficients) exceed the average values for the industry⁴. At the second step, a regional section is added to the selected clusters of industries and the localization of employment activities is determined. Further, within each reference cluster in a certain territory, intersectoral complexes are distinguished – stable intersectoral definitions that do not reach the size of the cluster, but serve as an alternative center. Thus, 15 types of activities related to light industry were identified in the work; according to the authors' methodology, these types of economic activities make up 1 cluster, 3 intersectoral complexes and 3 industry complexes.

In our opinion, M. Porter's approach like any other approach "top-down" (for example, the methodology of the European Cluster Laboratory⁵), does not allow us to move from the analysis of clusters of industries to the analysis of cluster systems. Joint localization of enterprises related to related types of economic activity (therefore, complementary) can potentially form a cluster, but this approach does not give an idea of links between firms' existing.

In this regard, it is interesting to search for the application of network analysis to the study of production clusters' formatting and developing. Thus, M. Esposito-Langa, H.-V. Thomas-Miquel and F. K. Molina-Morales conducted an empirical study on a set of firms belonging to the Valencian textile industry cluster in order to show the sources of innovation activity and draw up a picture of innovation processes in the cluster (Expósito-Langa, Tomás-Miquel, Molina-Morales, 2015). At the first stage, the authors used the social network analysis

method to study the structure of relationships, and then conducted a series of personal interviews with representatives of the companies participating in the cluster in order to obtain more detailed, in-depth information. As a result, it was possible to show that network analysis has a number of tasks related to the identification of business relationships – one of the most difficult to observe indicators.

The research, started by the staff of the Faculty of Economics of the Lomonosov Moscow State University in 2021, also involves the application of network analysis methods to the study of the formation and development of production clusters. At the first stage of the analysis, it is assumed to determine the list of potential participants of the Ivanovo Region textile cluster. At the second stage, comparing the participants of the textile cluster with the data of industrial registers allows us to understand what characteristics of the cluster enterprises distinguish them from the same firms that are not included in this cluster. At the third stage, it is necessary to use a service containing data on various relationships between enterprises (availability of contracts, ownership relations, participation in capital, litigation, etc.). At the fourth stage (not yet implemented), it is planned to conduct in-depth interviews with the heads of firms, the questions of the guide relate to the history of education, the cluster management system, the availability of a common infrastructure and platform for enterprise interaction, the nature of relations between participants and, finally, the presence of a synergy effects for cluster participants.

4. Empirical results and discussion

4.1. The Ivanovo region textile cluster

The textile industry and clothing production is one of the Ivanovo region economic specializations that was of national significance in the Soviet times. According to the Ministry of Industry and Trade of the Russian Federation⁷, now there is no textile cluster in the Ivanovo region, in spite of the estimated share of this region in total textile production employment as 16.6% (this is the industry leader)⁶. The share of those employed in the textile industry in the total regional employment is 6.4%. According to the Russian Cluster Observatory of the HSE⁸, there is also no cluster allocated in the Ivanovo region; the only textile cluster with 11 participants is counted to be in the Ryazan region. Remarkably, however, that our contacts in 2021 with representatives of some Ryazan enterprises supposed to be cluster members, pointed out that there is no real textile cluster in this region.

At the same time, according to the SPARK¹⁰ register, the Ivanovo region has at least 470 enterprises in the main type of activity "textile industry" and "clothing production", of which at least 50 have a "life span" of more than 20 years, and about 15 existed before the 90s.

To identify a potential textile cluster that could develop in the Ivanovo region, we used the algorithm already described above based on the works of M. Porter, proposed in (Markov, Markova, 2012).

Our analysis of the total cost coefficients of the input-output tables (a fragment see in Figure 1) shows that, with the exception of the electricity production and chemical industry (participating in the production chain of nonwovens and synthetics), the entire technological vertical of the textile cluster does not go beyond the textile industry and the clothing and accessories production.

Table 1 shows a list of industries most strongly connected to the textile industry in terms of the coefficients of total costs of domestic products.

In order to move from clusters of industries to clusters of enterprises, we turned to the database of industrial enterprises of the information and analytical company SPARK and compiled a list of enterprises operating in the territory of the Ivanovo region, whose products belong to the industries we are considering. In addition to enterprises engaged in textile production and clothing production, we also included companies that provide wholesale trade services.

The result of the analysis was a list of 928 companies related to the production and trade of textiles and clothing operating in the Ivanovo region, for all main types of activities. From this

list, 13 companies indicated "fiber spinning" as their main activity; 76 – "fabric production"; 17 – "production of non-woven materials"; 152 – "clothing production"; 172 - "wholesale trade"; 152 – "retail trade" (5 of them – on the Internet); 1 – "higher education" (Higher School of Folk Arts in St. Petersburg); 1 – "additional professional education"; 7 – "cargo transportation"; 6 institutions refer to "activities for the management and operation of prisons, correctional colonies and other places of deprivation of liberty, as well as for providing rehabilitation assistance to former prisoners" – these are correctional institutions in whose workshops clothing is sewn, and which can also be considered participants in the textile cluster with full rights.

To determine the boundaries of a cluster, it is necessary to understand the presence and nature of interaction between enterprises and organizations located on a limited territory. Both formal contracts (partnership, work, property) and informal ties (trust, interaction on the same platform, information exchange, relations of belonging to the same association) can be considered as links between cluster participants.

4.2. Identification of the cluster based on the analysis of business relations of the textile industry enterprises of the Ivanovo Region

Information about relations between firms within the industry is mostly confidential. The management of firms does not disclose the names of their counterparties, intermediaries, etc., and enters into relevant non-disclosure agreements with them. This is understandable, since information, on the one hand, provides competitive advantages, on the other hand, may carry potential threats. In some cases (for example, when checking by banks or potential counterparties), the company opens both information from accounting and tax reports, data on separate divisions and licenses, and confidential information (a list of clients, pricing policy, as well as the results of tax audits of the company and its business reputation). The company's consent to the recognition of information constituting a tax secret as publicly available makes it possible to obtain information about gaps in VAT amounts throughout the chain of its suppliers and buyers.

In the modern arsenal of tools for checking the reliability of counterparties, there are various accounting or legal services and information platforms for aggregating complete information about economic entities. They differ in the level of access to information and its completeness. There can be only financial information, but with a broad retrospective; only legal information (legal behavior and the history of lawsuits over a period), purely analytical, but very general information (graphs and diagrams on generalized performance indicators). Some services have all these aspects. In most cases, access is on a paid basis – an annual subscription or a one-time access for official purposes.

To obtain information about binary relationships between textile industry enterprises, which is necessary to solve the problem of cluster allocation based on the analysis of business relationships, we used the service Kontur.Focus¹¹, which collects data from all open sources, including information published by the Federal Tax Service, Arbitration Courts, the Bailiff Service and other bodies. This service allows you to analyze existing and historical relationships between individuals and legal entities.

There can be four types of ties:

- 1) close (there is a constant interaction between enterprises on the main type of activity);
- 2) long-distance (connections arise not for the main type of activity, but for auxiliary ones – rent, consulting, IT services, delivery, logistics, sales, accounting, etc.);
- 3) historical ties (ties were established in a distant period of time, had economic significance for the activity, but for a number of reasons – liquidation, reorganization, merger, transfer of management rights, change of type of activity, etc. – are currently interrupted).
- 4) property relations (owners and equity interests).

The Kontur.Focus service allows to work with ready-made lists of enterprises, as well as to disclose connections for a single business entity.

To check the availability of micro-links, we took the formed list of textile industry enterprises of the Ivanovo region from the SPARK – 357 enterprises system, for which the corresponding production is the main OKVED (production of fabrics, clothing for various purposes and trade in textile products). From this list, 6 currently operating enterprises can be attributed to large (1.7%), 9 – to medium sized (2.5%), 58 – to small (16.2%) and 260-to microenterprises (79.6%).

The primary visualization of ties is shown in Figure 2.

Some enterprises have micro-ties (small groups are tied to each other), but most of the firms function as independent units within the industry¹². Based on the results of the initial visualization, it can be concluded that at this moment in the Ivanovo region there are 24 groups of textile enterprises that interact relatively closely with each other, forming a core and network links.

The features of ties' visualization include:

- color indication for links for the main and non-main type of economic activity;
- different thickness of the edges – the thicker the connecting edge between enterprises, the closer the connection and the higher the frequency of interaction between companies, the dotted line marks single or irregular transactions.

The analysis of historical ties between companies allows you to "see" the process of linking enterprises into one cluster (Figure 3).

The process of revealing ties depends on the goal of the study. One can disclose ties up to an infinite number of iterations, but it is important to note that excessive detail leads the researcher away from optimal results. The analyzed cluster with multiple disclosure of ties can move from the core of the analyzed cluster to a connected enterprise from a completely different cluster, where the core becomes a leading enterprise of another industry. In this regard, the task was to establish the sufficiency of the ties disclosure to obtain results according to the purpose of the study.

It turns out that in the past, many enterprises of the textile industry in Ivanovo were interconnected through non-core activities (there are 123 groups of closely interacting enterprises in total, when historical ties are disclosed to a sufficient level). For example, individual textile manufacturing enterprises "connect" in the process of searching for sales agents, wholesale and retail trade enterprises, the same intermediaries for consulting, leasing, IT support; some construction companies are a link for the purchase of workwear from some manufacturers, special fabric fabrics for industrial purposes from others. Thus, different textile enterprises are indirectly connected in the past and form new profitable partnerships with each other in the present.

We used the Kontur.Focus interactive service: in the use mode, it is possible to work with a large array of data and visualize the results obtained a large number of times. In this paper, we will show in more detail a fragment, namely the relationships formed by TDL Textile, one of the Ivanovo region textile enterprises (Figure 4).

This enterprise, engaged in the production of cotton fabrics, is presented in Figure 3 as the center (core) of the network structure, with the largest number of ties in terms of network metrics. It can be seen that "TDL Textile" with some enterprises, is associated with property rights (for example, it owns 40% of "Trading House"), and with a number of enterprises it has a common owner (70% belongs to one owner who also owns 2 more related enterprises; in total, it has 3 owners).

The analysis of firms that have ceased their activities (are in a state of liquidation, declared bankrupt and excluded from the register) is of particular interest (shown in gray in Figure 5).

According to the SPARK system, at least 520 companies related to the textile industry have been operating in the Ivanovo region since the 1990s. Of these, 357 companies (68%) are currently operating, 138 (26%) are inactive, are being liquidated (3%), and are in a state of bankruptcy (2%). All liquidation records relate to the period from 2011 to 2021. Among the

liquidated companies, it is worth mentioning the textile company Kupavna, which existed on the market for 28.5 years, Mark-Kontrakt (27.5 years) and Yakovlevskaya Manufactory (23.5 years). Relatively recently, several companies established in 1991-1993 were also liquidated. Among the companies that are in a state of bankruptcy, there is also a "long-liver" – "Shuisky socks" (22.5 years in the industry). Comparing the number of liquidated enterprises in each year with the general economic dynamics gives an idea of the factors affecting the demography of the textile industry.

Summing up the brief results of the conducted microanalysis of ties, we can state:

1) historically, there were groups of textile enterprises in the Ivanovo region, whose participants had links with scientific organizations, with the administration of the region, with associations of light industry enterprises, and with large regional companies. Historical ties formed a complete vertical "fiber production — fabric production" — "tailoring" — "sewing colleges" — "trading houses" — "business";

2) over the past 10 years (2011-2021), almost 80% of large textile industry enterprises in the Ivanovo region have ceased their activities without subsequent reorganization. They are liquidated or are in the process of bankruptcy (at the time of evaluation, 24 operating groups of textile enterprises account for 19.5% of the total number of 123 groups that previously existed in the region, united by fairly close mutual ties).

3) information about binary relationships between companies in the textile industry makes it possible to build a common network of interacting firms and to quantify the role of each firm from the methodology of network analysis point of view – based on network metrics.

Conclusions

In this paper, we proposed an approach to the identification of industrial clusters that combines the analysis of vertical and horizontal relations between specific firms based on information about partners. On the example of Ivanovo region textile industry, the proposed approach to cluster identification was tested and proved as applicable.

In our opinion, this approach is scalable to a number of other industries and regions of the Russian Federation. This may be a promising avenue for further research, including using the methodology of network theory and mathematical tools of network analysis. We also plan a series of in-depth interviews with industry representatives to get information about the market "from the inside". Presumably, the interview results will help to shed light on the ways of managing and coordinating clustering activities, and on the opportunities to gain positive effects for cluster members.

Fig. 1. Fragment of the "input-output" table

COEFFICIENTS OF TOTAL COSTS of DOMESTIC PRODUCTS for 2016 (in rubles per 1000 rubles of products)					
		PRODUCTS	Textiles	Clothing and its accessories	Leather and leather products
	Codes		17	18	19
№			_024	_025	_026
_010	12	Uranium and thorium ores	0,01	0	0,01
_011	13.1	Iron ores	0,59	0,41	0,46
_012	13.2	Non-ferrous metal ores	0,39	0,32	0,26
_013	14	Other mining products	2,56	0,94	1,28
_014	15.1	Meat, meat products and other animal processing products	1,48	0,81	83,13
_015	15.2	Fish, processed fish products and canned	0,02	0,02	0,06
_016	15.3	Fruits, vegetables, potatoes, processed	0,08	0,05	0,18
_017	15.4	Oils and fats, animal and vegetable	0,25	0,1	0,66

_018	15.5	Dairy products and ice cream	0,10	0,07	0,25
_019	15.6	Products of flour and cereal production, starches	0,25	0,1	0,46
_020	15.7	Ready-made animal feed	2,34	0,66	5,92
_021	15.8	Other food products	0,27	0,21	1,25
_022	15.9	Drinks	0,06	0,05	0,06
_023	16	Tobacco products	0,00	0	0
_024	17	Textiles	1122,57	183,92	33,36
_025	18	Clothing and its accessories	0,53	1019,52	9,92
_026	19	Leather and leather products	0,16	4,34	1149,15

Source: compiled from the SPARK registry. <https://www.spark-interfax.ru>

Table 1 – Technological relationships of textile cluster industries

Industry	Interconnected industries
Textile	<ul style="list-style-type: none"> – Textile – Wholesale trade services, including trade through agents, except for services in the trade of motor vehicles and motorcycles; – Services for the production, transmission and distribution of electricity; – Chemical fibers and filaments; – Basic chemical substances
Clothing and accessories	<ul style="list-style-type: none"> – Clothing and accessories; – Textiles; – Wholesale trade services, including trade through agents, except for services in the trade of motor vehicles and motorcycles; – Other services related to business activities; – Services related to real estate; – Financial intermediation services; – Services for the production, transmission and distribution of electricity

Source: compiled by the authors

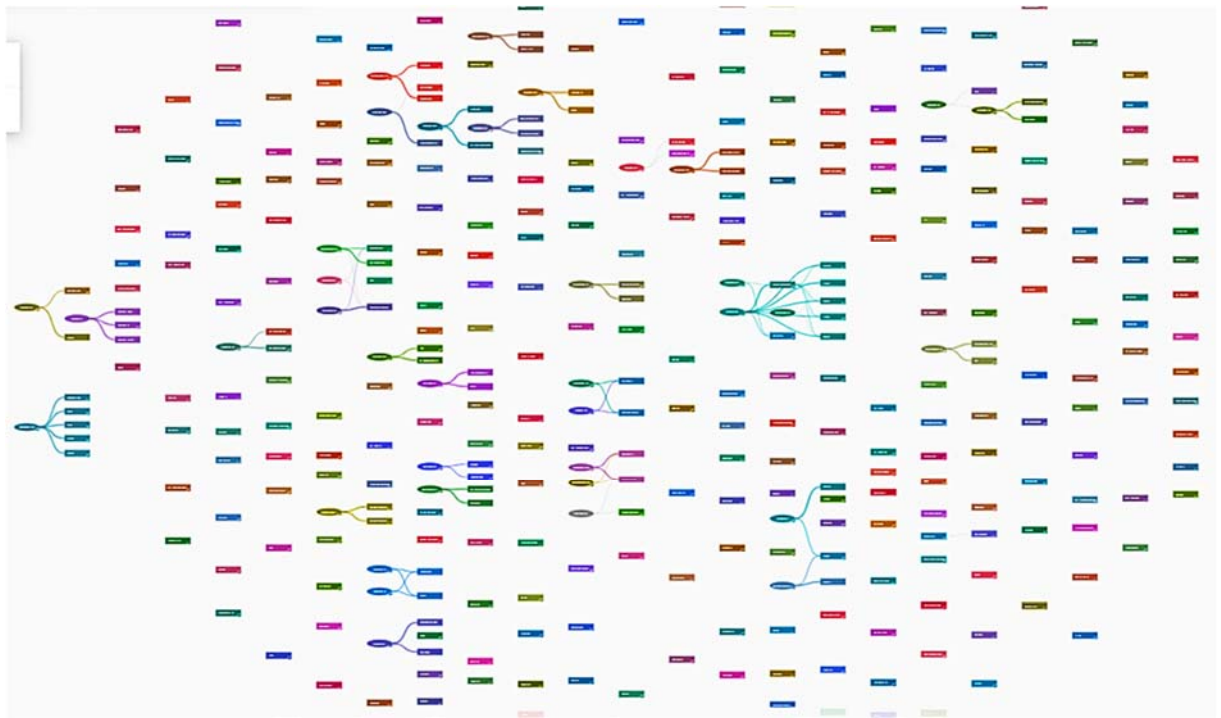


Fig. 2. Visualization of ties between textile industry enterprises in the Ivanovo region (fragment)

Source: visualization of ties in the Kontur.Focus service. <https://focus.kontur.ru>

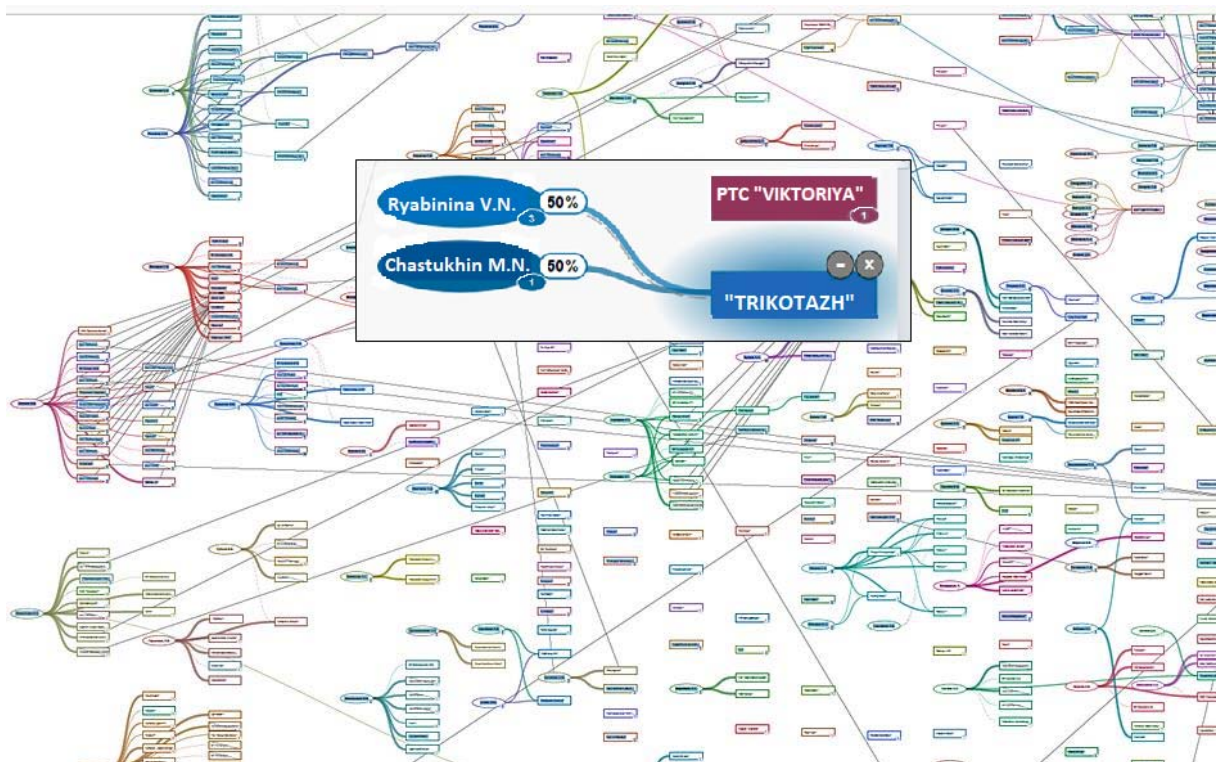
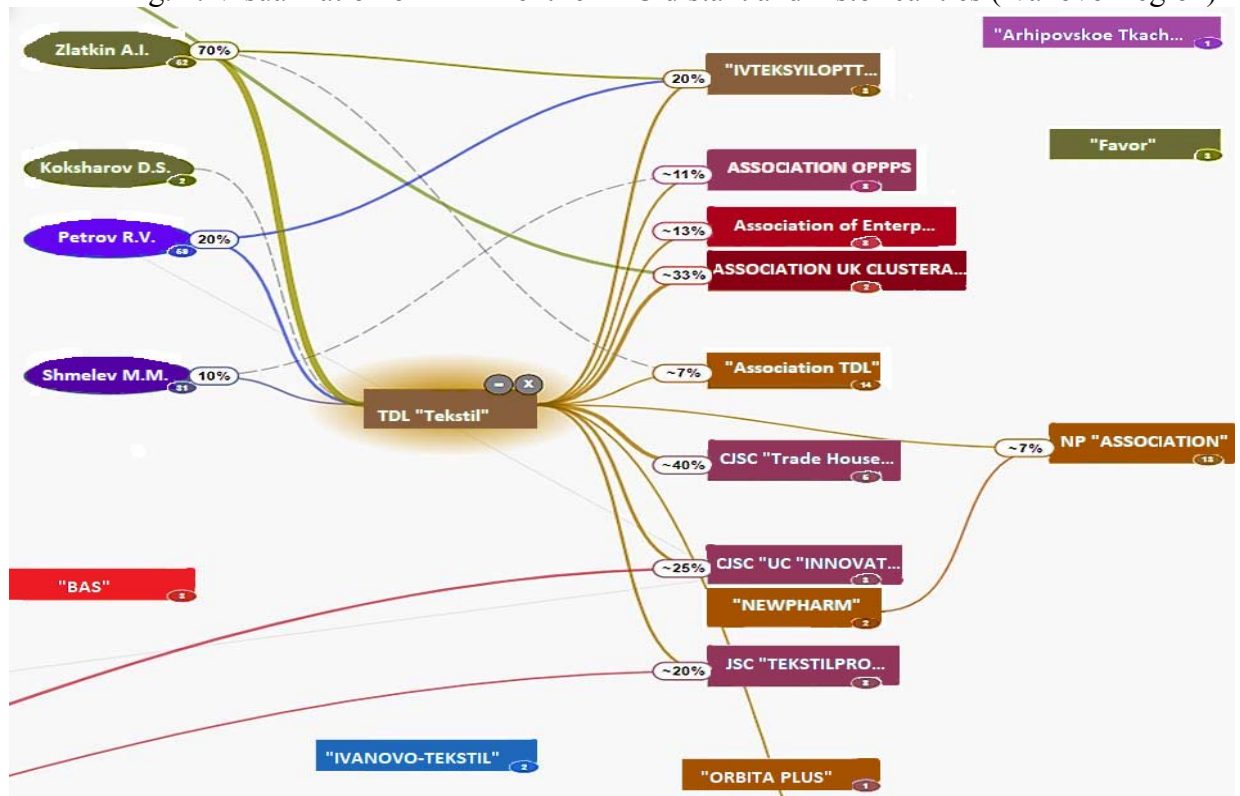


Fig. 3. Visualization of distant and historical ties between textile industry enterprises in the Ivanovo region (fragment)

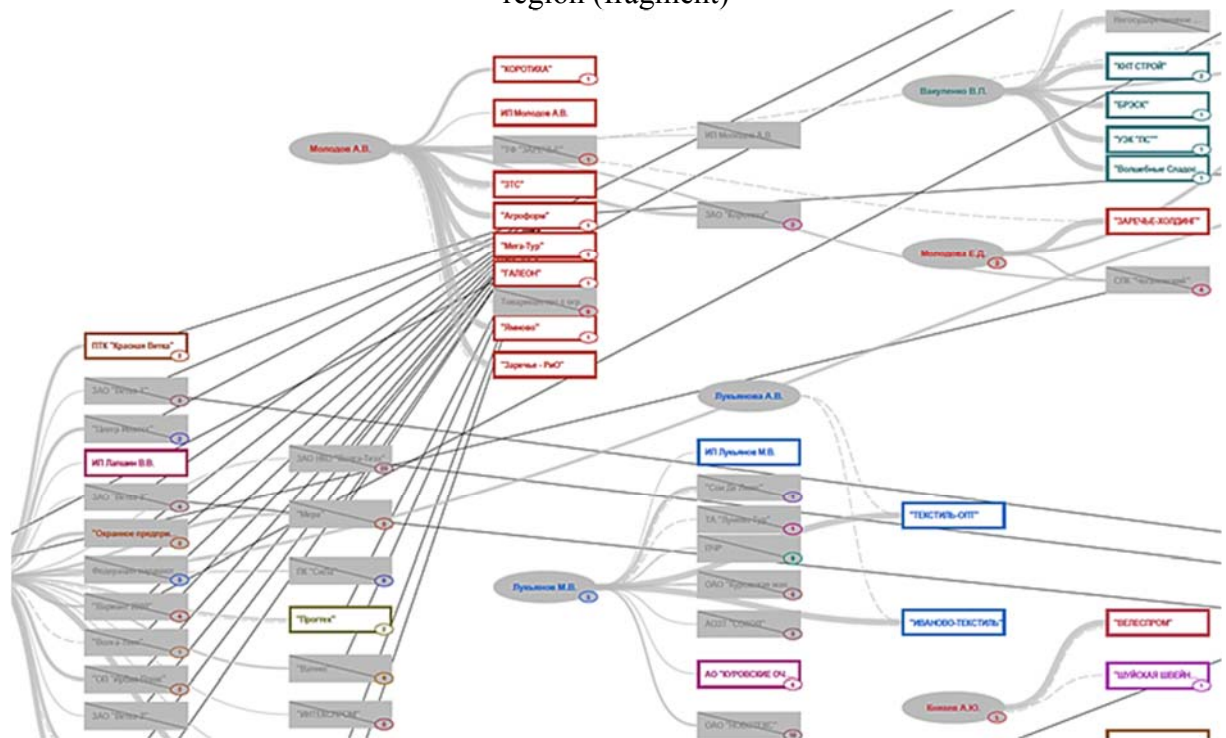
Source: compiled by the authors using the "Visualization of ties" tool in the Kontur.Focus service. <https://focus.kontur.ru>

Fig. 4. Visualization of TDL Textile LLC distant and historical ties (Ivanovo Region)



Source: compiled by the authors using the "Visualization of ties" tool in the service Kontur.Focus. <https://focus.kontur.ru>

Fig. 5. Visualization of residual ties between textile industry enterprises in the Ivanovo region (fragment)



Source: compiled by the authors using the "Visualization of ties" tool in the service Kontur.Focus. <https://focus.kontur.ru>

Footnotes:

¹We emphasize that not only positive, but also negative network externalities are possible (Giuliani, Balland, Matta, 2019).

²The founder of the concept of business ecosystems is D. F. Moore, who defined them as systems of mutually supporting organizations (communities of customers, suppliers, leading manufacturers, financial organizations, trade associations, standardization bodies, trade unions, governmental and quasi-governmental institutions and other interested parties (Moore, 1993, 1998).

³A similar approach was used in the compilation of the modern "Atlas of Economic Specialization of the Regions of Russia" by the HSE <https://cluster.hse.ru/mirror/pubs/share/460933626>

⁴The criterion proposed by Vasily Leontiev in the work "Studies of the structure of the American economy. Theoretical and empirical analysis according to the input-output scheme". M., 1958.

⁵European Cluster Laboratory. <https://clustercollaboration.eu>.

⁶Atlas of economic specialization of Russian regions. <https://cluster.hse.ru/mirror/pubs/share/460933626>

⁷Geographic Information System: Industrial parks. Science parks. Clusters. <https://gisp.gov.ru/gisip>.

⁸Russian Cluster Observatory. <https://map.cluster.hse.ru>.

⁹It should be noted, however, that the contacts of the authors with representatives of enterprises of this cluster, carried out in 2021, do not allow us to talk about the presence of a really functioning cluster.

¹⁰SPARK. <https://www.spark-interfax.ru>.

¹¹Kontur.Focus. <https://focus.kontur.ru>.

¹²In this article, we focused on the consideration of the Ivanovo region, although in the future the analysis can be extended to the relations of enterprises outside the borders of this subject of the federation, which can also be distinguished using this approach. This can provide a basis for justifying the feasibility of supporting the development of clusters within several territories of the Russian Federation or for analyzing the links between clusters.

References

Akhmadovich K.Z. (2019). Synergy effect textile clusters of Uzbekistan. *Asian Journal of Technology & Management Research*, 9(1), 65–71.

Albino V., Carbonara N., & Giannoccaro I. (2007). Supply chain cooperation in industrial districts: A simulation analysis. *European Journal of Operational Research*, 177(1), 261–280.

Belhadi A., Kamble S., Jabbour C.J.C., Gunasekaran A., Ndubisi N.O., Venkatesh M. (2021). Manufacturing and service supply chain resilience to the COVID-19 outbreak: Lessons learned from the automobile and airline industries. *Technological Forecasting and Social Change*, 163, 120447. DOI: 10.1016/j.techfore.2020.120447.

Bénassy-Quéré A., Marimon R., Pisani-Ferry J., Reichlin L., Schoenmaker D., Weder di Mauro B. (2020). COVID-19: Europe needs a catastrophe relief plan. *VOX CEPR Policy Portal*. 11 March. <https://voxeu.org/article/covid-19-europe-needs-catastrophe-relief-plan>.

Bergenholtz C., Waldstrøm C. (2011). Inter-organizational network studies – a literature review. *Industry and Innovation*, 18(6), 539–562.

Bode A., Talmon l'Armee T.B., & Alig S. (2010). Research note: clusters vs. networks—a literature-based approach towards an integrated concept. *International Journal of Globalisation and Small Business*, 4(1), 92–110.

Brandenburger, A., Nejlbaff, B. (2012). Co-opetition. Konkurentnoe sotrudnichestvo v biznese [Co-opetition. Competitive cooperation in business]. *Kejs – Case*. 352 p.

- Breznitz S.M. (2013). Cluster Sustainability: The Israeli Life Sciences Industry. *Economic Development Quarterly*, 27(1): 29-39. DOI: 10.1177/0891242412471846.
- Chen C.L. (2019). Value creation by SMEs participating in global value chains under industry 4.0 trend: Case study of textile industry in Taiwan. *Journal of Global Information Technology Management*, 22(2), 120–145. DOI: 10.1080/1097198X.2019.1603512.
- Dartnell L.R., & Kaitlin K. (2021). Do responses to the COVID-19 pandemic anticipate a long-lasting shift towards peer-to-peer production or degrowth? *Sustainable Production and Consumption*, 27, 2165–2177.
- Expósito-Langa M., Tomás-Miquel J.-V., & Molina-Morales F.X. (2015). Innovation in clusters: exploration capacity, networking intensity and external resources. *Journal of Organizational Change Management*, 28(1), 26–42. DOI: 10.1108/JOCM-10-2013-0192.
- Felzensztein C., Gimmo E., & Deans K.R. (2018). Coopetition in regional clusters: Keep calm and expect unexpected changes. *Industrial Marketing Management*, 69, 116–124.
- Giuliani E., Balland P.A., & Matta A. (2019). Straining but not thriving: understanding network dynamics in underperforming industrial clusters. *Journal of Economic Geography*, 19(1), 147–172.
- Ivanov D. (2021). Exiting the COVID-19 pandemic: after-shock risks and avoidance of disruption tails in supply chains. *Annals of Operations Research*, (1), 1–18.
- Kamal, M. M. (2020). The triple-edged sword of COVID-19: understanding the use of digital technologies and the impact of productive, disruptive, and destructive nature of the pandemic. *Information Systems Management*, 37(4), 310–317.
- Leontiev, V. (1958). *Studies of the structure of the American economy. Theoretical and empirical analysis according to the input-output scheme*. Moscow.
- Leviäkangas, P., & Öörni, R. (2020). From business models to value networks and business ecosystems—What does it mean for the economics and governance of the transport system? *Utilities Policy*, 64, 101046.
- Markov L.S., Markova V.M. (2012). Vyjavlenie jetalonyh klasterov: metodicheskie voprosy i prakticheskoe prilozhenie k otechestvennoj promyshlennosti [Identification of reference clusters: methodological issues and practical application to the domestic industry]. *Vestnik NGU. Serija: Social'no-jekonomicheskie nauki – Bulletin of the NSU. Series: Socio-economic sciences*, (1), 95–108. <https://cyberleninka.ru/article/n/vyyavlenie-etalonnyh-klasterov-metodicheskie-voprosy-i-prakticheskoe-prilozhenie-k-otechestvennoj-promyshlennosti>
- Martínez A., Belso-Martínez J.A., & Más-Verdú F. (2012). Industrial clusters in Mexico and Spain: Comparing inter-organizational structures within context of change. *Journal of Organizational Change Management*, 25(5), 657–681. DOI: 10.1108/09534811211254563.
- Moore J.F. (1993). Predators and prey: a new ecology of competition. *Harvard business review*, 71(3), 75–86.
- Moore J.F. (1998). The rise of a new corporate form. *Washington Quarterly*, 21(1), 167–181.
- Mueller, E. F., & Jungwirth, C. (2016). What drives the effectiveness of industrial clusters? Exploring the impact of contextual, structural and functioning determinants. *Entrepreneurship & Regional Development*, 28(5-6), 424–447.
- Nikolopoulos K., Punia S., Schäfers A., Tsinopoulos C., & Vasilakis C. (2021). Forecasting and planning during a pandemic: COVID-19 growth rates, supply chain disruptions, and governmental decisions. *European Journal of Operational Research*, 290(1), 99–115.
- Peeters L., Tiri M., & Berwert A. (2001). Identification of Techno-Economic Clusters Using Input-Output Data: Application to Flanders and Switzerland. In: *Innovative Clusters: Drivers of national innovation Systems*. Paris: OECD proceedings, 251–272. https://www.researchgate.net/publication/282236332_Identification_of techno-economic_clusters_using_input-output_data_application_to_Flanders_and_Switzerland
- Porter M.E. (2003). The Economic Performance of Regions. *Regional Studies*, 37(6&7), 549–578. <https://www.hse.ru/mirror/pubs/share/212158628>.

- Porter, M.E. (1998). *On Competition*. Cambridge, MA: Harvard Business School Press.
- Prause G. (2015). Sustainable business models and structures for Industry 4.0. *Journal of Security & Sustainability Issues*, 5(2), 159–169.
- Sheresheva, M., Efremova, M., Valitova, L., Polukhina, A., & Laptev, G. (2021). Russian Tourism Enterprises' Marketing Innovations to Meet the COVID-19 Challenges. *Sustainability*, 13(7), 3756.
- Valitova L.A., Sharko E.R., Sheresheva M.Yu. (2021). Identifying industrial clusters based on the analysis of business ties: A case of the textile industry. *Upravlenets – The Manager*, 12(4), 59–74. DOI: 10.29141/2218-5003-2021-12xxx.
- Vargo D., Zhu L., Benwell B., & Yan Z. (2021). Digital technology use during COVID-19 pandemic: A rapid review. *Human Behavior and Emerging Technologies*, 3(1), 13–24.
- Wang S., Shao Y., & Pang B. (2019). A Study of High-End Equipment Manufacturing Industry Cluster Network and Innovation Capability. In *International Academic Conference on Frontiers in Social Sciences and Management Innovation (IAFSM 2018)*, Atlantis Press, 310–319.
- Yim D.S., Kim W., & Nam Y.H. (2020). The Strategic Transformation from Innovation Cluster to Digital Innovation Cluster during and after COVID-19. *Asian Journal of Innovation & Policy*, 9(2), 126–147

Balancing in Crisis? Exploring the Impact of Innovative Ambidexterity on SMEs' Performance During COVID-19 Pandemic

Rafik Smara, St. Petersburg State University's Graduate School of Management (st091252@gsom.spbu.ru), Karina Bogatyreva, St. Petersburg State University's Graduate School of Management (k.bogatyreva@gsom.spbu.ru), Anastasia Laskovaia, St. Petersburg State University's Graduate School of Management (a.laskovaya@gsom.spbu.ru)

Abstract:

Exploration and exploitation have long been documented as prominent approaches to business management and organizational adaptation to external environment; however, few studies have focused on their relationship to firm performance in times of crisis, especially within small and medium sized enterprises (SMEs). The purpose of this study is to investigate the performance implications of these two types of strategic adaptation in times of crisis. To achieve this goal, proposed theoretical framework linking exploration and exploitation learning activities to the firm performance under technological uncertainty. We based on a data on 333 Russian SMEs collected in 2020-2021. The results suggest that exploratory innovation positively affects the performance of SMEs in crisis context, and the relationships between innovative strategies, their balanced combination and performance are contingent upon technological uncertainty. The results provide an improved understanding of knowledge strategic and successfully respond to multiple environmental conditions.

Keywords: *innovative exploration, innovative exploitation, innovative ambidexterity, technological uncertainty, firm performance.*

1. Introduction

In times of crisis, the environment changes abruptly, that obliges firms to act upon such change (Grewal & Tansuhaj, 2001), adapt their behavior to the new circumstances (Chattopadhyay et al., 2001), reconsider their strategic behavior to cope with the economic downturn (Archibugi et al., 2013a; Battisti et al., 2019), readjust their strategies and behaviors with new realities in order to prevent performance declines and ensure business survival (McKinley et al., 2014; Trahms et al., 2013) improve their strategic fit to the environment (Fainshmidt et al., 2019). Reactive strategies towards the crisis can be particularly visible within the decision making of investment in approaches to organizational adaptation: exploration and exploitation (Gupta et al., 2006; March, 1991; Ngo et al., 2019).

March (1991) defined exploration as search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation,” contrasting it with exploitation, which involves refinement, choice, production, efficiency, selection, implementation and execution. Exploration and exploitation rely on different organizational routines and capabilities (Benner & Tushman, 2003). Various literatures have argued that organizations need to become ambidextrous (Gibson & Birkinshaw, 2004; He & Wong 2004) and develop exploratory and exploitative innovation simultaneously in different organizational units (Benner & Tushman, 2003; Tushman & O'Reilly, 1996);

Exploratory and exploitative innovation have been shown to provide distinct strategic paths to improved firm performance in stable environments (Gonzalez & de Melo, 2018).The exploratory and exploitative innovation impact on firm performance may be dramatically shape in periods of economic crisis and severe market conditions (Auh & Menguc, 2005; Marino et al., 2015). However, few studies have focused on their relationship to firm performance in times of crisis, especially within small and medium sized enterprises that often are most vulnerable to

adverse economic conditions (Jansen et al., 2006; Osiyevskyy et al., 2020; Kim and Rhee, 2009). Both types of strategies can be conducive to enhanced performance outcomes, but have inherent contradictions that need to be managed

Related innovative strategies are united under the umbrella term “innovative ambidexterity” (Tushman & O'Reilly, 1996.). Studies of organizational ambidexterity suggest that the balance or combination of exploration and exploitation might have a major impact on firm performance, above and beyond the impacts of these strategies individually. (He & Wong, 2004; Ho et al., 2020) but the study of Osiyevskyy et al. (2020) failed to support this prediction. Under the light of all this, additional empirical tests are needed to produce some evidence which lends some support to this prediction.

Prior studies have revealed a number of impactful environmental aspects shaping the relationship between innovation and performance, such as hostility, dynamism, or competitive intensity. Dynamic environments may be characterized by changes in technologies, variations in customer preferences, and fluctuations in product demand or supply of materials (Jansen et al., (2006). The notion of technological uncertainty is well-accepted in the product innovation literature (Souder et al., 1998). Both the pace and degree of innovations and changes in technology induce technological uncertainty, furthermore technological turbulence is a source of uncertainty for innovation projects (Grewal & Tansuhaj, 2001),

However, knowledge of the impact of innovative ambidexterity and balance between exploration and exploitation on firm performance in turbulent environments occurring due to economic downturns remains limited and requires more in-depth analysis. To tackle these gaps, we draw upon the examination of this relationship under the pressure of technological and demand uncertainty at the time of crisis caused by COVID-19 pandemic. Thus, in this study, we address the following research questions -

"What is the impact of innovative ambidexterity on performance of SMEs during an economic downturn? and" How does the technological uncertainty shape this relationships?

Empirically, we test the relationship between exploratory and exploitative innovation, their balance and firm performance in a context of crisis caused by COVID-19 pandemic on emerging market, and examine how technological uncertainty moderates these relationships.

The paper is organized as follows. In the next section, we present the theory and hypotheses development. After describing our research method, we present the empirical findings using sample of 333 Russian firms collected at the time of crisis caused by COVID-19 pandemic. We conclude with a discussion of the results, implications, and issues for further research.

2. Theory and hypotheses development

2.1. Economic crisis and SME's strategic adaptation

Based on the prior literature, we define economic crisis as an unexpected change in the external macroeconomic environment (Doern e al., 2019). In such environments, firms face high levels of uncertainty, turbulence and market instability (Grewal & Tansuhaj, 2001), shrink the economy and constitute a threat to firms, consumers, competitors and suppliers.

Duchin et al., (2009) argued that the corporate investment decline was higher for firms that have low cash reserves or high net short-term debt, are financially constrained, or operate in industries dependent on external finance. Following Aldrich & Auster (1986), SMEs are highly sensitive to external threats and are most vulnerable to adverse economic conditions because of the “liability of smallness”, which refers to limitedness in terms of resources and capabilities, and thus vulnerability to environmental changes. Therefore, the probability of failure among such firms is typically much higher, in comparison with larger, well- established firms (Davidsson & Gordon, 2016). In turbulent environments, SMEs have to readjust their strategies and behaviors with new realities in order to prevent performance declines and ensure business survival (McKinley et al., 2014; Trahms et al., 2013).

In this study, we focus on two types of strategies SMEs may employ to achieve a better fit with the changing environment under conditions of a major economic downturn that illustrate

this dilemma—exploration and exploitation (March, 1991). Additionally, we examine the role of combination of these two strategies in firm outcomes.

2.2. Exploratory Innovation, Exploitative Innovation, innovative ambidexterity and firm performance:

It is well established that firm performance depends largely on the fit between the strategies it employs and the environment under which these strategies are employed (Zajac, et al., 2000).

Previous studies have shown that during time of stability, when the economy does not experience crisis, innovation brings a beneficial influence on firm's performance, competitive advantage ((Subramanian & Nilakanta, 1996; Gonzalez & de Melo, 2018), business performance (Gunday et al., 2011), enhanced productivity (Laforet, 2013), growth and profitability (Cho & Pucik, 2005).

Exploratory innovations are radical innovations and are developed to search for new knowledge (Benner & Tushman, 2002; Levinthal & March, 1993; McGrath, 2001), acquire novel technologies and resources and creation of products to meet the needs of emerging customers or markets (March, 1991, Benner & Tushman, 2003; Danneels, 2002; Lee et al., 2018). Conversely, exploitative innovations are incremental innovations and are designed to refinement of existing knowledge, technologies, and products and meet the needs of existing customers or markets and has more certain and proximate benefits (Levinthal & March, 1993; Benner & Tushman, 2003; Danneels 2002). Following O'Reilly III & Tushman (2008), we can define organizational ambidexterity as the ability to simultaneously undertake exploration and exploitation.

Strategic fit of firms' responses to organizational decline driven by economic crisis is decisive to economic performance (Trahms et al., 2013). A fundamental interest in innovation and organizational decline literature concerns the impact of exploratory and exploitative innovation on organizational performance. A number of studies demonstrate divergent effects these two strategies on firm performance (Jansen et al., 2006; Osiyevskyy et al., 2020; Xia & Dimov, 2019)

Many scholars have found that both exploration and exploitation innovation have significantly positive effects on firm performance and suggest that firms should consider both exploratory and exploitative innovation, establishing ambidexterity, which is central to enhancing performance (Hou & Zhu, 2019; Gonzalez & de Melo, 2018; Mathias, 2014; He & Wong, 2004). However, Ebben and Johnson (2005) that firm that pursue either exploration or exploitation outperform those that combine these activities. Furthermore, Auh and Menguc (2005) report that exploration has a positive impact on effectiveness, a longer-term aspect of performance whereas exploitation is associated with short-term performance.

In view of the mixed evidence in the existing literature, for exploration and exploitation innovations, there are many differences in resource demand, input costs, expected benefits, time lag and the difficulty degree of success, so their impact on performance will differ (Uotila et al., 2009), it is widely accepted that they are clearly different types of innovation strategies (Faems et al., 2005) and could be achieved simultaneously (Gupta et al., 2006).

2.3. Baseline hypotheses

2.3.1. Innovative strategies and firm performance

In a rapidly changing environment, the development of new capabilities, technology and knowledge are necessary so, firm should change its resource structure to adapt to new environmental opportunities. In other words, firm should redeploy or recombine its resource structure through the integration of internal and external sources of technology to capture new market opportunities and all this is captured by exploratory innovation.

Exploitative innovation often builds on existing technology channels, emphasizes use and further development of existing knowledge (Levinthal & March, 1993), existing organizational practices and routines may reduce a firm's flexibility to adapt to new changes (Levitt & March, 1988). The exploitation of existing resources and capabilities seems to be inappropriate,

particularly in situations of rapid change. So, exploitation is likely to become a burden for companies because the intense competition needs higher innovation to obtain a competitive advantage.

Researchers provide evidence that SMEs *can* achieve ambidexterity, integrating the contradictory demands of exploration and exploitation (Lubatkin et al., 2006). In situations of economic crisis, SMEs that focus only on exploitation concentrate on looking for more resources or freeing the available resources up, establishing key priorities and improving efficiency, whereas SMEs which focus only on exploration are able to find new markets, products or technologies. In contrast, ambidextrous SMEs may improve their performance, taking advantage of their ambidextrous capability through the complimentary between exploration and exploitation (Luger et al., 2018), using the freed up resources obtained by exploitation strategies for developing new knowledge and also using their capabilities for creating novel, out of the box, solutions for the implementation of exploitation measures. Various studies argue that the negative effect produced by exploitation on performance in dynamic environments is offset when companies develop a balanced strategy between exploitation and exploration (Jansen et al., 2012).

We expect firms pursuing exploratory innovations and innovative ambidexterity to increase performance. Conversely, firms pursuing exploitative innovations are likely to decrease performance.

Accordingly, we hypothesize that:

H1. Innovative exploration is positively associated with firm performance.

H2. Innovative exploitation is negatively associated with firm performance.

H3: Balancing innovative ambidexterity is positively associated with firm performance.

2.3.2. The moderating role of technological uncertainty

Accelerated changes in technology, unexpected variations in customers' preferences, unforeseeable fluctuations in the demand of products, and the supply of materials are some of the factors causing environmental dynamism (Jansen et al., 2006; Jaworski & Kohli, 1993).

We examine the moderating effect of uncertainty on the impact of innovative exploration, innovative exploitation and innovative ambidexterity on firm performance. In order to precisely attribute the effects of uncertainty, this study considers technological turbulence as the major source of uncertainty that came from consequences of COVID-19 pandemic.

Technological uncertainty is the perceived instability as well as the unpredictability of rapid and significant change and complexity of technology, such as the sudden emergence of new and breakthrough components or software, thus making it difficult for firms to make accurate predictions (it is due to a lack of knowledge about the state of technological advances (Sutcliffe & Zaheer, 1998; Jaworski & Kohli, 1993; Lichtenthaler & Ernst, 2007). Specifically, the greater the technological uncertainty, the faster the application of new knowledge, the updating of technology and the innovations among different industries will converge (Song & Montoya-Weiss, 2001). Technological uncertainty is high where technology is new or rapidly changing (Chen et al., 2005).

Rapid change in environments require firms to develop products fast enough to keep pace with changing technological advances (Chen et al., 2005; Tushman & Anderson, 1986; Zahra, 1996). However, firms are not yet aware of market preferences. Given this uncertainty, it seems that the appropriate strategies are those based on the constant development of innovations with a high degree of novelty. This is absolutely the nature of exploration strategies, whose search and acquire novel technologies and resources (Lee et al., 2018; March, 1991). Thus, a firm's rate of exploration and the rate of change in the environment must be in sync for a competitive advantage to be developed and be sustained, we expect firms pursuing exploratory innovations to increase their performance.

With respect to exploitation, it is reasonable to expect the opposite moderation effect, organizations pursuing exploitative innovations are likely to decrease their performance. Rapid technology change could be particularly unfavorable for these firms because technological trajectory is maintained over time (Jansen et al., 2006). Exploitation focuses on the utilization of its existing opportunities, knowledge, and competencies (Uotila, 2017), so firms pursuing this type of strategy do not support the type of innovative behavior and are unlikely to pay off in such situations (Ritala, Heiman, & Hurmelinna-Laukkanen, 2016; Voss et al., 2008), leading to decreasing returns with the rising of technology uncertainty. Therefore, we expect that under the condition of high technology uncertainty, the exploitation strategy will lead to performance outcomes that are “reliably decreasing”.

Accordingly, the following hypotheses are formulated:

H4a.: Technological uncertainty positively moderates the relationship between exploratory innovation and firm performance, so that with increased levels of technological uncertainty the positive link between exploration and performance become stronger.

H4b.: Technological uncertainty negatively moderates the relationship between exploitative innovation and firm performance, so that with increased levels of technological uncertainty the negative link between exploitation and performance become stronger.

Furthermore, SMEs pursuing innovative ambidexterity can benefit from the complementarity between exploration and exploitation and can control resources to succeed in their exploration goals to offset the effect of technology uncertainty or succeed in their exploitation goals to offset the effect of technological uncertainty and lead to performance outcome. Finally, the following hypothesis is formulated:

H4c.: Technological uncertainty positively moderate the relationship between balance in innovative ambidexterity and firm performance, so that with increased levels of technological uncertainty the positive link between ambidexterity and performance become stronger.

Theoretical model of the study is presented in Figure 1.

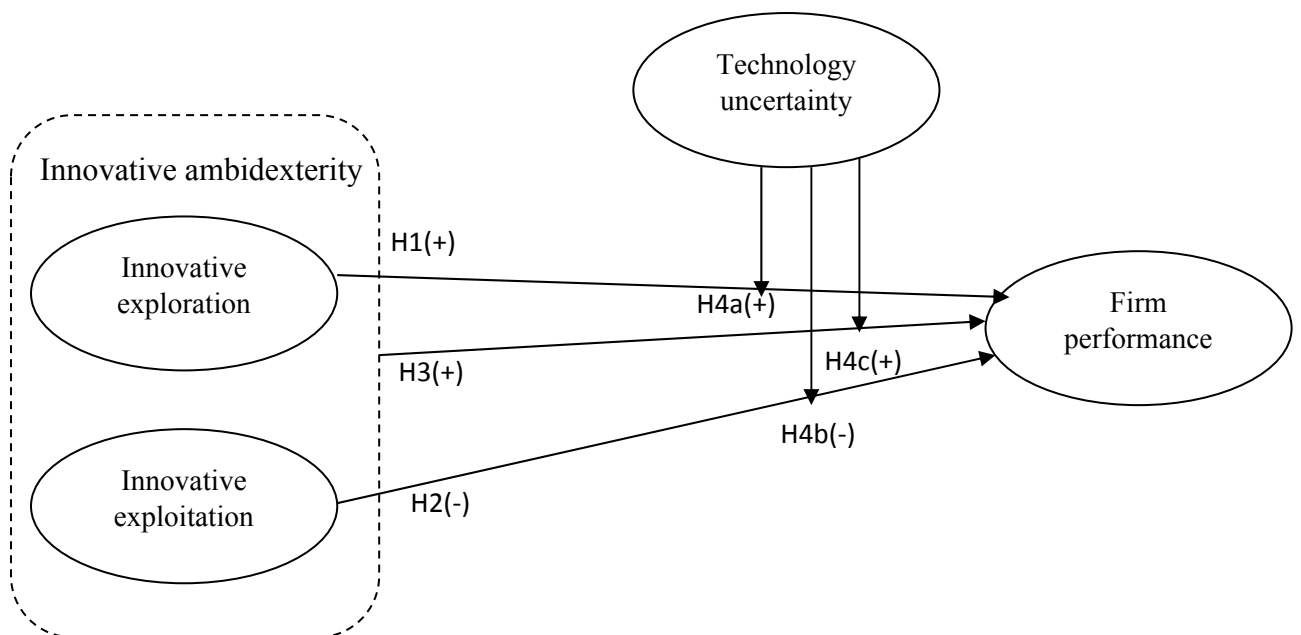


Figure 1 Theoretical framework of the study.

3. Research design

3.1. Sample

To empirically test the study hypotheses, the data from a large survey of SMEs' CEOs in Russia were employed. The survey was conducted by an independent agency from November 2020 till February 2021. The questionnaire referred to companies' activities and performance in 2020 – the year marked by COVID-19 pandemic and a subsequent economic downturn that occurred due to multiple restrictions and was especially difficult for small and medium sized enterprises. The database includes a representative sample of 333 respondents from randomly selected SMEs coming from all industries and regions of Russia.

To provide a better understanding of the respondents and characteristics of the responding companies, a descriptive statistics included manager educational level, firm ownership, firms age, number of employees and main industry of operation. The summary is presented in Table 1.

Table 1
Sample characteristics

Characteristics	Firms (percentage)
Educational Level of Manager	
Primary School/Secondary School/Professional Training	0.6
Incomplete higher education /University Degree	98
Ownership & Family	
Controlled by a Family owned	46
CEO a major owner of the company	67
Firms age	
Young firms	49
Mature firms	36
Old firms	15
Firms size	
Micro	28
Small	58
Medium-sized	12
Large	0.9
Main industry of operation	
Exploration and production of minerals (metal, coal, oil, gas, other minerals, etc.)	0.6
Building	14
Production	13
Transport and logistics services, communications, electricity, gas, sanitary services	7
Wholesale	17
Retail	6
Finance, insurance and real estate	2
Services	39

3.2. Variables

Exploratory and exploitative innovations were assessed with a 7-point Likert scale adopted from Jansen and colleagues (2009). Technological uncertainty was measured with a 7-point Likert scale suggested by Menguc and colleagues (2012). Firm performance was operationalized with an 8-items instrument derived from Morgan et al. (2009) capturing subjective assessment of market effectiveness and profitability of the firm compared to competitors. Among control variables, we relied on firm size, age, industry (1=services;

0=other), availability of human capital, social capital, and financial capital direct effects of moderators.

3.3. Data analysis

We estimate the effects of variables presented in the theoretical model using linear regression analysis and a number of nested models: all controls (Model 1), main effect of exploration and exploitation (Model 2), direct effect of innovative ambidexterity (Model 4), interaction effects (Model 3 and Model 5). The results of hypotheses testing are presented in Table 2.

Table 2
Results of Linear Regression Analyses: all controls, main effect on exploration and exploitation, direct effect of innovative ambidexterity, interaction effects

	Model 1	Model 2	Model 3	Model 4	Model 5
industry	-0.029 (0.076)	-0.030 (0.072)	-0.031 (0.071)	-0.030 (0.072)	-0.031 (0.069)
firm size	0.019 (0.044)	-0.009 (0.042)	-0.011 (0.041)	-0.009 (0.042)	-0.007 (0.040)
firms age	0.001 (0.006)	0.001 (0.005)	0.003 (0.005)	0.001 (0.005)	0.000 (0.005)
financial capital	0.316*** (0.053)	0.270*** (0.050)	0.258*** (0.050)	0.268*** (0.051)	0.244*** (0.049)
human capital	0.037 (0.058)	0.021 (0.055)	0.035 (0.055)	0.019 (0.056)	0.035 (0.054)
social capital	0.124** (0.053)	0.063 (0.051)	0.056 (0.051)	0.065 (0.052)	0.071 (0.049)
tech_ uncertainty	0.127** (0.051)	0.148** (0.049)	0.379** (0.155)	0.145** (0.049)	-1.619** (0.499)
exploration		0.333*** (0.053)	0.914*** (0.158)	0.330*** (0.054)	0.481** (0.190)
exploitation		0.002 (0.048)	-0.461** (0.173)	0.003 (0.048)	-0.118 (0.189)
exploration X tech unc			-0.170*** (0.043)		-0.066 (0.051)
exploitation X tech unc			0.129** (0.044)		0.037 (0.049)
ambidexterity (balance)				0.029 (0.068)	-1.080*** (0.283)
ambidex X tech unc					0.318*** (0.075)
cons	1.164** (0.395)	0.358 (0.394)	-0.385 (0.745)	0.208 (0.530)	6.572*** (1.951)
r2	.17	.27	.3	.27	.34
N	333	333	333	333	333

Standard errors in parentheses *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$

4. Results and findings

The results of direct effects analysis suggest that explorative innovation is positively related to SMEs performance ($b = 0.333, p < 0.001$), while no significant link was established for exploitation. This outcome is particularly interesting regarding the crisis context, showing that under uncertain environment of crisis completely new opportunities and knowledge lead to better performance, while innovation based on existing competencies might not work. It can be explained by the nature of crisis caused by COVID-19 pandemic, when the everyday reality completely changed, and the familiar way of doing things became inefficient.

With environmental effects, the study revealed that technological uncertainty negatively moderate the relationship between explorative innovation and firm performance ($b = -0.170, p < 0.001$) such that in highly uncertain environments relying on exploration decreases performance outcomes. This may indicate negative effect of extremely high uncertainty when there is lack of knowledge about technology development. Coupled with uncertainty caused by pandemic and economic crisis, such an environment can be perceived as too much uncertain to handle. Further, technological uncertainty positively moderates the relationship between exploitative innovation and firm performance ($b = 0.129, p < 0.05$), such that in highly uncertain environments relying on exploitation increases performance outcomes. Hence, in highly uncertain environment exploitation might bring some stability that itself decreases the level of unpredictability of outcomes.

Finally, balance in innovative ambidexterity is negatively related to firm performance under zero levels of technology uncertainty; however, this effect becomes positive when technological uncertainty of external environment is high ($b = 0.318, p < 0.001$). This implies that supporting balance between exploratory and exploitative innovation in crisis might be too resource consuming and lead to unnecessary defocusing. At the same time, technological uncertainty is a specific boundary condition that justifies positive role of maintaining balance in innovative ambidexterity for boosting firm performance in crisis.

5. Conclusion and implication

The foregoing analysis indicated that exploratory innovation positively affects the performance of SMEs in crisis context, and the relationship between innovative ambidexterity and performance is contingent upon technological uncertainty. With these findings we add to the literature on organizational adaptation to crisis environments. Prior literature showed that exploration-type strategies work better in dynamic environments and under economic downturn (Ahn et al., 2018; Jansen et al., 2006; Osiyevskyy et al., 2020). The context of our research is a unique condition of crisis forced all firms to completely redesign their business processes. Our results supported previous findings, showing the important role of exploratory innovation in increasing firm performance even under conditions of exogenous shock and consequent economic downturn caused by COVID-19 pandemic. What is more important, by testing moderating role of technological uncertainty, we identified that exploratory strategies work against performance outcomes under high levels of uncertainty in crisis context while exploitation increase performance outcome when technology turbulence is high. We also add to innovation literature by demonstrating the positive effect of innovative ambidexterity under conditions of extremely high uncertainty. For practitioners our study provides insights on the possible innovative strategies that are suitable in crisis and under different levels of external uncertainty.

References

- Ahn, J. M., Mortara, L., & Minshall, T. (2018). Dynamic capabilities and economic crises: has openness enhanced a firm's performance in an economic downturn?. *Industrial and corporate change*, 27(1), 49-63.
- Aldrich, H., & Auster, E. R. (1986). Even dwarfs started small: Liabilities of age and size and their strategic implications. *Research in organizational behavior*.
- Archibugi, D., Filippetti, A., & Frenz, M. (2013). The impact of the economic crisis on innovation: Evidence from Europe. *Technological Forecasting and Social Change*, 80(7), 1247-1260.
- Auh, S., & Menguc, B. (2005). Balancing exploration and exploitation: The moderating role of competitive intensity. *Journal of business research*, 58(12), 1652-1661.
- Benner, M. J., & Tushman, M. L. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of management review*, 28(2), 238-256.
- Benner, M. J., & Tushman, M. (2002). Process management and technological innovation: A longitudinal study of the photography and paint industries. *Administrative science quarterly*, 47(4), 676-707.
- Blome, C., Schoenherr, T., & Kaesser, M. (2013). Ambidextrous governance in supply chains: The impact on innovation and cost performance. *Journal of Supply Chain Management*, 49(4), 59-80.
- Chattopadhyay, P., Glick, W. H., & Huber, G. P. (2001). Organizational actions in response to threats and opportunities. *Academy of Management Journal*, 44(5), 937-955.
- Chen, J., Reilly, R. R., & Lynn, G. S. (2005). The impacts of speed-to-market on new product success: the moderating effects of uncertainty. *IEEE Transactions on engineering management*, 52(2), 199-212.
- Cho, H. J., & Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. *Strategic management journal*, 26(6), 555-575.
- Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic management journal*, 23(12), 1095-1121.
- Davidsson, P., & Gordon, S. R. (2016). Much ado about nothing? The surprising persistence of nascent entrepreneurs through macroeconomic crisis. *Entrepreneurship Theory and Practice*, 40(4), 915-941.
- Davis, T. (1993). Effective supply chain management. *Sloan management review*, 34, 35-35.
- Doern, R., Williams, N., & Vorley, T. (2019). Special issue on entrepreneurship and crises: business as usual? An introduction and review of the literature. *Entrepreneurship & Regional Development*, 31(5-6), 400-412.
- Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of financial economics*, 97(3), 418-435.
- Fainshmidt, S., Wenger, L., Pezeshkan, A., & Mallon, M. R. (2019). When do dynamic capabilities lead to competitive advantage? The importance of strategic fit. *Journal of Management Studies*, 56(4), 758-787
- Filippetti, A., & Archibugi, D. (2011). Innovation in times of crisis: National Systems of Innovation, structure, and demand. *Research policy*, 40(2), 179-192.
- Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of management Journal*, 47(2), 209-226.
- Grewal, R., & Tansuhaj, P. (2001). Building organizational capabilities for managing economic crisis: The role of market orientation and strategic flexibility. *Journal of marketing*, 65(2), 67-80.
- Gonzalez, R. V. D., & de Melo, T. M. (2018). The effects of organization context on knowledge exploration and exploitation. *Journal of Business Research*, 90, 215-225.

- Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of production economics*, 133(2), 662-676.
- Gupta, A. K., Smith, K. G., & Shalley, C. E. (2006). The interplay between exploration and exploitation. *Academy of management journal*, 49(4), 693-706.
- He, Z. L., & Wong, P. K. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization science*, 15(4), 481-494.
- Hou, B., Hong, J., & Zhu, R. (2019). Exploration/exploitation innovation and firm performance: the mediation of entrepreneurial orientation and moderation of competitive intensity. *Journal of Asia business studies*.
- Ho, H., Osiyevskyy, O., Agarwal, J., & Reza, S. (2020). Does ambidexterity in marketing pay off? The role of absorptive capacity. *Journal of Business Research*, 110, 65-79.
- Jaworski, B. J., & Kohli, A. K. (1993). Market orientation: antecedents and consequences. *Journal of marketing*, 57(3), 53-70.
- Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management science*, 52(11), 1661-1674.
- Jansen, J. J., Simsek, Z., & Cao, Q. (2012). Ambidexterity and performance in multiunit contexts: Cross-level moderating effects of structural and resource attributes. *Strategic Management Journal*, 33(11), 1286-1303.
- Jansen, J. J., Vera, D., & Crossan, M. (2009). Strategic leadership for exploration and exploitation: The moderating role of environmental dynamism. *The Leadership Quarterly*, 20(1), 5-18.
- Kim, T., & Rhee, M. (2009). Exploration and exploitation: Internal variety and environmental dynamism. *Strategic Organization*, 7(1), 11-41.
- Laforet, S. (2013). Organizational innovation outcomes in SMEs: Effects of age, size, and sector. *Journal of World business*, 48(4), 490-502.
- Lavie, D., Stettner, U., & Tushman, M. L. (2010). Exploration and exploitation within and across organizations. *Academy of Management annals*, 4(1), 109-155.
- Lee, S. U., Park, G., & Kang, J. (2018). The double-edged effects of the corporate venture capital unit's structural autonomy on corporate investors' explorative and exploitative innovation. *Journal of Business Research*, 88, 141-149.
- Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic management journal*, 14(S2), 95-112.
- Levitt, B., & March, J. G. (1988). Organizational learning. *Annual review of sociology*, 14(1), 319-338.
- Lewin, A. Y., Long, C. P., & Carroll, T. N. (1999). The coevolution of new organizational forms. *Organization science*, 10(5), 535-550.
- Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence, and the complementarity of organizational learning processes. *Academy of management journal*, 52(4), 822-846.
- Lichtenthaler, U., & Ernst, H. (2007). External technology commercialization in large firms: results of a quantitative benchmarking study. *r&d Management*, 37(5), 383-397.
- Lin, Z., & Carley, K. M. (2001, August). Organizational design and adaptation in response to crises: theory and practice. In *Academy of Management Proceedings* (Vol. 2001, No. 1, pp. B1-B6). Briarcliff Manor, NY 10510: Academy of Management.
- Lubatkin, M. H., Simsek, Z., Ling, Y., & Veiga, J. F. (2006). Ambidexterity and performance in small-to medium-sized firms: The pivotal role of top management team behavioral integration. *Journal of management*, 32(5), 646-672.
- Luger, J., Raisch, S., & Schimmer, M. (2018). Dynamic balancing of exploration and exploitation: The contingent benefits of ambidexterity. *Organization Science*, 29(3), 449-470.
- March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization*

science, 2(1), 71-87.

Marino, A., Aversa, P., Mesquita, L., & Anand, J. (2015). Driving performance via exploration in changing environments: Evidence from formula one racing. *Organization Science*, 26(4), 1079-1100.

Mathias, B. D. (2014). Exploration, exploitation, ambidexterity, and firm performance: A meta-analysis. In *Exploration and exploitation in early stage ventures and SMEs*. Emerald Group Publishing Limited.

McKinley, W., Latham, S., & Braun, M. (2014). Organizational decline and innovation: Turnarounds and downward spirals. *Academy of management review*, 39(1), 88-110.

Morgan, N. A., Vorhies, D. W., & Mason, C. H. (2009). Market orientation, marketing capabilities, and firm performance. *Strategic management journal*, 30(8), 909-920.

Ngo, L. V., Bucic, T., Sinha, A., & Lu, V. N. (2019). Effective sense-and-respond strategies: Mediating roles of exploratory and exploitative innovation. *Journal of Business Research*, 94, 154-161.

O'Reilly III, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in organizational behavior*, 28, 185-206.

Osiyevskyy, O., Shirokova, G., & Ritala, P. (2020). Exploration and exploitation in crisis environment: Implications for level and variability of firm performance. *Journal of business research*, 114, 227-239.

Parida, V., Lahti, T., & Wincent, J. (2016). Exploration and exploitation and firm performance variability: a study of ambidexterity in entrepreneurial firms. *International Entrepreneurship and Management Journal*, 12(4), 1147-1164.

Pertusa-Ortega, E. M., & Molina-Azorín, J. F. (2018). A joint analysis of determinants and performance consequences of ambidexterity. *BRQ Business Research Quarterly*, 21(2), 84-98.

Ritala, P., Heiman, B., & Hurmelinna-Laukkanen, P. (2016). The need for speed—unfamiliar problems, capability rigidity, and ad hoc processes in organizations. *Industrial and Corporate Change*, 25(5), 757-777.

Sharif, M. N. (2012). Technological innovation governance for winning the future. *Technological forecasting and social change*, 79(3), 595-604

Shirokova, G., Iivonen, L., & Gafforova, E. (2019). Strategic entrepreneurship in Russia during economic crisis. *Foresight and STI Governance*, 13(3), 62-76.

Song, M., & Montoya-Weiss, M. M. (2001). The effect of perceived technological uncertainty on Japanese new product development. *Academy of Management journal*, 44(1), 61-80.

Souder, W. E., Sherman, J. D., & Davies-Cooper, R. (1998). Environmental uncertainty, organizational integration, and new product development effectiveness: a test of contingency theory. *Journal of Product Innovation Management: AN INTERNATIONAL PUBLICATION OF THE PRODUCT DEVELOPMENT & MANAGEMENT ASSOCIATION*, 15(6), 520-533.

Subramanian, A., & Nilakanta, S. (1996). Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance. *Omega*, 24(6), 631-647.

Sutcliffe, K. M., & Zaheer, A. (1998). Uncertainty in the transaction environment: an empirical test. *Strategic management journal*, 19(1), 1-23.

Tachizawa, E. M., & Thomsen, C. G. (2007). Drivers and sources of supply flexibility: an exploratory study. *International Journal of Operations & Production Management*.

Trahms, C. A., Ndofor, H. A., & Sirmon, D. G. (2013). Organizational decline and turnaround: A review and agenda for future research. *Journal of Management*, 39(5), 1277-1307.

Tushman, M. L., & O'Reilly III, C. A. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California management review*, 38(4), 8-29.

Tushman, M. L., & Anderson, P. (1986). Technological discontinuities and organizational environments. *Administrative science quarterly*, 439-465.

Uotila, J., Maula, M., Keil, T., & Zahra, S. A. (2009). Exploration, exploitation, and financial performance: analysis of S&P 500 corporations. *Strategic Management Journal*, 30(2), 221-231.

Uotila, J. (2017). Exploration, exploitation, and variability: Competition for primacy revisited. *Strategic Organization*, 15(4), 461-480.

Voss, G. B., Sirdeshmukh, D., & Voss, Z. G. (2008). The effects of slack resources and environmental threat on product exploration and exploitation. *Academy of Management journal*, 51(1), 147-164.

Yannopoulos, P., Auh, S., & Menguc, B. (2012). Achieving fit between learning and market orientation: Implications for new product performance. *Journal of Product Innovation Management*, 29(4), 531-545.

Zahra, S. A. (1996). Technology strategy and financial performance: Examining the moderating role of the firm's competitive environment. *Journal of Business venturing*, 11(3), 189-219.

Zajac, E. J., Kraatz, M. S., & Bresser, R. K. (2000). Modeling the dynamics of strategic fit: A normative approach to strategic change. *Strategic management journal*, 21(4), 429-453.

Zhou, K. Z. (2006). Innovation, imitation, and new product performance: The case of China. *Industrial Marketing Management*, 35(3), 394-402.

Green Innovation Business (GIB) as a Comprehensive Entrepreneurship Model for the Internationalization. The case of BIO-FOM in the Urban Area of Guadalajara

José G. Vargas-Hernández, University Center for economic and Managerial sciences, Universidad de Guadalajara (jvargas2006@gmail.com), **Dr. César Omar Mora Pérez**, University Center for economic and Managerial sciences, Universidad de Guadalajara (cesar.moraperez@gmail.com), **Dr. Miguel Angel Esparza Íñiguez**, University Center for economic and Managerial sciences, Universidad de Guadalajara (maei58@hotmail.com)

Abstract:

The objective of this paper is to analyze the functioning of an integral model of entrepreneurship in green innovation business (GIB) that are currently emerging and in the process of internationalization. Therefore, this work aims to study the central perspectives of technology that are based on the phenomenon of entrepreneurship and thus develop a strategy that adapts to companies with an ecological basis to achieve internationalization. This article analyzes a particular company, which specializes in the area of ecological bio mineral organic fertilizer, where no chemical product is used to produce the composition, everything that is marketed is made up of a base of organic minerals and other organic compounds.

Keywords: *Integral model, eco efficiency, internationalization*

1. Introduction

Currently there is a new business model which has as the objective to be eco-efficient. Eco-efficiency is defined as the production of products and services at competitive prices that meet human needs and provide quality of life, while the ecological consequences and the use of numerous resources during the life cycle are progressively reduced. level equivalent, at least, to the estimated capacity of the planet (World Business Council for Sustainable Development, 1991).

On the other hand, it is mentioned that eco efficiency has the purpose of establishing a production of manufactured products of high durability, reducing the intensity in the application of energy for the production of goods and services, maximizing the use of raw materials, managing and dispose of hazardous materials and waste in an efficient and environmentally acceptable manner, have management systems and environmental quality, as well as procedures in occupational safety and health, among other provisions, that will bring them financial benefits and competitiveness (Cantú, 2008, page 78).

In both definitions, the authors agree that eco-efficient companies should have as their main objective, to develop quality products at competitive prices, as well as to reduce the environmental impact of producing or offering their products and services. Castro (1998) mentions that eco efficiency aims to address three relevant aspects that correspond to: 1) the total quality, which involves productivity and quality in the company, 2) the preservation of the environment, which is related to the sustainable development; 3) occupational health and safety (Castro, 1998).

2. Background of the problem and assumption

Green innovation in urban areas is a neglected issue in terms of urban planning and policing. Still, more neglected is a concern for changes in urban green areas toward the implementation of green innovation initiatives to revitalize the cities, increase the economic growth, improve the social justice and inclusiveness, as well as the improvement of environmental sustainable development, strengthen the biodiversity and socio-ecosystems. In fact, to achieve these goals it is necessary to implement some actions following the design and implementation of a comprehensive entrepreneurship model.

This new eco-efficient business entrepreneurship model will be analyzed in the context of the integral model, analyzing in this way the tripod of the strategy, which integrates considerations based on industry, resources and institutions. This paper begins with the assumption that the companies of ecological base present major difficulty at the time of wanting to internationalize, in comparison to the companies of industrial base.

3. Use of fertilizers in Mexico

The National Development Plan 2019-2024 establishes among the priority actions for food self-sufficiency and the rescue of the field the Fertilizer Program for the benefit of agricultural producers.

The Mexican Government's National Fertilizer Program aims to address the problem of low availability of national fertilizers at competitive prices for small producers. Includes chemical fertilizers and bio fertilizers. This National Fertilizer Plan aims to reduce dependence on the import of these fertilizers. To achieve this, the Cosoleacaque Petrochemical Complex plants and the Pajaritos plant are reactivated for the production of ammonia, an input to produce urea, which Mexico imports mainly from Ukraine. In the case of phosphates, in the Pacific, the Lázaro Cárdenas plant is operational and is the largest in Latin America.

The National Bio Fertilizer Program shows incipient progress. The fertilizer production in Mexico estimated for 2019 was 1.85 million tons, reflecting an annual reduction of 2%; while demand continues to rise, with a record estimate of around 5.5 million mt. However, by July 2020, the production volume of nitrogen fertilizers in Mexico almost reaches 48,800 metric tons, which represents a decrease of 32.7% compared to that reported during the same month in 2019. The production volume of phosphate fertilizers in Mexico exceeded 75,600 metric tons, which represents a decrease of 29.1% compared to that reported during the same month in 2019 ((Burgueño Salas, 2020).

4. Fertilizer demand in Mexico

A recent analysis of the fertilizer market in Mexico has pointed out that the consumption of fertilizers has undergone a change in the structure in favor of consumers with the highest concentration and diversification (UACH). This situation has contributed to a drop in the consumption of fertilizers due to the fact that the farmer's real income has fallen.

On the change in the consumption pattern (sources), I have no hard information about it. From experience in the field, it can be stated that there has been a growth in the use of physical fertilizer mixtures where the distributor makes certain formulations, mixing fertilizers and thus the producer only buys one product. Regarding those of high concentration, it is well understood,

if possible because there has been significant growth in the area of protected agriculture and in the area of strawberries and high-value vegetables where drip irrigation is used and through it fertilizers are applied and for this, highly soluble sources with minimal impurities are usually used, which are not normally traditional sources.

However, with more recent data reported by Instituted Trusts in relation to Agriculture (FIRA 2020), in the agricultural year 2019 71.8% of the sown area was fertilized, representing the seventh consecutive year with increases in the percentage of fertilized area. According to this report, the consumption of fertilizers in Mexico grew 5.8%.

In an interview with a FIRA fertilizer specialist analyst, Gallegos Cedillo (2021) asking about the trend in fertilizer consumption and asked about the demand and supply of fertilizers in Mexico, he warned that the lack of information with hard data does not always support trends in which the market moves. Regarding the consumption of fertilizers, the production information indicates that production has fallen: 15.4% from 2013 (2.06 million tons) to 2020 (1.75 million tons) for the period January-September. This, although in 2014 and 2019 increased compared to the previous year and the same period.

Now, if we consider the fertilized area, it has increased, as a percentage of the sown area. This proportion has increased from 2013 to 2019, the last reported year, going from 65.3% in 2012 to 71.8% in 2019. However, if we look at the apparent consumption, it increased from 5 million tons in 2013 to 6.7 in 2018, in 2019 (January-December) it does drop to 5.8 and in September 2020 it is 5.2 (Graph in quarterly report). There are no elements to attribute the drop in consumption from 2018 to 2019 to the decrease in producers' income, but if someone affirms this, it is difficult to prove otherwise.

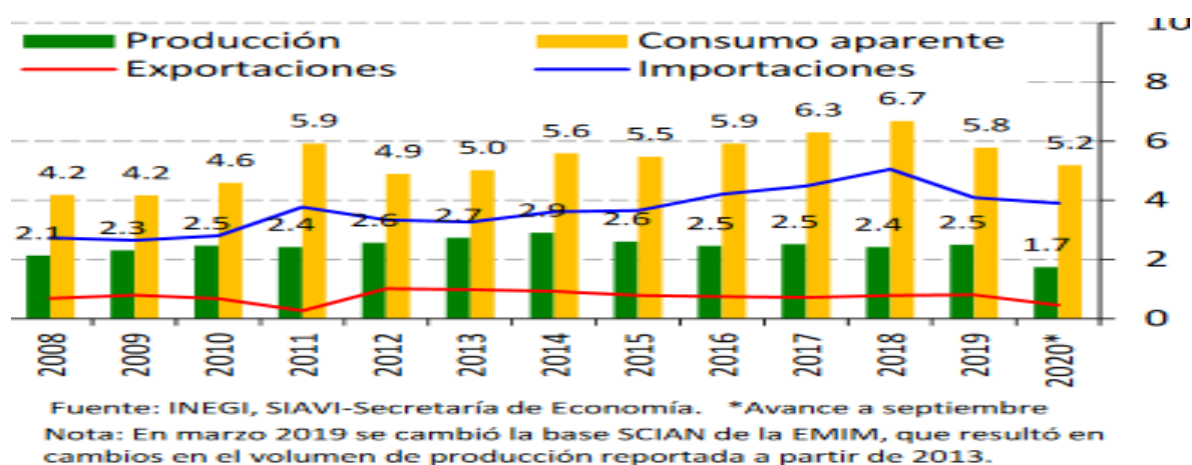


Fig. 1. Production and consumption of fertilizer in México (Millions of tons)

5. Fertilizer production in Mexico

The increase in Mexican fertilizer production during the last years is attributed, in part, to the reforms made to the Pemex Law since 2008. These had the objective of promoting the production and productivity of the Mexican fertilizer industry through the supply of raw materials, such as ammonia, at competitive prices for national manufacturers. In 2018, national production contributed 30.7% of apparent national consumption, which is estimated at 6.2 million dollars and represents an annual increase of 7.9%. The foregoing shows the country's high dependence on fertilizer imports.

With data from 2019, the national production of fertilizers is mainly composed of: Phosphate fertilizers (diammonium and others) with 55.7%. Nitrogen fertilizers (ammonium sulfate and nitrate and others) with 32.2% Acidic fertilizers (phosphoric, sulfuric and nitric) with 10.9%. The estimated value of the fertilizer industry in Mexico in 2019 is 13,616.4 million pesos, 2% lower than that registered in 2018.

Fertilizer production processes in Mexico are not integrated, a situation that has an impact on domestic producers, especially urea and nitrate, being at a disadvantage compared to producers of international competition (UACH). According to data from the latest Quarterly Report on Fertilizers from the Directorate of Research and Economic Evaluation of the Instituted Trusts in relation to Agriculture (FIRA, 2020), the production of fertilizers in Mexico decreased at an annual rate of 8.4% in the first nine months of the year compared to the same period in 2019.

Regarding the fact that the national producers of urea and ammonium nitrate are at a disadvantage with international competition, as a consequence of the lack of integration of their production processes, if the statement is well understood, especially the reason that is manifested by the lack of integration of their production processes, in general, it would be expected that greater integration greater profitability, but this is not considered to be the main reason for the disadvantage of domestic producers. It can affect, but is not the main reason.

More weight would be given to the characteristics of the Mexican farmer, small areas and little specialized, he grows various products, as well as the dependence to a large extent on the import of fertilizers that expose him to have fertilizers without due quality control, lack of weight in the containers (49 kg bags instead of 50 for example), exchange rate, etc. Gallegos Cedillo, 2021).

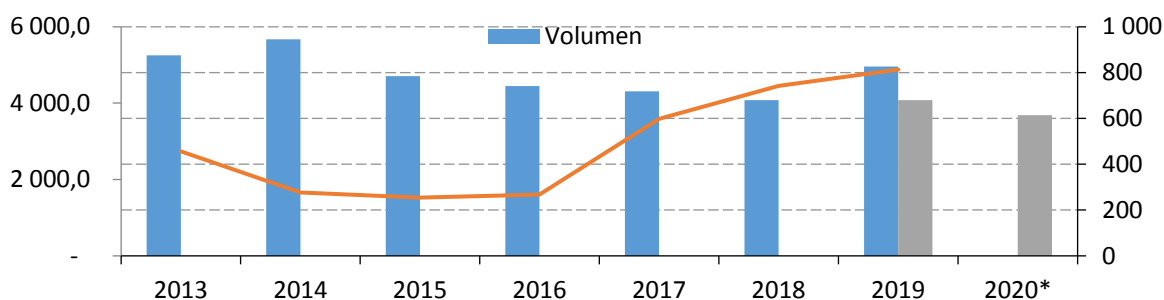


Fig 2. Acid fertilizer production in Mexico, 2013-2020* (Thousands of tons)

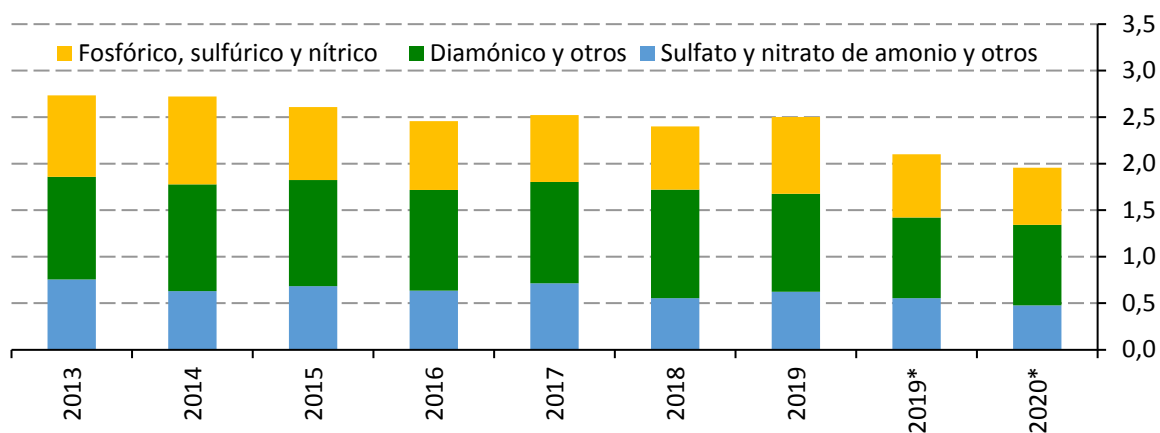


Fig. 3. Fertilizer production in Mexico, 2013-2020* (Millions of tons)

6. Fertilizer exports and imports in Mexico

In this regard, with information from the Ministry of Economy, imports of fertilizers in Mexico, during 2018, registered a volume of 5.06 million dollars and represented an annual increase of 12.6 percent. In said year, imports came from Russia (30.9%), the United States (14.3%), Norway (12.1%) and China (11.1%), mainly. In the last five years, these countries participated with 69.5% of the national fertilizer imports. In the case of exports, these stood at 0.79 million pesos and registered an annual growth of 10.5%. Between 2008 and 2018, consumption and imports grew on average at an annual rate of 6.3 percent.

Imports in 2019 are estimated at around 2.9 million tons, of which an advance of 92% was recorded as of November. Of the total imported, 67.2% corresponded to nitrogenous, 15.5% to phosphate, 12.5% to potash and others with 4.8%. The commercial value of these imports was 807.8 million dollars, reflecting a reduction of 14.3% in relation to the record of 943.1 million dollars registered in 2018. The main supplying countries were: Russia 30.6%, China 16.9%, United States 11.3%, Algeria 7.9%, Malaysia 3.8%, Chile 2.9%, Canada 2.1%, Egypt 1.4% and others 23.1%.

Between January and September 2020, Mexican fertilizer imports grew 9.9%, while exports decreased 16.6% at an annual rate, totaling 3.9 and 0.46 million dollars, respectively.

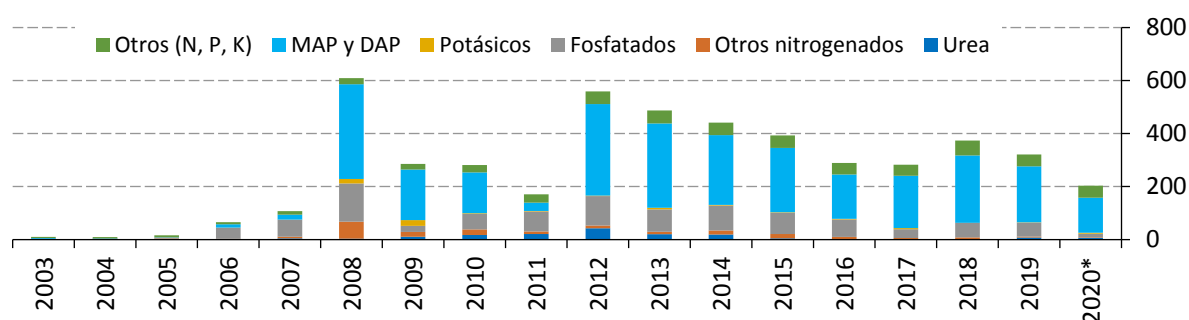


Fig. 4. Mexican Fertilizer Exports, 2003-2020 * (Millions of dollars)

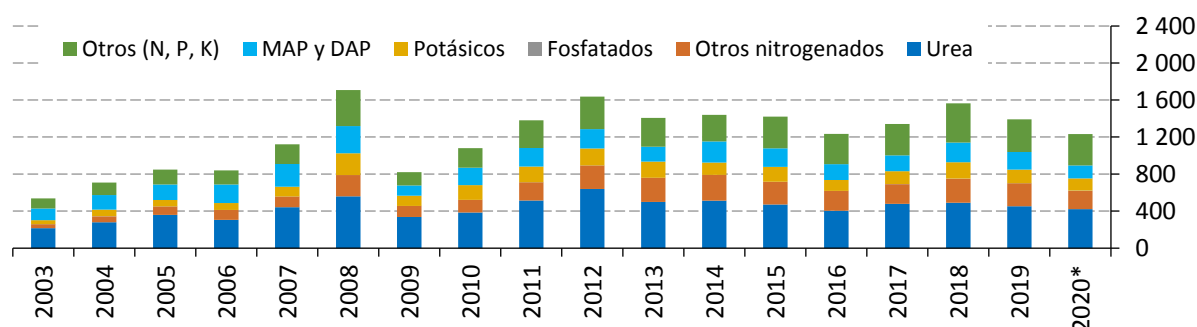


Fig. 5. Mexican fertilizer imports, 2003-2020 * (Millions of dollars)

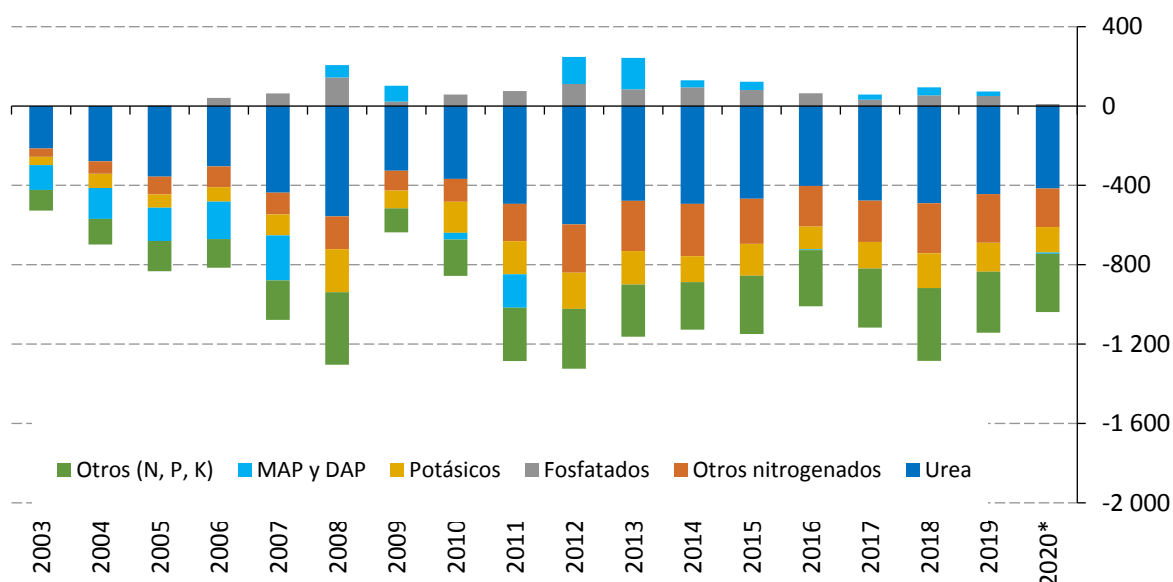


Fig 6 Balance of the fertilizer trade balance, 2003-2020 * (Millions of dollars)

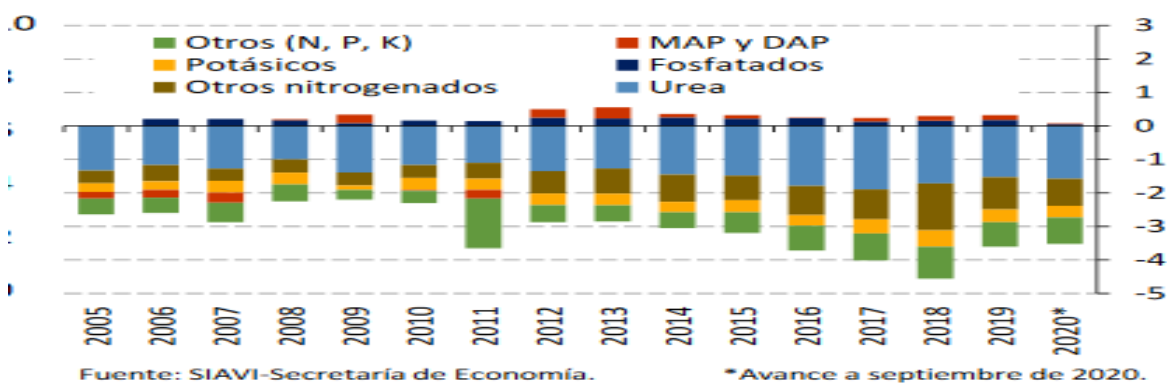


Fig. 7. Trade balance (Millions of tons)

7. The fertilizer market

The implicit price of fertilizer imports in Mexico in 2018 was \$ 322.3 per ton, and represented an annual increase of 6.7%. The implicit price of imports from Russia was 283.4 dollars per ton, 387.2 for those from China and 416.1 for those from the United States, and showed an annual growth of 10.8, 24.2, and 9.7%, respectively. Regarding the average price level of fertilizers in Mexico, since 2014 the behavior has been on the rise. In 2018, a ton of fertilizer, in distribution centers, was quoted on average at 10,254 pesos, which represents an increase of 3.5% compared to 2017.

The fertilizers with the highest annual increases in prices were, diammonium phosphate (DAP) (10.4%), Triple 17 (10%) and potassium nitrate (9.4 percent). In January and February 2019, the average price was reduced by 2.0 and 1.3% compared to December 2018, so it would be expected that the average price in 2019 will be at levels similar to those registered during 2018. In the domestic market, urea prices increased 7.3% from 2018 to 2019; while those of diammonium phosphate rose 4.8%.

The average price of fertilizers in the country maintains an upward trend. In November 2020, it registered growth of 2.7% at an annual rate and 3.3% from December 2019 to date. As of

November, the price increases of triple 17 (12.2% annually), ammonia (9.9%), ammonium sulfate (8.3%) and ammonium nitrate (7.9%) stand out. The prices of simple superphosphate and potassium chloride were the ones that showed the greatest annual decrease, at rates of 7.1 and 4.6%, respectively.

8. Bio organic fertilizers in México

The use of organic fertilizers in Mexico is not very common, this is because industrial-based companies need chemical products that make plants grow at a faster rate due to market demand. But these fertilizers damage the soil causing them to become unusable after a time for the harvest, in turn the food absorbs these fertilizers that are harmful to the human being in the long run.

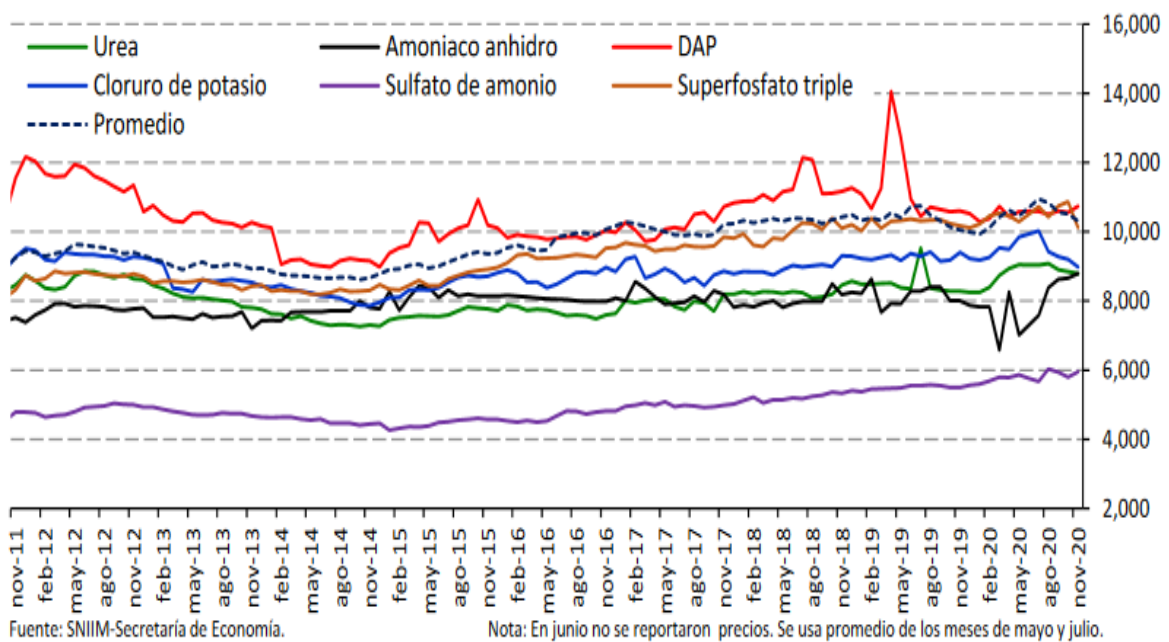


Fig. 8. Prices in the national market (In Mexican pesos per ton)

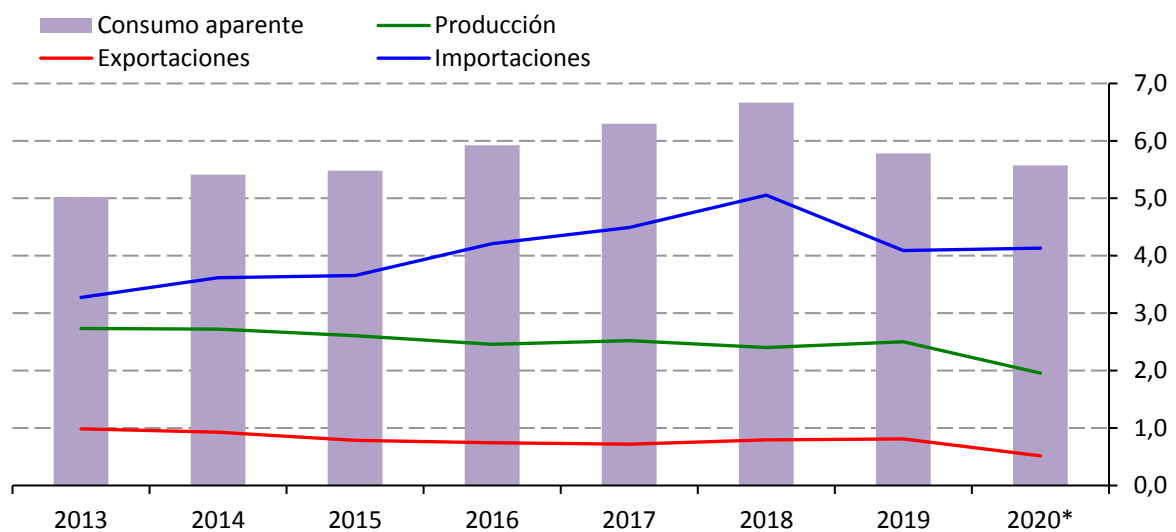


Fig. 9. Production, foreign trade and apparent consumption of fertilizers in Mexico, 2013-2020 * (Millions of tons)

On the other hand, organic fertilizers bring many benefits for the soil as well as for plants and food, according to a study carried out by SAGARPA, organic fertilizers favorably influence the physical characteristics of the soil (physical fertility); These characteristics are structure porosity, air action, water retention capacity, infiltration, hydraulic conductivity and stability of aggregates. The following table 1 shows a comparison made by the National Agricultural Survey (ENA) in which there is an increase in the use of chemical fertilizers in Mexico and a decrease in organic fertilizers.

Table 1: Comparison of the use of chemical and organic fertilizers in Mexico
National agricultural survey
Agricultural Technology (First part)
86% of agricultural production units carry out agriculture

Employed technology	Percentage	
	ENA 2012	ENA 2014
Type of seed	60.9%	82.2%
Creole	29.7%	29.2%
Improved	Na	Na
Certified	Na	Na
Transgenic	Na	Na
Seedling	Na	21.0%
Chemical fertilizers	65.5%	68.8%
Natural fertilizers	40.4%	27.5%
Herbicides	61.7%	62.7%
Insecticides	45.3%	48.2%

The sum does not give 100 because each production unit can use more than one technology
Na Not available

Source: INEGI; National Agricultural Survey (ENA 2014)

9. Theoretical-conceptual framework

The theoretical framework applied in this study is based on the analysis of the coefficient company using the main three theories of strategic design and implementation: The industry based considerations, the resource and capabilities considerations and the institutions based considerations, as shown below in figures 10 and 11.

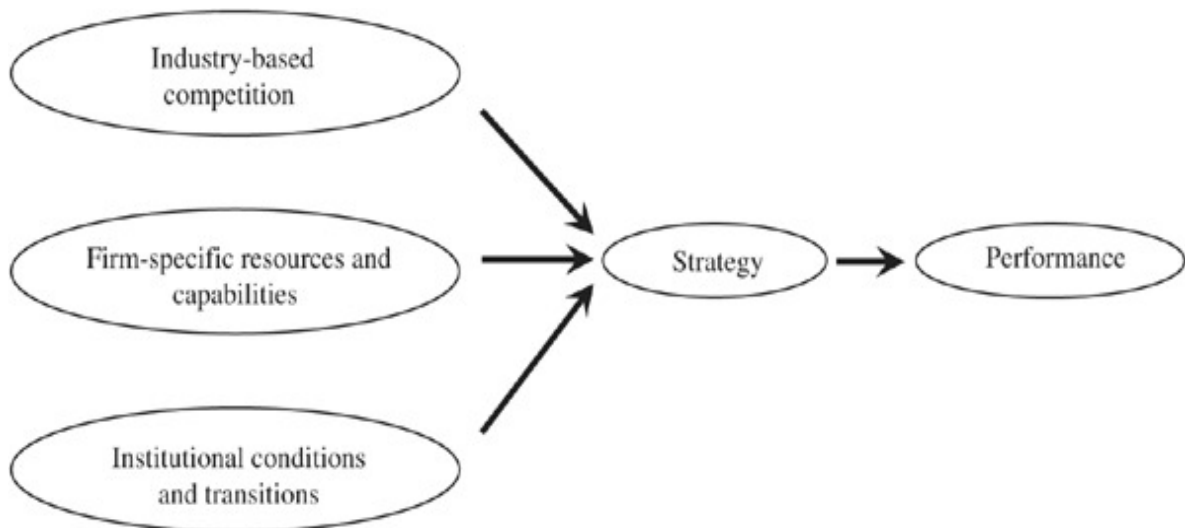


Figure 10. Model of strategic analysis
Source. Own elaboration based on Peng (2012).

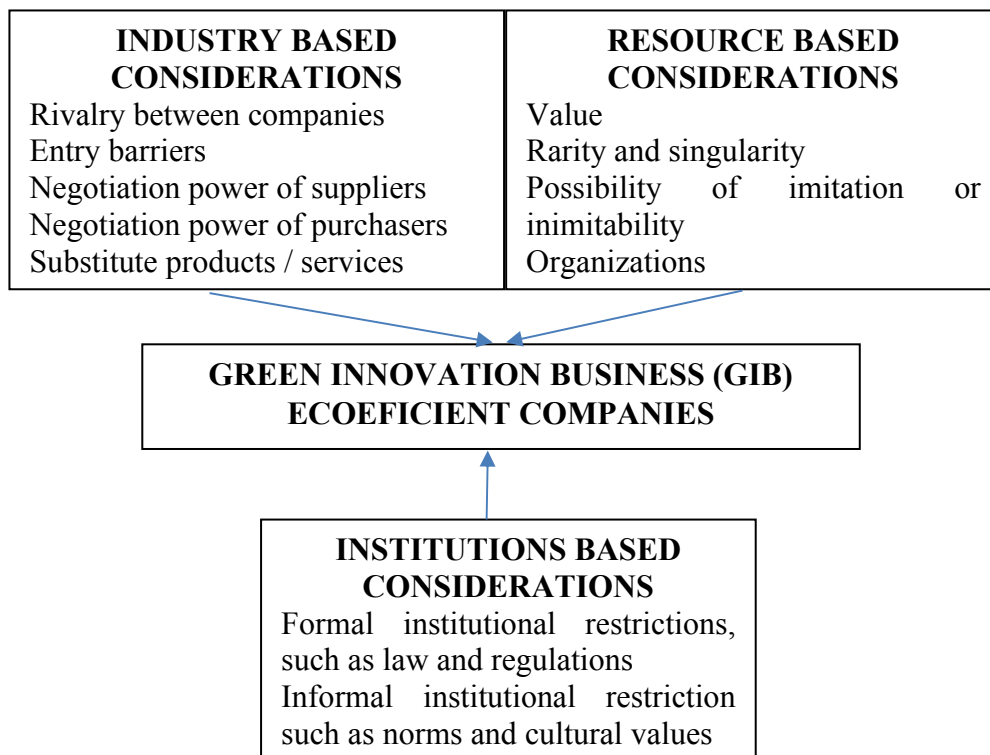


Figure 11: A comprehensive entrepreneurship model for the internationalization of green innovation business (GIB) and eco efficient companies

10. The green innovation business (GIB): BIO-FOM

BIO-FOM is a green innovation business (GIB) also characterized as an eco-efficient company with the objective to promote sustainable, profitable and inclusive development through the use of highly competitive Mexican seeds with fair prices; and with the use of organic mineral bio fertilizers, healthily increased the profitability of the producers. It is located in the metropolitan area of Guadalajara (Figure 12).



Figure 12. Localization of BIO-FOM a green innovation business (GIB).
Source: Web page of the company.

BIO-FOM is the most complete Organic Mineral Bio-fertilizer available on the market, which is made up of the interaction of elements: biological, organic and mineral. It is a mineral organic Bio-fertilizer for plant nutrition. The interaction of the BIO-FOM elements forms a: Functional Plant Nutrition System, whose results are reflected in: improved seed germination and initiation, healthy and adequate growth, larger roots, greater flowering and tie, increase in the quality of the fruits and provide resistance to pests and diseases. BIO-FOM, increases soil fertility and contributes to the decontamination and regeneration of the soil.

BIO-FOM bases its functionality on the interaction of the biological, organic and mineral elements that compose it: A Poly-Functional Consortium of Microorganisms, among them: antagonists to pests and diseases, nitrogen fixers and; mycorrhizal fungi; that help release the nutrients provided by the BIO-FOM blend itself. The 17 Basic Mineral Elements of plant nutrition (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, boron, copper, manganese, silicon, zinc, iodine, sodium, cobalt, molybdenum, selenium) Organic Matter, Amino Acids, Acids Humic and Fulvi.

BIO-FOM contains live microorganisms: 8 bacteria and mycorrhizal fungi that help unblock the chemical components that exist in the soil allowing their absorption, in addition to an important contribution of organic matter, amino acids, humic and fulvic acids, this, together with its content of 16 mineral elements (nitrogen, phosphorus, potassium, magnesium, calcium, iron, boron, copper, manganese, silica, zinc, iodine, sulfur, sodium, cobalt and chlorine) together give rise to a molecular dialogue that results in a functional plant nutrition system, fertile soil, larger root size and helps improve pH, which is essential for proper and healthy plant growth.

Among other benefits, it potentiates the chemical fertilizers that complement the application of BIO FOM as:

- a) It recovers the fertility of the soil, unlocking mineral nutrients present but not available, favoring their absorption due to its bio-organic profile.
- b) Increases the specific weight of grains, resulting in higher production.
- c) Increases the Brix degrees of the fruit, having better sales possibilities.
- d) Stimulates the immune system, so healthy, vigorous and productive plants are achieved. Strengthens the root system of the plant, thereby improving the use of water and mineral nutrients available in the soil.
- e) Respect the ecosystem, avoiding the contamination of the water table.
- f) 100% assimilable, achieving a greater expression of the genetic potential of plants.
- g) Retains and conserves moisture in soils.

11. Method

This analysis is based on the specific case study of an eco-efficient company using the methodological tools proposed for each one of the theoretical approaches.

For the analysis industry based considerations is employed the model of the five forces, also called the diamond model proposed by Porter (1980). The resource and capabilities analysis of the eco-efficient company is employed the model proposed by Barney (2001) complemented with the SWOT analysis. Finally, the eco-efficient company is also analyzed in terms of the institutional considerations considered as the “rules of the game”, formal and informal, that frame the entrepreneurial activities and the creation and development of companies according to the territorial environment.

12. Empirical results and conclusions

Industry-based considerations

When analyzing industry-based considerations, the framework of Porter's five forces is used, which takes into account factors such as rivalry between firms, barriers to entry, the power to negotiate with suppliers and buyers, as well as the substitute products.

The rivalry between companies

When talking about the rivalry of companies, it is referred to the struggle that companies face every day to obtain a position before consumers. These battles can be for prices, quality in products, advertising battles, etc. On the other hand, the author Huyghebaert mentions that the rivalry between firms generates a direct impact on the likelihood that a business will be successfully undertaken, as well as having an impact on the existence of barriers to entry, since fewer firms exist in one industry more complicated will be the entry of new firms (Huyghebaert, 2004).

The company to analyze is dedicated to organic fertilizers made from organic minerals, as it is an innovative product, it does not have much competition, but if there is competition in relation to the substitute products that would be all chemical fertilizers, due to the a great variety of substitute products that are available in the market, it is difficult to compete for price in the same way as being a medium-sized company is not even positioned in the mind of the consumer when thinking of an organic fertilizer.

Entry barriers

As already mentioned before, BIO-FOM faces competition from large chemical and organic fertilizer companies. Due to this there are difficulties when it comes to wanting to enter the foreign markets, as the big brands are doing well positioned in the market, and it would be complicated to unseat them or compete for prices, so that the company in this case could compete for product quality as well as innovation and for the benefits that its product provides.

It is also important to consider the transaction cost and the transportation cost if working with foreign currencies. If the costs become too high, BIO-FOM products would be less competitive in the foreign market. An alternative to export is the franchise, which allows local business units to produce BIO-FOM products for a fee.

Substitute products or services.

In the global marketplace and more specifically, North America, large, medium-sized and small competitors produce similar products. Geographically, most of the production plants are located in rural areas and seem to serve only local markets. The competitive advantage of BIO-FOM is that it is the company with the highest social awareness among all its competitors. And although its product is easy to imitate, it gives it a plus by mixing it with some other ingredients that make the compost a better quality. It is also easy to use as they pack the product inside disposable pod made biodegradable materials that only have to be deposited in a container with water waiting for it to dissolve and it starts to water in a normal way.

Bargaining power with buyers

According to Porter, at this point it is defined as the ability of customers to impose prices and conditions of sale (Porter, 1980). This force can be established by customers directly, whether negotiating a discount or financing model, demanding delivery forms or indirectly which is summarized with competitive purchases.

The bargaining power of buyers may depend on some variables such as a high supply of products and / or services and low demand for them. Another may be that the products offered have no differentiation among themselves, etc. At this point, the customer has the option to choose any product or service that is presented to them and that they consider to be the best and meet their expectations. As well as defining what is the maximum price customers are willing to pay for a product or service, as well as some other requirements that could be delivery times, product quality, etc. All this has an impact on the company's profits.

Bargaining power with buyers

In one of his writings, Peng mentions that "when the bargaining power of suppliers becomes too great, business solutions must be found that can reduce it" (Peng, 2012, page 127), this is due to the fact that many options must be available to the purchase of inputs at reasonable prices.

The organic fertilizer based on organic minerals require many inputs due to the fact that a lot of raw materials are used for its elaboration, so it is necessary to have a large number of suppliers. But if it is necessary that with the few suppliers that have contact make and establish the negotiation agreements and delivery times among many other things, in this way can reduce and to a certain extent eliminate transaction costs.

Considerations based on resources and capabilities

The resources are any input in a productive system in which an output is generated. These can be classified as financial, physical, human, technological, organizational, knowledge, management team experience and customer service, among others. On the other hand, Barney dogmatizes that the heterogeneity of organizations is due to the possession of resources: i) valuable, which must respond to environmental threats and take advantage of their opportunities; ii) rare or scarce, those that cannot allow obtaining competitive advantages with competitors; iii) difficult resources to imitate, without substitutes and organizational, which means that the company has aspects of order (Barney, 2001, page 41).

The company BIO-FOM, offers the market an innovative product because it is taking the greatest benefit to a product that people see as a waste, and transformed it into a product with added value. The strengths with which this product provides is that they are organic, have a higher

performance compared to other fertilizers, is favorable to the environment, is not expensive to produce. Something that gives a greater value is that the packaging is biodegradable by what makes the whole product itself is ecological and there is no waste of plastic or any other material that is difficult to decompose, the product is safe for children and pets so anyone can use it.

Therefore, for the considerations based on resources, a SWOT analysis was carried out to analyze both the internal and external factors that provide added value to the firm, as well as the positive and negative factors that can cause the company not to grow rapidly. what was expected.

Table 2: SWOT Analysis

Strengths	Opportunities
Organic products / products without chemicals Excellent performance compared to other inorganic fertilizers environment friendly It is not expensive to produce The packaging is biodegradable No toxic, safe for children and pets It is not easy to imitate	Growing trend in organic products Market development Product development Product differentiation
Weaknesses	Threats
Lack of advertising + visibility Small production capacity-challenge for the company at scale The products have limited functions The products are not standardized Hard to forecast production Limited capital and strategic partners Don't go alone Expensive compared to inorganic fertilizers	Regulations that exist for exports Animal diseases Environmental factors may affect production Breach of demand levels Low market level

Source: Prepared by the Authors

In this table it can be seen that the firm has many strengths that make its product different, but also has many threats. This is due to the same rarity of the product which makes it somewhat complicated for sale, likewise the product is easy to imitate, so at any time it could have a lot of competition, which can quickly get to the market firm.

Considerations based on institutions.

When talking about considerations based on institutions, we are talking about the rules of the game of these, in which the behavior of the company is determined and how they are developed

around the world. Peng, points out 5 strategies for an entrepreneurial company to be successful, which can be applied together, and they are growth, innovation, networks, financing / government, and harvest / output (Peng, 2012).

The BIO-FOM company integrates some of these strategies such as innovation in their products, as well as networks, since they try to have a wide network to get known as well as to obtain advice and keep growing as the company participates in a program called X-culture where companies are assigned a group of people from different parts of the world, giving advice to companies so they can expand or internationalize at the time the company uses all the networks that are possible for be able to expand.

Instead, McDougall notes that network analysis builds a very solid foundation and helps identify international opportunities, as well as establish credibility, provide access to critical resources, as well as knowledge and lead strategic and cooperative partnerships (McDougall, 2000).

13. Challenges and opportunities

Green innovation business (GIB) in the field of organic fertilizers are contributing with an input of fundamental importance in primary agricultural activity. The rehabilitation of organic fertilizer producing plants in the country is not economically viable in the short term, because the reactivation of activities in the plants takes time. Besides, is not common to find these kind of producer units in urban areas.

It is necessary to invest more resources for the qualification and to reduce the import of organic inputs and other ingredients necessary in the production of fertilizers. The importation of chemical as well as organic fertilizers will continue, since the national production of 2020 only covers 33.7% of the total demand, and the remaining 66.3% is brought from the foreign market.

14. Conclusions

When analyzing the green innovation business (GIB) and eco-efficient company through the comprehensive method of entrepreneurship, it is observed that just as the company has some advantages in the product also with many threats that are the large companies that are already positioned and that also compete with competitive prices. It is also determined that although the green innovation business (GIB) have a wide network which is using the best way possible, it is necessary to increase the international network of contacts so that the business can grow quickly. Although BIO-FOM has been positioned in the local, regional and national market for a short time in and has grown steadily, it has the challenge to enter to the international markets in a very competitive position.

Likewise, it can be seen that due to the culture of planting in Mexico, this company faces problems to become highly competitive in the country, since most farmers prefer chemical fertilizers and thus produce more in less time than caring for the land and having a product of a higher quality with organic fertilizers.

It is necessary to implement a culture of conscience in Mexico when we talk about caring for the land, since the use of organic fertilizers would not only help the environment, but also people, this is because the foods that are consumed will have better nutrients and they would not be contaminated with pesticides. Today some people started to make their gardens at home, so they grow their own food, this is a good technique because they can be sure that the consumption of

food is one hundred percent organic. Here is the importance of the topic for green innovation urban areas.

References

- Burgueño Salas, E. (25 Sept. 2020). *Volumen de producción mensual de fertilizantes fosfatados en México de enero de 2019 a julio de 2020 (en toneladas métricas)*. Statista. Retrieve on the 2 of July 2021 from <https://es.statista.com/estadisticas/594554/volumen-de-produccion-de-fertilizantes-superfosfatados-en-mexico/>
- Barney, J. (2001). *Is the resource-based “view” a useful perspective for strategic management research?* *Academy of Management Review* 2001, Vol. 26, No. 1.
- Cantú, P. (2008). Desarrollo sustentable: conceptos y reflexiones. *Universidad Autónoma de Nuevo León*. Colección: *Tendencias Científicas*. ISBN: 978-607- 433-117-2
- Castro, A. (Julio de 1998). *Hacia el desarrollo sostenible y la ecoeficiencia: integración de las normas ISO 9000, ISO 14000 e ISO 18000 diseño de un sistema de gestión ambiental certificable. (Tesis de maestría inédita)*. Obtenido de Facultad Regional de Buenos Aires: <http://posgrado.frba.utn.edu.ar/investigacion/tesis/MIA-1998-Castro.pdf>
- Consejo Mundial Empresarial para el Desarrollo Sostenible. (1991). Ecoeficiencia y sustentabilidad. . *Ciencia uanl*, 35.
- FIRA (2020). Reporte trimestral de fertilizantes, Dirección de Investigación y Evaluación Económica del Fideicomisos Instituidos en relación con la Agricultura. Diciembre 2020.
- Gallegos Cedillo, G. (2021). Interview to an specialist of FIRA conducted on January 13th, 2021.
- Gallegos Cedillo, G. (2021). Working paper [Agronegocios FIRA](#).
- Huyghebaert, N. (2004). *Comportamiento estratégico de los titulares en los mercados financieros y la salida de los arranques empresariales*.
- McDougall, P. (2000). *International entrepreneurship*. AMJ.
- Peng, M. (2012). *Global Strategy*. Cincinnati: Thomsom South-Western.
- Porter, M. (1980). *Competitive Strategy*. New York: Free Press.

Knowledge and Technology Transfer in Organic Farming in Russia: Results of Patent Analysis

Tatyana Zimnyakova, Siberian Federal University (tzimnyakova@inbox.ru), Ivan Drobyshev, Siberian Federal University (idrobyshev@sfu-kras.ru)

Abstract:

It is considered, that active interaction of participants in innovation process increases innovation output both at the level of individual companies and an industry as a whole. Knowledge and technology being transferred through network interactions of actors contribute to development of innovative potential in individual companies and economy sectors. In this study network interaction of participants in a process of developing new knowledge and technology has been analyzed with attention to a particular branch of the Russian economy, namely the organic farming. The analysis used patent information obtained from open sources. Using the tools to visualize links between patent authors and applicants for intellectual property rights, we confirmed the following barriers that impede the course of the innovation process: low level of interaction between state scientific organizations and the commercial sector; low patenting activity of private companies; lack of interregional transfer of knowledge and technology.

Keywords: *technology transfer, innovation potential, networks, patents*

1. Introduction

Collaboration of participants in innovation process has a positive impact on its effectiveness (Lundvall, 2010). A number of empirical studies show that active interaction between knowledge producers, acquirers, consumers, implementers, policy inventors, governing bodies and other types of actors increases innovative output both at the company level (Ahuja 2000, Baum et al. 2000) and at the level of industry alliances (Uzzi & Spirro, 2005). This interaction may take a form of knowledge and technology transfer – a process of sharing the new principles, methods and procedures by the inventors, researchers and developers with entities willing to commercialize it in a form of a new product or service, and thus disseminating new knowledge, diffusing innovations and making them a part of routine production and regular consumer agenda. The topic has become of huge interest due to the ever-growing movement towards defining advancements of an economy according to its “...dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by business and public sectors” (OECD, 2005, p. 28). The related concept of “knowledge-based economy” (as depicted in OECD, 1996) emphasizes, that diffusing and using information is of no lesser importance, than creating the said information. Furthermore, it acknowledges, that a functioning (not declarative) knowledge-based economy has obvious network character, as it is constituted with interrelated actions of different actors, intertwined in non-linear processes of innovative products and practices development.

The topic of knowledge-based economies is widely covered by numerous research conducted under auspices of the aforementioned Organization for Economic Co-operation and Development (OECD) and its branches. These works discuss the role of knowledge not only on a level of the whole economy or an industry, but rather a community level (although a community is depicted in a broad sense, as a wide spectrum of actors, which are not necessarily and not primarily individuals). A knowledge-based community is believed to be a viable agent of economic change (OECD, 2004). This type of community becomes a core for a knowledge

network, where knowledge and technology is transferred more freely, than outside of the network.

The term “network” is usually referred to a concept of both formal and informal ties within a knowledge-based community, that ensure efficient information flow and technology transfer or sharing. Networks, as contrary to clusters (e.g. “clusters of innovation”), are defined according not exclusively to its geographical proximity, but rather to easiness and pace of information and knowledge exchange. This side of network’s nature is of a great value when assessing innovative potential of a community or an industrial sector. It is shown in various studies, that the networks of larger sizes may be outperforming smaller networks, when it comes to network participants (Thorsten et al., 2009). Also, spatial network characteristics seem to have impact on innovation output via closure, diversity and brokerage (Baer et al., 2015). It is suggested, that there are two main characteristics of networking that influence innovation performance of a community or an industry: clustering and reach (Shilling & Phelps, 2007). “Clustering” in this approach refers to firms in a network forming groups with more mutual internal links, than other companies. It is determined by the number of partners of a firm connected directly to each other; then an average of this measure is calculated for the whole network. “Reach” refers to the size of the network, namely “The average number of connections separating each pair of firms in the network” (ibid., p. 115). Thus, the larger a network in an industry is, the more innovative the organizations within this network can become.

The idea of network is a metaphor of interrelations between industrial and/or communal actors, that represents characteristics of cooperation between them. Cooperation is a core concept that ensures, that innovations flow freely through various channels of knowledge and technology transfer. The purpose of this study is to assess a degree of cooperation in Russian organic farming as an indicator of the innovative potential of this industry. As a step of the analysis, presented in this paper, we aim to visualize the links between developers and patent applicants in organic farming in order to assess intensity of the interactions between the innovation process participants in the industry.

As noted earlier, new knowledge and technologies are transferred via certain channels between participants, making them more innovatively active. Although patenting is a mere channel among the many, it reflects a perspective commercial value of an invention (Carr, 1992), which defines its chances to become a full innovation in a Schumpeterian sense of the term. Therefore, a level of patenting activity can be used to evaluate a degree, to which an economic sector is susceptible towards both innovative and intensive commercial development.

Organic farming presents a unique case of a contradiction between a growing demand for gross production rates (especially in developing countries) and a strong social movement towards minimal intervention into a natural growing process of plants and domestic animals. It should be pointed out, that the latter is a peculiar trend in developed countries, or rather it is strongly correlated to the general income level of a population. In order to meet domestic or foreign demand, producers willing to implement the organic approach need to adopt intensive farming techniques, that will help them to balance out eventually growing unit costs by increasing the production. A possible alternative is to maintain a local organic farmer position and small production volumes. To increase the volume and to access outer markets is a task, that requires using the most novel and significant findings in agricultural science and practices, given that they have a commercial potential. Chances of a novelty commercialization is a topic of concern for the actors that provide solutions for organic farmers. They can use inventions developed and registered as an intellectual property by third parties, or they be involved in innovative process by being a part of it, in particular by taking part in collaborative work with the inventors and using the shared results of the said work, e.g. being co-authors (through their employees) or patent applicants. This type of collaboration can be interpreted as a network of knowledge and technology transfer, which provides us with grounds to visualize connections made via patents as a network and to apply appropriate network analysis instruments.

3. Methods and Materials

In order to conduct the patent network analysis, the corresponding data on patenting activity in the sector needed to be collected. Our dataset is based on open data from

Espacenet¹ and FIPS², obtained with search queries “organic farming”, “organic agriculture” as well as several IPC codes³. The overall search scope is ten years from 2010 to 2020. The data from 2021 are left out of the scope due to its natural inconsistency to the moment of the analysis. 564 patents were initially included in the dataset, but almost a half of it consisted of patents with similar content, developed by one group of authors from the Republic of Dagestan of Russian Federation (Table 1).

To improve the reliability of the results, we excluded the group of patents from the Republic of Dagestan from the initial dataset; further calculations were carried out separately.

The dynamics of patenting activity in organic farming remained positive over the period from 2010 to 2018 (Fig. 1). But since 2018 the number of registered patents has been declining annually, demonstrating an overall decrease in the activity of knowledge production in this area.

Table 1. Fragment of the patent dataset: patents registered by one semi-consistent group of authors from the Republic of Dagestan

Name of the patent	Author	The applicant
Sterilization method for stewed apples	Akhmedov Magomed Eminovich [ru] Demirova Amiyat Feizudinovna [ru] Rakhmatova Mafiyat Magomedovna [ru]	Akhmedov Magomed Eminovich [ru]
Method of stewed plums production	Akhmedov Magomed Eminovich [ru] Demirova Amiyat Feizudinovna [ru] Dibirgadzheva Khalika Gimbatovna [ru] Rakhmatova Mafiyat Magomedovna [ru]	Akhmedov Magomed Eminovich [ru]
Sterilization method for stewed pears and quinces	Akhmedov Magomed Eminovich [ru] Demirova Amiyat Feizudinovna [ru] Rakhmatova Mafiyat Magomedovna [ru] Zainalova Ratimat Magomed-Alievna [ru]	Akhmedov Magomed Eminovich [ru]
Sterilization method of cherry compote	Akhmedov Magomed Eminovich [ru] Demirova Amiyat Feizudinovna [ru] Rakhmatova Mafiyat Magomedovna [ru]	Akhmedov Magomed Eminovich [ru]
...

1 Espacenet is an open patent information database of the European Patent Organization
<https://worldwide.espacenet.com/>

2 FIPS (“ФИПС” in Russian) – Federal Institute of Industrial Property free database of the Russian Federal Service for Intellectual Property <https://www1.fips.ru/en/>

3 IPC codes used: CO5F1, CO5F5, CO5F9, CO5F17, Y02P60

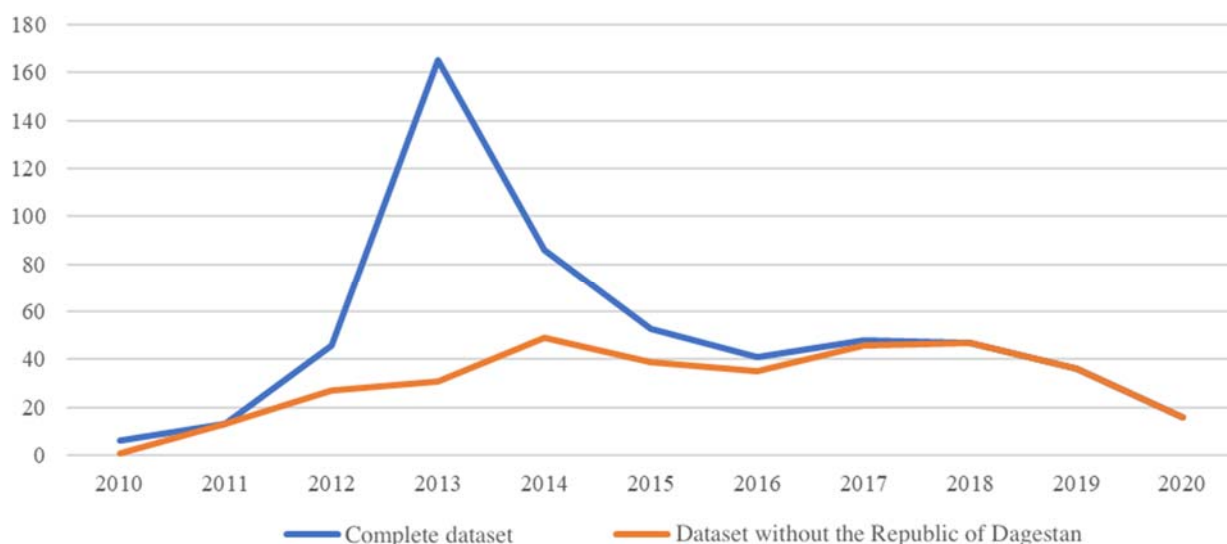


Fig. 1. Dynamics of patenting activity in the field of organic farming in Russia

The structure of the dataset by regions of Russia may be described as follows: almost a half of the patents belongs to the applicants from the Republic of Dagestan, while the share of the second most active region (Moscow) does not exceed 10% (Fig. 2.1). The second diagram (Fig. 2.2) shows the structure of the patent base excluding the Dagestan patents. Eight Russian regions concentrate the main patenting activities in the field of organic farming. Three of them are metropolitan areas of the country with high population density: the city of Moscow, Moscow Oblast and Saint Petersburg. The remaining five leading regions are located in the areas with the best farming conditions; together they produce about 22% of the total value added of the Russian agricultural sector. The role of other Russian regions in the patenting activities is insignificant (the share of each region from the “Others” group does not exceed 3% in the general dataset).

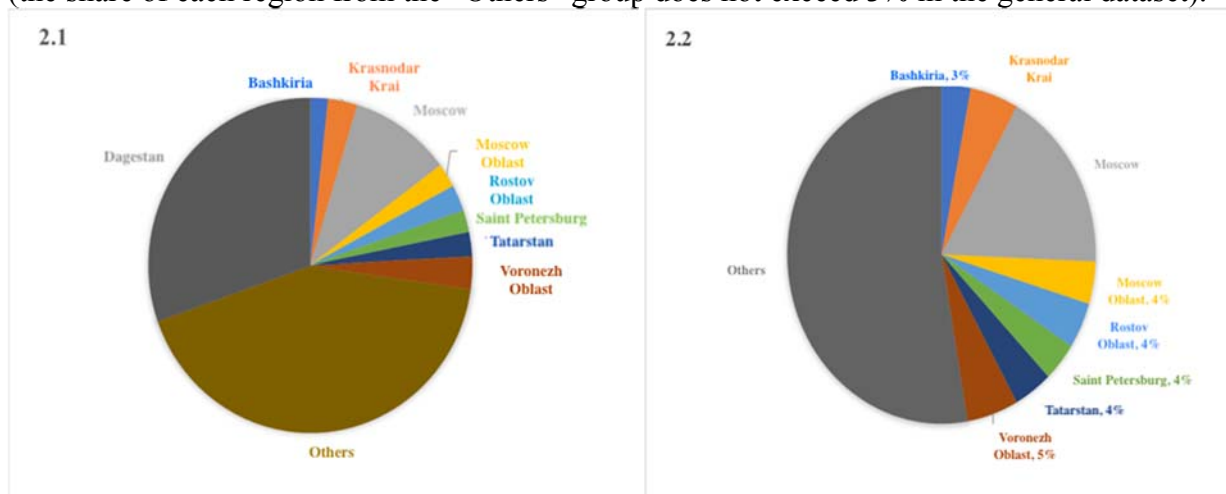


Fig. 2. Regional structure of the patent dataset: 2.1 – full dataset; 2.2 – the dataset with the data from the Republic of Dagestan removed.

Most of the patents belong to Russian applicants; foreign applicants collectively own less than 9% of all patents (Fig. 3).

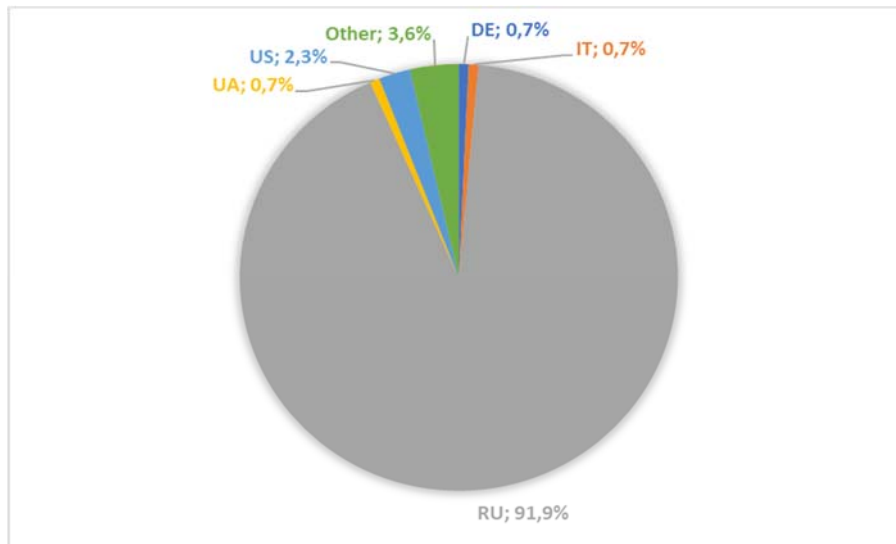


Fig. 3. Structure of the patent dataset by country of origin of an applicant

State organizations (scientific organisations, higher education institutions) prevail among the applicants (Fig. 4). Commercial entities (firms, companies) hold only 22% of all patents in the field of organic farming registered in the period 2010–2020.

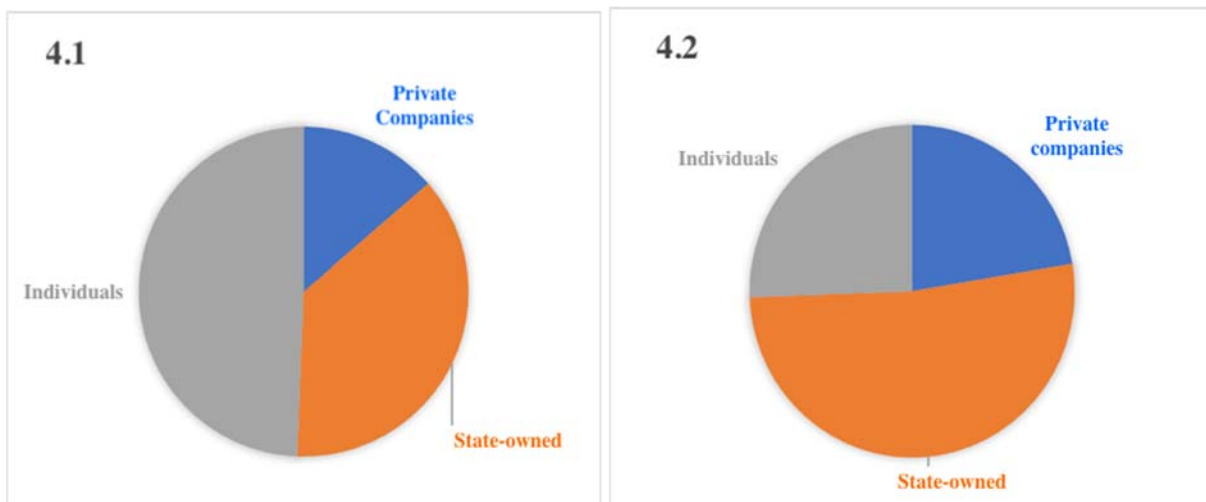


Fig. 4. Status of patent applicants: 4.1 – full dataset; 4.2 – the dataset with the data from the Republic of Dagestan removed

To assess the level of interaction of Russian participants in innovative activities in the field of organic farming, we conducted a network analysis using the Usinet software and its NetDraw application component. A network is formed by actors (in our study patent authors and patent applicants) acting as network nodes. Links between the nodes represent interconnections between actors. A link is drawn based on a fact of joint appearance of two or more actors as authors and/or applicants in the same patent. Although there are some patenting parties with high consistency over the course of time, it is normal for a collective actor to vary in terms of a list of persons and organizations involved. This creates connections between individuals and organizations visualized as the network links. The links are associated with mutual relations of knowledge and technology transfer, as patenting is viewed as one of notable channels of the said transfer.

Since the common database included a significant number of authors and applicants, it was difficult to visualize all links between actors. To address this challenge, we have drawn network components individually for the most active regions.

The first network visualization represents the relationship between the actors of innovative activities in the field of organic farming in the Republic of Dagestan (Fig. 5). This network includes mainly individuals and only two organizations – a university and a research institute.

The structure of the interconnections of the patenting participants presented in Figure 5 is quite well-developed: it involves a large number of participants and displays the interrelationships that unite more than two participants. It seems intriguing, that such a developed network ceased its activity in 2018 and has not produced a single patent since then (Fig. 1). For this reason, we have excluded this group of patents from further analysis.

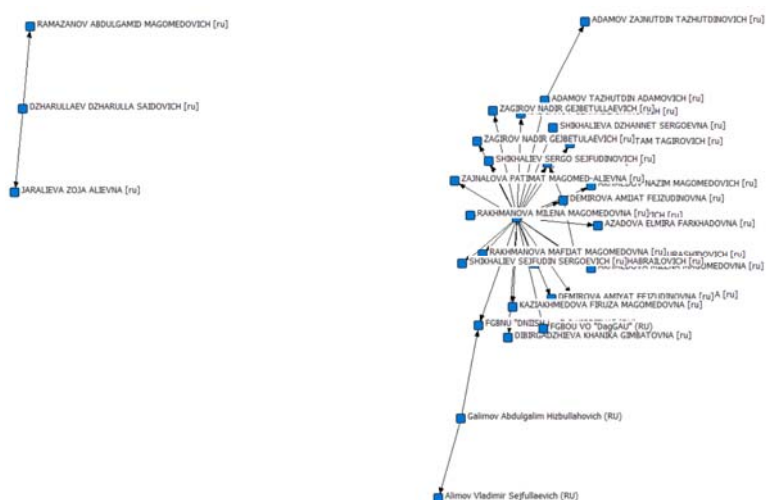


Fig. 5. Network component: the Republic of Dagestan

4. Empirical results and conclusions

Having reduced the dataset, we were able to draw a network for the entire Russian organic farming industry without a need to analyse the regions individually. Since the number of the nodes was still significant, we removed single nodes (meaning that the corresponding actors had no links at all) and the nodes with only one connection (so called “first level nodes”). As a result, we were able to visualize the largest networks of patenting activity (Fig. 6).

The visualization of network interaction shown in Fig. 6 allows us to identify the main points of localization of knowledge and technologies in the field of organic farming in Russia. Most of the networks are built around state scientific organizations, and only one network has a commercial organization (Agrocompost LLC). More importantly, each of these networks includes only one institutionalized participant, while the rest of the actors are individuals (possibly, employees of this organization). That basically means, that state the scientific organizations do not form relationships with other scientific centers, do not create “spin-offs”, do not cooperate with commercial companies. Only one network includes two scientific organizations from different regions: Gorsky Agrarian University (the Republic of North Ossetia–Alania) and the Voronezh Agrarian University (Voronezh Oblast). No other examples for any cooperation between organizations and regions have been found in the dataset.

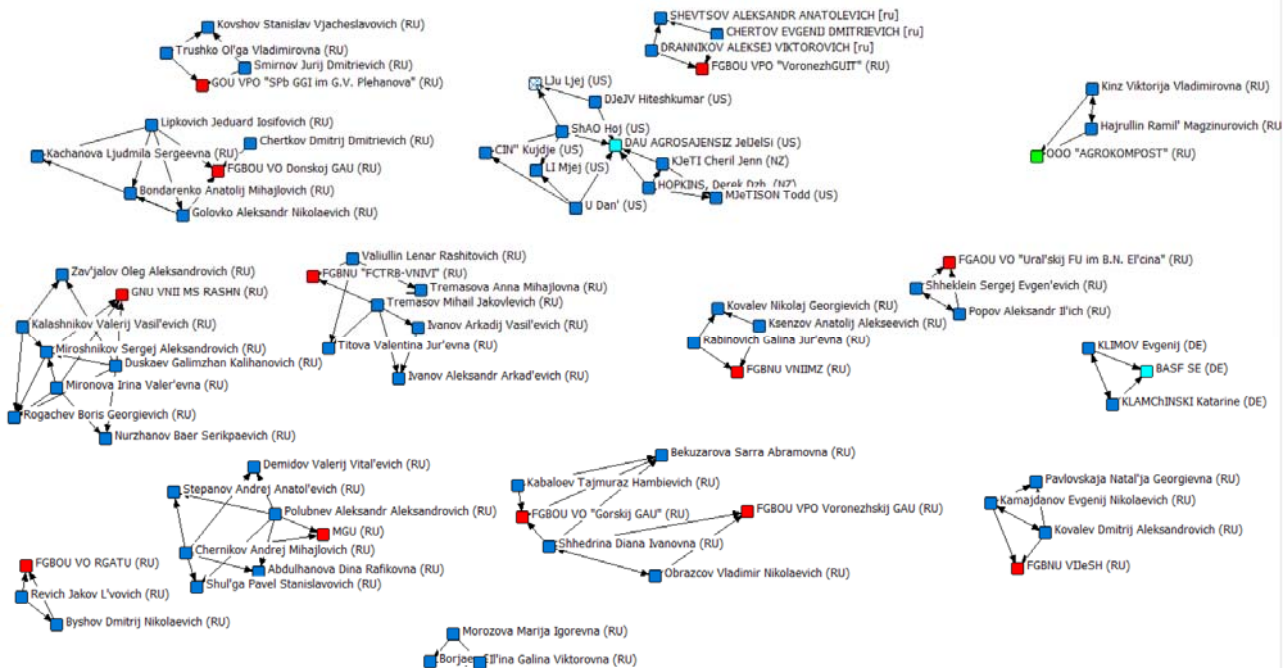


Fig. 6. Networking in patenting activities in the field of organic farming in Russia.
 Red nodes – government organizations, dark blue nodes – individuals,
 sky blue nodes – non-Russian companies, green nodes – Russian commercial organizations

The network visualization drawn separately for the city of Moscow (Fig. 7) shows several nascent sub-networks, which include a commercial organization. These sub-networks are identified as small and not demonstrating cooperation with other institutionalized participants in the patenting activities.

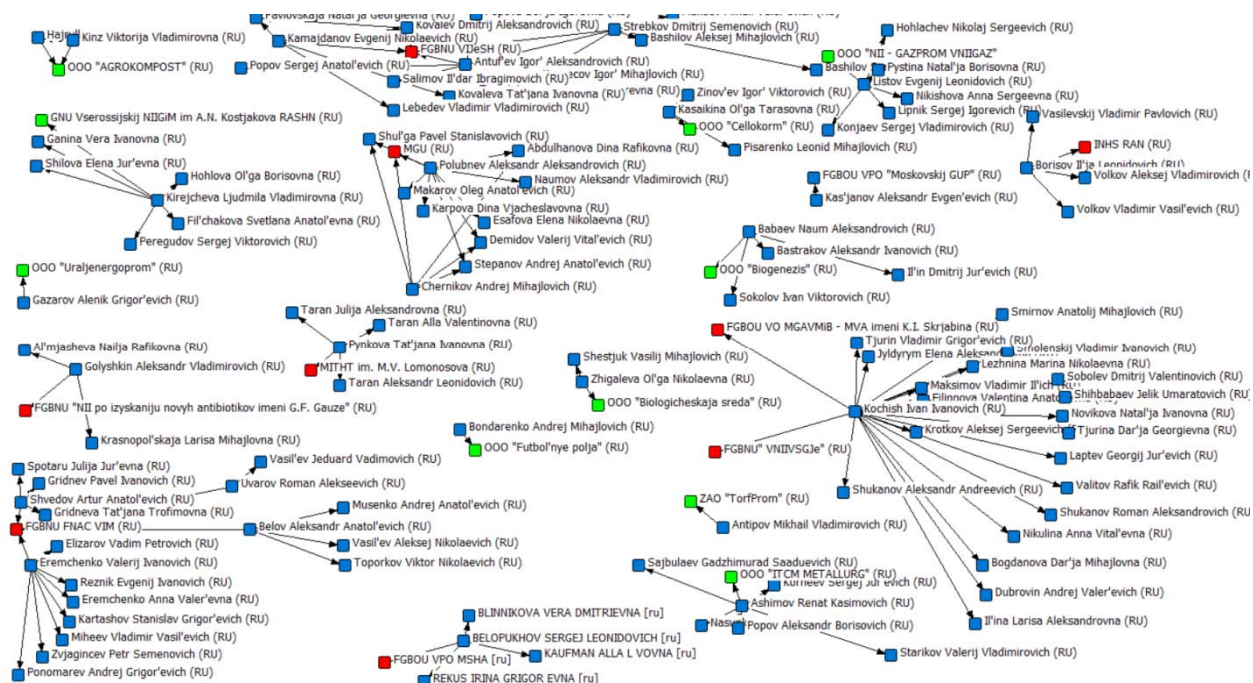


Fig. 7. Network component: Moscow. Red nodes – government organizations,
 dark blue nodes – individuals, sky blue nodes – non-Russian companies,
 green nodes – Russian commercial organizations

With the results of the patenting activities network analysis in the field of organic farming taken into account, the following conclusions have been made.

- In Russian organic farming industry patents do not fulfill their function of knowledge and technology transfer. Rather, patenting activity is stimulated by the need of state scientific and educational organizations to achieve corresponding key performance indicators; there is minimal or absent collaboration of the scientific organizations and the commercial sector.
- The main patenting activities are concentrated in the metropolitan region (Moscow, Saint Petersburg, Moscow Oblast). However, there is no trace of technology transfer from the metropolitan region to the territories, where farming facilities are heavily localized.

The results do not strictly prove a lack or an absence of either collaboration within the national organic farming industry or successful knowledge and technology transfer practices. They give us insights on the peculiarities of the said transfer and provide us with grounds to discard patenting as its primary (or even just relevant) channel. The analysis of the participants interaction in patenting activities also allows us to identify some barriers to implement the innovative potential of the organic farming industry.

Acknowledgements. This research conducted as a part of the project “Institutions, Networks, Knowledge Transfer, and Innovations: A Comparison of the Development of the Green Economy in Ukraine, Russia, and Germany” supported by the Volkswagen Foundation (VolkswagenStiftung).

References

- Ahuja G. 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative science quarterly*, 45 (3), 425–455.
- Baum J. A. C., Calabrese T., Silverman B. S. 2000. Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. *Strategic management journal*, 21(3), 267–294.
- Carr, R. K. (1992). Menu of best practices in technology transfer (Part 2). *The Journal of Technology Transfer*, 17(2–3), 24–33. <https://doi.org/10.1007/BF02199475>
- Lundvall B. Å. (ed.). 2010. *National systems of innovation: Toward a theory of innovation and interactive learning*. Vol. 2, Anthem press.
- Markus Baer M., Evans K., Oldham G. R., Boasso A. 2015. The social network side of individual innovation: A meta-analysis and path-analytic integration. *Organizational Psychology Review*, 5 (3), 191–223. <https://doi.org/10.1177%2F2041386614564105>
- OECD. 1996. The Knowledge-based economy. OCDE/GD(96)102. <http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD%2896%29102&docLanguage=En> (accessed August 14, 2021).
- OECD. 2004. *Innovation in the Knowledge Economy: Implications for Education and Learning*, OECD Publishing. <https://doi.org/10.1787/9789264105621-en>
- OECD. 2005. The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data: Oslo Manual, Third Edition” prepared by the Working Party of National Experts on Scientific and Technology Indicators. Para. 71. <https://doi.org/10.1787/19900414>
- Schilling M. A., Phelps C. C. 2007. Interfirm collaboration networks: The impact of large-scale network structure on firm innovation. *Management science*, 53(7), 1113–1126.
- Thorgren S., Wincent J., Örtqvist D. 2009. Designing interorganizational networks for innovation: An empirical examination of network configuration, formation and governance. *Journal of Engineering and Technology Management*, 26 (3), 148–166. <https://doi.org/10.1016/j.jengtecman.2009.06.006>
- Uzzi B., Spiro J. 2005. Collaboration and creativity: The small world problem. *American journal of sociology*, 111(2), 447–504.

Human Resource Development in a New Reality

The COVID-19 Influence in the Environment, the Society, and the Economy: the Educational and Social Human Resource Development Framework for the New Reality

Carina da Conceição Rodrigues Ferreira, Federal Center for Technological Education Celso Suckow da Fonseca (carinaacioli@gmail.com), **Annibal Scavarda**, Federal University of the State of Rio de Janeiro, **Augusto Reis**, Federal Center for Technological Education Celso Suckow da Fonseca, **Amedeo Rizzo**, Bocconi University, **Philani Nduna Zincume**, Stellenbosch University

Abstract:

This research sought to analyze the educational, institutional, social threats and opportunities influenced by the COVID-19 in the environmental, economic, and political spheres. To this end, this research proposes an educational and social human resource development framework for the new reality. The authors of this paper used the exploratory methodology and performed a literature review. The study result showed that the education is a determining and forming factor of the human and social human resource. The technological changes are shaping and improving the life, the work, and the learning styles. The analyses of the framework has determined the educational, institutional, and social threats and opportunities influenced by the COVID-19 in the economy, the environment, and the society. The education is part of social development. By raising education, you can contribute to society's well-being and sustainability's environmental and economic pillars.

Keywords: *COVID-19, Educational Institution, Opportunity, Society, Threat*

1. Introduction

The education represents a determining factor in the process of the sustainable development since the educational processes can improve natural abilities, awaken undiscovered talents, and contribute to the achievement of the social, personal, and professional sustainability (Oliveira and Moraes, 2017). The technological innovations from the industry 4.0 can contribute positively to the dissemination of the knowledge, the human resource development (Haines & Lafleur, 2008; Carvalho, L.F. Scavarda, & Lustosa, 2014; A. Scavarda, Daú, L. F. Scavarda & Caiado, 2019a), and the sustainability on hands-on activities (Barbosa, A. Scavarda, Sellitto & Marques, 2018; Ferrer, Thomé & A. Scavarda, 2018; Magon, Thomé, Ferrer & L.F. Scavarda, 2018; Azevedo, L.F. Scavarda & Caiado, 2019; A. Scavarda, Daú, L.F. Scavarda & Korzenowski, 2019b; A. Scavarda, Daú, L.F. Scavarda, Azevedo & Korzenowski, 2020; Dias, A. Scavarda, Reis, Silveira & Ebecken, 2020). Scur and Barbosa (2017) highlight the relevance of the related practices as issues of the transformation and the sustainable development (Azevedo *et al.*, 2019). The triple bottom line (environment, society, and economy) is incorporated by the sustainable development, which, according to the report of Brundtland (1987), it is defined as meeting the needs of the present generations by not compromising the future ones (WCED, 1987). Furthermore, it contributes with the improving the teaching quality, the disruptive technologies, and the changing economies to modify the future of the work environments. Therefore, the educators and the employers are encouraged to explore the new skills required (King, Newman & Luthans, 2015). These innovative technologies allow object-object, man-man, and man-object interactions (Kagermann, Wahlster & Helbig, 2013; Müller, 2019; Acioli, A. Scavarda & Reis, 2021).

At the present time, several countries are facing the COVID-19 pandemic. The pandemic is also retarding the human and social development. According to the UNEP, for the first time

since 1990, the global development might decline due to this pandemic (UN, 2020). United to the human intelligence, the technology can favor the diseases identification, recognition and prediction that can affect society. In addition, the industry 4.0 technologies can contribute to human resource development. This research sought to propose the educational and social framework for developing human resources for the new reality.

This work is structured as follows: Section 2 presents the methodologies applied in this research. Section 3 describes the result of the research. Section 4 discusses the results and presents the educational and social human resource development framework for the new reality. Finally, Section 5 concludes the research.

2. Methodology

While structuring this work, the authors of this paper were concerned with: (1) analyzing the issues related to the education, the institutions, and the society regarding the economy, the environment, and the politics; (2) determining the educational, institutional, and social threats and opportunities created by the COVID-19 in the environmental, economic, and political spheres; and (3) presenting limitations of the literature and making contributions. The authors of this paper divided the research into three phases. Figure 1 shows the phases that represent these goals and that support the theoretical arguments.

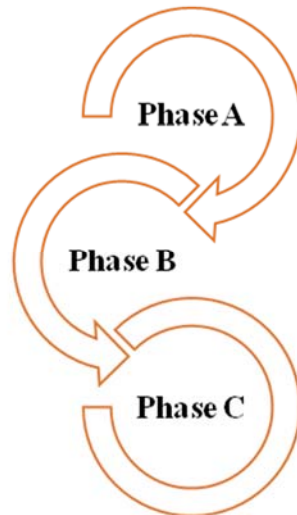


Figure 1. Phases that set the goals of the research

Phase A shows the specific goal of analyzing the relationship among the education, the institutions, the society, the environment, the economy, and the politics, Phase B aims to analyze the threats and the opportunities regarding this relationship. Phase C analyzes the COVID-19 influence on the economy, the environment, and the society and it presents the general goal of this reaserch. According to Figure 1, the phases represent sequential items, in which Phases A and B are connected, originating Phase C.

The authors of this study develop exploratory research and a literature review, using the Emerald Insight electronic database between April and June 2020 without any time restrictions applied to the papers, using the following keywords: educational, institution, social, threats, and opportunities. The first search retrieved 7,000 papers. Then, the authors of this paper applied a full English paper filter (resulting in 5,000 papers), followed by an open-access paper filter (resulting in 134 papers). After reading the titles and the abstracts of the 134 remaining papers, only 25 of them were perceived as both related to the education and relevant to the topic. The keywords and the parameters applied in the bibliographic search returned papers published from 2016 to 2019: 2016 - four papers, 2017- two papers, 2018 - five papers, and 2019 -14 papers. The papers are: Jayatilleke and Gunawardena (2016), Leng, Ali and Hoo (2016), Martins and Canhoto (2016), Sembiring (2016), Ntim, Soobaroyen and Broad (2017), Pfautsch and Gray (2017), Bin, Gavira, Figueira, de Carvalho, Salles-Filho and Colugnati (2018), Jeong (2018),

Sembinging (2018), Sidratulmunthah, Hussain and Malik (2018), Tait (2018), Castro, Nagano and Ribeiro (2019), Chen, Tang and Mou (2019), Gaisch, Preymann and Aichinger (2019), Garger, Jacques, Gastle and Connolly (2019), Gerdin and Englund (2019), Ismail (2019), Klitzing, Hoekstra and Strijbos (2019), Mallika Appuhamilage and Torii (2019), Meriläinen, Kõiv and Honkanen (2019), Pacheco, Ningsu, Pujol, Gonzalez and Ferrer (2019), Rowe (2019), Sułkowski, Fijałkowska and Dzimińska (2019), Wakeling, Spezi, Fry, Creaser, Pinfield and Willett (2019), and Zhong, Xie and Wang (2019).

There are papers from nineteen different countries. The countries and their respective publication years are as follows: Australia (2017), Austria (2019), Brazil (2018 and 2019), China (2019), Egypt (2019), Estonia (2019), Finland (2019), Indonesia (2016 and 2018), Japan (2018 and 2019), Malaysia (2016), Pakistan (2018), Poland (2019), Portugal (2016), Spain (2019), Sri Lanka (2016 and 2019), Sweden (2019), the Netherlands (2019), the UK (2016, 2017, 2018, and 2019), and the USA (2016 and 2019). Despite the UK and China have published two papers in 2019, each other country has published only one paper in each published year.

Based on the papers, the journals addressed in this research are: Accounting, Auditing and Accountability Journal, Asia Pacific Journal of Innovation and Entrepreneurship, Asian Association of Open Universities Journal, Employee Relations, Higher Education Evaluation and Development, Innovation and Management Review, International Journal of Sustainability in Higher Education, Journal of Applied Research in Higher Education, Journal of Documentation, Journal of Humanities and Applied Social Sciences, Journal of Work-Applied Management, Library Review, Managerial Finance, and Revista de Gestão. According to the data, the Asian Association of Open Universities Journal stands out with eight publications: three papers in 2016, three papers in 2018, and two papers in 2019.

The following section presents the results of the literature review and the analysis of the issues related to the education, the institutions, and the society regarding the economic, environmental, and political spheres. Even though some papers retrieved and analyzed in this study refer to universities, this research covers the education in all phases. At the end of this section, the authors of this paper present the variables that support the educational and social human resource development framework for the new reality. Figure 2 shows the sequence of the procedures used to create the hypothesis of the research and to contribute with the better understanding of the outcome of this research.

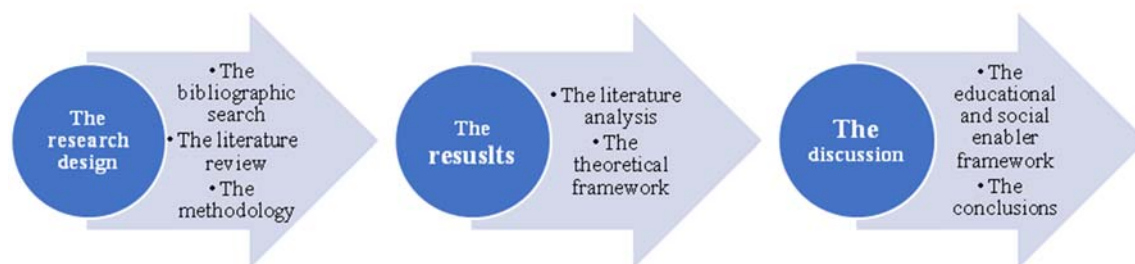


Figure 2. Sequence of steps used in the research

According to the sequence of procedures presented in Figure 2, the development of the hypothesis supported by the research happened as the following steps: The first step originated the research design. This step involved bibliographic search, literature review and methodological design. The second step originated the results. It involved literature analysis, in which the authors analyzed the relation among the education, the society, the institutions, the economy, the environment, and the politics. In the second step, the authors also analyzed the threats and the opportunities regarding this relation. The last step presented the discussion and the outcome of the research, introducing the educational and social human resource development

framework for the new reality. The authors built a framework by using the variables selected on the literature review (the technology and the behavior). Together with the main keywords of this research, these variables allowed the authors to analyze the COVID-19 influence on the economy, the society, and the environment.

3. Results

From the second half of the twenty-first century, the society has begun to focus on the new technologies as universities have taken focus on the education, research, and extension activities (Castro et al., 2019). The disruptive technologies have made employers to invest in strategies that encourage learning processes (Rowe, 2019). The adoption of the practices that contribute to the social development collaborates with a democratic society and the idea of the human-centered educational institutions (Gaisch et al., 2019). It also contributes to the economic growth.

The higher education allows undergraduates to implement the behavioral changes in the society, which can contribute to the future social sustainability (Pfautsch and Gray, 2017). Regarding the entrepreneurship issue, the undergraduate and Ph.D. students are more participative in the business activities (Bin *et al.*, 2018). The organizations are looking to recruit candidates with undergraduate degrees. There is some concern on the part of some employers regarding the availability of the well-suited candidates for the high-level positions (Rowe, 2019). Directly or indirectly, the universities contribute to the social and economic development (Ismail, 2019).

The advances in the information and the communication technologies have enabled the educational experiences with greater flexibility and in long-distance. The students can be enrolled in networked learning activities with academics from all around the world. Also, the teachers can lecture courses at the educational institutions in a different country of where they reside (Jayatilleke and Gunawardena, 2016).

The disruptive technologies, the globalization, and the commodification of the knowledge are issues in the disciplinary communities (Trowler, 2014; Wakeling *et al.*, 2019). The teaching and learning activities of the educational system undergo changes generated by technological innovation (Jeong, 2018). Between the technologies applied in the education, there are e-learning that enables learning through the use of the web technology or a digital device (Clark and Mayer, 2016; Zhong et al., 2019). The semantic Web technology is considered a smart network that provides automatic services, and it is effective in the social learning environment (Sampson, Lytras, Wagner & Diaz, 2004; Halimi, Seridi-Bouchelaghem & Faron-Zucker, 2014; Zhong *et al.*, 2019). Another example is a children-centered programming platform called KidsProgram. This Chinese platform aims to encourage the students to develop the capacity and the knowledge of the programming and the learning information (Chen et al., 2019).

The internet facilitates the transformation of the learning practices and the models, as well as cognitive styles (Chen *et al.*, 2019). The advancement of the technologies has allowed for a great increase in the distance education (Olszewski-Kubilius and Corwith, 2011; Chen *et al.*, 2019). The distance education brings some benefits, like reducing transportation costs and making learning methods more flexible to the students who do not have the opportunity to participate in presential classes. The knowledge, the information, the teaching, and the learning are facilitated and multiplied between the students through the internet and the large-scale digital information (Hart, 2014; Sembiring, 2016).

The integration and the management team model provide support for shared leadership in the higher education institutions, which results in increased the transparency and the accountability (Ntim et al., 2017). An internationally and nationally recognized university creates a brand that attracts the students, aspiring academic and corporate careers (Sułkowski et al., 2019).

The European study states that competitive challenges or unfavorable performance results are issues that threaten universities to open, to closure, or to merge. According to the university

managers that are open to the innovations, the application of the disruptive technologies in other higher education sectors threatens the open universities market (Tait, 2018). Garret (2016) and Tait (2018), about research related to the Commonwealth open universities in 2016, says that nearly 50% of the open universities showed a decline in enrollments and lost market share.

The ability to integrate the new and external knowledge contributes to the knowledge absorption capacity development (Martins and Canhoto, 2016). The students can improve their learning process as they experience and modulate real problems (Pacheco et al., 2019). The examples of the knowledge sources include the journal papers that are relevant for the academic community (RIN, 2007; Fry *et al.*, 2009; Nicholas, Williams, Rowlands & Jamali, 2010; Tenopir *et al.*, 2016; Wakeling *et al.*, 2019). The academic libraries and the databases can support the information spread by improving their materials (Leng et al., 2016). The training and many years of the dedication to do research have improved the researchers' practice, which contributes to the improvement and results of the developed studies research (Klitzing et al., 2019).

The professor is considered an essential player who contributes to the achievement of the students' success as well as influencing their trajectory (Garger et al., 2019). The students' satisfaction leads them to pursue an academic career by attending undergraduate programs, increasing the expectations and the opportunities (Mallika Appuhamilage and Torii, 2019). The proactive students and the self-efficacy motivate entrepreneurship and the factors that support the university. Also, it makes the students identify the threats and the opportunities that impact social development (Mustafa, Hernandez, Mahon & Chee, 2016; Sidratulmunthah et al., 2018). Kossek and Perrigino (2016) assume that resilience and skills are conceptual requirements for the employability. The literature describes the resilient people as being transformative and adaptable (Harvey, 2003; Rowe, 2019).

The prevalence of bullying in the schooling environment is an example of a threat that affects the students and the staff (Sinkkonen, Puhakka & Meriläinen, 2014; Henning *et al.*, 2017; Meriläinen, Kõiv & Honkanen, 2019). The bullying can cause the stress, the frustration, the irritability, the tiredness, and the reduced interest in activities (McKay, Arnold, Fratzi & Thomas, 2008; Meriläinen *et al.*, 2019).

Aiming to put together theory and practice and to contribute to the education and the society, the authors of this paper present the educational and social human resource development framework for the new reality as the outcome of this research, which can be put into practice and can be endorsed by other studies research. The analysis of the relation among the education, the institutions, the environment, the society, the economy, and the politics, as well as the evaluation of the threats and the opportunities regarding this relation, contributed to the study of the COVID-19 influence in these areas. As to provide a better understanding on the COVID-19 influence on the economy, the society, and the politics, the authors of this paper created an educational and social human resource development framework for the new reality. The framework was created according to the following sequence: after analyzing the literature review, the authors of this paper selected two variables for the development of the educational and social human resource development framework for the new reality. They determined the variables based on the analysis of the threats and the opportunities in the education, the institutions, and the society. Figure 3 shows these variables, and the Figure 4 shows the educational and social human resource development framework for the new reality. The next section presents discussions and the educational and social human resource development framework for the new reality.

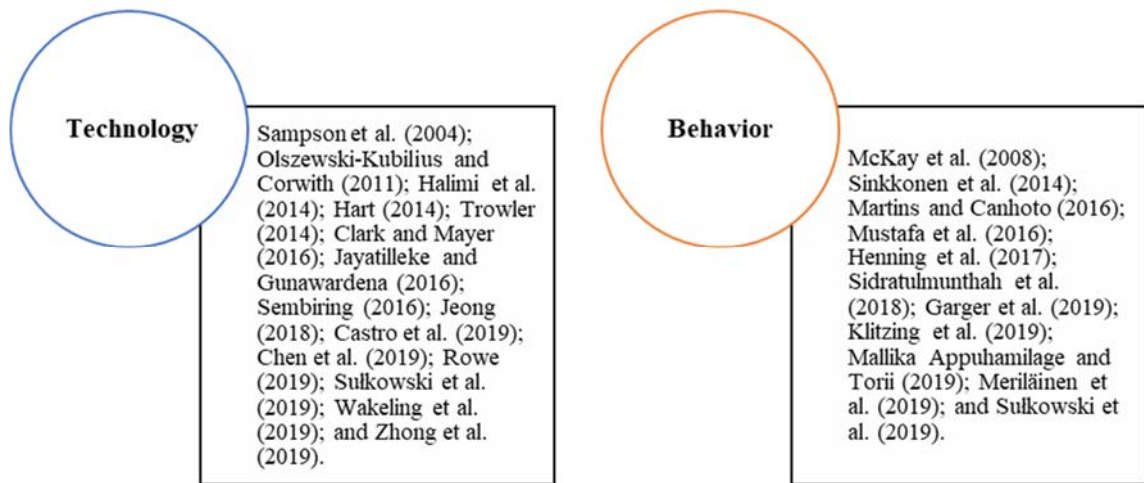


Figure 3. Variables that supported the construction of educational and social human resource development framework for the new reality

The COVID-19

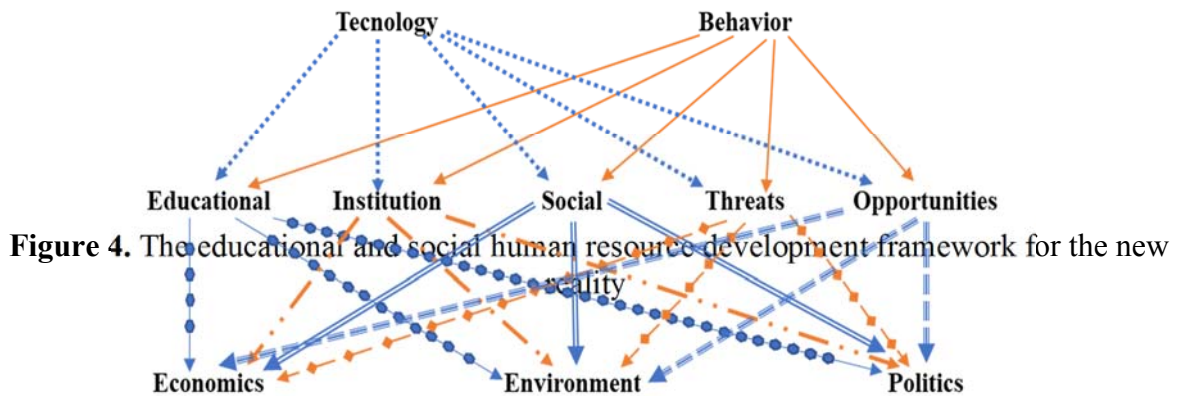


Figure 4. The educational and social human resource development framework for the new reality

4. Discussions

The pillar variables that form this framework can be explored in order to develop strategies to minimize the issues that bring negative consequences for the society. They can also help maximize the factors that favor society's performance and contribute to the education promotion as a determining factor in the human and social human resource construction. The positive technological impacts presented on the analysis of this study may help to seek environmental, economic, and political sustainability, in the educational, social and institutional context influenced by the COVID-19, as well as in other scenarios experienced by local and international societies. The society can turn to try to mitigate the factors that lead to the social inequalities by creating the public politics. In the light of the education, focused on the environmental, social, and economic factors, the public politics can help to make sure everyone can be treated equally and have the same opportunities. Thus, the authors of this paper propose that the public politics and the strategic measures can mitigate risks during the local, regional, and international emergencies.

4.1 The technological variable analyses

The authors of this paper selected the technological variable, as the pillar of the framework, due to the technological changes related to the industry 4.0. The technological transformations have been supporting changes in teaching methodologies and allowing improvements in learning processes. The technology integrated with the education collaborates with the social, economic, and environmental development. The industry 4.0 technologies can help with the information processes and the activities, making them more accurate (Daú, A. Scavarda, L. F. Scavarda & Portugal, 2019). The educational aspects contribute to the development of the human resource and the skills to interact with cycles of the digital economy. The educational issues can help the evolution of the industry 4.0 (Daú *et al.*, 2019; Hamada, 2019; Kovacs, 2019). The technologies collaborate with the generation, the implementation, and the sharing of the knowledge (Ciulli, Kolk & Boe-Lillegraven, 2019; Julianelli, Caiado, L. F. Scavarda & Cruz, 2020).

The literature presents several benefits related to the integration of the education and the technology, like distance learning (A. Scavarda, Dias, Reis, Silveira & Santos, 2021). The distance education contributes to the propagation of the information and the knowledge since the technology can reach a considered number of the people from different locations. On the other hand, human and social inequalities limit some people to have access to the technology. For example, during the COVID-19 pandemic, the students need to carry out their study activities at home. The students who do not have the infrastructure (the internet, the computer, and the cell phone access) at home are unable to do so. In a normal situation, these students could even use laboratories of their educational institutions to study, but during the social distancing, they are unable to carry out their activities. According to the UNEP, the COVID-19 is affecting the health, the income, and the education, causing several deaths, a drop in the global per capita income growth rate, and an increase in the scholar dropout rate (UN, 2020).

4.2 The behavior variable analyses

The behavior is an integral part of the education as a factor of the environmental, social, and economic development. The individual and collective behaviors can affect the educational, human, and social development. The negative behaviors can limit the students' development by making it difficult for them to seize study and work opportunities. The positive behaviors, on the other hand, can lead the students to personal growth and develop skills that can help them throughout their academic and professional life.

Both presential and distance education has the potential to stimulate people's learning perspective throughout their lives (Sembiring, 2018). The teaching quality is one of the issues that can affect the educational performance as well as the education as a factor of the social development. Besides, aspects related to the students' satisfaction, the motivations, the individual goals, and the achievements support the process of an institution's continuous improvement (Stracke, 2017; Sembiring, 2018). Moreover, other aspects like the infrastructure (the technological innovation, the laboratories, and the furniture), the accessibility, the politics, the culture, the health, the safety, and the social service can also contribute to the education as a factor of the social development.

The formal and technical education improve work capacity (Sachs, 2015). According to Rowe (2019), the selection processes require the technical and academic skills from candidates. The people can begin to develop during school the initial basis for the work demands and changes, the problem-solving skills, the resilience, and the readiness. According to Mincer (1974) and Becker (1964), some concepts about the human resource model suggest that employers hire workers who invest in the education, the training, and the skill development (Miner, 2019). The lack of the professional experience leads recent undergraduates to work long periods and to change jobs frequently, which creates uncertainty about their professional future (Buchmann and Kriesi, 2011; Gasiukova and Korotaev, 2019). The development of the skills like social awareness, the self-efficacy, and the self-management contributes to good academic

performance in the mathematics and the English as well as in the undergraduate courses, in general (West *et al.*, 2017; Allbright *et al.*, 2019). The education plays a role in the shaping human and the social human resource, and it enables the construction of the collective thought as being part of a social group (Oliveira and Moraes, 2017). The partnership between the educational institutions and the companies can place students in work environments (the office, the laboratory, the factory floor, and the clinic) according to the students' training. In this way, the students will develop individual and collective skills and behaviors required in the workplace. They will also combine the academic and the corporate skills, contributing to both the company and the sustainability between their academic and professional life.

The literature has brought up to attention some behavioral issues that can cause positive or negative impacts, both for the students and the society, and for the image of the educational institution. The presence of the bullying, which is related to the collective behaviors, was also present in the literature. The bullying can cause people to lose self-motivation, to develop relationship problems, to have difficulty concentrating, and to miss interest in developing their activities (McKay *et al.*, 2008; Meriläinen *et al.*, 2019). Allbright, Marsh, Kennedy, Hough & McKibben (2019) propose building positive relationships through the learning of the social skills and conversations about issues like bullying, which can occur inside or outside the educational institutions.

5. Conclusions

Through analyzing the educational, institutional, and social threats and opportunities and analyzing the influence of COVID-19 in these environments, this study proposed the educational and social human resource development framework for the new reality. As a result, the education is determined as a factor for the social development. The education is the basis for the formation of the society, which in turn is part of the foundations of the sustainable development. The society can collaborate with the reduction of the human inequalities through the creation and the implementation of the public politics, and the strategic measures aimed at caring for the others, promoting the equality regarding the education, the health, and the income.

This research has some limitations regarding the relationship between the technological evolution and the lack of the opportunity to access and to interact with the technological innovations. Besides being able to collaborate with ongoing studies research about the education as a factor of the social development, this paper aims to contribute to the exploration of the future research. The research related to the construction of the public politics aimed at mitigating the human inequalities. The research related to the development and the sustainability between the man and the technological relationship, and the research aimed at the sustainable development.

References

- Acioli C., Scavarda A., Reis A. (2021). Applying Industry 4.0 technologies in the COVID-19 sustainable chains. *International Journal of Productivity and Performance Management*, 70 (5), 988-1016.
- Allbright T. N., Marsh J. A., Kennedy K. E., Hough H. J., McKibben S. (2019). Social-emotional learning practices: insights from outlier schools. *Journal of Research in Innovative Teaching & Learning*, 12 (1), 35-52.
- Azevedo B. D., Scavarda L. F., Caiado R. G. G. (2019). Urban solid waste management in developing countries from the sustainable supply chain management perspective: A case study of Brazil's largest slum. *Journal of Cleaner Production*, 233, 1377- 1386.
- Barbosa F. S., Scavarda A. J., Sellitto M. A., Marques D. I. L. (2018). Sustainability in the winemaking industry: An analysis of Southern Brazilian companies based on a literature review. *Journal of Cleaner Production*, 192, 80-87.

- Becker G. (1964). *Human Capital: a theoretical and empirical analysis, with special reference to education, national bureau of economic research*. The University of Chicago Press, New York, NY.
- Bin A., Gavira M. O., Figueira J. B., de Carvalho T. M. B., Salles-Filho S. L. M., Colugnati F. A. B. (2018). Profile of academic entrepreneurship in Brazil: Evidence from the evaluation of former holders of undergraduate research, master and PhD scholarships. *Innovation & Management Review*, 15 (4), 394-415.
- Buchmann M. C., Kriesi, I. (2011). Transition to adulthood in Europe. *Annual Review of Sociology*, 37, 481-503.
- Carvalho A. N., Scavarda, L. F., Lustosa, L. J. (2014). Implementing finite capacity production scheduling: Lessons from a practical case. *International Journal of Production Research*, 52 (4), 1215-1230.
- Castro I. J., Nagano M. S., Ribeiro S. X. (2019). Elements that influence knowledge sharing in the university-industry-government collaboration. *Revista de Gestão*, 26 (1), 61-72.
- Chen W., Tang X., Mou T. (2019). Course design and teaching practice in STEAM education at distance via an interactive e-learning platform. *Asian Association of Open Universities Journal*, 14 (2), 122-133.
- Ciulli F., Kolk A., Boe-Lillegraven S. (2020). Circularity brokers: digital platform organizations and waste recovery in food supply chains. *Journal of Business Ethics*, 167, 299-331.
- Clark R. C., Mayer R. E. (2016). *E-learning and the Science of Instruction: proven guidelines for consumers and designers of multimedia learning*. John Wiley & Sons, Hoboken, NJ.
- Daú G., Scavarda A., Scavarda L. F., Portugal V. J. T. (2019). The healthcare sustainable supply chain 4.0: the circular economy transitions conceptual framework with the corporate social responsibility mirror. *Sustainability*, 11 (12).
- Dias A., Scavarda A., Reis A., Silveira H., Ebecken N. F. F. (2020). Managerial strategies for long-term care organization professionals: COVID-19 pandemic impacts. *Sustainability*, 12 (22).
- Ferrer A. L. C., Thomé A. M. T., Scavarda A. J. (2018). Sustainable urban infrastructure: A review. *Resources, Conservation and Recycling*, 128, 360-372.
- Fry J., Proberts S., Creaser C., Greenwood H., Spezi V., White S. (2009). PEER behavioural research baseline: authors and users vis-à-vis journals and repositories. www.peerproject.eu/fileadmin/media/reports/Final_revision_-_behavioural_baseline_report_-_20_01_10.pdf (accessed June 14, 2020).
- Gaisch M., Preymann S., Aichinger R. (2019). Diversity management at the tertiary level: an attempt to extend existing paradigms. *Journal of Applied Research in Higher Education*, 12 (2), 137-150.
- Garger J., Jacques P. H., Gastle B. W., Connolly C. M. (2019). Threats of common method variance in student assessment of instruction instruments. *Higher Education Evaluation and Development*, 13 (1), 2-17.
- Garrett, R. (2016). The state of open universities in the commonwealth: a perspective on performance, competition and innovation. <http://oasis.col.org/handle/11599/2048> (accessed June 14, 2020).
- Gasiukova E., Korotaev S. (2019). Precarity in Russia: attitudes, work and life experience of young adults with higher education. *International Journal of Sociology and Social Policy*, 39 (7-8), 506-520.
- Haines V. Y., Lafleur G. (2008). Information technology usage and human resource roles and effectiveness. *Human Resource Management*. 47 (3), 525-540.
- Halimi K., Seridi-Bouchelaghem H., Faron-Zucker C. (2014). An enhanced personal learning environment using social semantic web technologies. *Interactive Learning Environments*, 22 (2), 165-187.
- Hamada T. (2019). Determinants of Decision-Makers' Attitudes toward Industry 4.0 Adaptation. *Social Science*, 8 (5), 1-18.

- Hart K. (2014), *OER Strategy 2014-2016 of University of South Africa*. Office of the Pro-Vice Chancellor, the University of South Africa.
- Harvey L. (2003). *Transitions from higher education to work*. A briefing paper prepared by Lee Harvey (Centre for Research and Evaluation, Sheffield Hallam University), with advice from ESECT and LTSN Generic Centre Colleagues, Sheffield, <http://bit.ly/oeCgqW> (accessed June 14, 2020).
- Henning M. A., Zhou C., Adams P., Moir F., Hobson J., Hallett C., Webster C. S. (2017). Workplace harassment among staff in higher education: a systematic review. *Asia Pacific Education Review*, 18 (4), 521-539.
- Ismail T.H. (2019). Does Egyptian universities' disclosure on social responsibility enhance sustainable development? *Journal of Humanities and Applied Social Sciences*, 2 (2), 81-99.
- Jayatilleke B. G., Gunawardena C. (2016). Cultural perceptions of online learning: transnational faculty perspectives. *Asian Association of Open Universities Journal*, 11 (1), 50-63.
- Jeong H. (2018). Rethinking the rationale of open and distance education: a case of the UK Open University. *Asian Association of Open Universities Journal*, 13 (2), 169-178.
- Julianelli V., Caiado R. G. G., Scavarda L. F., Cruz S. P. M. F. (2020). Interplay between reverse logistics and circular economy: Critical success factors-based taxonomy and framework. *Resources, Conservation and Recycling*, 158.
- Kagermann H., Wahlster W., Helbig J. (2013). *Recommendations for implementing the strategic initiative Industrie 4.0 – final report of the Industrie 4.0 working group*. Communication Promoters Group of the Industry-Science Research, Frankfurt.
- King D. D., Newman A., Luthans F. (2015). Not if, but when we need resilience in the workplace. *Journal of Organizational Behavior*, 37 (5), 782-786.
- Klitzing N., Hoekstra R., Strijbos J. W. (2019). Literature practices: processes leading up to a citation. *Journal of Documentation*, 75 (1), 62-77.
- Kossek E. E., Perrigino M. B. (2016). Resilience: a review using a grounded integrated occupational approach. *The Academy of Management Annals*, 10 (1), 729-797.
- Kovacs O. (2019). Big IFs in Productivity-Enhancing Industry 4.0. *Social Sciences*, 8 (37), 1-17.
- Leng C. B., Ali K. M., Hoo C. E. (2016). Open access repositories on open educational resources. *Asian Association of Open Universities Journal*, 11 (1), 35-49.
- Magon R. B., Thomé A. M. T., Ferrer A. L. C., Scavarda L. F. (2018). Sustainability and performance in operations management research. *Journal of Cleaner Production*, 190, 104-117.
- Mallika Appuhamilage K. S., Torii H. (2019). The impact of loyalty on the student satisfaction in higher education: A structural equation modeling analysis. *Higher Education Evaluation and Development*, 13 (2), 82-96.
- Martins J. T., Canhoto R. (2016). Leveraging new knowledge with relational capabilities: An investigation of rural school libraries in southern Portugal. *Library Review*, 65 (6-7), 386-403.
- McKay R., Arnold D. H., Fratzi J., Thomas R. (2008). Workplace bullying in academia: a Canadian study. *Employee Responsibilities and Rights Journal*, 20 (2), 77-100.
- Meriläinen M., Kõiv K., Honkanen A. (2019). Bullying effects on performance and engagement among academics. *Employee Relations*, 41 (6), 1205-1223.
- Mincer J. (1974). *Schooling, Experience, and Earnings*. Human Behavior & Social Institutions, National Bureau of Economic Research, New York, NY.
- Miner M. A. (2019). Unpacking the monolith: Intersecting gender and citizenship status in STEM graduate education. *International Journal of Sociology and Social Policy*, 39 (9-10), 661-679.
- Müller J. M. (2019). Business model innovation in small- and medium-sized enterprises: Strategies for industry 4.0 providers and users. *Journal of Manufacturing Technology Management*, 30 (8), 1127-1142.
- Mustafa M. J., Hernandez E., Mahon C., Chee L. K. (2016). Entrepreneurial intentions of university students in an emerging economy: the influence of university support and proactive

personality on students' entrepreneurial intention. *Journal of Entrepreneurship in Emerging Economies*, 8 (2), 162-179.

Nicholas D., Williams P., Rowlands I., Jamali H. R. (2010). Researchers' e-journal use and information seeking behaviour. *Journal of Information Science*, 36 (4), 494-516.

Ntim C. G., Soobaroyen T., Broad M. J. (2017). Governance structures, voluntary disclosures and public accountability: The case of UK higher education institutions. *Accounting, Auditing and Accountability Journal*, 30 (1), 65-118.

Oliveira, M., Moraes M. B. (2017). A relação entre educação e desenvolvimento. Paper presented at XVII - MIPG Congresso Internacional De Ciência, Tecnologia e Desenvolvimento, Taubate, SP.

Olszewski-Kubilius P., Corwith S. (2011). Distance education: where it started and where it stands for gifted children and their educators. *Gifted Child Today*, 34, 16-24.

Pacheco L., Ningsu L., Pujol T., Gonzalez J. R., Ferrer I. (2019). Impactful engineering education through sustainable energy collaborations with public and private entities. *International Journal of Sustainability in Higher Education*, 20 (2), 393-407.

Pfautsch S., Gray T. (2017). Low factual understanding and high anxiety about climate warming impedes university students to become sustainability stewards: An Australian case study. *International Journal of Sustainability in Higher Education*, 18 (7), 1157-1175.

RIN (2007), *Researchers' use of academic libraries and their services*. Research Information Network and the Consortium of Research Libraries, London, UK.

Rowe L. (2019). Educating for the modern world: a report review. *Journal of Work-Applied Management*, 11 (1), 5-16.

Sachs J. D. (2015). *The age of sustainable development*. Columbia University Press, New York, NY.

Sampson D. G., Lytras M. D., Wagner G., Diaz P. (2004). Ontologies and the semantic web for E-learning. *Educational Technology & Society*, 7 (4), 26-28.

Scavarda A., Daú G., Scavarda L. F., Azevedo B. D., Korzenowski A. L. (2020). Social and ecological approaches in urban interfaces: A sharing economy management framework. *Science of the Total Environment*, 713.

Scavarda A., Daú G., Scavarda L. F., Caiado R. G. G. (2019a). An analysis of the corporate social responsibility and the industry 4.0 with focus on the youth generation: a sustainable human resource management framework. *Sustainability*, 11 (18).

Scavarda A., Daú G., Scavarda L. F., Korzenowski A. L. (2019b). A proposed healthcare supply chain management framework in the emerging economies with the sustainable lenses: The theory, the practice, and the policy. *Resources, Conservation and Recycling*, 141, 418-430.

Scavarda A., Dias A., Reis A., Silveira H., Santos I. (2021). A COVID-19 Pandemic Sustainable Educational Innovation Management Proposal Framework. *Sustainability* 13.

Scur G., Barbosa M. E. (2017). Green supply chain management practices: multiple case studies in the Brazilian home appliance industry. *Journal of Cleaner Production*, 141, 1293-1302.

Sembiring M. G. (2016). OER impact study perceived by faculty within ODL framework. *Asian Association of Open Universities Journal*, 11 (1), 78-89.

Sembiring M. G. (2018). Modelling the notions and dimensions of MOOCs. *Asian Association of Open Universities Journal*, 13 (1), 100-114.

Sidratulmunthah, Hussain S., Malik M. I. (2018). Towards nurturing the entrepreneurial intentions of neglected female business students of Pakistan through proactive personality, self-efficacy and university support factors. *Asia Pacific Journal of Innovation and Entrepreneurship*, 12 (3), 363-378.

Sinkkonen H. M., Puhakka H., Meriläinen M. (2014). Bullying at a university: students' experiences of bullying. *Studies in Higher Education*, 39 (1), 153-165.

Stracke C. M. (2017). The quality of MOOCs: how to improve the design of open education and online courses for learners?, in Zaphiris, P. and Loannou, A. (Eds), *Learning and Collaboration*

- Technology. *Novel Learning Ecosystems, Lecture Notes in Computer Science*, 285-293, Springer.
- Sułkowski Ł., Fijałkowska J., Dzimińska M. (2019). Mergers in higher education institutions: a proposal of a novel conceptual model. *Managerial Finance*, 45 (10-11), 1469-1487.
- Tait A. (2018). Open Universities: the next phase. *Asian Association of Open Universities Journal*, 13 (1), 13-23.
- Tenopir C., Dalton E., Fish A., Christian L., Jones M., Smith M. (2016). What motivates authors of scholarly articles? The importance of journal attributes and potential audience on publication choice. *Publications*, 4 (3).
- Trowler P. (2014). Academic tribes and territories: the theoretical trajectory. *Österreichische Zeitschrift Für Geschichtswissenschaften*, 25 (3), 17-26.
- UN (2020). COVID-19: Desenvolvimento Humano deve retroceder no mundo pela primeira vez desde 1990. <https://nacoesunidas.org/covid-19-desenvolvimento-humano-deve-retroceder-no-mundo-pela-primeira-vez-desde-1990/> (accessed June 14, 2020).
- Wakeling S., Spezi V., Fry J., Creaser C., Pinfield S., Willett P. (2019). Academic communities: The role of journals and open-access mega-journals in scholarly communication. *Journal of Documentation*, 75 (1), 120-139.
- WCED. *Our common future*. In: World Commission on Environment and Development. Oxford University Press, Oxford, 1987.
- West M. R., Buckley K., Krachman S. B., Bookman N. (2017). Development and implementation of student social-emotional surveys in the CORE Districts. *Journal of Applied Developmental Psychology*, 55, 119-129.
- Zhong J., Xie H., Wang F. L. (2019). The research trends in recommender systems for e-learning. *Asian Association of Open Universities Journal*, 14 (1), 12-27.

Short-term and Long-term Local vs Global Career Intentions: The role of Cultural Intelligence (CQ) and the Closed Borders

Marina Iskhakova, Australian National University (marina.iskhakova@gmail.com) , Sofia Kosheleva, St. Petersburg State University's Graduate School of Management (kosheleva@gsom.spbu.ru)

Abstract:

Companies's international operations require an early identification, development and preparation of potential employees who are open and willing to take on a global career. Drawing on Bandura's (1977) Social Cognitive Theory, the current comparative study investigates the extent to which students' level of Cultural Intelligence (CQ) affects the Global vs Local career choice. A theoretical model of the relationship and direct influence of structural components of cultural intelligence on the intensity (strength) of students' intention to work abroad is proposed. We test hypotheses about the impact of students' Cultural Intelligence (CQ) facets, which influences the intention to work abroad. Short-term as well as long-term covid-effects on Local vs. Global career intentions are studied.

This study has a comparative nature and adopts a mixed research methodology, with both quantitative and qualitative research methods. That includes survey measures of Cultural Intelligence index, career choices variables for collecting quantitative data from samples of 330 undergraduate business students of leading Russian and Australian Universities (stage 1) and includes up to 20 semi structured in-depth interview from each side (stage 2). National covid-strategies in relation to borders closures at the cases of Russia and Australia are analysed. Practical recommendations for Universities to facilitate sufficient preparation for global careers and to enable effective career planning in the new post-covid reality are made.

Keywords: *Cultural Intelligence (CQ), Career Intentions; Global vs Local career; Short-term and Long-term effects*

1. Introduction

Companies's international operations require an early identification, development and preparation of potential employees who are open and willing to take on a global career. We draw on Bandura's (1991) Social Cognitive Theory to investigate the extent to which students' pre-existing international experience (IE), their Cultural Intelligence (CQ) and social environment factors influence the Global vs Local career choice decision making.

Companies would highly benefit from the ability to predict applicants' intention to work abroad (Mol et al., 2009). The ability to predict a potential candidate's intention to live and work aboard would likely lead to the selection of individuals who have higher willingness to work aboard, ultimately increasing the chances for assignment or relocation success (Remhof et al., 2013). This view is supported by existing findings in the literature that persuading originally unwilling expatriates corresponds negatively with cultural adjustment, job satisfaction and job performance (Peltokorpi & Froese, 2009). Those conclusions sparked further research interest in key antecedents of willingness to work abroad as well as in key characteristics of individuals who might show an interest in working abroad rather in domestic career (Remhof et al., 2013). While recent research has enriched the understanding of the antecedents of self-initiated expatriation and willingness to work abroad, such as international experience as well as

individual characteristic, skills and abilities, scholars still know little about the process how this intention to work abroad does develop (Ryan et al, 2013; Remhof et al., 2013).

International careers are becoming more common and their patterns are becoming more varied (Baruch et al., 2013). While we acknowledge that many career boundaries between Global type and Local type of career are breaking down, but key distinctions are still in place, such as a *necessity to cross borders(s)* and reside in a new cultural location(s) Baruch et al., (2013); *time spent away* from home culture and market (Peiperl & Jonsen, 2007) (ranged from no time at all (virtual employee) to long-term work (traditional expatriation) and stretch to long-term (temporary migration) and very long-term careers (immigration); *intensity and breadth of international interactions* (Baruch et al., 2013). So while Baruch et al., 2013 identify twenty the most typical global career patterns, in our study we treat “global career” choice as a choice including a majority of possible global career alternatives and modifications (that includes short-term/long-term expatriation, frequent flying, international project work, self-initiated foreign sojourns and long-term cross-border commuting), and we contrast it to a "local career" in a home country or a country perceived as a home country.

2. Theoretical Framework

Social Cognitive Theory

Our study uses Bandura’s (1991) Social cognitive theory to explain the development of the intention to work abroad. Social cognitive theory considers knowledge, skills and abilities crucial for the development of an individual. The theory also states that competencies are acquired through prior experience (Bandura, 2002). We use Remhof et al. (2013) relationship’ mechanisms who argue that an individual’s international exposure in own turn affects their cultural intelligence, which in turn influences the intention to work abroad.

The Role of International Experience and Cultural Intelligence

Engle and Crowne (2014) refer to *International Experience (IE)* as one’s exposure to a foreign region, including encounters with members of different cultures, enabling individuals to become familiar with and develop an understanding of new cultural norms, values and beliefs. Previous research with focus on the direct impact of previous international experience on the willingness, readiness and intention to work aboard yielded inconclusive findings mainly due to influences of different types of experiences have not been disentangled that lead to conflicting conclusions as well as predominant focus on testing only direct relationships (Froese et al, 2013; Remhof et al., 2013). The concept of international experience (IE) in driving CQ development has gained much scholarly attention in recent years (Engle and Crowne, 2014; Ott and Iskhakova, 2019; Tarique and Takeuchi, 2008).

Cultural Intelligence (CQ) represents an individual’s ability to function effectively in various cultural contexts (Earley and Ang, 2003). It is a multi-faced concept, comprising of four capabilities, namely metacognition, cognition, motivation and behaviour (Ang and Van Dyne, 2008). Specifically, the four key facets of the CQS are: *Metacognitive CQ*, which relates to an individual’s higher order cognitive function that allows the individual to adjust to new cultural experiences; *Cognitive CQ*, which focuses on explicit knowledge of values, norms, and practices in different cultures; *Motivational CQ*, a dimension that reflects an individual’s ability and desire to initiate, maintain and sustain functional behaviours in culturally unfamiliar environments; and *Behavioural CQ*, which reflects an individual’s ability to employ appropriate verbal and nonverbal actions when interacting with people from different cultures.

The Case of Russia and Australia. Australia and Russia have been selected as distinct cases for a comparison as they share a number of common characteristics. Australia is one of the leading

education exporters worldwide and is consistently ranked in the top nations on Education ranking (WER, 2019); Russia historically is a country of highly educated population being ranked 2nd by percentage of population completed tertiary education (WER, 2019). Both Countries share a degree of isolation. Australia – geographical isolation; Russia – more or less political and international isolation. At the same time top-ranked education systems of both countries allow them to be competitive on the international job market. From domestic perspective, own massive domestic job markets don't create enough incentives for global careers.

Borders restrictions. Every country chose an own response towards a world pandemic covid-19 based on a mix of national economic, geographical, behavioral, cultural characteristics. Russia and Australia took very much opposite poles, while Russia faced the full hit of the pandemic earlier, about in the middle of 2020 and went back to more or less “life-as-normal” conditions closer to the start of 2021 already; Australia preferred zero-cases strategy for 18 months with fully closed international borders and with only gradual borders reopening aimed for early 2022. While global dimension has been significantly reduced for students in Russia, selected international travels and outcoming study options still were possible. It is an interesting task to analyze and see how different national border restrictions affected the short-term and long-term global intentions. So we rate Russia as a country with weaker border restrictions and Australia as a country with stricter border restrictions. Based on assumptions above we suggest the following four hypotheses to guide our study:

Hypotheses:

H1a: 4 Facets of CQ (MC, COG, MOT & BEH) are positively related to an Intention to work Abroad in Long-term period

H1b: 4 Facets of CQ (MC, COG, MOT & BEH) are positively related to an Intention to work Abroad in Medium-term (in 5 years) period

H1c: 4 Facets of CQ (MC, COG, MOT & BEH) are positively related to an Intention to work Abroad in Medium-term (in 2 years) period

H1d: 4 Facets of CQ (MC, COG, MOT & BEH) are positively related to an Intention to work Abroad in Short-term period

H2a: Total CQ is positively related to an Intention to work Abroad in long-term period.

H2b: Total CQ is positively related to an Intention to work Abroad in short-term period.

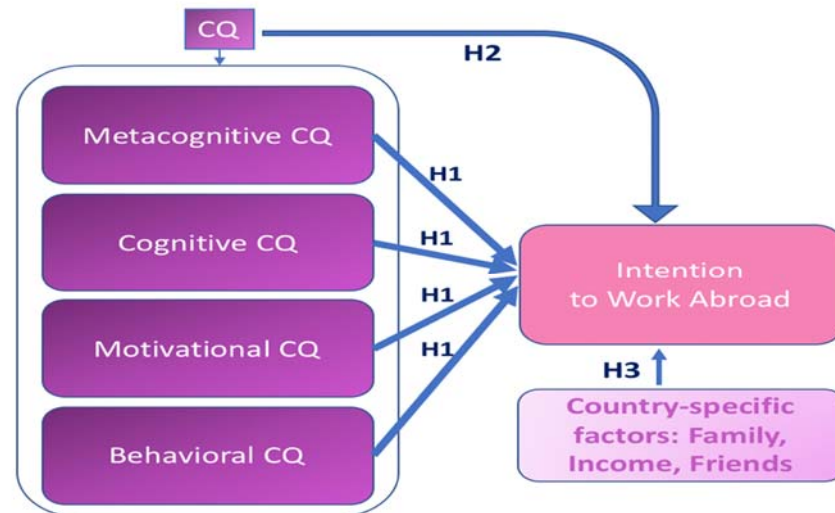
H3a: Intention to work abroad in long-term is lower in a country with stricter covid-borders restrictions

H3b: Intention to work abroad in short-term is lower in a country with stricter covid-borders restrictions

3. Method

3.1. Research Model

Figure 1. Research Model



3.2. Method and Data

Participants were 330 undergraduate business students close to graduation (42% males and 58% females) enrolled in Business degree in during Semesters (February 2020 – June 2021) at one of the G8 universities in Australia and one of the Top-3 leading Business Schools in Russia. Participation in the research project was voluntary. Students' age ranged from 18 to 38 years ($M = 21.3$; $SD = 3.21$), participants came from 18 different nations with the majority being Russians (35%) and Australians (31%), followed by students from China (11%) and Kazakhstan (3%). Descriptive statistics are presented in Table 1.

Table 1. Samples profile and IE characteristics

Indicator	Russia	Australia
Number of Respondents	135	195
Mean age	19.5	22.5
Female : Male ratio	30% : 70%	50% : 50%
Average age of the first overseas trip	7.0	9.0
Average age of the most memorable overseas memory	9.9	12.3
Average number of languages spoken	2.0	1.7
Average number of countries visited	11	12
Average Length of previous travel (months)	8	9
Have you lived overseas? (Yes)	37%	69%
Average Length of living abroad (months)	4	24
% of students born in the same country as parents	98%	73%

% of students with relatives overseas	61%	67%
% of students with friends overseas	70%	88%
Aver. % of friends from other culture	17%	33%
Aver. % of friends with different mother tongue	14%	26%

3.3. Measurements

Cultural intelligence (CQ): The 20 items forming the Cultural Intelligence Scale developed by Ang et al. (2007) were utilised in this study, capturing *metacognitive CQ*, *cognitive CQ*, *motivational CQ* and *behavioural CQ*. All items were rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). A high score indicates that an individual could better adjust to new cultures, understand local practices, and behave appropriately and effectively in other cultures outside his or her own. *Previous International Experience (IE)*: Findings reported by Ott and Iskhakova (2019) indicated that the existing body of knowledge related to IE measurements in CQ research is fragmented due to inconsistent terminologies, lack of solid conceptual frameworks underpinning the research, and its reliance on a variety of measures for IE. Drawing on previous research we used 4 single traditional depth and breadth measures of international experience (see Tab.2 & Tab.4 for IE measures) and Language skills being measured by number of language(s) student indicates he/she speak fluently. The dependent variable *Intention to work Abroad* is measured with a set of four questions, adapted from Vandor (2009). “With a probability of ____% I will live and work in another country than Australia/Russia within the first 6 months (2 years, 5 years, in the course of my life) after having finished my studies”. Also a culture-specific question from Remhof et al. (2013) “What is your preferred country to live and work?” has been included in the survey. *Short-term* period has been measured as 6 months time span from the moment of survey response took place; *Medium-term* has been indicated with 2 options as the period of 2 years and 5 years from now; *Long-term* period has been indicated as Life-long time span.

4. Empirical Results and Conclusion

4.1. Results

Regression analysis was used for testing the hypotheses for direct effects (H1, H2). H1a-H1d has been tested with a direct regression model of CQ facets on an Intention to Work Abroad. Results (Tab. 2a-2d) for four various time periods: short-term (in 6 months), medium-term (in 2 years, in 5 years) and long-term (life-long). We start with Life-long period and Table 2a showed that two facets - *Motivational CQ (MOT)* and *Behavioral CQ (BEH)* out of four facets of students’ CQ are positively related to their Intention to Work Abroad in Long-term period. **Such H1a has been partly confirmed.** We can say that developed Motivational and Behavioral facets of cultural intelligence could serve as predictors of long-term global career.

Table 2a. Regression results of Intention to Work Abroad and facets of CQ (LIFE-LONG).

Intention to Work Abroad (Life Long)	B	SE	t	P> t
MCQ	2.671	1.666	1.60	0.110
COG	-2.857	1.802	-1.59	0.114
MOT	7.341*	2.183	4.01	0.000
BEH	3.272***	1.485	2.20	0.028

Const. -2.063 9.758 -0.21 0.833
 $P^* < 0.001$; $P^{***} < 0.05$; $R\text{-squared} = 0.127$

We move to Mid-term period (5 years time-horizon) and Table 2b showed that two facets - *Motivational CQ (MOT)* and *Metacognitive CQ (MCQ)* out of four facets of students' CQ are positively related to their Intention to Work Abroad in Mid-term period (in 5 years' time horizon). **Such H1b has been partly confirmed.** We can say that developed Motivational and Metacognitive facets of cultural intelligence could serve as predictors of 5 years mid-term global career.

Table 2b. Regression results of Intention to Work Abroad and facets of CQ (MID-TERM, IN 5 YEARS)

Intention to Work Abroad (In 5 Years)	B	SE	t	P> t
MCQ	4.247**	1.620	2.62	0.009
COG	-1.301	1.752	-0.74	0.458
MOT	6.524*	1.783	3.66	0.000
BEH	0.361	1.444	0.25	0.803

Const. -12.167 9.489 -1.28 0.201
 $P^* < 0.001$; $P^{**} < 0.01$; $R\text{-squared} = 0.113$

We move to Mid-term period (2 years time-horizon) and Table 2c showed that only one facet - *Motivational CQ (MOT)* out of four facets of students' CQ are positively related to their Intention to Work Abroad in Mid-term period (in 2 years' time horizon). **Such H1c has been partly confirmed.** We can say that developed Motivational facets of cultural intelligence could serve as predictors of 2 years mid-term global career, in spite of pretty visible and near pandemic effects and restrictions.

Table 2c. Regression results of Intention to Work Abroad and facets of CQ (MID-TERM, IN 2 YEARS)

Intention to Work Abroad (In 2 Years)	B	SE	t	P> t
MCQ	2.835	1.745	1.62	0.105
COG	2.573	1.888	1.36	0.174
MOT	4.640***	1.921	2.42	0.016
BEH	-1.170	1.559	-0.75	0.453
Const.	-14.899.	10.228	-1.46	0.146

$P^{***} < 0.05$; $R\text{-squared} = 0.065$

And we move to the final, that is short-term period (6 month time-horizon) and Table 2d showed that two facets - *Motivational CQ (MOT)* and *Metacognitive CQ (MCQ)* out of four facets of students' CQ are positively related to their Intention to Work Abroad in Mid-term period (in 2 years' time horizon). **Such H1d has been partly confirmed.** We can say that developed Motivational and Metacognitive facets of cultural intelligence are playing the most critical role in defining the direction of career in short-term span, under the conditions of very visible covid-effects and restrictions.

Table 2d. Regression results of Intention to Work Abroad and facets of CQ (SHORT-TERM, IN 6 MONTHS)

Intention to Work Abroad (In 6 month)	B	SE	t	P> t
MCQ	4.247**	1.619	2.62	0.009
COG	-1.301	1.753	-0.74	0.458
MOT	6.524*	1.783	3.66	0.000
BEH	0.361	1.444	0.25	0.803
Const.	-12.167	9.489.	-1.28	0.201

$P^* < 0.001$, $P^{**} < 0.01$; $R\text{-squared} = 0.036$

Next, we move to the block of the Hypotheses 2 and would like to check the H2a: *Total CQ is positively related to an Intention to work Abroad in long-term period* and the H2b: *Total CQ is positively related to an Intention to work Abroad in short-term period*. Table 3 serves as a proof that H2a and H2b are fully supported, and both models show that *Total CQ is positively related to an Intention to work Abroad in long-term and short-term period*. At the same time, for both periods we can conclude that *Months travelled* is positively related to the long-term and short-term intention to work abroad! That is a very insightful finding, as we can see that the lengths of overseas travel contribute higher to the intention to work abroad, than number of countries travelled, or the length of living overseas, or more than the age of the first overseas trip. Number of languages spoken contributes positively to Intention to work abroad, but only for short-term period, possibly creating higher confidence in own abilities.

Table 3. Regression Model - Intention to Work Abroad on Students' CQ

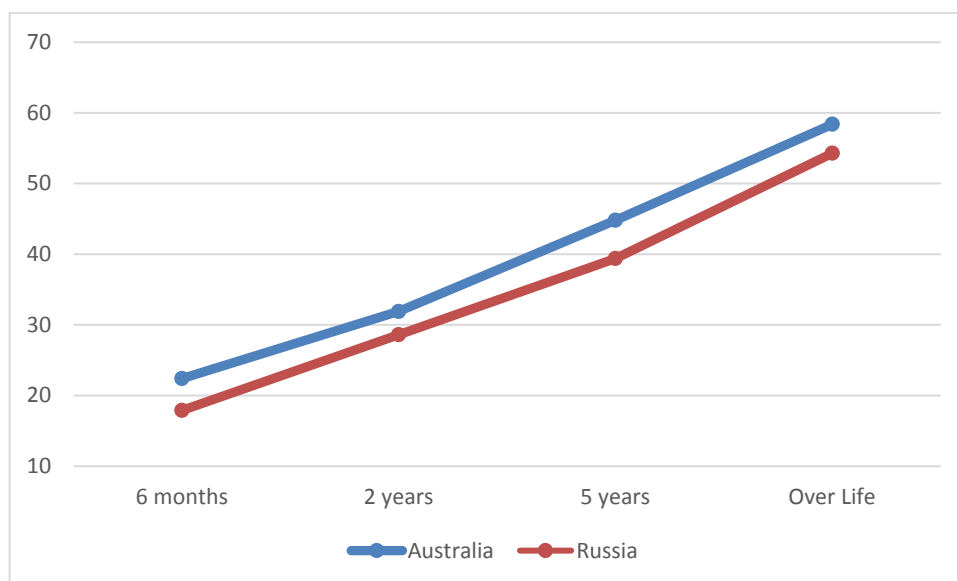
Variables	Intention to Work Abroad	
	Model 1 Long-Term	Model 2 Short-Term
CQ	10.451 (.000)****	3.800 (.049)*
Number of Countries travelled	-0.049 (.801)	-0.244(.209)
Months lived overseas	0.081 (.161)	0.052 (.368)
Months travelled	0.363 (.054)*	0.220 (.024)*
Age of first overseas trip	-0.372 (.129)	0.384 (0.115)
Languages spoken	-2.714 (0.244)	5.364 (0.021)*
Const	8.957 (0.3666)	-10.906
R-squared	0.127	0.062
F	7.74 (0.000)*	3.50 (0.002)**

P**** <0.0001, P*** <0.001; P** <0.01; P* <0.1;

And the final, we move to the third block of hypotheses: *H3a: Intention to work abroad in long-term is lower in a country with stricter covid-borders restrictions* and *H3b: Intention to work abroad in short-term is lower in a country with stricter covid-borders restrictions*.

Fig. 2 represents the students' intention to work abroad by country and we see a stable gap in intention in 3-5% that stays for the studied period over life. The Australian cohort showing significantly higher intentions at two out of four intentions points – 6 months and 5 years (with t-tests = 1.46, p<0.1 for 6 months, t-test = 1.74, p<0.05 for 5 years). Our results show that the block of Hypotheses 3 is not supported. Based on earlier discussion and ranking of countries as weaker border restrictions for Russia and stricter border restrictions for Australia, we can see the opposite case: Australian cohort in spite of tougher restrictions demonstrates higher intention to work overseas through all four measurement points; Russian cohort in spite of relatively weaker restrictions demonstrated relatively lower intention to work overseas through all four measurement points. It is insightful to see that short-term intentions are at a very reduced state comparing to gradually advancing trend towards possible global careers in a life-long time-span. We can't assign those differences to only covid-related effects, but it is insightful to see, that in spite of different existing borders restrictions and factors that slow down a global career development, students still report on up to 60% possibility on taking on a global career in a long-term. Further study on additional economic, geographical, behavioral, political, cultural, factors that might affect the gap is encouraged. Further study on factors that would facilitate the interest and would spark higher intentions for a global career over in a short-time horizon as well as in life-time are needed.

Figure 2. *Intention to work abroad over the period of life (by country).*



In our full study, except studying CQ and IE influence, we will try to investigate which potential country factors could try to explain the gap.

4.2. Conclusion

The study comes to four main conclusions that:

(1) development of students' *Motivational CQ* facet is critically important as it facilitates broader working opportunities and ignites the strong intention to work abroad for all four time periods; (2) development of students' *Metacognitive CQ* facet is critically important as it ignites the strong intention to work abroad for both *short-term* and *medium-term* (5 years) periods; (3) development of students' *Behavioral CQ* facet is critically important as it ignites the strong intention to work abroad for life-long time periods; (4) *Total CQ* is positively related to an *Intention to work Abroad* in *long-term* and *short-term* period. At the same time, for both periods we can conclude that *Months travelled* is positively related to the long-term and short-term intention to work abroad; (5) With the respect to a covid-context: Australian cohort in spite of tougher restrictions demonstrates higher intention to work overseas through all four measurement points; Russian cohort in spite of relatively weaker restrictions demonstrated relatively lower intention to work overseas through all four measurement points. But still we can conclude that in spite of borders closure and a grim picture of international working opportunities in short-term, working abroad intentions show a growing attraction for participants in long-term period not depending on a sample. Further discussion, study limitations, practical implications and directions for future research will be provided in the full version of the paper.

References

Ang, S., and L. Van Dyne. 2008. *Handbook on Cultural Intelligence: Theory, Measurement and Applications*. Armonk, NY: M.E. Sharpe.

Bandura, A. 1991. *Social Cognitive Theory of Self-regulation*. *Organisational Behaviour and Human Decision Process*, 50 (2), 248-287.

- Bandura, A. 2002. Social Cognitive Theory in Cultural Context. *Applied Psychology: An International Review*, 51 (2), 269-290.
- Baruch, Y. et al., 2013. Exploring International work: types and dimensions of global careers. *The International Journals of Human Resource Management*, 24 (12), 2369-2393.
- Earley, P. C., and S. Ang. 2003. *Cultural Intelligence: Individual Interactions Across Cultures*. Palo Alto, CA: Stanford University Press.
- Engle, R., and K. A. Crowne. 2014. "The Impact of International Experience on Cultural Intelligence: An Application of Contact Theory in a Structured Short-Term Programme." *Human Resource Development International*, 17 (1), 30-46.
- Froese, F., Jommersbach, S., and Klautzsch, E. 2013. Cosmopolitan career choices: a cross-cultural study of job candidates' expatriation willingness. *The International Journals of Human Resource Management*, 24(17), 3247-3261.
- Mol, s et al. 2009. When selection ratios are high: predicting the expatriation willingness of prospective domestic entry-level job applicants, *Human Performance*, 22(1), 1-22.
- Ott, D., and M. Iskhakova. 2019. Meaning of International Experience for CQ development. *Critical Perspectives on International Business*, 15 (4), 390-407.
- Peiperl & Jonsen. 2007. *Global Careers in Handbook of Career Studies*, eds. H.P. Gunz and M.A. Peiperl, Los Angeles, CA: Sage, 350-372.
- Peltokorpi. V. & Froese, F. 2009. Organizational expatriates and self-initiated expatriates: who adjusts better to work and life in Japan? *International Journal of Human Resource Management*, 20(5), 1096-1112.
- Remhof et al. 2013. Working in the "Global village": the influence of cultural intelligence on the intention to work abroad". *German Journal of Research in Human Resources Management*, 27 (3), 224-250.
- Ryan, J., Silvanto, S., and Brown, H. 2013. The impact of experience-based MBA educational programs on international career mobility. *Journal of Global mobility: the Home of Expatriate Management Research*, 1(1), 28-45.
- Tarique, I., and R. Takeuchi. 2008. Developing Cultural Intelligence: The Roles of international non-work experiences. In *Handbook of Cultural Intelligence: Theory, Measurement and Applications*, edited by S. Ang, and A. Van Dyne, 56-70. Armonk, NY: M.E. Sharpe.
- Vandor, P. 2009. *The Bond Between International Mobility and Entrepreneurship: Examining the Role of Personality*. Paper presented at the 2009 annual meeting of the Academy of Management, Chicago, IL.
- World Education Ranking, 2020. <https://worldtop20.org/worldbesteducationsystem> (Accessed 6 September, 2020).

Team Resilience Framework: the Case of an International Company

Olga Mondrus, National Research University Higher School of Economics (omondrus@hse.ru), Veronica Parolini, National Research University Higher School of Economics

Abstract:

In the paper, the theoretical perspectives and practical applications of project team resilience are presented. The framework of project team resilience is developed to demonstrate how companies anticipate, prepare, respond, and adapt to changes and sudden inconveniences, with the aim of surviving and thriving. To determine whether it is possible to define a resilient company before it undergoes a crisis, we provided a case study carried out in 3 subsidiaries with 27 respondents from specialist to top-management positions of an international company to develop the framework of project team resilience and define guidelines on the concept of resilience, and on the attitude that companies should have to increase its level.

Keywords: *team resilience, project teams, organisational resilience*

1. Introduction

The last few years have been characterised by a series of negative events, like the pandemic and the economic crisis, which represented a threat to the survival of many organisations. Facing external threats, some companies have improved their performance while others have been forced to close. Such difference in the consequences might be explained by resilience of organisations.

Starting from a general definition, the concept of resilience recalls the ability of an entity to bend but not break, to "bounce back" adversity, to grow and sometimes reinvent itself.(Stoverink et al., 2020). Resilience must therefore be considered as a competence, present in every individual or organisation, which allows us not to succumb to adverse events, but to react and reach, or return, to a state of equilibrium(Pavez et al., 2021).

In the last two decades, however, the understanding of human behaviour in the onset of difficult situations has developed rapidly in relation to the identification of protective factors and the understanding the process by which individuals overcome the adversities they are often forced to face (Adler et al., 2021). In turbulent, dynamic, and ever-changing market environments, only flexible, agile and dynamic organisations will be able to thrive (Carmeli, Gittell, 2009). In fact, companies often need to be able to go beyond mere survival, developing in complex, uncertain and threatening environments (Christopher, Peck, 2004). Unstable environments create frequent challenges, but relatively stable markets are also subject to shocks or periods of turbulence (Morales et al., 2019).

Therefore, a company is able to define itself as resilient when it is able to react positively to environmental stress, to adverse and unexpected situations, and will be convinced in embracing the development of new features combined with an expanded and renewed ability to keep up and create new opportunities.(Borg et al., 2020)

The purpose of this research is to illustrate the structure and principles of a resilient international company. To this end, the study addresses the following research question: What are the key factors for explaining project team resilience in an international company? The main research question will also have two sub-questions: which are the factors which make a team resilient? What might a truly resilient team look like?

2. Team resilience theoretical framework

Resilience in a team is based on the ability or not of the group system to adapt quickly and quickly return to working properly after overcoming adversity and can be used to characterise individuals' ability to overcome setbacks and, in some way, measure life outcomes and career expectations or ambitions (Varajão et al., 2021). The term resilience has been used at the organisational level to describe the intrinsic characteristics in those organisations that are able to respond faster to change, recover more quickly from unexpected events, develop different ways to be efficient. In turbulent, dynamic, and ever-changing market environments, only flexible, agile, and dynamic organisations will be able to thrive. In fact, companies often need to be able to go beyond mere survival, developing in complex, uncertain and threatening environments. (Sutcliffe, Vogus, 2003).

Especially in the modern era, as largely determined by the digital revolution, the concept of resilience is a fundamental aspect to say the least, which should therefore be included in the studies concerning human reliability and professional training to increase operations and stability of the system, which is often based on the human element. (Varajão et al., 2021)

However, this construction changes as we shift our focus from the resilience of the individual to the resilience of the team, since although the mechanisms in the resilience of a team are similar to those highlighted in the individual: the resilience of a team can be defined as strength. team to tackle obstacles without crashing (Varajão et al., 2021)

The working environment of teams always involves new challenges (Chiocchio et al., 2011). They have to get used to very high levels of uncertainty (Walker et al., 2016) to continuous pressure to meet the established deadlines (Nordqvist et al., 2004) and quickly adapt to the continuous and almost inevitable changes in the course of the team's formation and life process (Eskerod, Blichfeldt, 2005). This obviously involves high levels of stress, which affects the personal growth of the individual team members and then directly on the entire team performance (Savelsbergh et al., 2012).

To identify what has been the development of knowledge and gaps in corporate research, it is necessary to distinguish five research streams that consider resilience as the organisational response to external threats, organisational reliability, employee strength, business adaptability and design models or principles that reduce vulnerabilities and disruptions. of the supply chain.

The ability to be resilient consists of a series of factors that make the team more or less resilient and help protect it from the psychological negativity dictated by stress (Savelsbergh et al., 2012); to survive this type of adversity it is important to develop bonds between team members and an adequate mental openness, also improving concentration, learning of the individual, the environment in the company and increasing adaptability in case of future crises (Cohen, Bailey, 2016).

Therefore, a resilient team is a system that can lessen the impact of a crisis and the consequences it entails, returning to the previous operational level within a reasonable period of time and with the least possible cost (Buvik, Rolfsen, 2015). In order for the team to be resilient, it is necessary to establish a system of relationships with the main metrics of the team's life, so as to make resilience an intrinsic factor of the team and ensure better adaptability to problems and obtain a better overall performance. The basic concept is therefore that organisational resilience is the ability of the team to solve a problem and then recover from the shock and changes resulting from the adversity itself (Varajão et al., 2021)

Studies on resilience in the team are on the rise, but despite this, not enough is yet known about what actually creates resilience capacity, let alone what concerns the results of these skills (Hobfoll, 2012).

The literature review has brought to light several gaps in the literary and methodological context of the resilience topic. In fact, there is no clear and precise delineation of what represents a state of resilient international company and team resilience in particular. The main question of our research therefore is “What are the key factors which can explain the resilience of the project team in an international company?”

3. Method (including sample and measures description)

Having defined the various nuances of meaning that make up the concept of resilience, it will now be extremely important to underline how, in the business environment, it is identified not only in the ability to deal with change in a constructive way, but also in the ability to survive turbulence and to market critical issues in a flexible and proactive way. The shocks suffered by an organisation can be both exogenous and endogenous, and can therefore manifest themselves in different ways and in different temporal situations, varying from company to company.

In the empirical part of our research, we examine practical case of a company that have had to face various negative experiences, but which have equally threatened the development and productivity of the organisation, and in some cases even its survival. We use the case study approach and implement it in an international company presented in 6 countries. The company is established in Athens, Greece. The company is one of the international leaders in finance and economy, the main professional pool is investments. We interviewed the representatives of 3 main subsidiaries located inside and outside the European Union and in all of them they have a fixed structure: 1 general manager, 1 shift manager, 3 team leaders with 4 agents each, for a total of 27 interviews.

According to the theoretical framework developed in the research, the main contributors for team resilience are: focus on the results, commitment, management, embracing conflicts, work conditions, and skill and behaviours, which became the basis of our team resilience framework.

The goal of the case study is to understand what it means to be resilient for an international company from multiple points of view, both from the point of view of the various roles that make up the company, and from the point of view of a subsidiary rather than another. Therefore, the analysis of an international company will be proposed: in this article we used a mixed method approach, so we created and used interviews to develop more case studies. As this is qualitative research, the goal here is to understand what team resilience is for an international company and its subsidiaries.

4. Empirical results and conclusions

From the responses of the general manager and shift managers, it is clear that we can define a resilient company if it has a great ability to adapt to changes, both historical and social: above all, a resilient company is a company that is not afraid to reinvent itself.

Focus on results:

The business interests for the manager are totally overshadowed by those of the company, as with everything to do with the job, there is always the best business decision to make in the first place. This is also justified by the fact that global changes significantly affect internal work: the theme of influenza, the global pandemic has made it clear that many aspects of the business can also be looked at from another angle. From the point of view of shift managers, the vision is very linear for everyone: a team that recognises in its boss a figure they can trust is the key to managing a group of people in harmony. Showing the team that the interests of the people who work for a manager of any rank and level come before yours builds loyalty and motivates them to help you when you need it most. As for the team leaders, the answers were all very similar to each other, even among the various subsidiaries. They can be summarized by saying that everyone agrees that the interests of the team must always be first and that personal interests within the group must not really exist: the leader must lead the team to the final result, leaving out everything that is personal and hindering the focus on the result. As for the results, the employees did not split among themselves despite the differences in location between the subsidiaries. Some have argued that, within the bounds of a sustainable work-life balance, teamwork is the key to both personal and professional success, so team interests are at the top of the relevance pyramid.

Commitment:

The manager has in fact specified that the shift managers in our operation are actually department heads of each branch and supervise each of their foremen and employees, they are in daily contact and communicate every day on ongoing issues, since the manager himself is very physically present in the various offices, departments and branches, directing directly and continuously, but also always making sure to leave enough space for the managers on duty for freedom, and everyone knows their range of action. Even for all shift managers, the feedback from the foremen takes place daily and constantly. As for the feedback, all the team leaders faced a united front: the feedback is given by the agents several times during the day because the team leader must always be aware of what is happening in the team, whether it is positive or negative. They also all specified that the feedback must not only be negative and must not be given only when a person makes a mistake, but it is also essential to reward and make the employee feel important especially when they do a great job and you have to do it to motivate their subordinates too. If the desired result has not been achieved. Here, for the employees, the answers varied somewhat, but not according to the subsidiary, but the personal character of the employee and the experience she has in the company had a great influence. In general, almost all negative criticisms are always constructive if made by competent people and who use appropriate tones: therefore, if the feedback comes from a person who respects herself and who has more experience than the employee, a competent person, the subordinate does everything to improve and show that your feedback is a springboard for future improvements.

Management:

As pointed out by the manager, most of the employees are hired as entry level, and with limited experience in the sector, which authorizes us with great loyalty on their part to the company, it is also the case that they develop the same logic as their senior manager, and it is not often that you have innovative internal ideas from the lower floors. All the shift managers have expressed a fundamental point to manage a group of people knowing how to listen, learn and make some work mechanics their own. Two shift managers also added that the manager is always ready to help them with any problems they may bring to his / her desk, while another specified that any help that comes from him / her is always analyzed and understood, so that next time, following the footsteps of the manager, can do the same directly with the skills learned. A team is naturally composed of heterogeneous people, and this allows you to be in close contact with people with different interests and skills which is certainly the greatest source of learning that there can be at work. This always allows you to learn something by working as a team and it is essential that one's work environment is a continuous source of stimuli for continuous personal and collective growth. For some specific cases, some employees have been hired for a job they have never had previous experience: on the one hand they are happy to learn new things and not being in their comfort zone, on the other hand they sometimes struggle to progress as they have studied different things than this job and have different backgrounds.

Embracing conflicts:

The conflict part has given some really interesting results. In fact, the manager stated in the interview that he is actually the conflict happens almost daily, but once all parties are effectively involved in the actual business and have a transparent view and direct access to all levels of the operation, it is easier to resolve this conflict with the right call for action from the company, even if it is not always the same and must change with the current times. All shift managers have in fact stressed several times how dialogue is a fundamental part of conflict resolution. In fact, most of them derive from situations that may not be clear to the single person and it is therefore necessary to clarify the goal that is required of the team leader to be achieved. Once the goal is clear, the person must be provided with the tools to achieve it and clarity is the basis of the human relationship to put an end to any kind of conflict that may occur. Even the team leaders have based their own method of conflict resolution through dialogue: the solutions they indicate are to make a group on the part of everyone by comparing and finding different solutions together. Within the team it happens that there are clashes and misunderstandings and

people who can't stand each other, to manage them you need to be mature and know how to make every single member of the teamwork at their best. To do this, it is necessary to remain impartial and avoid feeding unnecessary fires, perhaps by listening more to one or the other employee. It is not always easy but in all the cases that have occurred in the company then the situations have smoothed out in a short time. From the point of view of the employees, the company policy is very clear regarding conflicts, and here too the key point of the dialogue prevailed in all the answers. The general approach is to react constructively and look for the best solution, the one that guarantees the best result for everyone: the important thing is to listen to others and to take a step back to maintain a collaborative atmosphere, whether it is a team leader or another employee.

Working conditions:

According to the manager of the company, the challenge is both national and international since it concerns all the subsidiaries in the various countries: the state in which each subsidiary is located is obviously subject to constant changes. Especially in the last 10 years, the external environment has developed and changed slightly, so the company has also had to adapt and we still have to do it. The regulatory environment is also becoming tougher, which requires all subsidiaries to be better and better every year and it is a challenge that the company in general has embraced with extreme positivity and a reason for continuous improvement. From this point of view, the shift managers have indicated different points, but always inclined to the same vision. The first said in fact that the balance is such within a team only when all its members are treated equally. The second reported that the team is strengthened when each member sees the next as an ally and not an opponent, while according to the third a team is really strong when you reach goals because you appreciate your efforts, value the results positively and always try to explain how to improve or eliminate errors. According to the team leaders, in every team there are elements that think positively and negatively and this is a common point for all team leaders. Employees confirmed that stress is the main obstacle to learning management for entry levels and that very often failures come from pressures and stresses that cannot be managed. The support of the team is knowing how to ask for help from colleagues is the way in which you manage difficult times on a personal level.

Skills and behaviours:

The company, as specified by the manager, has acquired maximum resilience by overcoming any challenge along the way and the difficulties have been numerous and of all sizes and the focus is all on collaboration between the various employees of the different layers of the organisational hierarchical pyramid of the various subsidiaries. The creed of the company to overcome adversity is that each overcoming only makes them stronger and more capable and is focused above all on the human side: challenges will always arise and as long as they prepare to embrace and adapt accordingly, they will become stronger and stronger together. This was the most complicated question for shift leaders. In general, the management is totally aimed at achieving the totalitarian objectives assigned monthly by the shift supervisor. In any case, the well-being of workers for the whole society is actually the extra quid to lead a company to success. Happy, committed workers who believe in the company project can only raise the company to higher levels, certainly customer loyalty and satisfaction also play a fundamental role. Same thing to recover from adversity: in those moments the aforementioned dynamics are probably missing, so in essence you have to review the various procedures with customers and maybe refresh the staff of your team to make the workplace dynamic and stimulating again. The team leaders have all made a common front regarding this point: to dismantle the negativity and give a lot of positivity, always demonstrate that constant work and commitment lead to results. The natural motivators, the people who always try to bring positivity, the tireless and precise workers and those who do not let themselves be overwhelmed by negative situations are the ones who truly strengthen the team. On the contrary, what kills a team are people who instinctively think negatively, those who complain too much and not at all and those who bring discord.

Thanks to the answers to this question, the interviews gave light to different experiences depending on the personal history of the employee. The most popular mistakes were those dictated by stress: making a mistake in compiling documents, forms, overlapping appointments by mistake, failing to manage customer files. The steps to solve the problem are always the same in each subsidiary: find and understand the error, reorganize, apologize and learn from the error. It can be an excuse to learn and never make such a mistake again, it's all experience and it's useful. Others have set the error more from a personal point of view, such as not trusting colleagues and bosses, not asking for help to understand and learn how to do something or in general to enter a world that at first did not belong to the employee.

References:

- Adler A.B., Bliese, P.D., Barsade S.G., Sowden W.J. 2021. Hitting the mark: The influence of emotional culture on resilient performance. *Journal of Applied Psychology*. <https://doi.org/10.1037/apl0000897>
- Borg J., Borg N., Scott-Young, C. M., Naderpajouh, N. (2020). The work readiness–career resilience linkage: implications for project talent management. *International Journal of Managing Projects in Business*, 14(4), 917–935.
- Buvik M.P., Rolfsen M. 2015. Prior ties and trust development in project teams - A case study from the construction industry. *International Journal of Project Management*, 33(7), 1484–1494.
- Carmeli A., Gittell J.H. 2009. High-quality relationships, psychological safety, and learning from failures in work organizations. *Journal of Organizational Behavior*, 30(6), 709–729.
- Chiocchio F., Forgues D., Paradis D., Iordanova I. 2011. Teamwork in integrated design projects: Understanding the effects of trust, conflict, and collaboration on performance. *Project Management Journal*, 42(6), 78–91.
- Christopher, M., Peck, H. 2004. Building the resilient supply chain. In *International Journal of Logistics Management*, 15 (2), 1-14.
- Cohen S.G., Bailey, D.E. 2016. What Makes Teams Work: Group Effectiveness Research from the Shop Floor to the Executive Suite, 23(3), 239–290.
- Eskerod P., Blichfeldt B. S. 2005. Managing team entrees and withdrawals during the project life cycle. *International Journal of Project Management*, 23(7), 495–503.
- Hobfoll, S. E. 2012. Conservation of Resources Theory: Its Implication for Stress, Health, and Resilience. *The Oxford Handbook of Stress, Health, and Coping*.
- Morales S.N., Martínez L.R., Gómez J. A.H., López R.R., Torres-Argüelles V. 2019. Predictors of organizational resilience by factorial analysis. *International Journal of Engineering Business Management*, 11, 1-13.
- Nordqvist, S., Hovmark, S., Zika-Viktorsson, A. 2004. Perceived time pressure and social processes in project teams. *International Journal of Project Management*, 22(6), 463–468.
- Pavez I., Gómez H., Lalié L., González, V.A. 2021. Project team resilience: The effect of group potency and interpersonal trust. *International Journal of Project Management*. DOI: 10.1016/j.ijproman.2021.06.004
- Savelsbergh C., Gever J.M.P., Heijden B.I.J.M. van der, Poell, R.F. 2012. Team Role Stress: Relationships With Team Learning and Performance in Project Teams, 37(1), 67–100.
- Stoverink, A. C., Kirkman, B. L., Mistry, S., Rosen, B. 2020. Bouncing back together: Toward a theoretical model of work team resilience. *Academy of Management Review*, 45(2), 395–422.
- Sutcliffe, K.M., Vogus, T.J. (2003). Organizing for Resilience. In *Positive Organizational Scholarship: Foundations of a New Discipline*, Publisher: Berrett-Koehler, Editors: K.S. Cameron, J.E. Dutton, R.E. Quinn, 94–110.
- Varajão J., Fernandes G., Amaral A., Gonçalves, A.M. 2021. Team Resilience Model: An Empirical Examination of Information Systems Projects. *Reliability Engineering and System Safety*, 206. <https://doi.org/10.1016/j.ress.2020.107303>

Walker, D.H.T., Davis, P.R., Stevenson A. 2017. Coping with uncertainty and ambiguity through team collaboration in infrastructure projects. *International Journal of Project Management*, 35, 180-190.

International Business and Emerging Markets

Business Models of Energy Companies in the Markets of Isolated and Remote energy Supply

Nayil Ismailov, National Research University Higher School of Economics
(nismailov@edu.hse.ru)

Abstract:

This article examines the business models (BM) of companies in the electric power sector of the economy operating in geographically isolated energy territories. Due to the fact that isolated territories are characterized by a high level of tariffs and are subsidized at the expense of the population and business, governments of different countries are interested in solving these problems by creating conditions for attracting private investors to territorial energy projects. There are already a number of companies that, thanks to their BM, successfully cope not only with the tasks set by the government, but also managed to achieve profitability from their energy projects, taking into account the use of renewable energy sources (RES). In this regard, we propose to develop a typology of such BM, taking into account the influence of external and internal factors on them, which, in our opinion, will help solve the problem of choosing a BM under certain conditions in isolated territories in which the company is going to operate.

Keywords: *Business models; Isolated Territories; Renewable Energy Sources (RES); Electric Power Sector; Energy Companies.*

1. Introduction

The transformation of the electric power industry brings many changes: the transition to "green energy", the decentralization of energy production, the development of "smart" networks, an active model of consumer behavior, etc. – all this leads to the fact that companies are radically changing their BM, moving away from the usual planned energy supply to an analytical model of energy demand, which is also evident in energy companies in isolated territories.

Despite this transition, the problems of energy companies remain the same: high cost of electricity supply, relatively low profitability of projects, lack of investor interest in the development of companies in isolated territories, etc.. This is due to the fact that such territories are poorly developed, with a low population density, with a low level of economic development, where diesel generation is more often used as one of the cheapest sources.

However, many governments are tightening the requirements for reducing CO₂ emissions by companies, which creates additional problems for energy companies that have to adapt and introduce energy production through RES into the value chain. Thus, it is necessary to study the experience of energy companies in designing an effective BM, which solved all the tasks set within the isolated territories.

2. Research design

The main concept for the development of a typology of BM energy companies in isolated territories is to gradually solve three key tasks:

- analysis and systematization of BM of energy companies in such territories;
- identification and classification of external and internal factors that affect the BM;
- carrying out the typologization of BM;

To date, 20 energy companies and 6 demonstration projects have been selected, for which a BM analysis tool was selected in order to identify patterns and deviations in the BM. A detailed design of the study of the current element is shown in Figure 1.

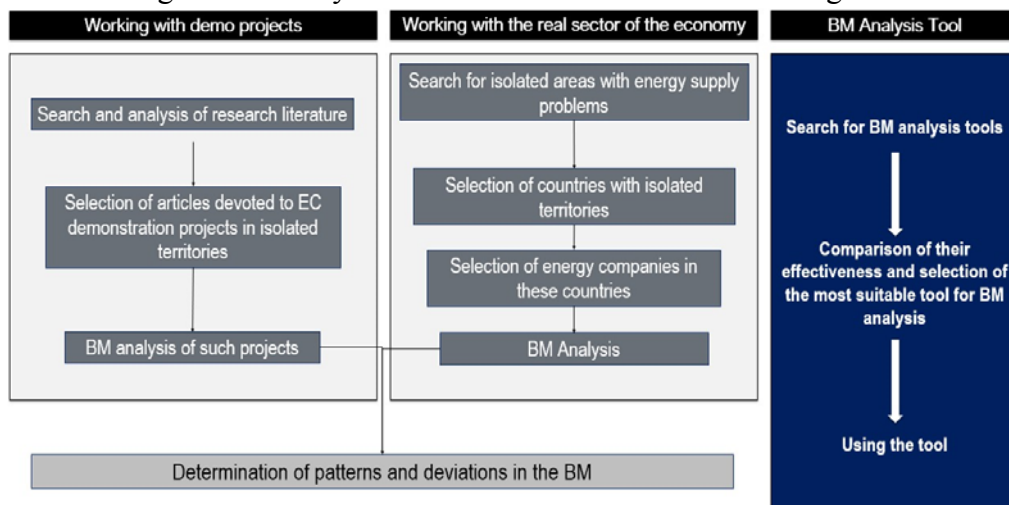


Figure 1 – Design of the study of the first key element – created by the author

In addition, it is planned to conduct a survey among company managers about the found patterns and deviations in the BM elements. This will allow us to more accurately form hypotheses that will be key when deciding on the choice of BM when working in isolated territories.

Preliminary results and Conclusion

The preliminary results of the BM analysis show that the structure of the market (consumers) has changed slightly, but their percentage share in consumption is changing – more and more often you can find companies serving electric gas stations or data centers that are becoming a more marginal segment. Such customers show more independence, and companies differentiate and prioritize them among themselves, thanks to which virtual communities are formed where the consumer can perform the role of a donor: controlling their energy costs, save and sell a certain amount of excess energy, depending on the assigned priority in this system. Thus, energy companies reduce the costs of maintaining the energy system, increase the loyalty and involvement of consumers in creating a value proposition, which in the long term increases the profitability of the company's projects in isolated territories.

Strong changes are taking place in the value proposition: companies in isolated territories are increasingly switching to "green" energy, as a result of using a hybrid form of electricity generation, which reduces the costs of its organization. In addition to the classic products of energy companies, new electronic services, virtual energy networks and digital assistants inside them are emerging. Companies conduct collaborations on their product lines. All this creates new tasks, for the solution of which an increasing number of IT specialists in the energy sector are involved. There is an expansion of the vertical boundaries towards the consumer in order to better understand his needs and offer the best solutions.

The main conclusion of the analysis was the identification of patterns in the BM value proposition: companies are increasingly focused on a range of services, respectively, they are coming to the "digital subscription" model, where the consumer gets the opportunity to choose their own tariff, which will include both basic services and additional opportunities for managing their own consumption, selling excess energy and other services, which allows to assign more profit for non-basic services that are used by more solvent customers. All this

suggests the importance of developing a typology of BM in isolated territories, due to the many traceable patterns.

References

Articles

Barbose G., Satchwell A. J. 2020. Benefits and costs of a utility-ownership business model for residential rooftop solar photovoltaics. *Nature Energy*, Vol 5. 750–758.

Burger, Scott P. & Luke, Max, 2017. Business models for distributed energy resources: A review and empirical analysis, *Energy Policy, Elsevier*, vol. 109(C), 230-248

Kosygina A. V., Volkova I., Gitelman L. 2018. Perspectives on distributed generation in electric power industry, in: *Challenges and Solutions in the Russian Energy Sector. Springer*, Ch. 5, 37-44.

Maeder M., Weiss O., Boulouchos K. 2021. Assessing the need for flexibility technologies in decarbonized power systems: A new model applied to Central Europe. *Applied Energy* vol. 282, part A. 1-16.

Zhao, D., Wang, H., Huang, J., & Lin, X. 2020. Virtual energy storage sharing and capacity allocation. *IEEE Transactions on Smart Grid*, 11(2), 1112-1123.

Books

Gassmann O., Frankenberger K., Csik M. 2013 *The St.Gallen Business Model Navigator*. Working Paper, University of St.Gallen.

Business Leadership in Pandemic: When the East meets the West or..?

Sergei Kladko, Innapolis University (s2kladko@gmail.com)

Abstract:

The abstract analyses the impact of COVID-19 on leadership in different business cultures. The author believes that the main "blow" to Western approaches to leadership fell on two characteristics of this phenomenon: direct contact and demonstration of activity. In this regard, it is proposed to pay special attention to the eastern leadership experience, which has shown its good effectiveness in the midst of a pandemic. On the other hand, there are serious concerns that the consideration of such an experience will again take place through the previously accumulated Western experience, which will inevitably lead to another cross-cultural error. In its turn, this is not much different from the situation before the pandemic, when leadership was explained solely in terms of characteristics that were consolidated over the years among Western managers and specialists. To avoid such an approach, the author calls for the establishing of a new paradigm of culturally integrated leadership based on the unbiased approach to leadership in different cultures with the aim to create a practical tool to overcome the consequences of the pandemic

Keywords: *cross-cultural management, leadership, COVID-19, cultural challenges in business.*

1. Introduction

The challenges the phenomenon of leadership is facing nowadays allows to agree with the characteristic of the latter one as the "one of the most talked about and yet least understood social phenomena on earth." [Snook]. The ongoing pandemic of COVID-19 has practically annulated the majority of the add-ins represented by well-established formulae and theories. Regarding leadership, the so-called 'black elephant' made top-managers adapt extremely quickly their leadership aspirations to new realities, sacrificing previously successful approaches. On the other hand, such a situation has stimulated the interest of Western managers in well-established practices of leadership in other cultures, which seems rather reasonable taking into consideration that, for instance, the SEA countries has managed to avoid such a great economic plummet faced by Western countries [Financial Times October 2020]. At the same time, even here the consideration goes through the prism of perception of Western managers who traditionally tend to forget that the essence of leadership directly depends on the cultural context it finds its implementation [Trompenaars, 175-198; Nhung-Binh Ly, 3-5]. This turns especially acute when it comes to the consideration of the following differences between oriental and occidental approaches to leadership.

2. Direct Contact in Leadership

Despite numerous attempts to make the leader less self-centered, Western business culture considers the personal presence of the leader an essential factor. Of course, this does not mean that, as several decades ago, the boss must meet with subordinates in person every day, and subordinates must regularly go to the office to listen to their top-manager's live instructions. However, it is historically important for Western culture to be aware of the "physical" presence of a leader with whom one can communicate face-to-face in case of necessity. Needless to say that the transfer of employees to the "remote work" has broken the usual team ties and blocked the possibility of personal communication with the manager, which inevitably resulted in the

disruption of the importance of personal leadership. In contrast, in the eastern business culture, the leader embodies that moral authority that does not need to be legitimized through physical presence. The “family” approach, rooted in Confucianism, assumes the boss is just some kind of moral authority [Yaling, 1310]. There is no need to discuss activities with the boss, and accordingly, you do not need to see the leader, thus allowing those operating within the frameworks of oriental business cultures not to pay attention to their working conditions.

3. Manifestation of Leadership

The leader in the West is more selfish due to the basis of Western culture in the cult of individuality. To be a leader here means to be such not only in the eyes of others, but also to be known to the widest possible circle of necessary target audiences. Accordingly, the leader in the West ‘builds’ himself/herself, feeling obliged to consider the weight of the so-called ‘personal brand.’ In this case, the managers in Western cultures pay special attention to measurable results, which can prove their efficiency (it is no wonder that the KPI systems are so popular here). The business culture in Eastern countries, on the contrary, do not require its leaders to get involved in such a demonstration as, culturally, such a behavior is never self-rewarding (the manifestation of modesty can bring here much better return to investment). The leader in the East acts more as a certain "moral compass" through which the followers are improved through their personal development (take care of others, and the result will then come by itself).

4. Traditional Step on a Cultural Rake?

It so happened that during the pandemic the aforementioned factors turned under the greatest pressure for the leadership in terms of Western business culture: personal presence was completely eliminated, leadership KPIs had to be rethought, and the results that companies were striving for had to be largely revised. Today, analyzing the articles and studies on how leadership should be changed in the era of COVID-19, one involuntarily sees calls to learn “leadership through uncertainty” or “building a climate of purpose and belonging,” which are the characteristics of the Eastern leadership strategy. Such an integrated model can really be considered a new paradigm to overcome the crisis of traditional leadership theories. However, previous experience in cross-cultural management research suggests that there is a high risk of repeating the traditional mistake inherent in most Anglo-Saxon theories: examining the applicability of leadership concepts in the East through the "glasses" of the West. In turn, this may mean that the cross-cultural characteristics of different leadership approaches may continue to be ignored, which is unlikely to contribute to effective leadership in a pandemic and post-pandemic era. Such a situation really offers new opportunities to business schools to be at the forefront of the development of the integrated cultural approach to successful leadership with clear cross-cultural perspectives as the unity of the equally treated characteristics of leadership in oriental and occidental business cultures [Klett and Arnulf, 3].

References

- East-west divide: winners and losers in the Covid economy // The Financial Times (October 4, 2020) <https://www.ft.com/content/e1d3b23e-ebad-4195-94e9-6cf1c1ee5351> (accessed August 20, 2021)
- Yaling Li. The Comparison between the Eastern and Western Management Ideas // *Advances in Social Science, Education and Humanities Research*, volume 233. Atlantic Press, 2018. C1307-1310

Snook S. Imagine the Future of Leadership // Harvard Business Review (April 26, 2010) <https://hbr.org/2010/04/imagine-the-future-of-leadership.html> (accessed August 25, 2021)

Nhung-Binh Ly. Cultural Influences on Leadership: Western-Dominated Leadership and Non-Western Conceptualizations of Leadership // Sociology and Anthropology 8(1): 1-12, 2020

Trompenaars F., Hampden-Turner Ch. Riding the Waves of Culture. Understanding Cultural Diversity in Business. London: Nicholas Brealey Publishing, 2003.

Klett T., Arnulf J.K. Are Chinese Teams Like Western Teams? Indigenous Management Theory to Leapfrog Essentialist Team Myths //Frontiers in Psychology 11:1758. C. 1-15

Global Trends and its Impact on Strategies of Oil and Gas Companies

Yuliya Tyulkina, National Research University Higher School of Economics,
(yuatyulkina@edu.hse.ru)

Abstract:

This paper is dedicated to analysis of global trends and describe how they influence on companies in oil and gas sector. Global trends such as digitalization, energy transition, ecology policy, global warming, renewable energy expansion influence the implementation of companies' strategies and its sustainability in modern dynamically changing environment. The capitalization of companies, their growth and shareholder value depend on the of the strategy execution. Provided trend analysis aggregate the data of main tendencies and describe its impact on strategy transformation. Furthermore, it will be used in the future research of oil and gas companies' strategies.

Keywords: *oil and gas sector, strategy transformation, energy transition, esg issue, digitalization, net-zero economy, renewable energy*

1. Introduction

The global energy market is a complex environment with a high level of uncertainty. The strategies of companies operating on the oil and gas market are influenced by many external factors. These factors introduced below can be considered not only as risks, but also as opportunities in the long-run perspective.

2. Global trends in oil and gas industry

2.1. Energy transition and ecologic issues

The transformation of the energy industry involves the transition from traditional energy sources to renewables such as solar energy, wind energy, thermal energy, hydropower. One of the main reasons of forced energy transition around the world is a climate change. Countries have set themselves ambitious goals which become part of the Paris Agreement. According to this Agreement reducing emissions to net zero by 2050-the point at which greenhouse gases are removed from the atmosphere as quickly as they're added - is considered vital to limit the increase in average global temperatures to no more than 1.5 degrees Celsius. [Ошибка! Источник ссылки не найден.]

The policy at the government level in developed countries implies significant support of development of alternative energy sources. For example, investments in infrastructure for generating and storage of electricity from renewable energy sources, introduction tax charges for oil and gas supplies, set quotas for acceptable level of emissions. However, there is the strong challenge in developing renewable energy – cost for producing it. Renewable energy generation need a massive investment in power grids, electric vehicle charging, energy storage and other technology.

2.2. Breakthrough technologies and digitalization

Importance of digital transformation is strongly connected with the energy transition, as digitalization facilitate energy companies decarbonize and use resources more efficiently. Digital transformation is the factor that influence on both reducing the cost in supply chain of energy generation and optimizing the organizational processes. Currently, the main digital technologies are Big Data, neurotechnologies and artificial intelligence, distributed registry systems, quantum technologies, robotics, virtual and augmented reality technologies adopted for the production life cycle.

According to BP, development and integration of technologies, technically recoverable reserves could increase by 35%, and the cost could decrease by 25%. Accenture found out that approximately 36% of the world's oil and gas companies are now actively using Big Data technology, and another 38% intend to adopt it rapidly in the next decade. **[Ошибка! Источник ссылки не найден.]**

3. Transformation of oil and gas companies' strategies

Nowadays strategies formulation of all levels should consider the ESG principles, which were formulated in response to global warming, environmental degradation, corporate governance, and social development. **[Ошибка! Источник ссылки не найден.]**

Support for the ESG principles is aimed at improving the reputation of companies in the oil and gas sector. For Russian companies in the future, compliance with these principles can be a criterion of signing contracts for the supply of energy resources. Worth noting that integration and improvement of these principles will require significant investments from companies to comply with them. This may affect the financial results and the revision of investment strategies.

Another necessary step to increase the competitiveness of oil and gas companies is the development of a strategy of diversification the project portfolio and shift the guidelines towards a low-carbon economy.

Thus, oil and gas companies need to diversify their assets and types of generated energy to meet the requirements of the energy transition, as well as to maintain sustainability in the long-term perspective. Several international companies, for example, Shell, Equinor, Eni, Total add new business and assets for renewable energy sources production. However, Russian companies are less active in diversification their businesses. Oil and gas companies need to develop complex approach to form their strategies including modern trends in innovation, technologies, energy transition and etc.

References

Global renewables outlook: Energy transformation 2050. (n.d.). /Publications/2020/Apr/Global-Renewables-Outlook-2020. Retrieved September 1, 2021, from <https://www.irena.org/publications/2020/Apr/Global-Renewables-Outlook-2020>

R&d and technology innovation – world energy investment 2020 – analysis. (n.d.). IEA. Retrieved September 1, 2021, from <https://www.iea.org/reports/world-energy-investment-2020/rd-and-technology-innovation>

PricewaterhouseCoopers. (n.d.). The ESG movement: Are you ready for the ESG revolution? PwC, from <https://www.pwc.com/gx/en/issues/esg/esg-revolution.html>

Managing Diverse Talent in a Divided World

To be or not to be: New Perspective on Retention of Female Employees

Aleksandra Bordunos, National Research University Higher School of Economics (abordunos@hse.ru), **Sofia Kosheleva**, St. Petersburg State University's Graduate School of Management (kosheleva@gsom.spbu.ru) **Anna Zyryanova**, SelfMama

Abstract:

This paper investigates opportunities how to retain female employees. In Russia, long maternity leave, accompanied with the increased monetary support of the government, creates a fruitful environment for women start-ups, raising probability of their withdrawal from the labor market. General approach to inclusion implies improvement of work-to-family spillover, while our research shows that positive work-to-family spillover is on the contrary associated with higher entrepreneurial intentions, while negative work-to-family spillover has insignificant relationship with entrepreneurial intentions. Our research suggests increasing the level of autonomy instead, due to the reversed relationship: the higher is autonomy, the lower are entrepreneurial intentions. We controlled for attitude towards COVID-19, which had negative association with the entrepreneurial intentions, and for masculinity, which was positively associated with them.

Keywords: *gender inclusion, sustainability, gender diversity, employees retention, spillover, WTF spillover effect*

1. Introduction

Current research joins debates in the topic of gender inclusion by investigating the problem of retention of female employees in Russia. According to our previous research, only 34% of employees during their maternity leave planned to return to the same employer, while 27% shared high entrepreneurial intentions (Bordunos, Kosheleva, Zyryanova, 2020). We were motivated by these findings to deepen analysis, observing the antecedents of entrepreneurial intention of women with childcare commitments and aimed to search for a solution, how employers can retain such employees. Preceding research suggested that showing employers' interest in female employees during their maternity leave could be a good predictor of their return (ibid). However, there is an additional concern that certain actions might on the contrary increase employees' entrepreneurial intention. For example, prior research shows that entrepreneurs-to-be are motivated by autonomy and independence (Choo and Wong, 2006), and thus companies tend to decrease autonomy in order not to provoke entrepreneurial intentions (Bordunos and Kosheleva, 2018). On the contrary, the most acknowledged strategy is a support in a family-to-work spillover (Grzywacz and Marks, 2000), which helps employees to raise positive effects of work on family. Thus, the goal of the research was to explore these two paths towards gender inclusion by analyzing the role of autonomy and family-to-work spillover in entrepreneurial intentions.

2. Theoretical lens

Current research relies on a Theory of Planned Behavior (Ajzen, 2020), which is often applied in a research of entrepreneurial intentions (Díaz-García and Jiménez-Moreno, 2010). It states there

is the behavior of interest (starting new enterprise), which is predefined by intention (entrepreneurial intentions). The stronger the intention, the higher the probability of action. The intention depends on behavioral, normative, and control beliefs (Ajzen, 2020). For example, perceived behavioral control shows capability of performing a given behavior and thus increases intention. It explains why employees might treat autonomy as possible trigger for entrepreneurial intentions (Bordunos and Kosheleva, 2016):

H1: There is positive association between the level of autonomy and entrepreneurial intention

Alvesson and Willmott (2002) highlighted that organizations might rely on identity regulation as organizational control. It implies that employees strive towards congruency between organizational and personal objectives, adjusting self-image. Positive family-to-work spillover might signal about such congruency, while negative family-to-work spillover might signal the necessity to change the identity and could trigger interest in alternatives, e.g. entrepreneurial identity.

H2a: There is negative association between positive work-to-family spillover and entrepreneurial intention

H2b: There is positive association between negative work-to-family spillover and entrepreneurial intention

We also accounted for the role of the attitude to COVID-19, expecting negative association with entrepreneurial intentions, and masculinity, expecting positive association (Díaz-García, Jiménez-Moreno, 2010).

3. Method

Starting from March 2021, we collected 174 responses from Russian-speaking parents. After cleaning the data, we narrowed the sample to 159 women with employment experience. The research is still open for answers. The questioner was arranged in Google Forms and distributed across the network of SelfMama – consulting project for employed or entrepreneurial parents. Data was analyzed in SPSS, using regression analysis. To measure dependent variable we applied scale by Linan and Chen (2009), for work-to-family spillover - scale of Grzywacz and Marks (2000), for autonomy – adjusted scale Basic Psychological Need Satisfaction at Work Scale (Kasser, Davey, Ryan, 1992; Ilardi et al., 1993; Deci et al., 2001). For control variables we referred to

4. Empirical results and conclusions

Results show the opposite relationship to the expected one. Positive work-to-family spillover is associated with higher entrepreneurial intentions, while negative work-to-family spillover has insignificant relationship with entrepreneurial intentions. Autonomy also has negative association with entrepreneurial intention. Thus, none of the hypotheses were supported (Illustration 1 and Table 1) as relationship is the opposite of the hypothesized, only the control variables showed the expected relationship.

The research suggests that gender inclusion practices might involve more autonomy, so that women would not need to change the environment in a search of higher flexibility of the context, while positive family-to-work spillover might create a feeling that the workload might be increased, so women start entrepreneurial experience even simultaneously with the employment.

Illustration 1: Research model and results

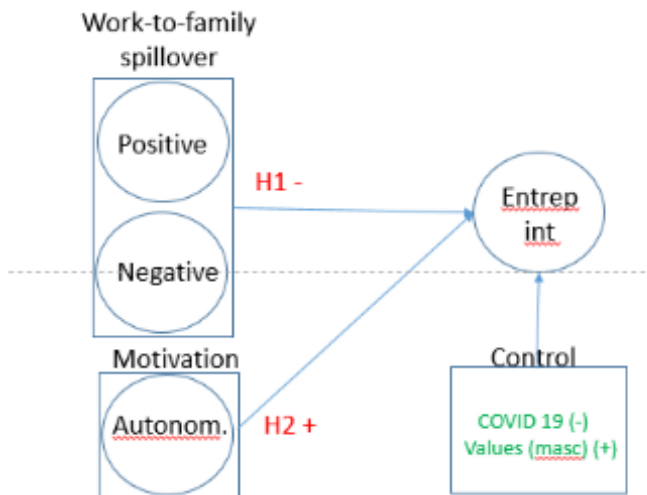


Table 1: Results

Variables	Standardized Beta	t	p	Tolerance	VIF
Constant		-2.945	0.004		
Covid-19	-0.193	-2.577	0.011	0.986	1.014
Masculinity	0.325	4.260	0.000	0.946	1.057
WTF positive spillover	0.239	2.437	0.016	0.571	1.750
WTF negative spillover	0.122	1.394	0.165	0.714	1.400
Autonomy	-0.252	-2.290	0.023	0.455	2.199

References (in alphabetical order).

- Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies*, 2(4), 314-324.
- Bordunos A. K., Kosheleva S. V. 2018. Freedom of choice in human resource management strategy: Limitations and opportunities. *Vestnik of Saint Petersburg University. Management* 17 (4): 499–546. <https://doi.org/10.21638/11701/spbu08.2018.403> (In Russian).
- Bordunos A. K., Kosheleva S. V., Zyryanova A. V. 2020. Determinants of return to work after maternity leave in Russia: A discourse perspective. *Russian Management Journal* 18 (3): 363–382.
- Choo, S., & Wong, M. (2006). Entrepreneurial intention: triggers and barriers to new venture creations in Singapore. *Singapore management review*, 28(2), 47-64.
- Deci E. L., Ryan R. M., Gagné M., Leone D. R., Usunov J., Kornazheva B. P. 2001. Need satisfaction, motivation, and well-being in the work organizations of a former Eastern Bloc country. *Personality and Social Psychology Bulletin* 27 (8): 930–942.
- Díaz-García, M.C., Jiménez-Moreno, J. (2010) Entrepreneurial intention: the role of gender. *International Entrepreneurship and Management Journal*, 6, 261–283.

- Grzywacz, J. G., & Marks, N. F. (2000). Reconceptualizing the work–family interface: An ecological perspective on the correlates of positive and negative spillover between work and family. *Journal of occupational health psychology*, 5(1), 111.
- Iardi B. C., Leone D., Kasser R., Ryan R. M. 1993. Employee and supervisor ratings of motivation: Main effects and discrepancies associated with job satisfaction and adjustment in a factory setting. *Journal of Applied Social Psychology* 23 (21): 1789–1805.
- Kasser T., Davey J., Ryan R. M. 1992. Motivation, dependability, and employee supervisor discrepancies in psychiatric vocational rehabilitation settings. *Rehabilitation Psychology* 37 (3): 175–187.
- Linan F., Chen Y.W. Development and Cross-Cultural Application of a Specific Instrument to Measure Entrepreneurial Intentions. *Entrepreneurship Theory and Practice*. 2009. Vol. 33. N 3. P. 593–617.

Comparative Research of Platform Work Legal Risks

Petr Fedorov, RANEPА (263816@mail.ru)

Abstract:

The development of information and communication technologies stimulated the development of platform work, the new form of labor organization. However, along with new opportunities for gig companies, new legal risks have arisen. This paper investigates how legal systems of different countries answer the question about the legal nature of work on demand through mobile applications.

Keywords: *platform work, gig work, work on demand through mobile applications.*

1. Introduction

The development of information and communication technologies, as well as the demand of the labor market for increasing the flexibility and adaptability of work modes, stimulated the development of new forms of labor organization, in particular platform work. Work on demand via mobile applications («platform work» or «gig-work») has transformed the courier and taxi market. The main growth factor is low labor costs: a courier or a taxi driver working with an Internet platform concludes, as a rule, a civil contract with a minimum level of social guarantees.

However, along with new opportunities for gig companies, new economic, managerial and legal risks have arisen. One of the legal risks is the litigation risk to establish the fact of labor relations between the aggregator company and the platform worker. At the same time, the legal systems of different countries answer the question about the legal nature of work on demand through mobile applications in different ways. And understanding of these country specificities is important for the success of international business in modern conditions.

2. Cases

We compared, how the legal systems of different countries (Russia, the USA, UK, EU) answer the question about the legal nature of platform work.

2.1. Russia

Russian courts, considering platform work as labor relations, are guided by the following criteria:

a. The subject of an employment contract is the performance of a certain labor function by an employee. But in a civil law contract, the subject is the provision of a service or the performance of a specific task known at the time of the conclusion of the contract. Therefore, in labor relations for the employer, the very process of the employee's labor activity is important, and in civil law relations, the specific result of the work is important for the customer.

b. Labor relations involve the employee's personal performance of the labor function. In civil law relations, as a general rule, it is allowed for the contractor to engage a subcontractor in the performance of work.

c. The next significant difference is the organization of the work process and the «employer power». In labor relations, the employee must comply with the internal labor regulations and labor discipline. Civil relations presuppose equality of the parties.

As an example, we can cite the case considered on July 7, 2020 by the Petrogradsky District Court of St. Petersburg on the claim of the worker to the company on the establishment of the fact of labor relations. The employee worked as a courier of the restaurant for the delivery of dishes ordered through a mobile application. Establishing the fact of labor relations, the court noted that the employee was given a job description, he was sent to for a medical examination, he received delivery assignments from a restaurant employee, delivery addresses were recorded in the waybills. [1]

2.2. The USA

In 2018 two drivers in California filed the class action alleging that Dynamex Operations West, Inc. had misclassified its delivery drivers as independent contractors rather than employees. The trial court ultimately certified a class action embodying a class of Dynamex drivers who, during a pay period, did not themselves employ other drivers and did not do delivery work for other delivery businesses or for the drivers' own personal customers. [2].

Then, in 2019, the California state legislature expanded the scope of the case and established criteria for recognizing relations as labor relations (so called «ABC test» in AB5 Act). Under the «ABC test», a worker is considered an employee and not an independent contractor, unless the hiring entity meets all three conditions:

a. The person is free from the control and direction of the hiring entity in connection with the performance of the work, both under the contract for the performance of the work and in fact.

b. The person performs work that is outside the usual course of the hiring entity's business.

c. The person is customarily engaged in an independently established trade, occupation, or business of the same nature as that involved in the work performed.

California law allows a group of voters to initiate a local «referendum» to change a regulation [3]. This right was exercised by the gig companies to propose an amendment to the AB5 Act (called «Proposition 22»). Under Proposition 22 app-based driver is an independent contractor and not an employee or agent with respect to the app-based driver's relationship with a network company if the following conditions are met:

a. The network company does not unilaterally prescribe specific dates, times of day, or a minimum number of hours during which the app-based driver must be logged into the network company's online-enabled application or platform.

b. The network company does not require the app-based driver to accept any specific rideshare service or delivery service request as a condition of maintaining access to the network company's online-enabled application or platform.

c. The network company does not restrict the app-based driver from performing rideshare services or delivery services through other network companies except during engaged time.

d. The network company does not restrict the app-based driver from working in any other lawful occupation or business. [4].

According to CNBC journalists, DoorDash, Instacart, Lyft and Uber poured \$200 million into the campaign for Prop 22, while the opposition raised less than \$20 million. Plus, the companies had access to voters right through their phones, pushing messages through their apps urging them to vote yes on the proposition and threatening to scale back their services if it did not prevail. As a result, nearly 59% of California voters voted yes on Proposition 22, the ballot initiative supported by the gig companies to maintain their workers' status as independent contractors, rather than employees. [5].

2.3. UK

In 2021, The UK Supreme Court's seven judges unanimously rejected Uber's appeal against a lower court ruling, which had found that two Uber drivers were «workers» under British law. While drivers were free to choose when and where to work, five specific aspects of the relationship between drivers and Uber, according to the court, are indicative of an employment relationship:

a. Remuneration was effectively fixed by Uber, not the drivers.

b. The contractual terms were dictated by Uber.

c. Once logged into the Uber app, the driver's choice around accepting requests was constrained by Uber.

d. Uber exercised significant control over the way in which drivers delivered the service.

e. Uber restricted communication between the passenger and driver to the minimum necessary to perform the trip.[6]

2.4. EU

On April 22, 2020, the Court of Justice of the EU (CJEU) has issued an order finding that a delivery driver did not have the status of a «worker» under EU regulations. According to the court, a person is a self-employed independent contractor (not a «worker») if that person is afforded discretion:

- to use subcontractors or substitutes to perform the service which he has undertaken to provide;
- to accept or not accept the various tasks offered by his putative employer, or unilaterally set the maximum number of those tasks;
- to provide his services to any third party, including direct competitors of the putative employer, and
- to fix his own hours of «work» within certain parameters and to tailor his time to suit his personal convenience rather than solely the interests of the putative employer.

Two conditions are also important: the independence of that person does not appear to be fictitious and, second, it is not possible to establish the existence of a relationship of subordination between that person and his putative employer. [7]

3. Method

The study uses the functional method of comparative law, the essence of which, according to David Gerber, is as follows: «prescription for the comparatists was, in its essence, simple: look at how a problem is solved in two or more legal systems and explore the differences and similarities in the respective treatments of the problem» [8, 199].

One problem (of the platform work legal nature) is facing the legal systems of different countries. A comparison is made and criteria are identified according to which such work is recognized as labor relations.

4. Conclusions

We compared, how the legal systems of different countries (Russia, the USA, UK, EU) answer the question about the legal nature of platform work. There are different criteria to consider platform work as labor relations. But one of the most important is the «employer power» (the control and direction of the hiring entity).

References

- Petrogradsky District Court of St. Petersburg. <https://sudact.ru/regular/doc/rQWf6MAACuL1/>
- Superior Court of Los Angeles County. *Dynamex Operations West, Inc. v. Superior Court of Los Angeles County*. <https://law.justia.com/cases/california/supreme-court/2018/s222732.html>
- California Secretary of State. Elections and Voter Information. Ballot Measures. <https://www.sos.ca.gov/elections/ballot-measures>
- Employment Development Department State of California. AB 5 – Employment Status. ABC Test. https://edd.ca.gov/Payroll_Taxes/ab-5.htm
- CNBC. Gig companies prepare to bring their fight for independent work nationwide under a more skeptical Biden administration. <https://www.cnbc.com/2021/02/27/uber-doordash-vs-gig-workers.html>
- CBS News. U.K. top court rules drivers are Uber "workers," so they're entitled to benefits. <https://www.cbsnews.com/news/uber-stock-down-uk-supreme-court-rules-drivers-are-workers-entitled-to-benefits/>
- The Court of Justice of the European Union. Order of the Court (Eighth Chamber) 22 April 2020. [http://curia.europa.eu/juris/document/document.jsf?text=&docid=225922&pageIndex=0&dolang=EN&mode=req&dir=&occ=first&part=1&cid=8688449](http://curia.europa.eu/juris/document/document.jsf?text=&docid=225922&pageIndex=0&dclang=EN&mode=req&dir=&occ=first&part=1&cid=8688449)
- Gerber, D.J. 2001. Sculpting the agenda of comparative law: Ernst Rabel and the facade of language. In A. Riles (Ed.), *Rethinking the Masters of Comparative Law*. 190-208. London: Hart Publishing.

Marketing: Current Trends & Challenges

Costs and Benefits of Personalised Marketing Communication in Online Retail: the Comparison of Customer and Business Perspectives

Megi Gogua, St. Petersburg State University's Graduate School of Management
(m.gogua@spbu.ru)

Abstract:

This paper investigates the benefits and costs of personalized marketing communication (PMC) from the academic and practical perspectives. Rapid and frequent changes in personalized marketing communication led to the academicians-practitioners divide in marketing theory associated with the practitioner knowledge autonomy. Such tendency is expected to continue due to the inclusion of more people in the online procurement caused by social distancing during the COVID-2019 pandemic and, hence, modified customer behavior patterns. This paper follows the literature analysis to identify the academic approach to personalized marketing communication costs and benefits from customers and business perspectives. The analysis is structured into 8 categories of personalized marketing communication: a) online behavioral targeting, b) email marketing, c) social media advertising, d) apps and notifications, e) on-site personalization; f) customization, g) price differentiation. The paper develops the framework based such analysis and intends to set the initial grounds for further comparison with the practitioners' side of the divide.

Keywords: *personalized marketing communication, online retail, customer perspective, business perspective, personalization*

1. Introduction

The digital realm currently offers the online retailers numerous tools for their business processes: “digital technologies, such as mobile, location-based, virtual reality, digital twins, blockchains, AI, wearable technologies, neuroscience and business process automation, as well as machine-to-machine interactions through the IoT” [Bolton et al., 2018, p. 779]. This huge variety of tools leads to the quickly emerging possibilities of personalization [Parise et al., 2016], however, the integrated overview of costs and benefits associated from the academic and practice perspectives are frequently overlooked.

In retail there is an evident trend towards the highly personalized communication as a shift away from the one-to-many communication that treats everyone the same [Sheth et al., 2000; Shah et al., 2006; Matz et al., 2019]. According to [Wattal, Telang, Mukhopadhyay, 2009], interactions are tailored uniquely for each customer through the use of information technologies following the personalization strategies. This paper focuses on the personalized marketing communication (PMC) as such an interactive process [Vesonen, Raulas, 2006].

The academicians-practitioners divide in marketing and practitioner knowledge autonomy in the field are recognized [Nyilasy and Reid, 2007; Nyilasy et al., 2012; Strycharz et al., 2019]. Nevertheless, apart from the vast in-depth research available on the aspects of personalization, academic literature struggles to keep up with the practical developments and tools [Strycharz et al., 2019] and evaluation of respective costs and benefits. Therefore, this paper takes the first step and aims to fill this gap by clarifying initial academic perspective on the costs and benefits of personalized marketing communication in retail. Such aim is achieved by answering the research question on how the perspectives of customers and businesses differ in regards to costs and benefits of personalized marketing communication. The objective of this paper is to set the initial foundation of academic perspective on the PMC costs and benefits based on the analysis of papers from top-level international journals within the categorization of PMC suggested by [Strycharz et al., 2019]: a) online behavioral targeting, b) email marketing, c) social media advertising, d) apps and notifications, e) on-site personalization; f) customization, g) price differentiation. The contributions of the paper are twofold: academic contribution relates to the systematization of the vast literature on PMC to identify the patterns of costs and benefits to set

initial further directions of research, and practical contribution relates to the development of roadmap on the consequences of each PMC tool implementation.

Costs and benefits of personalized marketing communication

With the rise of technology, the scientific literature identified the upcoming fundamental changes in the practice of marketing [Moon, 2000]. This was caused by the identification of the opportunities the technology may bring: through “a combination of computing, database, and network technology” [Moon, 2000, p. 323] there was a path beginning towards the companies’ incentives in building long-term, personalized relationships with the customers [Moon, 2000, Pine 1993; Schwartz 1997]. This understanding of the pivotal change in the marketing environment gave the foundation for the movement away from the mass production and broadcast marketing to relationship building and one-to-one marketing and personalization [Fournier 1998; Peppers, Rogers 1993, 1997; Moon, 2000, Javai et al., 2020].

Personalization as an umbrella term includes segmentation, targeting, customization, depending on data used and its initiator [Strycharz et al., 2019]. Three interfaces are mostly in use for personalized communications: web-site of the online retailer through the desktop browsers, mobile applications and wearable technology (such as smart watches) [Inman and Nikolova, 2017]. This variety is justified by the customers’ purchase habits and convenience.

Various aspects of marketing output can be personalized [Strycharz et al., 2019]: banners [Bang, Wojdyski, 2016], address lines [Maslowska et al., 2011], website content [Tam and Ho, 2005]. In contrast with the academic perspective, it is recognized that practitioners do not differentiate between the channels, they refer to seven techniques: a) online behavioral targeting, b) email marketing, c) social media advertising, d) apps and notifications, e) on-site personalisation; f) customization, g) price differentiation [Strycharz et al., 2019]. This paper is structured based on these categories. It is worth to mention that such approach of abandoning separate marketing channels in favor of more integrated digital marketing communication leads to the acceptance of consumers’ inclination to think in terms of convenience rather than the channels use [Manser Payne et al., 2017, Strycharz et al., 2019].

The analysis on the costs and benefits was theory-based, as 137 articles from the ABS list in the field of business and management were selected for in depth literature analysis for the development of the overview, presented at the Table 1 and highlighting most frequent and prevailing issues (based on the frequency of occurring and the nature of focus).

This chapter further defines the techniques and concludes with the developed overview of the costs and benefits of personalized marketing communications from the academic perspective.

1.1. Online behavioral targeting

Online behavioral targeting is defined as “adjusting advertisements to previous online surfing behavior” [Smit et al., 2014, p. 15]. The targeting is recognized as the beneficial option for the customer and one of the most investigated form of personalization in consumer research, however, the need of personal data for the better operations of targeting leads to their discomfort [Strycharz, 2019]. Online behavioral targeting has strong links with the online behavioral advertisement (OBA), which is known to be used for ad avoidance mitigation and advertising effects maximization [Baek and Morimoto, 2012; Van Doorn and Hoekstra, 2013; Smit et al., 2014]. Academic-based term OBA equals the term “automated personalization” used by the practitioners [Strycharz, 2019] as the simplest approach to personalization due to its facilitation only through customer prior behavior with the particular algorithms for personalized marketing communication.

1.2. Email marketing

Emails as the new type of mails to the individual customers research more than 20 years ago [Albaum, 1987] remains one of the most researched personalization channels [Postma and Brokke, 2002; Maslowska et al., 2011; Steinhoff et al., 2019]. Currently personalized emails are

considered to be the common practice or the standard procedure of company-customer communication [Strycharz et al., 2019], including the identification strategies, such as the newspapers by including certain information about the customer (either the recipient's name or, for example, the email with congratulations on birthday and the discount or present for the occasion). With the intention to achieve better open rates, practitioners confirm the emails become more advanced as not only the title but the content of the email undergoes the adaptation (personalization). Such personalization happens based on either customers' prior click behavior data or general demographical data [Strycharz et al., 2019].

1.3. Social Media Advertising

Apart from the presence of the companies as the page or group on the social network, the social media allows to gather the objective data that refers to the public data and metadata (tags, comments, explicit personal relationships) to gain more information about the users and get better understanding of the target audience [Guy et al., 2010; Strycharz et al., 2019]. Therefore, the core operations in the social media are based on targeting and suit better the targeting intentions being displayed as customers visit the social media for purposeless browsing [Strycharz et al., 2019].

1.4. Apps and Notifications

With the emergence of technology, the most recent personalization interfaces are getting attention in the consumer context research [Inman and Nikolova, 2017]. The mobile application availability helps customers to increase their loyalty to the particular retailer, additionally, applications increase customers' trust [Ozturk et al., 2017]. One of important aspect of mobile applications relate to the in-app notifications. Even though it could be considered convenient for the customer, there is strong evidence towards strong reactance of the customers towards such notifications: customers consider them too private and intrusive [Strycharz et al., 2019].

1.5. On-site personalization

On-site personalization is also known as “web-morphing” and is defined as “inferring latent customer segments from clickstreams and then changing websites' look and feel to maximize revenue” [Hauser et al., 2014]. Each visitor will see slightly different appearance of the web-site depending on the priorly collected data as well as particular demographic and geographical aspects [Tam and Ho, 2005]. On-site personalization relates to the adaptation of certain parts of the web-site to meet the needs and profile of the customer. Such changes include the identification of customer location (city, country), appropriate currency, appropriate clothing sizes and personal recommendations of different filtering types and framings [Gai, Klesse, 2019].

1.6. Customization

Even though general academic literature refers to personalization process without direct involvement of the customer, certain research and numerous practitioners emphasize the importance of giving the customers the option of change the web-sited based on their needs and preferences [Nunes and Kambil, 2001; Barnes and Vidgen, 2003; Pang et al., 2018]. Such options include changes in parameters, filters, all the aspects considered to be self-driven personalization. Major customization options relate to the customer profile (age, location, preferences), which allows further the algorithms to adapt the business offerings to the customers' interests [Strycharz et al., 2019]. Moreover, the web-site remains adapted to the needs and settings of the customer for their next visit to avoid repetition of customer profile setting.

1.7. Price Differentiation

Price differentiation is less discussed topic as it refers not to the product or service but its price [Strycharz et al., 2019]. According to [Rust et al., 2017], dynamic pricing influences customers' demand on particular goods and services. Such approach relates to particular aspects on the online retailer interfaces in the form of recommendations framed as “good bargain” or “good sell”. Additionally, it is worth mentioning that dynamic prices may also relate to the geographical location of the customer, meaning that the price changes are based on the average prices of the customer location.

1.8. Development of the overview of the personalized marketing communication costs and benefits from the academic perspective

Following the PMC techniques listed in this paper as the categorization, the overview based on the literature is presented at the Table 1. It begins with the overview of the general concerns, when the use of personalization and personalized marketing communication is addressed. Further, the analysis is broken down according to the introduced framework with the full description of the issue to ensure the clarity of the overview.

Conclusions, Limitations and Future Directions

Personalization has many faces [Vesanen, 2007], and this paper confirms this statement. Rooted in the theoretical analysis, benefits and costs of personalization and framed by the practice-rooted personalization techniques developed by [Strycharz et al., 2019], this research enriched current literature in several ways.

This paper expands and systematizes the costs and benefits of personalization and its techniques from customer and business perspectives. Having the potential for further development, the systematization in this paper provides the nature of mitigation and facilitation for the use of personalization and personalized marketing communication.

According to the Table 1, there is high variety of benefits and costs per each personalization technique, therefore, it is quite expected that companies utilize not particular channels but the general techniques, which unify the channels. The costs and benefits therefore will be cumulative as the result of the overall personalization techniques used by the online retailer.

Regardless of the contributions of this paper, it has certain limitations. The foundation of this article relates to the limited amount of personalization techniques, therefore, the expansion of the list of the techniques would benefit the further exploration of the topic. Additionally, the selected sector is retail – if tested on financial or streaming platforms, the results could be different due to different type of communication.

The expansion of the tools and channels analysis would also be beneficial, especially in regards of the chatbots. As predicted by [Moon 2000], the more human-like the computer (or the technology) behaves and construct the dialogue, the more successful it is in electing information form the customer. For the future, the ability to extract the intimate information about general customer attitudes may lead to the potential expansion of the knowledge on the customer's needs and inclinations [Moon 2000]. The inclusion of artificial intelligence also makes in interesting to follow the emerging trends [Huang, Rust, 2021].

Additional attention can be paid at the elements of the personalized marketing communication. As the images are processed at the higher speed than the text [Potter, Wyble, Hagmann, McCourt, 2014; Matz et al., 2019], they are also evoking the emotional and cognitive responses from customers [Lindgaard, Fernandes, Dudek, Brown, 2006] and images are also expected to be forming first impression [Matz et al., 2019]. In addition to that, research states the impact of images higher and faster than the reading and processing of the accompanying text [Lindgaard, Fernandes, Dudek, Brown, 2006]. Great impact in this regard relates to the understanding and predicting the image appeal, “How appealing is this image to the average consumer?” [Palmer, Schloss, Sammartino, 2013; Matz et al., 2019]. According to the literature,

the appeal of the image is strongly influenced by demographic variables, such as gender [Child, Hansen, Hornbeck, 1968; Hurlbert, Ling, 2007; Palmer, Schloss, 2011, Matz et al., 2019] and age [Matz et al., 2019, Child et al., 1968], however these limited parameters are not enough for more interesting classifications [Matz et al., 2019].

Research methodology for the analysis of customer preferences is changing with the emergence of the sources such digital footprints as “digital footprints such as the content of personal websites [Marcus, Machilek, Schutz, 2006], Facebook or Twitter profiles [Kosinski, Stillwell, Graepel, 2013; Youyou, Kosinski, Stillwell, 2014], or language used in social media [Park et al., 2014; Schwartz et al., 2013]” [Matz et al., 2019, p. 372].

To sum up, this paper followed its aim in developing the initial overview of PMC costs and benefits from the perspectives of customers and business to structure the available academic knowledge and set the grounds for the following steps: a) the frequency-based analysis of the availability and functioning of 8 PMC on the businesses’ web-sites, apps and wearable technology; b) the semi-structured interviews with the business representatives in online retail, and c) surveys and objective tracking data to learn the points of view of the customers. By following these steps, the broad goal of this research in limiting the academician-practitioners divide in marketing will be accomplished.

Acknowledgement

This research has been conducted with financial support from Saint Petersburg State University, grant ID 77098515 («PERSOGRAPHICS: Typologizing personalization in the context of AI solutions in online retail»).

Table 1. Overview of the personalized marketing communication costs and benefits from the academic perspective

PERSONALIZATION TECHNIQUES	PERSPECTIVE	BENEFITS	COSTS/RISKS
General	Customer	<ul style="list-style-type: none"> • Better preference match [Vesanen, 2007] • Better service [Vesanen, 2007] • Better communication [Vesanen, 2007] • Better experience [Vesanen, 2007] • Expectation of economic benefits from PMC (coupons, discounts, vouchers) [Zhu et al., 2017] 	<ul style="list-style-type: none"> • Privacy risks: fear of their personal data to be sold to the third parties, Spam risks [Vesanen, 2007] • Perceived privacy costs and risks [Aguirre et al., 2015] • Increased processing costs for looking through all the messages [Krishnamurthy, 2001] • Feeling of being followed, personalization based on prior experience is considered to be “creepy” [Schade et al., 2017; Krafft et al., 2017, McDonald and Cranor, 2010]
	Business	<ul style="list-style-type: none"> • Development of better understanding of customer knowledge and needs [Strycharz et al., 2019] • Higher/better response rates [Vesanen, 2007] • Differentiation from competition [Vesanen, 2007] • Higher persuasive impact on customer [Wind and Rangaswamy, 2001; Postma and Brokke, 2002; Baek and Morimoto, 2012; Strycharz et al., 2019] • Higher price from product/service [Vesanen, 2007] 	<ul style="list-style-type: none"> • Lack of common personalization framework, hence, risk of misunderstanding (ex., with the third party) [Strycharz et al., 2019] • Reactance to personalization due to customers’ lack of digital literacy and digital capabilities [Smit et al., 2014; Turow, 2015] • Rising negativity among customers leads to lower effectiveness of personalization and chilling effects [TRUSTe, 2016] • Limitation of online activities due to customers’ own concerns about their data [Strycharz et al., 2019] • Refraining from clicking on personalized ad [Strycharz et al., 2019]
Online behavioral targeting	Customer	<ul style="list-style-type: none"> • Reduction of customer’s time waste [Strycharz et al., 2019] 	
	Business	<ul style="list-style-type: none"> • Ad avoidance mitigation [Baek, Morimoto, 2012] • Maximization of advertising effects [Van Doorn and Hoekstra, 2013; Smit et al., 2014] • Reduction of organization’s time waste [Strycharz et al., 2019] 	
Email marketing	Customer		
	Business	<ul style="list-style-type: none"> • Positive effect on click-through rates [Postma, Brokke, 2002] • Improved open rates [Strycharz et al., 2019] 	<ul style="list-style-type: none"> • More advanced email personalization requires considerable financial resources [Strycharz et al., 2019]
Social Media Advertising	Customer		<ul style="list-style-type: none"> • Consumer reactance to highly personalized ad [Strycharz et al., 2019]
	Business	<ul style="list-style-type: none"> • Effectiveness in mitigating the ad skepticism and improving ad credibility [Tran, 2017] 	

		<ul style="list-style-type: none"> No substantial costs are required for targeting and data access [Strycharz et al., 2019] Comparatively low banner blindness [Strycharz et al., 2019] 	
Apps and Notifications	Customer		<ul style="list-style-type: none"> Increased privacy concerns due to perceived vulnerability to privacy intrusiveness [Gu et al., 2017] Considerable reactance towards the in-app notifications [Strycharz et al., 2019]
	Business	<ul style="list-style-type: none"> Positive influence on customer trust and loyalty [Ozturk et al., 2017] 	
On-site personalization	Customer	<ul style="list-style-type: none"> Better customer experience [Strycharz et al., 2019] 	
	Business	<ul style="list-style-type: none"> Emphasis on the increased direct sales due to the personalized content/product offering [Strycharz et al., 2019] Better customer experience leading to longer customer visits [Strycharz et al., 2019] Longer customer visits leading to the higher ROI [Strycharz et al., 2019] 	<ul style="list-style-type: none"> Very costly to the organization: technological and marketing costs [Wu et al., 2003]
Customization	Customer	<ul style="list-style-type: none"> Improvement of visitor's satisfaction [Barnes and Vidgen, 2003] and decreased consumer concerns [Strycharz et al., 2019] Reduction of time waste in non-relevant offerings scrolling [Strycharz et al., 2019] Customer is empowered to identify their preferences and get the offerings they want [Strycharz et al., 2019] 	
	Business	<ul style="list-style-type: none"> Opportunities for more active interaction with the customers [Pang et al., 2018] 	<ul style="list-style-type: none"> High amount of content is needed for full customization for various individuals [Strycharz et al., 2019] Not all customers are ready to engage in the customization process [Strycharz et al., 2019]
Price Differentiation	Customer		<ul style="list-style-type: none"> Feeling of discrimination based on the purchasing possibilities [Odlyzko, 2009]
	Business	<ul style="list-style-type: none"> Possibility to identify customers who show higher willingness to pay [Baker et al., 2001] Possibility to attract new customers to increase ROI [Strycharz et al., 2019] 	<ul style="list-style-type: none"> Not used frequently due to companies' fear of backlash from the customers [Odlyzko, 2009] Fear of the unlawful discrimination with this practice and lack of clarity on what data to use for the pricing [Strycharz et al., 2019]

Major references

- Aguirre, E., Mahr, D., Grewal, D., de Ruyter, K., Wetzels, M. 2015. Unraveling the personalization paradox: The effect of information collection and trust-building strategies on online advertisement effectiveness. *Journal of Retailing*, 91 (1): 34-49.
- Albaum, G. 1987. Do source and anonymity affect mail survey results? *Journal of the Academy of Marketing Science*, 15 (3): 74-81.
- Feld, S., Frenzen, H., Krafft, M., Peters, K., Verhoef, P.C. 2013. The effects of mailing design characteristics on direct mail campaign performance. *International Journal of Research in Marketing*, 30 (2): 143-159.
- Huang, M.-H., Rust, R.T. 2017. Technology-driven service strategy. *Journal of the Academy of Marketing Science*, 45 (6): 906-924.
- Inman, J.J., Nikolova, H. 2017. Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. *Journal of Retailing*, 93 (1): 7-28.
- Leeflang, P.S.H., Bijmolt, T.H.A., van Doorn, J., Hanssens, D.M., van Heerde, H.J., Verhoef, P.C., Wieringa, J.E. 2009. Creating lift versus building the base: Current trends in marketing dynamics. *International Journal of Research in Marketing*, 26 (1): 13-20.
- Liberali, G., Urban, G.L., Hauser, J.R. 2013. Competitive information, trust, brand consideration and sales: Two field experiments. *International Journal of Research in Marketing*, 30 (2): 101-113
- Matz, S.C., Segalin, C., Stillwell, D., Müller, S.R., Bos, M.W. 2019. Predicting the Personal Appeal of Marketing Images Using Computational Methods. *Journal of Consumer Psychology*, 29 (3): 370-390.
- Moon, Y. 2002. Personalization and personality: Some effects of customizing message style based on consumer personality. *Journal of Consumer Psychology*, 12 (4): 313-325.
- Pan, Y., Zhang, J.Q. 2011. Born Unequal: A Study of the Helpfulness of User-Generated Product Reviews. *Journal of Retailing*, 87 (4): 598-612.
- Strycharz, J., van Noort, G., Helberger, N., Smit, E. 2019. Contrasting perspectives – practitioner’s viewpoint on personalised marketing communication. *European Journal of Marketing*, 53 (4), pp. 635-660
- Zhang, J., Wedel, M. 2009. The effectiveness of customized promotions in online and offline stores. *Journal of Marketing Research*, 46 (2): 190-206.

Measuring Sustainable Consumption: the Results of Empirical Study of Russian Consumers

Olga Konnikova, Saint-Petersburg University of Economics (olga.a.konnikova@gmail.com)
Oksana Yuldasheva, Saint-Petersburg University of Economics (yuldasheva2006@yandex.ru),
Julia Solovjova, Saint-Petersburg University of Economics (solovjova@unecon.ru)

Abstract:

This paper is the result of longstanding research by the team of authors dedicated to sustainable consumption in Russia. Since the paper is submitted for the interactive session, it does not consider a theoretical review, but represents a description of the methodology and results of an empirical study of sustainable consumption in Russia. Using the methods of critical literature review, open card sorting and semi-structured expert interviews, the authors developed a construct for measuring sustainable consumption, the reliability of which was confirmed using exploratory and confirmatory factor analysis. Based on the developed construct, a quantitative empirical study of 3,500 respondents from all over Russia was carried out. The novelty of this study and the difference from the previous ones is that it analyzes in detail only consumers who already implement the concept of sustainable consumption in this or that way. As a result, four clusters of sustainable Russian consumers were identified: “Reasonable egoists”, “Beginning Sustainable Consumers”, “Social activists” and “Absolutely sustainable consumers”. The analysis of the obtained consumption models in IBM SSS AMOS made it possible to reveal the structure of the interconnections between the various components of sustainable consumption within the identified clusters.

Keywords: *sustainable consumption, consumer clustering, empirical research*

Research Methodology

A quantitative empirical study of sustainable consumption patterns in Russia was carried out in June - August 2019.

The total sample size was 3496 respondents, the sampling method was deterministic, according to the "snowball" principle, the data collection method was an Internet survey.

The goals of the quantitative empirical study were as follows:

- to assess the level of awareness of Russians about the concept of sustainable consumption in general and its individual components.
- to assess the level of implementation by Russians of the concept of sustainable consumption in general and its individual components.
- to identify possible clusters of consumers in relation to the peculiarities of the implementation of the concept of sustainable consumption.

To achieve these goals, the authors created a questionnaire based on their own developed construct that measures sustainable consumption.

To develop this construct, the following stages were carried out:

Stage 1: Based on the analysis of literature on sustainable development, sustainable consumer behavior and sustainable consumption, the authors formulated 104 statements describing various aspects of sustainable consumption.

Stage 2: For a preliminary estimation of the number of sustainable consumption components, the Open Card Sorting method was chosen, during which participants sorted the index cards into logical groups and created their own names for the new categories. This procedure was performed by 14 respondents (9 women, 5 men, average age 32.1 years), which led to the formation of 4-9 groups (on average 7) with the following categories (labels): healthy eating, physical activity, health care, choice sustainable products, reuse, and recycling, limiting consumption, receiving, and transmitting information about sustainable development.

Stage 3: 23 Semi-structured interviews with experts in the field of healthy lifestyle (wellness) were conducted to assess the formed groups and statements within the groups. Experts were leaders of companies involved in sustainability reporting; bloggers raising sustainability issues; representatives of NGO working in the field of sustainable development.

As a result, the authors have developed a research construct that includes three components: reasonable consumption (3 generating factors, described by 10 variables); socially responsible consumption (4 factors and 24 variables); information culture and information consumption (2 factors and 13 variables).

Stage 4: To check the reliability of the developed construct, the authors carried out a quantitative study using the Internet survey method, the results were processed using exploratory and confirmatory factor analysis in IBM SPSS, and Amos IBM SPSS software (see Fig. 1).

Exploratory factor analysis		Confirmatory factor analysis: Converged reliability (AVE, CR)	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO).	,936	Factor 1. Ecological behavior (AVE = .75, CR = .92)	
Bartlett's Test of Sphericity	Approx. Chi-Square	Factor 2. Declared values (AVE = .71, CR = .83)	
	Df	Factor 3. Healthy eating (AVE = 0,72, CR = 0,80)	
	Sig.	Factor 4. Physical activity (AVE = 0,62, CR = 0,74)	
		Factor 5. Limiting content consumption (AVE = .66, CR = .75)	
		Factor 6. Cost reduction (AVE = .49, CR = .61)	
		Factor 7. Medical diagnostics (AVE = .59, CR = .76)	
Cronbach's Alpha			
,922			
Total variance explained - 60,25%			

Figure 1 – Results of construct reliability checking

The analysis showed a high degree of reliability of the developed construct, the final version of which is shown in Fig. 2.

			Declared values	Real behavior
Sustainable consumption	Reasonable consumption	<ul style="list-style-type: none"> - healthy food - physical activity - preventive examinations 	3 statements	7 statements
	Socially responsible consumption	<ul style="list-style-type: none"> - consumption limitation - reuse and recycling - consuming green (organic) products and services - participation in social and environmental events 	10 statements	14 statements
	Information culture and information consumption	<ul style="list-style-type: none"> - content consumption - content generation 	5 statements	8 statements

Figure 2 - Construct for measuring sustainable consumption

To further realizing the research objectives (assessing the level of awareness of the concept of sustainable consumption, assessing the level of implementation of this concept, and especially for the subsequent clustering of respondents), the questionnaire also included questions describing the geographic and demographic characteristics of the sample (gender, age, income level, city of residence, level of education and main occupation), as well as psychographic and behavioral characteristics (15 statements on the Likert-type scale). The description of the final sample (3496 respondents) is presented in table. 1.

Table 1 - Brief description of the quantitative study sample

Gender	Female – 56%, Male – 44%
Age	Under 25 – 45%, From 26 to 45 – 28%, Older than 46 – 27%
Income	100% of income is spent on priority expenses and payments – 17%, 80% of income is spent on priority expenses and payments – 28%, 50% of income is spent on priority expenses and payments – 33%, Less than 30% of income is spent on priority expenses and payments – 22%
City of residence	Saint-Petersburg – 45%, Moscow – 4%, Cities with a population of 1 mln or more - 10%, Cities with a population of less than 1 mln. – 41%
Level of education	higher – 51%, lower than higher – 49%
Occupation	workers – 20% managers – 14% students / pupils – 36% retired – 10% self-employed – 10% other – 8%

Data processing was carried out using the IBM SPSS and IBM SPSS AMOS software according to the following plan:

1. Exclusion from further analysis the consumers who do not implement the concept of sustainable consumption. According to fig. 2, 47 statements were included in the questionnaire assessing various aspects of consumer sustainability. Statements were rated on a 5-point Likert scale. The respondents who rated all statements as 3 or less were excluded from further research as unsustainable consumers (9.75% of the total sample turned out to be such consumers). Although the analysis of unsustainable consumers may also be of research interest, they were not included in further processing within this study.

2. Carrying out cluster analysis and description of the resulting clusters by the method of hierarchical clusterisation.

3. Carrying out correlation and regression analysis between the variables within the identified clusters to describe the characteristics of the behavior of the representatives of each of them. The consistency of the models was checked using PCMIN / DF (criterion value did not exceed 2); GFI (criterion value not less than 0.95); AGFI (criterion value did not exceed GFI); CFI (criterion value not less than 0.95); RMSEA (criterion value less than 0.05); PCLOSE (criterion value more than 0.5).

Research Results

Based on the results of processing the results of quantitative empirical research, the following resulting clusters were obtained:

Cluster 1 - "Reasonable egoists" (41.4% of the number of respondents implementing sustainable consumption and 37.2% of the total sample).

This cluster is characterized by a tendency to selfishness, the main self-identification can be formulated as follows: "I am leading a healthy lifestyle" and "I must be healthy." They formulate the main problem in the study area as "Excessive consumption is harmful to my health." These consumers not only demonstrate a high level of awareness of proper nutrition, exercise, and medical diagnostics, but they really choose products that cause less harm to their bodies, eat well, exercise regularly and undergo regular medical examinations. However, their consumption cannot be called socially oriented, since the representatives of the cluster practically do not perform actions related to this type of consumption. All their choices related to sustainable consumption are primarily aimed at benefiting themselves, and the benefits to the environment and society are not their primary concern.

Testing "Reasonable egoists" cluster in IBM SPSS AMOS showed the following significant correlations and regression relationships:

- awareness of proper nutrition and awareness of physical activity (0.56).
- selection of information sources and limitation of consumed information (0.66).
- awareness of medical diagnostics affects the passage of regular medical diagnostics (0.55).

Cluster 2 - "Beginning sustainable consumers" (31% of respondents implementing sustainable consumption and 27.9% of the total number of respondents).

Representatives of this cluster are characterized by a combination of egoistic and altruistic values, the presence of critical thinking. Subjective norms for them can be formulated as follows: "We probably harm the environment." When choosing from possible alternatives, these consumers try to choose energy-saving products, products that are less harmful to the environment, organic products, products with eco-packaging, products of "green" brands. A characteristic feature of this cluster is that its representatives are only at the beginning of their path towards sustainable consumption, they do not yet have enough reliable information, are easily influenced by such barriers as high prices and insufficient infrastructure, they can easily be deceived by the concept "greenwashing". Due to their limited experience, they do not publicly express their ideas about healthy lifestyles and support for environmental protection. Nevertheless, in the case of systematic work with representatives of this cluster on the part of interested stakeholders, they are able to become much more sustainable consumers in a short time, since they have the primary impulse, desire, interest and opportunities for this.

Testing "Beginning sustainable consumers" cluster in IBM SPSS AMOS showed the following significant correlations and regression relationships:

- awareness of companies leading sustainable development and awareness of the differences between eco-products (0.57).
- awareness of medical diagnostics affects the passage of regular medical diagnostics (0.53).

Cluster 3 - "Social activists" (12.5% of the number of respondents implementing sustainable consumption and 11.2% of the total number of respondents).

Representatives of this cluster are characterized by an active lifestyle, a combination of altruistic and selfish values. Their main feature is that they are well aware of healthy lifestyle concept, as well as channels for public expression of ideas on the concept of sustainable consumption, and they themselves publicly express ideas in support of healthy lifestyle and environmental protection. However, the actual implementation of the concept of sustainable consumption among these consumers lags far behind the declared one: in fact, the representatives of this cluster publicly propagate what they themselves do not follow.

Testing “Social activists” cluster in IBM SPSS AMOS showed the following significant correlations:

- awareness of proper nutrition and awareness of physical activity (0.64).
- desire to learn new and many hobbies (0.51).

Cluster 4 - “Absolutely Sustainable Consumers” (15.1% of the number of respondents implementing sustainable consumption and 13.6% of the total number of respondents).

Consumers belonging to this cluster lead an active lifestyle, have a high level of critical thinking, as well as a high level of altruism (more than representatives of all other clusters). They are well characterized by statements such as “Current global consumption is badly damaging to the environment” and “All people must consume sustainably”. They not only implement all the analyzed components of sustainable consumption (such as the choice of products that are less harmful to the environment, the purchase of organic products, products with eco-packaging, the purchase of “green”, sustainable brands), but they are also ready to boycott companies that harm the environment. The basis of their self-identification can be described as follows: "I can help others to switch to sustainable consumption." Representatives of this cluster publicly express ideas in support of healthy lifestyle and environmental protection, but at the same time they themselves demonstrate sustainable consumption (even in the selection of information sources, they deliberately limit the amount of information consumed, and prefer official sources of information).

Testing “Absolutely Sustainable Consumers” cluster in IBM SPSS AMOS showed the following significant correlations and regression relationships:

- awareness of proper nutrition and awareness of physical activity (0.62).
- public expression of ideas about healthy lifestyle and public expression of ideas in support of environmental protection (0.69).
- preference for brands that implement the concept of sustainable development affects the conscious restriction of consumption in order to care for the environment (0.51).

Interesting results were shown by testing the hypothesis about the relationship between the respondent’s income level and his or her belonging to a particular cluster. This hypothesis was not confirmed: when conducting ANOVA test, in which the independent variable was the level of income, and the dependent variable was belonging to one of the four identified clusters, the level of significance of all pairs of multiple comparisons when conducting a posteriori tests turned out to be more than 5%, which proves lack of connection between the indicator of the respondent's income and the peculiarities of his implementation of the concept of sustainable consumption.

The limitations of this research are the low average age, namely, that 60% of the sample are respondents under the age of 35, and 45% of respondents live in St. Petersburg.

In the future, regular studies are planned to monitor the dynamics of clusters and the emergence of new clusters. Also, the authors of this study intend to compile an integrated index of sustainable consumption and use this index for international comparative studies. Another no less interesting direction for the further development of this study is a more detailed study of information culture as a component of sustainable behavior.

References

- Barnett, C., Cloke, P., Clarke, N., & Malpass, A. (2005). Consuming ethics: Articulating the subjects and spaces of ethical consumption. *Antipode*, 37(1), 23–45. <https://doi.org/10.1111/j.0066-4812.2005.00472.x>
- Belz, F–M., Peattie, K. (2009). *Sustainability Marketing: A Global Perspective*. Wiley.
- Buğday, E. & Babaoğul, M. (2016). Conscious consumer scale: the study of validity and reliability. *Asian Journal of Social Sciences & Humanities*, 5(2), 119-143
- Campbell, C. (2006) *Considering others and satisfying the self: the moral and ethical considerations of modern consumptions*. The moralization of the markets by Nico Stehr, New York.

- Chkoniya, V., Madsen, A. O., & Bukhrashvili, P. (2020). Anthropological approaches to understanding consumption patterns and consumer behavior. IGI Global. <https://www.igi-global.com/book/anthropological-approaches-understanding-consumption-patterns/240165>.
- Datschefskey E. (June 1999, Revised October 2002) Sustainable Products: Using Nature's cyclic /solar /safe Protocol for Design, Manufacturing and Procurement. BioThinking International. http://www.biobiothinking.com/sustainable_products1.pdf
- Delai, I., & Takahashi, S. (2013). Corporate sustainability in emerging MARKETS: Insights from the Practices reported by the Brazilian retailers. *Journal of Cleaner Production*, 47, 211–221. <https://doi.org/10.1016/j.jclepro.2012.12.029>
- Hirschman, E.C., & Holbrook M. B. (1982). Hedonic Consumption: Emerging Concepts, Methods and Propositions. *Journal of Marketing*, 46, 3, 92-101.
- Jones, C. I. (2009, November 25). Consumption. Read consumption2009-11-25.pdf. <http://www.readbag.com/stanford-chadj-consumption2009-11-25>.
- Khalina, E.V., Solovjova, J.N., Yuldasheva, O.U., Pogrebova, O.A. (2017) Values of sustainable development in consumer behavior: Case of Russia. *Espacios*, 38(54), 21.
- Konnikova, O.A., Yuldasheva, O.U., Solovjova, J.N., Shubaeva, V.G. (2019) Consumer behavior on the Russian wellness market: Results of empirical study. *Academy of Strategic Management Journal*, 18(6), 1–15.
- Kronenberg, J. (2007). Making consumption “reasonable.” *Journal of Cleaner Production*, 15(6), 557–566. <https://doi.org/10.1016/j.jclepro.2006.05.012>
- Manning, C. (Sept. 2009). The psychology of Sustainable behavior. <https://www.pca.state.mn.us/sites/default/files/p-ee1-01.pdf>.
- McKenzie-Mohr, D. (1996). Promoting a sustainable future: An introduction to community-based social marketing. Ottawa, Ontario, Canada: National Round Table on the Environment and the Economy.
- McKenzie-Mohr, D., & Smith, W. (1999). Fostering sustainable behavior: An introduction to community-based social marketing (2nd ed.). Gabriola Island, British Columbia, Canada: New Society.
- Mohr, L., Webb, D. J., & Harris, K. E. (2001). Do consumers expect companies to be socially responsible? The impact of corporate social responsibility on buying behavior. *Journal of Consumer Affairs*, 35(1), 45–72. <https://doi.org/10.1111/j.1745-6606.2001.tb00102.x>
- Praude, V., & Bormane, S. (2021). Sustainable marketing – prospects and challenges under present economy. *Regional Formation and Development Studies*, 11(3), 165–176. <https://doi.org/10.15181/rfds.v11i3.619>
- Quoquab, F., & Mohammad, J. (2016). Sustainable consumption: Sacrificing for the future. *Procedia - Social and Behavioral Sciences*, 224, 599–604. <https://doi.org/10.1016/j.sbspro.2016.05.449>
- Sheth, J. N., Sethia, N. K., & Srinivas, S. (2010). Mindful consumption: A customer-centric approach to sustainability. *Journal of the Academy of Marketing Science*, 39(1), 21–39. <https://doi.org/10.1007/s11747-010-0216-3>
- Yuldasheva, O. (2005) Cognitive Marketing: promotion of consumption standards. Saint-Petersburg, SPbSUE (UNECON).

Operations Management and Business Informatics

Platform Solution Project for Interdisciplinary Project Teams Building on Cognitive Style Basis

Evgeny Blagov, St. Petersburg State University's Graduate School of Management (blagove@gsom.spbu.ru), Dmitry Eroshkin, Forward Creative Agency

Abstract:

The paper is describing a project of a platform for online teambuilding of distributed multidisciplinary project teams using the algorithm matching the following parameters:

a) the characteristics of problems suggested by the problem owners:

a1. Overall uncertainty of the Problem;

a2. technological uncertainty of the Problem;

a3. human-related uncertainty of the Problem;

a4. architectural innovation necessity for Problem solving;

a5. modular innovation necessity for Problem solving;

b) problem solvers' (team members') team roles;

c) cognitive styles backing the team roles:

c1. field dependence/independence;

c2. equivalence range width;

c3. impulsivity/reflexivity.

The developed algorithm is aimed to complement the multidisciplinary distributed project teams building based on matching the problem nature with the hard skills of the team members, thus increasing the effectiveness and efficiency of the teamwork by increasing the team's psychological synergy.

In addition to describing the methodology, in the paper actuality of the project (based, e.g., on methodological gaps in existing distributed teambuilding platforms) is shown, on the basis of which the projected platform's business model, variables and formulae of the algorithm, and the project's limitations and further development directions are discussed.

Keywords: *Team building, cognitive styles, team roles, online problem solving*

1. Literature review.

Distant and distributed working forms have undergone gradual development within several last decades in parallel with the development of information and telecommunication technologies. However, the forced onlinezation caused by the CoViD-19 pandemic significantly increased the pace and depth of implementation of such forms of work into various industries and spheres of life. Due to the increasingly open and ecosystemic nature of innovation in the incoming era of the 4th Industrial Revolution (Yoon et al., 2018; Costa, Matias, 2020; McPhillips, 2020), special demand, especially in innovation intensive high technology industries (Kurikka, 2017; Lee et al., 2018; Portuguese Castro, Ross Scheede & Gómez Zermeño, 2019) as well as in education, especially higher education with developed university-industry collaboration institutions (Oke & Fernandes, 2020; Costa, Neves, Reis, 2021; Segundo et al., 2021) has risen for distributed teamwork online services, preferably having functionality of distributed multidisciplinary project teams creation and acceleration (Mancl & Fraser, 2020; Rho, Lee & Makkonen, 2020; NicCanna et al., 2021).

Main principles of such services functioning (to give a few examples – e.g., “Professionals 4.0”, or, to a bit least extent, “Innocentive”) are usually based on synergy of hard skills (professional knowledge and competences) and individual soft skills (Beltagui, Sesis & Stylos, 2021; Modaresnezhad et al., 2021).

However, successful teambuilding, especially of distributed teams, does also require synergy of team roles and psychological traits underlying them (Olaniran, 2017; Du et al., 2019; Seshadri & Elangovan, 2019), creating what could be called “collective” or “group soft skills”.

Thus, a gap in existing services lies in taking into account variables that can underlie such synergy.

A project described in the current paper is oriented on closing this gap by creating a service for building distributed multidisciplinary project teams having such team roles and psychological traits synergy.

What variables can be taken into consideration designing the algorithms of creating such teams and supporting their activity?

Obviously, when speaking about team synergy, the first thing to discuss are the team roles.

Among the various team roles classification, one of the most suitable for distributed teams is discussed in literature to be Belbin’s classification (Hosseini, Akhavan, 2017; Bolton, 2020; Lee, Smith & Chen, 2020).

However, Belbin’s roles, although considerably accurately describing team behavior, are having situational nature, i.e., one and the same person can take on different roles depending from the situation. Thus, to develop a viable role-based methodology of distributed teams building it is necessary to take into consideration both the situations characteristics influencing the roles manifestation, and the situation characteristics influenced psychological traits underlying the roles and their situation-dependent change.

As the developed project is oriented on creating project teams for solving problems, it has been decided that such “situation characteristics” should give possibility to compare problems of maximally various nature, so the characteristics shall be as abstract and “high-level” as possible.

Following this requirement, among these “high-level” characteristics such had been chosen as, first of all, the overall level of uncertainty related to the problem, conceptually following the Williamsonian idea of transaction and asset related uncertainty as key factor of transaction design (Williamson, 1991; Bylund & McCaffrey, 2017; Geiger, Danner-Schröder & Kremser, 2020) and this idea’s implication for knowledge management as a pivot of solving technological as well as organizational innovation problems (Popov, Simonova & Maksymchik, 2018; Baronian, 2020; Spender, 2021).

In addition to the overall uncertainty of the problem, also such types of uncertainty are included as separate parameters as technical (Fixson, Khachatryan & Lee, 2017; Lasso et al., 2020) and human (Blagov & Anand, 2020; Durana et al., 2020; Liu, Feng & Wang, 2020) nature uncertainty, because these types of uncertainty are different in a fundamental trait of subjectivity of human objects (making them able to deliberately counteract any treatment, e.g., to give desired answers or in other ways deliberately deceive and mislead the researcher) absent in the inanimate natural as well as technical ones (Bodas Freitas & Fontana, 2018; Lioliou & Willcocks, 2019; Alvarez, Porac, 2020).

Finally, as any problem can be treated as a system consisting from elements and linkages between these elements, such characteristics are included as possibility to solve the problem through change of some system’s architecture (in the other words, by “architectural innovations”) (Galunic & Eisenhardt, 2001; Han, 2017; Ngalim, 2020) or change in system elements (in other words, by “modular innovations”) (Carayannopoulos, 2017; Mao, Li & Guo, 2020; Naik, Fritzsche & Moeslein, 2021).

Considering the psychological parameters that can reflect factors underlying the team roles, it has been decided to use parameters unrelated to collective interactions and having personal nature; from various factors of such type several cognitive styles have been chosen, reflecting, from one side, deep neurophysiological characteristics of a person, while from another side, described in literature as having managerial applications due to influencing problem solving parameters (Lapp, Jablockow & McComb, 2019; Volk, Pearsall, Christian & Becker, 2017).

Namely, the following cognitive styles have been chosen.

The obvious first candidate is the field dependence/ independence, about which there is considerably extensional evidence of influence on solving a wide array of problems from strategic managerial decision making to specific problems like developing subject area ontologies and knowledge maps (Lu, Lin, 2018; Sholahuddin, Yuanita & Supardi, 2018; Chen, Zhao & Li, 2019).

Another candidate is the equivalence range width, also described as influencer of problem categorization and further solving capabilities on strategic, operational and tactical level (Gavrilova et al., 2013; Briones & Benham, 2017; Kostiuichenko, Dykhnych & Cristóvão, 2021).

Finally, such cognitive style had been chosen for adding into a model as impulsivity/reflexivity, also having influence on problem solving, mainly, peculiarities of managerial decisions making (Wiklund, Yu & Patzelt, 2018; Sipovskaya, 2019; Kotova & Pisarev, 2021) and obviously correlating with differences in organizational behavior between holders of various Belbin's roles (Aggarwal et al., 2019; Male, Marinelli & Kim, 2019; Belousova, Kozhukhar & Efremova, 2021).

What is also good in cognitive styles – and what did, thus, also influence on the decision to add these into the model – is that due to their psychological generality and, thus, distractedness from specific practice of teamwork, managerial decision making or technological problem solving, the tests for cognitive styles (at least, the ones included into the model) are having low risk of the respondents giving “desired answers” to the tests (Agoestanto & Sukestiyarno, 2019; Bendall et al., 2019; Viator et al., 2020), thus increasing the tests accuracy and, thus, predicting power of the model and resulting problem solving teams effectiveness and efficiency.

In the developed platform project two described categories are used to form algorithms for problem and solver characteristics matching, thus enabling building teams with maximal psychological synergy between the solvers and the problem, leading to increased effectiveness and efficiency of the problem solving.

2. Platform business model.

A developed product is based on the multi-sided platform business model, thus by definition having several (Gandia & Parmentier, 2017; Yablonsky, 2018; Bivona & Cosenz, 2021), in this case – two user sides: Problem Owners (e.g., representatives of various industry companies – roughly speaking, Clients) and Problem Solvers (e.g., young talents in search for part-time work and records in the resume). The Solvers during the process of registration on the platform describe their professional competences and undergo a battery of tests, mainly based on the Belbin team role tests and the tests for the cognitive styles. Problem Owners, in their turn, formulate the problems, among sets of problem description questions answering these related to the variables described above.

As a result of matching the problem description with the solvers base, platform algorithms form the teams optimally adjusted for solving specific problems, thus allowing each of the team members to maximally effectively manifest their knowledge, skills and competences, thus assuring maximally effective and efficient work of the team as a whole.

The Solvers are registering on the Platform and using it for free, as the key factor of the Platform's successful functioning is reaching a size of the installed base of solvers enough for enabling the algorithms to choose between various candidates for formation of one team (that is a considerably typical trait of the platform business models, leading to free registration and usage of at least one side (Stummer, Kundisch & Decker, 2018; Fujii & Tsujimoto, 2021; Schmidt et al., 2021), and a typical source of vulnerability of the model (Brillinger et al., 2020; Presenza, Panniello & Messeni Petruzzelli, 2021).

The Problem Owners are the side that pays for using the Platform; they are paying for it in two stages. Firstly, they pay for subscription to the Platform, thus getting ability to upload the problems description to the system. Then the algorithms create a problem solving team, that solves the problem; when this is done, the Problem Owner is paying for its solving (with the

amount paid depending on the problem volume), thus generating remuneration both for the Platform and the Solvers.

3. Variables and formulae of the Platform algorithms.

3.1. Variables.

As the Platform, as is described above, performs matching of the Problem Owners and Solvers, the matching algorithm has two input categories, namely – characteristics of the Problem and of the Solvers.

The characteristics of the Problem include:

- a1. Overall uncertainty of the Problem;
- a2. technological uncertainty of the Problem;
- a3. human-related uncertainty of the Problem;
- a4. architectural innovation necessity for Problem solving;
- a5. modular innovation necessity for Problem solving.

The characteristics of the Problem Solver, in their turn, include:

- b) problem solvers' (team members') team roles;
- c) cognitive styles backing the team roles:
 - c1. field dependence/ independence;
 - c2. equivalence range width;
 - c3. impulsivity/ reflexivity.

3.2. Formulae.

The above-described variables are used in an algorithm counting particular Solver's overall fitness for the problem solving team ("Fitness for the team - total" (FTT)) as a sum of results of tests for the team role (FTT_r), field dependence/independence (FTT_f), equivalence range width (FTT_e) and impulsivity/reflexivity (FTT_i).

The test results are counted in the following way.

Firstly, the Solvers are undergoing the test for team roles, roughly based on and developing the Belbin team roles classification.

Then the obtained roles are compared with the characteristics of the problem in such a way that the FTT_r for each role is the multiplication of the problem characteristic values (assessed, in their turn, by the Problem Owners on the 0...100 scale) by coefficients reflecting the role fitness for solving problems of various types.

(For development of such coefficients, the authors are currently undertaking series of tests on various audiences comparing their capabilities of solving problems with the results of tests on team roles and cognitive styles. In particular, such tests have been undertaken by the authors within their class on the Archipelago 2121 educational intensive in July 2021, and now the tests are being held on the audience of students of a number of Universities; for getting accurate enough coefficient predictions, surely, a statistically significant sample of respondents shall be reached, that is not yet the case, so for the current stage of the research – and, thus, of the product development – specific coefficient values are not given).

The respective formulae, thus, have a following general form (if we denote overall problem uncertainty as U_o , technological uncertainty as U_t , human-related uncertainty as U_h , architectural innovations necessity as I_a and modular innovations necessity as I_m):

$$FTT_r = x_1 U_o - x_2 U_t - x_3 U_h + x_4 I_a + x_5 I_m$$

Values of FTT_f , FTT_e и FTT_i are counted as sums of problem characteristic values multiplied by the values of the cognitive style parameter and the coefficients reflecting... being developed...

Let us give the example of such formulae for the FTT_f :

$$FTT_f = x_1 U_o f + x_2 U_t f + x_3 U_h f + x_4 I_a f + x_5 I_m f$$

Values of the FTT_e and FTT_i are counted analogously.

4. Limitations and further research development directions.

The project is currently on the stage of development of technical requirements to the prototype. Thus, both the Platform business model and the algorithm formulae coefficients, when these would be developed on the basis of analysis of the above-described respective empirical research, require empirical testing. In the case of unsatisfactory results of application of the developed algorithm it can be complemented by introduction of additional variables. The first candidate for such variables seems to be these of the MBTI model, also widely used in teambuilding for innovation problem solving (Alberola et al., 2019; Latorre & Suárez, 2017; Calefato, Lanubile & Vasilescu, 2019).

Regarding the characteristics of the problem, deeper analysis of its uncertainty can be introduced, possibly including variables describing uncertainty not only in parameters of the problem and its solving methods, but in required time (Chiadamrong & Piyathanavong, 2017; Tchernykh et al., 2021) and production as well as transaction costs (Brito et al., 2017; Latusek & Vlaar, 2018; Foss & Jensen, 2019).

The business model and prototype functionality would be checked in the series of the A/B tests.

In case of low viability of the business model of the platform as a product itself, the developed matching algorithms or its parts (characteristics of the Problem and the Solver) can be integrated into other products. Namely, it seems prospective to integrate either both components or one of them into such sweepingly growing segments of educational technology markets as:

- services for personalized educational products and trajectories construction (Sorokina, 2018; Bystritskaya et al., 2020; Bekmanova et al., 2021), including these for life-long learning (where the psychological tests must be regularly retaken with possibility of the developed trajectories dynamic adaptation to the changed test results, as the personal psychological profiles tend to evolve during the course of the lifetime (Milhaleva, 2020; Shishkova, Kozhevnikova & Starovoytova, 2020);

- constructors of flexible curricula and syllabi as elements of architecture of an educational program, taking into account the dynamically evolving interests of such stakeholders as the students (for whose characteristics psychological profiling (with team roles as its especially actual element in contemporary network-based world) could be an additional input (Tengberg, 2018; Bourekache, Kazar & Abik, 2020; Jhang, 2020)) and administration of the educational institution following the regulations around educational standards and competences, reality beyond which can also to an extent be reflected by the uncertainty characteristics based on these described in the current paper (Landorf, 2017; Fahrman et al., 2020).

References

- Aggarwal, I., Woolley, A. W., Chabris, C. F., & Malone, T. W. (2019). The impact of cognitive style diversity on implicit learning in teams. *Frontiers in psychology*, *10*, 112. <https://doi.org/10.3389/fpsyg.2019.00112>
- Agoestanto, A., & Sukestiyarno, Y. L. (2019). The Position and Causes of Students Errors in Algebraic Thinking Based on Cognitive Style. *International Journal of Instruction*, *12*(1), 1431-1444. <https://doi.org/10.29333/iji.2019.12191a>
- Alberola, J. M., Sanchez-Anguix, V., Del Val, E., Palomares-Chust, A., & Teruel, M. D. (2019). Team Formation Strategies in Higher Education. In *INTED2019 Proceedings: 13th International Technology, Education and Development Conference* (pp. 11-13). <https://doi.org/10.21125/inted.2019.0955>

- Aryan, V., Bertling, J., & Liedtke, C. (2021). Topology, typology, and dynamics of commons-based peer production: On platforms, actors, and innovation in the maker movement. *Creativity and innovation management*, 30(1), 63-79. <https://doi.org/10.1111/caim.12392>
- Baronian, L. (2020). Digital platforms and the nature of the firm. *Journal of economic issues*, 54(1), 214-232. <https://doi.org/10.1080/00213624.2020.1720588>
- Bekmanova, G., Ongarbayev, Y., Somzhurek, B., & Mukatayev, N. (2021). Personalized training model for organizing blended and lifelong distance learning courses and its effectiveness in Higher Education. *Journal of Computing in Higher Education*, 1-16. <https://doi.org/10.1007/s12528-021-09282-2>
- Belousova, A., Kozhukhar, G., & Efremova, O. (2021). Features of Creativity of Employees of Project Organizations with Different Types of Thinking. In *E3S Web of Conferences (Vol. 273, p. 10001)*. EDP Sciences. <https://doi.org/10.1051/e3sconf/202127310001>
- Beltagui, A., Sesis, A., & Stylos, N. (2021). A bricolage perspective on democratising innovation: the case of 3D printing in makerspaces. *Technological Forecasting and Social Change*, 163, 120–453. <https://doi.org/10.1016/j.techfore.2020.120453>
- Bendall, R. C., Lambert, S., Galpin, A., Marrow, L. P., & Cassidy, S. (2019). Psychophysiological indices of cognitive style: A triangulated study incorporating neuroimaging, eye-tracking, psychometric and behavioral measures. *Personality and Individual Differences*, 144, 68-78. <https://doi.org/10.1016/j.paid.2019.02.034>
- Bivona, E., & Cosenz, F. (2021). Designing a Multi-Sided Platform business model assessment framework: a Dynamic Performance Management perspective. *Systems Research and Behavioral Science*, 38(1), 93-107. <https://doi.org/10.1002/sres.2665>
- Blagov, E., & Anand, A. (2020). CoViD Induced Onlinezation Influence on Knowledge Sharing for Corporate Innovation. In *ANNUAL GSOM EMERGING MARKETS CONFERENCE 2020* (pp. 178-189).
- Bodas Freitas, I. M., & Fontana, R. (2018). Formalized Problem-Solving Practices and the Effects of Collaboration with Suppliers on a Firm's Product Innovation Performance. *Journal of Product Innovation Management*, 35(4), 565-587. <https://doi.org/10.1111/jpim.12432>
- Bolton, D. V. (2020). Transformational Leadership and Its' Relationship to Managing Team Conflict in Healthcare: A Quantitative Study. *Doctoral dissertation, The Chicago School of Professional Psychology*, 134 p.
- Bourekache, S., Kazar, O., & Abik, M. (2020). Multi-agent approach for collaborative authoring and indexing of pedagogical materials. *International Journal of Continuing Engineering Education and Life Long Learning*, 30(3), 255-275. <https://doi.org/10.1504/IJCEELL.2020.108527>
- Brillinger, A. S., Els, C., Schäfer, B., & Bender, B. (2020). Business model risk and uncertainty factors: Toward building and maintaining profitable and sustainable business models. *Business Horizons*, 63(1), 121-130. <https://doi.org/10.1016/j.bushor.2019.09.009>
- Briones, E. M., & Benham, G. (2017). An examination of the equivalency of self-report measures obtained from crowdsourced versus undergraduate student samples. *Behavior research methods*, 49(1), 320-334. <https://doi.org/10.3758/s13428-016-0710-8>
- Brito, E. P. Z., Sambiase, M. F., Ferreira, F. C. M., & Da Silva, A. A. (2017). The effect of uncertainty and cooperative behavior on operational performance: Evidence from Brazilian firms. *Journal of Operations and Supply Chain Management (JOSCM)*, 10(2), 71-84. <https://doi.org/10.12660/joscmv10n2p71-84>
- Bylund, P. L., & McCaffrey, M. (2017). A theory of entrepreneurship and institutional uncertainty. *Journal of Business Venturing*, 32(5), 461-475. <https://doi.org/10.1016/j.jbusvent.2017.05.006>
- Bystritskaya, E. V., Burkhanova, I. Y., Ivanova, S. S., Stafeeva, A. V., Vorobyov, N. B., Latypov, I. K., & Petin, D. E. (2020). The Effectiveness of Anthropoc Educational Technologies as a Means to Develop Master's Students' Meta-Subject Competence. *International Journal of Applied Exercise Physiology*, 9(4), 125-131.

- Calefato, F., Lanubile, F. and Vasilescu, B. (2019). A large-scale, in-depth analysis of developers' personalities in the Apache ecosystem. *Information and Software Technology*, 114, 1–20. <https://doi.org/10.1016/j.infsof.2019.05.012>
- Carayannopoulos, S. (2017). Small, young firm flexibility and performance in the context of disruptive innovations. *International Journal of Entrepreneurship and Innovation Management*, 21(1-2), 105-118. <https://doi.org/10.1504/IJEIM.2017.081467>
- Chen, X., Zhao, S., & Li, W. (2019). Opinion dynamics model based on cognitive styles: Field-dependence and field-independence. *Complexity*, 2019. <https://doi.org/10.1155/2019/2864124>
- Chiadamrong, N., & Piyathanavong, V. (2017). Optimal design of supply chain network under uncertainty environment using hybrid analytical and simulation modeling approach. *Journal of Industrial Engineering International*, 13(4), 465-478. <https://doi.org/10.1007/s40092-017-0201-2>
- Costa, J., & Matias, J. C. (2020). Open innovation 4.0 as an enhancer of sustainable innovation ecosystems. *Sustainability*, 12(19), 8112. <https://doi.org/10.3390/su12198112>
- Costa, J., Neves, A. R., & Reis, J. (2021). Two Sides of the Same Coin. University-Industry Collaboration and Open Innovation as Enhancers of Firm Performance. *Sustainability*, 13(7), 3866. <https://doi.org/10.3390/su13073866>
- Du, Y., Zhou, H., Yuan, Y., & Liu, X. (2019). Explore knowledge-sharing strategy and evolutionary mechanism for integrated project team based on evolutionary game model. *Advances in Civil Engineering*, 2019. <https://doi.org/10.1155/2019/4365358>
- Durana, P., Valaskova, K., Vagner, L., Zadnanova, S., Podhorska, I., & Siekelova, A. (2020). Disclosure of strategic managers' factotum: Behavioral incentives of innovative business. *International Journal of Financial Studies*, 8(1), 17. <https://doi.org/10.3390/ijfs8010017>
- Fahrman, B., Norström, P., Gumaelius, L., & Skogh, I. B. (2020). Experienced technology teachers' teaching practices. *International journal of technology and design education*, 30(1), 163-186. <https://doi.org/10.1007/s10798-019-09494-9>
- Fixson, S.K., Khachatryan, D., & Lee, W. (2017). Technological uncertainty and firm boundaries: The moderating effect of knowledge modularity. *IEEE Transactions on Engineering Management*, 64(1), 16–28. <https://doi.org/10.1109/TEM.2016.2638847>
- Foss, N. J., & Jensen, H. (2019). Managerial meta-knowledge and adaptation: Governance choice when firms don't know their capabilities. *Strategic Organization*, 17(2), 153-176. <https://doi.org/10.1177/1476127018778717>
- Fujii, N., & Tsujimoto, M. (2021, May). Indirect Integration: Orchestrating Complementors behind Competitors to Shrink Platform Boundaries in Digital Multi-sided Platform Ecosystems. In *2021 IEEE Technology & Engineering Management Conference-Europe (TEMSCON-EUR)* (pp. 1-6). IEEE. <https://doi.org/10.1109/TEMSCON-EUR52034.2021.9488582>
- Galunic, D. C. & Eisenhardt, K. M. (2001). Architectural Innovation and Modular Corporate Forms. *Academy of Management Journal*, 44(6), 1229–1249. <https://doi.org/10.5465/3069398>
- Gandia, R., & Parmentier, G. (2017). Optimizing value creation and value capture with a digital multi-sided business model. *Strategic Change*, 26(4), 323-331. <https://doi.org/10.1002/jsc.2134>
- Gavrilova, T., Bolotnikova, E., Leshcheva, I., Blagov, E., & Yanson, A. (2013, October). Measuring psychological impact on group ontology design and development: an empirical approach. In *International Conference on Knowledge Engineering and the Semantic Web* (pp. 29-43). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41360-5_3
- Geiger, D., Danner-Schröder, A. & Kremser, W. (2020). Getting ahead of time - Performing temporal boundaries to coordinate routines under temporal uncertainty. *Administrative Science Quarterly*, 66(1), 220–264. <https://doi.org/10.1177/0001839220941010>
- Han, J. (2017). Exploitation of architectural knowledge and innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 3(15), 1–15. <https://doi.org/10.1186/s40852-017-0068-x>

- Hosseini, S. M., & Akhavan, P. (2017). A model for project team formation in complex engineering projects under uncertainty: A knowledge-sharing approach. *Kybernetes*, 46(7), 1131-1157. <https://doi.org/10.1108/K-06-2015-0150>
- Jhang, F. H. (2020). Teachers' attitudes towards lesson study, perceived competence, and involvement in lesson study: Evidence from junior high school teachers. *Professional Development in Education*, 46(1), 82-96. <https://doi.org/10.1080/19415257.2019.1585383>
- Kostiuchenko, O., Dykhnych, L., & Cristóvão, A. (2021). Cognitive Stylistic Component of Socio-Cultural Activity Manager Training. *Socio-Cultural Management Journal*, 4(1), 57-82. <https://doi.org/10.31866/2709-846x.1.2021.235689>
- Kotova, E. E., & Pisarev, I. A. (2021, May). Researching Cognitive Tasks Solving Taking into Account Visual Uncertainty. In *2021 XXIV International Conference on Soft Computing and Measurements (SCM)* (pp. 127-130). IEEE. <https://doi.org/10.1109/SCM52931.2021.9507145>
- Kurikka, J. J. (2017). OBI-Developing an idea sharing platform for online collaboration and distributed student projects. *CERN IdeaSquare Journal of Experimental Innovation*, 1(1), 13-13. <https://doi.org/10.23726/cij.2017.458>
- Landorf, H. (2017). Passport to change: Designing academically sound, culturally relevant, short-term, faculty-led study abroad programs. Stylus Publishing, LLC.
- Lapp, S., Jablolkow, K., & McComb, C. (2019). KABOOM: an agent-based model for simulating cognitive style in team problem solving. *Design Science*, 5, 1-34. <https://doi.org/10.1017/dsj.2019.12>
- Lasso, S., Kreye, M., Daalhuizen, J., & Cash, P. (2020). Exploring the link between uncertainty and project activities in new product development. *Journal of Engineering Design*, 31(11-12), 531-551. <http://dx.doi.org/10.1080/09544828.2020.1839743>
- Latorre, R., & Suárez, J. (2017). Measuring social networks when forming information system project teams. *Journal of Systems and Software*, 134, 304-323. <https://doi.org/10.1016/j.jss.2017.09.019>
- Latusek, D., & Vlaar, P. W. (2018). Uncertainty in interorganizational collaboration and the dynamics of trust: A qualitative study. *European Management Journal*, 36(1), 12-27. <https://doi.org/10.1016/j.emj.2017.10.003>
- Lee, V., Smith, D., & Chen, Y. J. (2020). An Integrated Perspective: Applying Team Learning and Knowledge Creation through Team Learner Styles. *International Journal of Business and Economics*, 5(2), 83-116. <https://doi.org/10.5281/zenodo.4384760>
- Lee, M., Yun, J. J., Pyka, A., Won, D., Kodama, F., Schiuma, G., ... & Zhao, X. (2018). How to respond to the fourth industrial revolution, or the second information technology revolution? Dynamic new combinations between technology, market, and society through open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 4(3), 21. <https://doi.org/10.3390/joitmc4030021>
- Lioliou, E., & Willcocks, L. P. (2019). The Study of Information Technology Outsourcing. In *Global Outsourcing Discourse* (pp. 21-57). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-74045-4_2
- Liu, Z., Feng, J., & Wang, J. (2020). Resource-constrained innovation method for sustainability: application of morphological analysis and TRIZ inventive principles. *Sustainability*, 12(3), 917-939. <https://doi.org/10.3390/su12030917>
- Lu, H., & Lin, P. (2018). A study on the effect of cognitive style in the field of STEM on collaborative learning outcome. *International Journal of Information and Education Technology*, 8(3), 194-198. <https://doi.org/10.18178/ijiet.2018.8.3.1032>
- Male, S., Marinelli, M., & Kim, L. V. (2019). Creating Gender Inclusive Engineering and Science Classes-Establishing Baseline Experiences, Perceptions and Practices. In: *Proceedings of the Eighth Research in Engineering Education Symposium. Research in Engineering Education Network* (pp. 292-301). <https://doi.org/10.1109/EDUCON46332.2021.9453990>

- Mancl, D., & Fraser, S. D. (2020, June). COVID-19's influence on the future of agile. In: *International Conference on Agile Software Development*, 309–316. Springer, Cham. <https://doi.org/10.1145/2660252.2661293>
- Mao, L., Li, J., & Guo, C. (2020). Integrator's Coordination on Technological Innovation Performance in China: The Dual Moderating Role of Environmental Dynamism. *Sustainability*, *12*(1), 308. <https://doi.org/10.3390/su12010308>
- McPhillips, M. (2020). Trouble in Paradise? Barriers to Open Innovation in Regional Clusters in the Era of the 4th Industrial Revolution. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(3), 84. <https://doi.org/10.3390/joitmc6030084>
- Milhaleva, U. (2020). Innovation in education: problems and ways of their solution. In: *E3S Web of Conferences (Vol. 210, p. 18054)*. EDP Sciences. <https://doi.org/10.1051/e3sconf/202021018054>
- Modaresnezhad, M., Iyer, L., Palvia, P., & Taras, V. 2020. Information Technology (IT) enabled crowdsourcing: A conceptual framework. *Information Processing & Management*, *57*(2), 102–135. <https://doi.org/10.1016/j.ipm.2019.102135>
- Naik, H. S., Fritzsche, A., & Moeslein, K. M. (2021). Modularity in making: simplifying solution space for user innovation. *R&D Management*, *51*(1), 57-72. <https://doi.org/10.1111/radm.12427>
- Ngalim, P. F. (2020). Examining Relationships between a Technology Firm's Value Innovation Achievements, Its Cognitive Diversity, Strategic Sensitivity, Agility, and Situational Leadership. *Doctoral dissertation, Colorado Technical University*, 178 p.
- NicCanna, C., Razzak, M. A., Noll, J., & Beecham, S. (2021). Globally Distributed Development during COVID-19. *arXiv preprint, arXiv:2103.17181*, 8 p.
- Oke, A., & Fernandes, F. A. P. (2020). Innovations in teaching and learning: Exploring the perceptions of the education sector on the 4th industrial revolution (4IR). *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(2), 31. <https://doi.org/10.3390/joitmc6020031>
- Olaniran, O. J. (2017). Barriers to tacit knowledge sharing in geographically dispersed project teams in oil and gas projects. *Project Management Journal*, *48*(3), 41–57. <https://doi.org/10.1177/02F875697281704800303>
- Prezenza, A., Panniello, U., & Messeni Petruzzelli, A. (2021). Tourism multi-sided platforms and the social innovation trajectory: The case of Airbnb. *Creativity and Innovation Management*, *30*(1), 47-62. <https://doi.org/10.1111/caim.12394>
- Popov, E., Simonova, V., & Maksymchik, M. (2018, October). Factor model of the network capacity of a firm. In: *Proceedings of the 14th European Conference on Management, Leadership and Governance, ECMLG 2018 (pp. 221-230)*.
- Portuguez Castro, M., Ross Scheede, C., & Gómez Zermeño, M. G. (2019). The impact of higher education on entrepreneurship and the innovation ecosystem: A case study in Mexico. *Sustainability*, *11*(20), 5597. <https://doi.org/10.3390/su11205597>
- Rho, S., Lee, M., & Makkonen, T. (2020). The role of open innovation platforms in facilitating user-driven innovation in innovation ecosystems. *International Journal of Knowledge-Based Development*, *11*(3), 288-304. <https://doi.org/10.1504/IJKBD.2020.112801>
- Schmidt, A. L., Petzold, N., Lahme-Hütig, N., & Tiemann, F. (2021). Growing with others: A longitudinal study of an evolving multi-sided disruptive platform. *Creativity and Innovation Management*, *30*(1), 12-30. <https://doi.org/10.1111/caim.12401>
- Secundo, G., Mele, G., Del Vecchio, P., & Degennaro, G. (2021). Knowledge spillover creation in university-based entrepreneurial ecosystem: the role of the Italian “Contamination Labs”. *Knowledge Management Research & Practice*, *19*(1), 137-151. <https://doi.org/10.1080/14778238.2020.1785347>
- Seshadri, V., & Elangovan N. D. (2019). Role of Manager in Geographically Distributed Team; A Review. *Journal of Management (JOM)*, *6*(1), 122–129. <https://doi.org/10.34218/JOM.6.1.2019.013>

- Shishkova, A. V., Kozhevnikova, L. V., & Starovoytova, I. E. (2020, March). Virtualization of Educational Environment in a Modern Tertiary School. In: *Institute of Scientific Communications Conference* (pp. 938-946). Springer, Cham. https://doi.org/10.1007/978-3-030-59126-7_104
- Sholahuddin, A., Yuanita, L., & Supardi, I. (2018, September). Nurturance Effects of the New Cognitive Style-Based Learning Strategy in Science Learning. In: *International Conference on Teacher Training and Education 2018 (ICTTE 2018)*. Atlantis Press. <https://doi.org/10.2991/ictte-18.2018.3>
- Sipovskaya, Y. I. (2019). Ratio of Manifestations of Conceptual, Metacognitive Abilities and Features of Moral Sphere. In: *The European Proceedings of Social & Behavioural Sciences EpSBS* (pp. 843-850). <https://doi.org/10.15405/epsbs.2019.09.02.94>
- Spender, J. C. (2021). Towards a Firm for Our Time. *Kindai management review*, 9, 124-137.
- Stummer, C., Kundisch, D., & Decker, R. (2018). Platform launch strategies. *Business & Information Systems Engineering*, 60(2), 167-173. <https://doi.org/10.1007/s12599-018-0520-x>
- Tchernykh, A. N., Bychkov, I. V., Feoktistov, A. G., Gorsky, S. A., Sidorov, I. A., Kostromin, R. O., ... & Avetisyan, A. I. (2021). Mitigating uncertainty in developing scientific applications in integrated environment. In: *Proceedings of the Institute for System Programming of the RAS*, 33(1), 151-172. [https://doi.org/10.15514/ISPRAS-2021-33\(1\)-11](https://doi.org/10.15514/ISPRAS-2021-33(1)-11)
- Tengberg, M. (2018). Validation of sub-constructs in reading comprehension tests using teachers' classification of cognitive targets. *Language Assessment Quarterly*, 15(2), 169-182. <https://doi.org/10.1080/15434303.2018.1448820>
- Viator, R. E., Harp, N. L., Rinaldo, S. B., & Marquardt, B. B. (2020). The mediating effect of reflective-analytic cognitive style on rational thought. *Thinking & Reasoning*, 26(3), 381-413. <https://doi.org/10.1080/13546783.2019.1634151>
- Volk, S., Pearsall, M. J., Christian, M. S. and Becker, W. J. (2017). Chronotype diversity in teams: Toward a theory of team energetic asynchrony. *Academy of Management Review*, 42(4), 683-702. <https://doi.org/10.5465/amr.2015.0185>
- Wiklund, J., Yu, W., & Patzelt, H. (2018). Impulsivity and entrepreneurial action. *Academy of Management Perspectives*, 32(3), 379-403. <https://doi.org/10.5465/amp.2016.0177>
- Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American journal of sociology*, 87(3), 548-577. <https://doi.org/10.1086/227496>
- Yablonsky, S. (2018). A multidimensional framework for digital platform innovation and management: from business to technological platforms. *Systems Research and Behavioral Science*, 35(4), 485-501. <https://doi.org/10.1002/sres.2544>
- Yoon, S. H., Thin, N. S., Thao, V. T. T., Im, E. T., & Gim, G. Y. (2018, June). A study on success factors for business model innovation in the 4th industrial revolution. In: *International Conference on Software Engineering Research, Management and Applications* (pp. 105-127). Springer, Cham. http://dx.doi.org/10.1007/978-3-319-98881-8_8

Using Ontology Framework for Consumer Knowledge Audit: Electric Vehicle Charging Stations Case

Artemii Gibalov, St. Petersburg State University's Graduate School of Management (Artemiy.gibalov@mail.ru), Dmitry Kudryavtsev, St. Petersburg State University's Graduate School of Management (d.v.kudryavtsev@gsom.spbu.ru), Tatiana Gavrilova, St. Petersburg State University's Graduate School of Management (gavrilova@gsom.spbu.ru)

Abstract:

In the context of the avalanche of information growth and the further formation of a digital society, the role of knowledge of all participants in market interaction is a critical factor in consumption, value creation, and innovation. In addition to the general increase in the amount of information and a decrease in consumer confidence in it, the relevance of working with consumer knowledge is explained by the complication of both the products and services themselves, and the technology and culture of consumption. This complication requires educating consumers and sharing knowledge with them. For innovative products and services, customer (or consumer) knowledge is of particular importance because it is a critical factor in the decision-making process of innovation. For practical work with consumer knowledge, it is necessary to accurately define and understand the concept of "consumer knowledge", its types and properties, the processes of acquiring and changing this knowledge, their impact on consumer behavior, as well as the capabilities of companies to form knowledge. Such definition may be shaped by using ontology – a conceptual knowledge model. This paper considers the adoption of knowledge ontology based approach to the emerging innovative industry of electric cars supply charges.

Keywords: *customer knowledge, consumer behavior, knowledge management, innovative products and services, knowledge economy, ontology.*

Introduction

The task of monitoring and managing consumer knowledge is relevant for almost all large companies of our time. Currently, consumers have access to a huge amount of information about products of all types, and this access to it is as simple as possible: to obtain this information, a consumer must not take ordinary actions as in the past, it is enough to use an application on a smartphone that gives access to the amount of information not available to any library of the world. Companies, especially innovative ones, need to familiarize the consumer with the product for its commercial success, and for this it is necessary to use practical tools to work with consumer knowledge: what knowledge happens, how consumers perceive new data, how a company can form knowledge.

Both business experts and representatives of the academic community speak out in support of consumer training and knowledge management: following the results of the round table "Bridging the gap between science and practice: What do we know about what consumers know? How do they learn? And how can we train our consumers?", "In which more than 20 representatives of the business and scientific community took part, colleagues actually unanimously expressed the need for these tools for the stable functioning and development of the business.

Ontology of consumer knowledge can be a tool for achieving these goals. This concept was proposed by the authors of the article "Building the ontology of consumer knowledge in marketing: a cross-disciplinary approach" within the framework of the ONTARIS project. The ontology of consumer knowledge, depending on its complexity, can significantly help solve this problem and improve the company's important business processes, from marketing communications to the use of intelligent interaction systems based on it.

The purpose of this paper is to demonstrate and test ONTARIS [Kudryavtsev et al, 2020] consumer knowledge ontology using a real business case – the electrotechnical company Touch, which sells and produces charging stations for electric vehicles. The structure of the current paper is the following:

1. Provide an overview of ONTARIS consumer knowledge ontology,
2. Describe the process of the ontology-based consumer knowledge audit
3. Application of the ontology-based consumer knowledge audit for the electrotechnical company Touch.

Literature review precedes the main body of the paper.

Literature review

Part of the consumer/buyer and related concepts are represented in different business ontologies, for example,

- in the Edinburgh ontology of the enterprise (Uschold et al, 1997) there is a section "Marketing"; business model ontology (Osterwalder, 2004) describes the concepts of "Customer segment", "Marketing channels", "Customer relations";
- ontology (Human et al, 2017) addresses the needs and desires of the consumer;
- ontology (Blaschke et al, 2018) examines the role of the consumer in value creation. However, in such business ontologies, the consumer/buyer and, in particular, his knowledge are not sufficiently considered in detail.

Since the consumer in the digital economy is a user of information systems that help him in choosing products and services, the ontology of the user, his profile partially describe the consumer / buyer. Examples of user profile ontologies are considered in the works (Sosnovsky, Dicheva, 2010), in particular (Peñas et al, 2013).

However, such ontologies do not reflect the consumer behavior of the human user, as well as his knowledge. Since the consumer/buyer is a person, ontology describing the knowledge, thinking processes and intellectual activity of people are applicable to the consumer/buyer (Ferrario, Oltramari, 2005; Garbacz et al, 2012). However, these ontologies also do not reflect consumer behavior of a person and the associated features of knowledge and thinking processes.

Overview of ONTARIS consumer knowledge ontology

The focus of the proposed ontology is put on the classification of consumer knowledge from the point of view of the knowledge object, which is shown in Fig. 1.

The presented classification includes three main parts of consumer knowledge:

- A) products and services as objects of market exchange,
- B) the consumer himself/herself and his/her peculiarities of thinking and behavior in the context of market exchange and use of products and services (self-consciousness),
- C) a system of market interactions between consumers and companies, in which products and services are exchanged and used.

All these types of knowledge can be formed at three levels: (i) at the level of a particular brand, (ii) at the level of the class of products/services and (iii) at the level of the consumer sphere.

The general process of the ontology-based consumer knowledge audit

The general process for knowledge audit using the ontology consists of three steps:

1. Identification of consumer consumer knowledge items for the selected consumer and product/service, distributing it within the ontology,
2. Analysis it in accordance with the methodology,
3. Generation of recommendations for the analysis results to improve business processes.

Case Company specification

The company was founded in 2014 for the production and distribution of electric vehicle charging stations, as well as creation of software collateral for them. Now it has over 1,000 installed charging stations in Russia and works in both B2B and B2C sectors. The study of the consumer market shows that

60% of consumers have false assumptions about the basic characteristics of electric vehicles, 95% of U.S. citizens have not heard of government support measures for electric vehicle owners, 70 percent of people who passed the electric car drive test expressed a desire to buy it []. It has been proven that there is a strong positive correlation between the amount of knowledge and the desire to buy an electric car.

As part of the test, the proposed ontology was used to conduct a Touch knowledge audit to improve marketing communications with consumers. The ontology proposed in the work allowed the analysts and managers of the company to identify the knowledge of consumers, conduct their assessment, as well as develop recommendations for improving the company's communications with consumers.

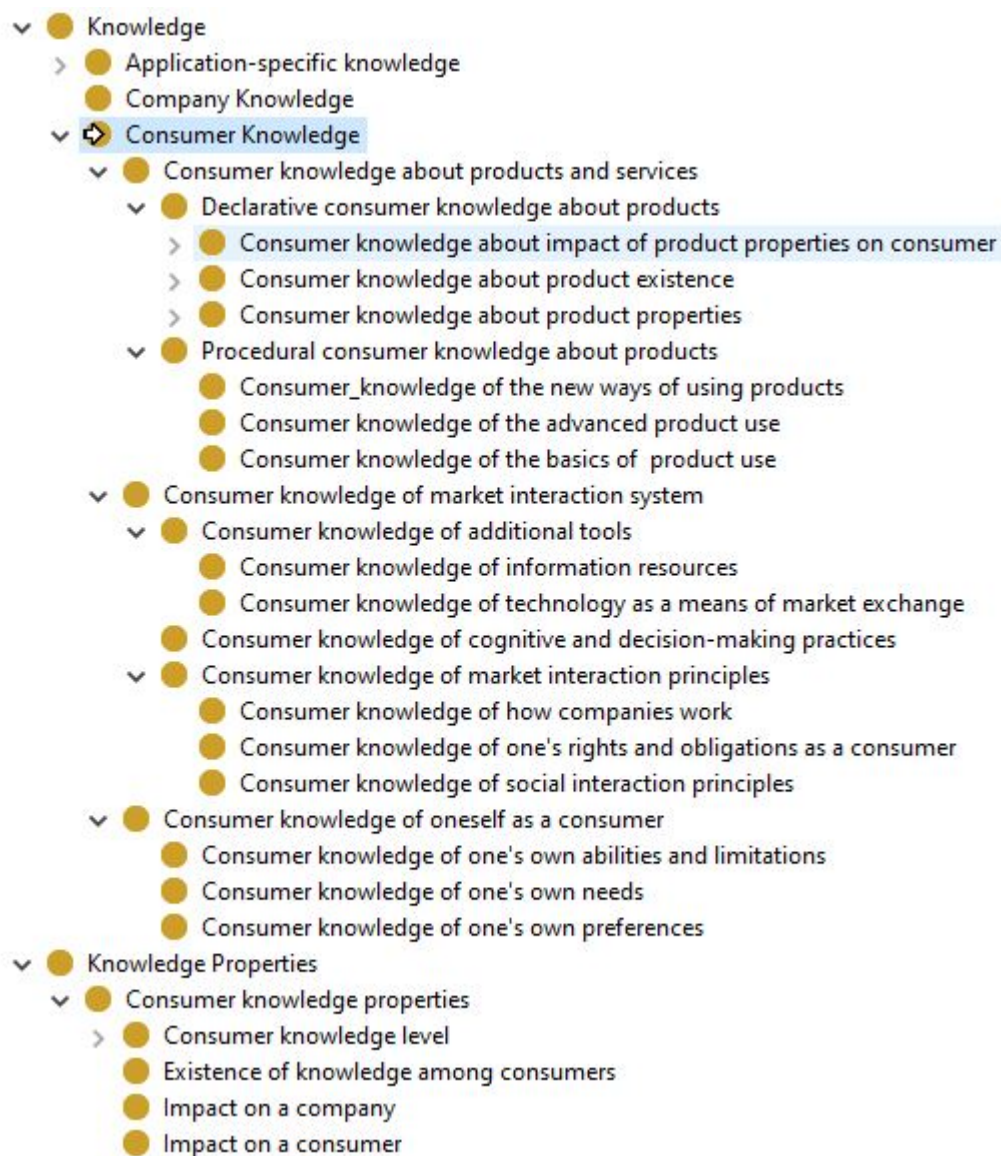


Fig. 1. A fragment of consumer knowledge taxonomy and its properties

Ontology-based consumer knowledge audit for the case company

Step 1. Identification of knowledge of consumers of electric charging stations

At this step, the ontology proposed was filled with class instances related to the selected subject area.

Examples of company-relevant topic knowledge:

(A1.1) Product Existence:

Knowledge about the existence of machines on an electric motor - the consumer knows about the existence of such a type of car that is driven by an electric motor and a traction battery, and not by internal combustion engine.

(A1.2) On the presence of product characteristics:

Knowledge about power of charging stations - Consumers Know which current power can different stations support and to what extent it can be manually changed

(A1.3) Effect of product characteristics on the consumer:

Knowledge about the weather effect on the operation of an electric vehicle

Knowledge about the effect that type of charging port imposes on the charging speed

(A 2.1) Knowledge of basic product usage:

Knowledge about the safe usage of the charging station at home - the consumer is aware that it is safe to charge an electric car from the charging station. The probability of ignition or short circuit is present when charging an electric car through a cable without a protective unit, or through an unofficial cable.

(A2.2) Knowledge of advanced use:

Knowledge of charging station power adjustment - consumers know that modern charging stations have the power adjustment option. With its help, you can manually set the power at which the station will work, on which the charging time of the electric car will depend.

(A2.3) Knowledge of new ways to use products:

Knowledge about the alternative use of the electric car battery - the old Nissan Leaf battery (the battery replacement period in an electric car is 6-8 years depending on the intensity of use) can be used as a backup power source at home.

Similar knowledge items were identified for other classes of consumer knowledge

The ontology of consumer knowledge presented in the work contains more than 50 classes. Axioms for classes were not developed, since they were not stated in the requirements.

Step 2. Consumer Knowledge analysis

The next stage of work was a full-fledged analysis of identified knowledge in accordance with the methodology developed by the authors of ontology.

The first step was to determine the impact of knowledge on the company. At this stage, it is necessary to determine how individual knowledge and its availability among consumers at the moment will affect the commercial success of the company. It is important to note that ontology authors allowed flexibility in the analysis of knowledge, so my analysis is slightly different from the method indicated in the article. According to the recommendations of the authors of ontology, the "static" influence of knowledge on the company is determined. In my analysis, it is the combination of the essence of knowledge and its presence that determines its influence: knowledge itself can benefit the company, but if it is not available to consumers, then at the moment it has a negative effect on the company.

To determine the impact on the company, it was decided to conduct an interview with its representative, responsible for working with knowledge. During the interview, the expert got acquainted with the list of identified knowledge and expressed his opinion on each of them. The final assessment of the impact may still differ from the opinion expressed by the expert, since another important factor remains the analysis of the literature (market reviews, forecasts, expert opinions). During the interview, it was found that it is worth highlighting another type of influence: indirect influence. Some knowledge does not play a key role for the company and in

most cases will not affect consumer behavior, but ignoring it and assigning "no influence" status would be an actual mistake. In this case, this is the knowledge that will affect the purchase and operation of an electric car, which can lead to the purchase of Touch products.

The second stage was the determination of the impact of knowledge on the consumer and their availability. If a certain knowledge helped make rational and effective decisions, knowledge was assigned a positive influence, otherwise negative. There are also situations when knowledge does not affect the rationality of the consumer. It may seem that any knowledge related to the purchase should have a positive impact on the consumer, since the more information is available to the consumer, the more rational its choice will be. However, some knowledge may be misinterpreted, misconceptions, or may be false. In such cases, their impact should be considered negative. To determine both the impact and the availability of knowledge, a survey was developed in which more than 55 respondents participated, of which more than half are car owners. The survey text is in the Applications section.

The third stage of the analysis was the development of the path of the Touch client. As a result, it can be assumed at what stage of working with the client some kind of knowledge is needed and how to present it. The customer path is a simulated process that the customer of a company goes through from the occurrence of a task/lead to the purchase of a product that satisfies the task/lead. Linking knowledge to a customer's path will help you develop your company's guidance and marketing strategy.

Table 1. Examples of some fragments of knowledge analysis

Knowledge	Influence on the company	Influence on the consumer	Presence of knowledge at consumers
Knowledge about the existence of machines on the electric motor	+/-	+	+ 100 percent of respondents know about the existence of electric vehicles
Place in the path of the client	Emerging interest in electric vehicles		
Electric cars are a rather new phenomenon and at the same time extremely popular. Due to the wide dissemination of knowledge, the company may not take special measures to work on this knowledge.			
Knowledge of the electric vehicle range	-/+	+	+/- 50 percent of respondents know about the correct approximate margin, and another 25 percent mistakenly believe that the indicators are even higher.
Place in the path of the client	Search for specific information regarding electric vehicles		
The company is interested in training this knowledge: a limited range makes the home charging station more popular, since it is often not always convenient to use public stations. In addition, a fairly large part of consumers have overestimated expectations regarding the electric vehicle range, which can negatively affect the company.			
Knowledge of prices for home charging stations for electric	-	+	- The results of the survey showed that most consumers

vehicles			believe that charging stations are more expensive than in reality.
Place in the path of the client	Searching for Information on Electric Vehicle Charging Stations		
The company should actively disseminate information about prices, especially to its products, given the fact that Touch products are much cheaper than imported analogues. For promotion, it is worth considering the possibility of selling goods through marketplaces, as well as SEO - promotion, as a result of which the company's website will not only be displayed earlier in the search, but the goods from it will be visible in a separate section "purchases," which consumers often use to compare prices.			

Legend:

Impact on the company: "+" - positive impact on the company, "-" - negative impact on the company, "0" - no impact on the company, "+/-" - indirect positive impact on the company, "-/+ " - indirect negative impact on the company.

Impact on the consumer: "+" - positive impact on the consumer, "-" - negative impact on the consumer, "0" - no effect on the consumer

Knowledge: "+" - knowledge present, "-" - no knowledge, "+/-" - knowledge is not uniform .

Step 3. Provide guidance on working with knowledge

The analysis suggested the following recommendations:

1. Creating a "Knowledge Base" on the company's website and social networks
2. Coverage of new products and updates on the market
3. Compilation of Tutorials and Training Materials
4. Working with knowledge in the same way as before
5. Placing links to third-party sources on the site, on social networks of the company
6. Ignoring knowledge or highlighting it in a company-positive light
7. Selling products on third-party marketplaces
8. Active Mobile App Promotion

Discussion

The adoption of described approach leads to the development of creating a "knowledge base" that may be landed posted on the company's website and social networks. This "knowledge base" includes information about the knowledge considered above. A new section should appear on the company's website, which will include separate pages containing articles, reviews and reviews on individual knowledge or its groups. Also, this information should be presented on social networks in a more simplified/short form. Also, further dissemination of this knowledge is possible using word of mouth. The critical knowledge that needs to be worked on under this recommendation can be divided into two categories: knowledge of electric vehicles and knowledge of charging stations.

Knowledge of electric vehicles includes:

- Knowledge of the existence of machines such as hybrid electric vehicles with rechargeable
- Knowledge of the range of electric vehicles
- Knowledge of the type of charging port installed on the vehicle
- Knowledge of state support of electric transport owners
- Knowledge of electric vehicle maintenance
- Knowledge of the environmental impact of electric vehicles
- Knowledge of clean electric vehicle exhaust

- Knowledge of the impact of weather on electric vehicle operation

Knowledge of charging stations:

- Knowledge about the possibility of installing a personal charging station in a country/multi-storey building.
- Knowledge of the existence of companies providing charging station installation services.
- Knowledge of the impact of frequent DC charging
- Knowledge of power of charging stations/charging stations Touch
- Knowledge of safe use of the charging station at home
- Knowledge of electric car charging prices at home and public charging stations
- Knowledge of prices for electric vehicle charging home stations
- Knowledge about the existence of mobile applications with a station map and the possibility of charging.
- Knowledge about the existence of a mobile Touch application (platform) with a station card and the possibility of payment.

Conclusion

Practical work with consumer knowledge requires an accurate understanding of this concept ("consumer knowledge"), its types and properties, the processes of acquiring and changing this knowledge, their impact on consumer behavior, as well as the ability of companies to form consumer knowledge. Creating an ontology of knowledge of consumers of innovative products and services allows us to provide such an understanding.

The described case shows how ontology based approach shapes and structures the consumer knowledge/ Practical work with consumer knowledge requires an accurate understanding of this concept ("consumer knowledge"), its types and properties, the processes of acquiring and changing this knowledge, their impact on consumer behavior, as well as the ability of companies to form consumer knowledge. Creating an ontology of knowledge of consumers of innovative products and services allows us to provide such an understanding.

But some knowledge in this industry requires more deep training, e.g.,

- Knowledge of the electric vehicle charging process from the public charging station
- Knowledge of electric vehicle charging time calculation
- Knowledge of the right charging methods
- Knowledge of the charging station installation process in the country/multi-storey building
- Knowledge about the existence of calculator sites for calculating the charging time of an electric car.

The company has already worked on parts and pieces of that knowledge, but thorough further investigations of some extra knowledge bodies is needed:

- Knowledge about the existence of machines on the electric motor
- Knowledge of the existence of home AC charging stations
- Knowledge of the existence of local charging stations
- Knowledge about the possibility of charging an electric car from a household and industrial outlet.

References

Blaschke, M., Haki, K., Aier, S., & Winter, R. (2018). Value co-creation ontology—a service-dominant logic perspective. Proceedings of Multikonferenz Wirtschaftsinformatik 2018: "Data-driven X - Turning Data into Value", 398-409.

- Bunce L., Harris M., & Burgess M. Charge up then charge out? Drivers' perceptions and experiences of electric vehicles in the U.K. *Transportation Research Part A: Policy and Practice*, 59, 2014, 278-287
<https://www.sciencedirect.com/science/article/abs/pii/S0965856413002395>
- Ferrario, R., Oltramari, A. (2005). Towards a computational ontology of mind. In 2005 IEEE Aerospace Conference, 1-9.
- Garbacz, P., Kulicki, P., & Trypuz, R. (2012). A formal ontology of knowing and knowledge. *Knowledge Management Research & Practice*, 10(3), 206-226.
- Human, S., Fahrenbach, F., Kragulj, F., & Savenkov, V. (2017, November). Ontology for representing human needs. In *International Conference on Knowledge Engineering and the Semantic Web* (pp. 195-210). Springer, Cham.
- Kowalska-Pyzalska, A. (2018). What makes consumers adopt to innovative energy services in the energy market? A review of incentives and barriers. *Renewable and Sustainable Energy Reviews*, 82, 3570-3581.
- Kowalska-Pyzalska, A., Kott, J., & Kott, M. (2020). Why Polish market of alternative fuel vehicles (AFVs) is the smallest in Europe? SWOT analysis of opportunities and threats. *Renewable and Sustainable Energy Reviews*, 133, 110076.
- Kudryavtsev D., Gavrilova T., Smirnova M., Golovacheva K. (2020) Modelling Consumer Knowledge: the Role of Ontology // Knowledge-Based and Intelligent Information & Engineering Systems, Proc. of 24th International Conference KES 2020, Procedia Computer Science, vol.176, Elsevier. – pp. 500-507. <https://doi.org/10.1016/j.procs.2020.08.052>
- Osterwalder, A. (2004). The business model ontology a proposition in a design science approach (Doctoral dissertation, Université de Lausanne, Faculté des hautes études commerciales).
- Peñas, P., Del Hoyo, R., Veá-Murguía, J., González, C., & Mayo, S. (2013, November). Collective knowledge ontology user profiling for Twitter--automatic user profiling. In 2013 IEEE/WIC/ACM International Joint Conferences on Web Intelligence (WI) and Intelligent Agent Technologies (IAT), Vol. 1, pp. 439-444
- Sosnovsky, S., Dicheva, D. (2010). Ontological technologies for user modelling, *International Journal of Metadata Semantics and Ontologies*, 5(1), 32-71.
- Uschold, M., King, M., Moralee, S., & Zorgios, Y. (1998). The enterprise ontology. *The knowledge engineering review*, 13(1), 31-89.

Using the Kano Model in Operational Management to (Re)build a Package Service Offering

Anna Levchenko, St. Petersburg State University's Graduate School of Management (a.v.levchenko@gsom.spbu.ru), Dmitry Ovsyanko, St. Petersburg State University's Graduate School of Management (ovsianko@gsom.spbu.ru), Pavel Sharakhin, St. Petersburg State University's Graduate School of Management (p.sharakhin@gsom.spbu.ru)

Abstract:

This paper investigates the prospects for using the quality management tool - N. Kano's model for the purpose of analyzing and redesigning the characteristics of a product or service and presents the results of an experiment conducted on examples of real enterprises, which made it possible to conclude that N. Kano's model is applicable not only for strategic purposes, management and marketing, but also for the level of operational solutions. In a period of growing popularity of servitization ideas, the transition from production to the provision of services or package offers, operational management tools must inevitably change towards ensuring production flexibility, meeting the needs of the end customers, regardless of the stage of value stream.

Keywords: *Servitization, quality management, N. Kano model, operational redesign*

One of the key trends in modern management is the transition from the sale of products to the provision of services, no matter what area it concerns. A growing number of manufacturers are realizing that a competitive advantage can be gained from service but not just from selling finished products [4], and this, in turn, leads to the development and launch of integrated products and services that provide the value of joint utilization [3]. This tactic allows companies to occupy more marginal business sectors, increase customer loyalty, and develop a balanced strategy to meet customer needs.

Servitization provides manufacturers with opportunities to expand their customer relationships and expand their revenue streams. However, this transformation not only requires manufacturers to develop new services, but also to create new service organizations that extend the manufacturer's supply chain. In this way, companies that were previously involved in manufacturing are getting significantly closer to customers, and this allows them to better understand the needs of end users.

One of the best-known sales-to-service transitions is the example of Rolls-Royce, with their Rolls-Royce Power-by-the-Hour, where product (aircraft engine) and service (proactive engine monitoring) are delivered as a single value for the customer. Customers are charged for the number of passengers carried, or the mileage of the aircraft flying, so the customer pays for the volume of the products and services package utilization. Rather than offering its product in the form of a transactional hardware purchase, Rolls-Royce offers to purchase it in the form of an "extended service," a ten-year service contract that links customer and manufacturer and provides performance incentives such as fines for downtime due to inoperability.

The transformation requires a substantial efforts from a manufacturer to develop and deliver "advanced" services. This requires the creation of a service function that can not only develop such a product service, but before that implement significant marketing efforts to identify the required services.

In such a field as supply chain management for example, there are also features that make it necessary to study the different needs of a stratified set of consumers of logistics services. This is typical for cases when the object of logistics services becomes a complex product that implies specialized logistics efforts. Since in the same organization the needs of different departments may differ, it seems important to study and interpret the needs and

expectations of these groups within the framework of the stratification of the set of service consumers.

The objective of this study is to consider the prospects for using the tool proposed by the Japanese professor Noriaki Kano to interpret the needs and expectations of specific groups of target consumers and, on this basis, plan value propositions that are attractive to them. The formation of a complex offer for the client should satisfy his needs as much as possible, while it is absolutely unprofitable for the manufacturer to deploy "redundant" services, the inclusion of which in a package solution can negatively affect not only the costs and service component, but also reduce the demand for the product itself.

It should be noted that the addition of a service component inevitably leads to an increase in the manufacturer's awareness of the client, since it implies, firstly, direct interaction with the client, and secondly, it makes its own service department an intermediate client of the goods produced. So the Rolls-Royce service department, obviously, contributes to the improvement of production in helping to show problems with the quality of engines, simplifying repairs, and so on.

This article discusses the issues of quality management, which become one of the most important in servitization, describes N. Kano's method, which allows classifying the needs of target consumers, as well as planning the properties of a product produced on the market for a more or less wide group of target consumers. The proposed method of N. Kano in the framework of the experiment was applied on the example of various production and service enterprises and the results were obtained allow us to draw preliminary conclusions about conditions where this method is appropriate at the operational level for the design and redesign of the product and production technology, and the addition of packaged service offerings for customers.

There are a lot of formulations that, in different words, to define the modern understanding of quality. The 2015 version of GOST R ISO 9000 proposes the following wording: "The quality of an organization's products and services is determined by the ability to satisfy customers and whether it intentionally or unintentionally influences the relevant stakeholders. The quality of products and services includes not only the performance of functions in accordance with the purpose and their characteristics, but also the perceived value and benefits for the consumer." [1].

This formulation seems to be especially interesting, since it allows directly substantiate the logic of quality management stratification on the basis of the first general definition of the concept of quality. Indeed, the understanding of quality in a specific period for a specific organization is determined by the context of its activities and the strategic goals that are formed by the owners and top management. This context should be described, the goals are clearly formulated, a decision is made which groups of needs and of which customers the organization is going to meet and what type of technology it is going to apply. Then it becomes possible to study in detail needs, preferences and expectations of target consumers or to determine the specific requirements of contract customers. From the quality management point of view, the organization should firstly identify and analyze the needs and expectations of consumers, then develop and compare ways to satisfy them, afterwards plan the properties of the organization's value proposition and the methods of its promotion, with the help of which it tries to form and maintain its position in the market. This requires in-depth research of selected markets, consumers, competition in them in order to understand how realizable general strategic ideas.

It should be remembered that consumers do react not to the objective characteristics of the utility offered to them, but to the "perceived quality", i.e. on what seems to them corresponding to ideas of "beauty." Therefore, the marketing task is not limited exclusively to a passive determination of the objective needs of potential consumers but should include the emerging expectations of target groups. Another important aspect of the marketing level of quality management is planning the product's characteristics and value proposition as a whole for each group of target consumers. There is a fundamental difference between the needs or expectations of consumers and the characteristics of the supplier's value proposition. This

difference lies, first of all, in the fact that the needs of the end user are often formulated in terms of satisfying needs, and the supplier of the value proposition has to formulate the features of a product-service complex that will satisfy these needs. Having identified the needs and expectations of consumers, the manufacturer-supplier must determine those features and characteristics of the product-service complex that will ensure the satisfaction of these expectations. The supplier can supplement the set of characteristics of the proposed utility, offer new additional properties of this utility or service, allowing the consumer to satisfy some additional needs that he or she did not expect to be satisfied. If the target consumers approve of the corresponding modification of the proposed utility through its purchase, then this means an increase in the competitiveness of the supplier's value proposition.

Finally, since the quality of products and services includes the performance of functions in accordance with the purpose and their characteristics, then products must be produced and services rendered accordingly. This is the operational phase in which significant quality assurance efforts are always made. They will be referred to as the operational level of quality assurance. Determining the place of business in the system and meeting the needs of end users, management must decide what these needs are and how the company, given the availability of technologies, will meet the needs of target customers. It is necessary to determine what the target consumers expect, what "quality" means for them. This knowledge can be obtained through the analysis of consumer needs, expectations and preferences and the translation of the "consumer's voice" revealed in some way into the characteristics of the offered product or / and service, determining what consumers perceive as the quality of products and services in target groups (marketing level of quality management).

One of the popular tools for interpreting the needs and expectations of consumers and, on this basis, planning attractive value propositions for specific target groups, is the model developed by the Japanese professor Noriaki Kano. In this model, the author classifies factors in terms of their influence on the formation of customer satisfaction with a product or service. Kano identified target (expected) needs, for which the utility is acquired, basic (basic, background) needs that must be satisfied under any circumstances and the dissatisfaction of which causes sharp disappointment of consumers, and admiring (unexpected) which consumers do not feel, but if the supplier offer them a way to meet these needs, then they will be supremely satisfied [2].

On the basis of this model, a special tool (Kano method) has been built, which makes it possible to classify the needs of target consumers based on the results of a specially conducted questionnaire. This method can be adequately applied when studying the needs and expectations of end users (primarily individuals and households), business consumers (primarily consumers of services, for example, logistics services), as well as internal consumers of supporting (auxiliary) processes. In all these situations, it is often difficult or impossible to formulate consumer requirements in terms of product characteristics. The consumer can express wishes in terms of satisfying needs, and the supplier (manufacturer) of the product and/or service must come up with the characteristics of the utility supplied, i.e. to plan a product-service so that the consumer is as satisfied as possible and chooses this particular product for its maximum adequacy to expressed needs.

The Kano method can be used both for planning the characteristics of a product produced to the market for a more or less wide group of target consumers, and in a project mode for joint development of complex products to order, if the consumer is not personalized and there are a number of requirements formulated by different departments and key figures. Also, the Kano method can be useful in the development of a new or modification of an old product (service) and in the formation of a marketing strategy for products and services. In the first case, it allows you to adapt the product to the real needs of consumers, and in the second, to correctly emphasize the advantages of the proposed utility. Key elements of the method: identify and understand what consumers want - the "consumer's voice"; translate the consumer's voice into Critical to Quality Characteristics - CQCs. Then there is a need to categorize the CQCs into three

categories:

Elements of mandatory quality - “a condition for entering the market”. Focused on meeting basic needs.

Elements of one-dimensional qualities - "the more, the better" - ensuring competitiveness - are aimed at meeting target (expected) needs.

Elements of attractive quality - “I’m not sure I wanted this, but I like it” - differentiators. They are focused on satisfying admirable (unexpected) hidden needs.

Based on the information received regarding the actual needs of target consumers, it is necessary to assess the current level of the product in terms of "Critical Quality Characteristics" (CQC) and try to increase this level. The use of the Kano method to study the "consumer's voice" and build on this basis an adequate quality strategy includes 4 stages:

1. Studying the set of target consumers and their relationship to the proposed utility (products, services and their combinations).

2. Analysis of the set of properties of the utility offered by the company and brainstorming to formulate adequate questions that correctly reflect the most important needs of target consumers and the properties of products.

3. Conducting a questionnaire (survey) and technical analysis of the survey results based on the use of special tools (Kano matrix, graphs and diagrams)

4. Building a quality strategy either jointly with customers, or on the basis of constant testing of a new (modified) product on limited groups of consumers.

On the second stage a pair of questions is formed regarding the same feature of the proposed utility:

- One asks your customers how they feel if they have the feature
- The other asks how they feel if they did not have this feature

The first question is functional question and the second is dysfunctional question.

The standard Kano questionnaire responses to both listed above questions are:

- I like it
- I expect it
- I’m neutral
- I can tolerate it
- I dislike it

The key stage in formalizing the result of the survey is third stage, when Kano evaluation table combine the functional and dysfunctional answers in its columns and rows respectively.

Table 1. Kano evaluation table.

	I like it	I expect it	I’m neutral	I can tolerate it	I dislike it
I like it	Q	R	R	R	R
I expect it	E	Q	R	R	R
I’m neutral	E	I	Q	R	R
I can tolerate it	E	I	I	Q	R
I dislike it	L	B	B	B	Q

You can locate the answer for the functional question in columns and for the dysfunctional question in rows. The answer pair leads to one of the categories marked by the first letter of its name:

- E – exciting
- L – leveraging (or One dimensional)
- B – basics
- Q – questionable
- I – indifferent
- R – reverse the questions in the pair

Of course, Kano's method is only a preliminary step for designing a competitive

product, but it can be useful in a certain context. It is important to implement it not only when planning the properties of a product for sale on the mass market, but as a method that allows to develop the characteristics of a complex product, service or product-service complex (value proposition) under the order. It is applicable if the customer organization, internal departments and key employees have a certain variety of opinions about the characteristics of the planned product, as well as forming a list of services offered jointly.

At the operational level, the Kano method can be applied to design and redesign a product and manufacturing process based on the results of planning and proposed improvements. To determine the possibility, as well as limitations on the use of the Kano method, we carried out case studies that allowed to draw preliminary conclusions about conditions and efficiency of the method at the operational level. A separate question that the authors tried to pose was the question of whether it is possible, using the Kano method, to investigate the needs of not external, final consumers of the product, but internal consumers participating in the production of the final product.

The study was conducted in a format of an experiment, based on the involvement of several dozen business representatives in the use of the Kano method, each of whom, using this method, studied several properties of the good (product or service) that the business produces. We investigated several cases to illustrate what decisions can be made by business representatives in the operational area based on the results of applying the Kano method.

Case 1. Revealing of good's additional features to add these to a main good in order to raise cumulative value for the customer.

Several pair of questions were formulated regarding the options for ocean container shipment service, namely Web-service that could be added to this service. The first question (here we mention the functional one) was What are your feelings when you can have ocean freight cost estimate directly on the Web site of forwarding company. Based on twenty respondents replies this option was regarded as exciting. According to Kano evaluation table, if this feature would be added into the total value proposition, the overall value of this service is increased.

The second question (again we refer to the functional one only) was What are your feelings if you can track your container shipment on the Web site of forwarding company. Here the opinions of the same respondents split; the majority named this feature as exciting but significant share of the responses referred to this as basics. We can lose the customers keeping idle with adding this feature into the value proposal.

As a result of using Kano method the management of the forwarding company decided to develop further Web-based client services with the priority given to the tracking tool of container shipments for clients on the Web site of the forwarding company.

Case 2. Revealing the need for additional segmentation of customers to modify a value proposition without changing the main product.

Here both functional and dysfunctional question were formulated by the manufacturing company regarding its main product – hi-tech equipment. The features under investigation in this case were those that could be changed at the distribution stage, on an operational level, without modifying the equipment itself. At the distribution level for technological equipment, one could change such features like additional hard- and software, end user training, warranty, and post-warranty service. Two of the features were selected for this case: delivery of the equipment with manual printed on paper and end user training.

First functional question was shaped like this: What are your feelings if the equipment is delivered with the manual printed on paper? 23 respondents (48%) said this feature is basics, but 18 respondents (38%) replied so that the feature is indifferent. And another 15% of respondents (7 replies) mentioned in the way we should treat feature as R – reverse the questions in the pair. Deeper investigation showed all those 7 R were received from the companies that were in one holding with electronic data interchange implemented. That's why this feature is not an opportunity for this group of respondents but a negative factor – the clients in the group do not

want documents printed on paper at all.

When this fact had been realized, all the respondents were split into three segments:

1. Large industrial enterprises with high utilization rate of facilities
2. Manufacturing entities with moderate utilization rate
3. Research and development entities with utilization rate lower than moderate.

For 23 of clients the contract states that printed manual is a must. For the rest 18 clients this feature is less needed according to the business practice, and an absence of printed manual is not a factor to stop using the equipment. The device is commissioned to the customer completely ready for use, and the end users are trained. That's why clients do not worry much if printed manual is not provided. The feature under investigation is recognized to still belong to basics (B), though one could see the influence of electronic documentation implementation on the situation.

Thus, Kano model revealed the necessity of additional segmentation of the value proposition given the fact that the product itself had not been modified. Then for different segment the company decides either to print the manuals on paper or to avoid printing it out.

The other feature studied in this case was end user training. This training is devoted to train the client personnel for the equipment maintenance. These efforts result in less equipment break down time and higher utilization rate.

The feature under discussion was checked and found I – indifferent with the majority of 36 respondents (75% of the total respondents). However, further investigation showed the respondents could be divided into segments. We got to know that the majority of these 36 clients feel positive regarding end user training, but they realize it will raise the price of purchase.

An absence of proper technical service specialists and unwilling to deal with sophisticated equipment were mentioned among the other reasons of feeling indifferent to the end user training. And finally, the clients said that trained end user service would hardly substitute original equipment manufacturer's service. As a result, it was stated that the clients would not accept trained end user service as an alternative of original equipment manufacturer's maintenance.

Nevertheless, three clients (6%) see this option as a must. More detailed look showed the reason: these clients are located in far regions where manufacturer's service technician visit is complicated. 9 clients (19%) see the option of end user training as B - basic. The reason behind that is supposed to be that those group are potential clients still looking into the possibility to purchase this equipment and willing to ensure this device is maintained properly.

Case 3. Finding a need to reshape operational priorities.

This case describes mobile telecommunication business. The feature under investigation related to complicated question: initially this option had been included into the value proposition as default, but later market changes made this default feature doubtful. In other words, a possibility to rebuild the operational priorities was under investigation.

For using Kano model and method the functional question was shaped as follows: What are your feelings if your mobile phone is not blocked even if zero account balance is reached? The result of the review showed this option is I – indifferent.

The investigators were surprised a lot. It was decided that this feature does not contribute now to customer satisfaction, and there is no reason to use this option in the value proposition anymore. Therefore, it was found the need to reshape the value proposition for the clients and operational priorities of the company.

Case 4. Proper form of question is important for Kano model – otherwise you would get unclear pattern of responses.

The fourth case under review was devoted to the natural gas industry. The investigator formed the functional question as follows: What is your feeling about the government's initiative to use natural gas as a fuel to reduce CO₂ emission? And the dysfunctional question was shaped this way: What is your feeling if there is no initiative use natural gas as a fuel to reduce CO₂ emission from the government?

Twenty responses were received for this pair of questions with the results being as

follows. This option was recognized as exciting for most customers (42,6%) but on the second place (38,2%) was Q result in Kano evaluation table (when the answer “I like it” was given for both questions in the pair). That is very important for us to illustrate the importance of shaping the questions in a proper way.

This Q result is referred to as questionable by Kano model and usually is caused by unclear form of the questions in the pair. As we can see here the researcher changed the form of Kano classic functional question about the feature of the good, not about a vague case or situation.

As a result, we can propose that Kano model and method is valuable to reshape customer's value proposition, given that there is the product itself is engineered that way it could be modified if needed without significant costs. Some scientists say operational management is not the sphere you can change easily nowadays. However, Kano method seems to be cheap and easy solution when you try to be flexible and change your value proposition for the clients even on the operational level.

References

- Baines, T., Lightfoot, H. and Smart, P. 2011, “Servitization within manufacturing: Exploring the provision of advanced services and their impact on vertical integration”, *Journal of Manufacturing Technology Management*, Vol. 22 No. 7, pp. 947–954.
- Bigdeli A.Z., Baines T., Schroeder A., Brown S., Musson E., Shi V.G., Calabrese A. 2018 Measuring servitization progress and outcome: the case of ‘advanced services’, *Production Planning & Control*, 29:4, 315-332
- Bustinza, O.F., Vendrell-Herrero, F. and Baines, T. 2017, “Service implementation in manufacturing: An organisational transformation perspective”, *International Journal of Production Economics*, Vol. 192, pp. 1–8.
- ISO 9000-2015 “Quality management systems. Fundamentals and vocabulary” 2015, p. 2.2.1 Quality management / D. V. Ovsyanko; Graduate School of Management, St. Petersburg State University. - SPb .: Publishing house " Graduate School of Management ", 2011. - 204 p.

E-sports no Brazil: a Mais Nova Paixão Nacional

Cristiane Madeiro a Souza, Fametro University Centre (crismadeirods@gmail.com), Cristiane Souza, Fametro U Wesley Farias, Fametro University Centre, (joseweslleymoura@gmail.com), Anne Freire, Ceara State University (annegabriellefreire@gmail.com), Thais Feitosa, Fametro University Centre, (thaisvn@gmail.com), Zaila Oliveira, Center for Organizational and Social Studies of the Polytechnic of Porto (CEOS.PP) (zailaoliveira@gmail.com)

Abstract:

The ‘E-Sports’ market is the scenario of professional electronic games competition occurring in the most diverse modalities, such as Moba, FPS, Battle Royale, Fight Games, among others. With the international market already consolidated and in full meteoric expansion, the sport has been taking steps towards its consolidation in Brazil. And, due to the growth of the sector worldwide, which moves a significant amount of values, it is necessary to analyze the aspects of growth in Brazil. The quantitative methodology was used through research applied to an audience of 200 people in Brazil, made available on Google Forms and distributed on social networks among industry consumers, personal contacts and disclosures via WhatsApp and Twitter, in May/2021. The results show that growth in Brazil is happening and it is necessary to pay attention, and there may be more investment due to the growth in the country.

Keywords: *E-Sports, Market, Games, Brazil.*

Introduction

In the sports market, the electronic sport or better known as 'E-Sports', is the scenario of professional competition for electronic games that take place in the most diverse modalities (Moba, FPS, Battle Royale, Fight Games, among others). The games can take place individually or collectively in regional, national and international competitions with millionaire awards and with audiences even larger than in traditional sports. In recent years, E-Sports in Brazil has been discussed more frequently. With the international market already consolidated and in full meteoric expansion, the sport modality has been taking its steps towards consolidation in the country. As a result of the evolution of technology and globalization that has taken place in recent decades, access to technology has become easier and more diverse. In Brazil, three out of four people have access to the internet, where the cell phone is the instrument most used by Brazilians (IBGE, 2018). In the gaming environment, it is important to note that 53.8% of the Games and E-Sports consumer in Brazil are women (PGB, 2020). The fact is that the consumption and audience of products related to games has been increasing, drawing the attention of major market players to the exposure of their brands in championships and professional teams, such as Vivo and Havan (national) and Red Bull and BMW among others worldwide.

Due to the expansion of technology, several E-Sports teams have emerged through traditional clubs such as Flamengo E-Sports (Flemish, Brazilian football), 100Thieves (Houston Rockets, American basketball), Golden Guardians (Golden State Warriors, basketball American), which seek to insert themselves in the ecosystem to attract and engage fans of the most diverse modalities. Thus, due to the fact that it is more globalized and easily accessible, it is possible to visualize, in the near future, a greater reach of status than in some traditional sports. However, in a society undergoing a process of globalization and constant technological evolution, social and cultural aspects change over time. Technology is part of people's lives, young people spend much of their recreation in virtual games that over time become hobbies, such as following an influencer of a certain game, rooting for a team or player or even becoming a professional player of that team.

In this context, this study raises a question: What are the reasons for E-Sports to be the newest Brazilian passion? The general objective is to identify the growth factors of E-Sports in Brazil. Specifically, it seeks to achieve the following specific objectives: i) Identify the profile of the consumer public; ii) Identify which games are most accessed by Brazilians; iii) Identify the most used social network for consumption; iv) Identify which products are most consumed by the public.

The study intends to expand the domain of investigations in E-Sports to include some of the

concepts that allow analyzing sport as a business and listing the driving aspects of the sector. In this sense, several aspects are taken into account to justify the research. First, E-Sports is a phenomenon of audience and consumption, as it manages to cover all social strata in a variety of ways, from content consumption to the purchase of personalized products and food. Because of this, a survey was carried out to identify aspects of the profile of this public in Brazil and find out what their preferences are. According to Newzoo (2018), Brazil has the third largest audience in the world, second only to China and the United States, and is one of the largest consumer markets in the sector.

Theoretical reference

2.1 E – Sports

E-Sports is the professional scenario of electronic games in the most varied modes, individually or in teams, which involves high-value prizes and live broadcasts.

According to Oliveira and Rios (2016), E-Sports is basically electronic games faced in a professional way where any game can generate a competition, as long as it is being played at a high level and in different modalities.

From strategy games such as Starcraft, MOBA (Multiplayer Online Battle Arena) such as League of Legends and Dota 2, as well as FPS (First Person Shooter) such as Counter Strike Global Offensive and Rainbow Six Siege, in which the first championships of the disciplines appeared in events such as : WCG (World Cyber Games), MLG (Major League Gaming), E3 among others that over time have had independent championships. The figure of the pro player (professional E-Sports player) is one of the most important to achieve this (Goes, 2017). Unlike the casual player who plays for leisure, the pro player takes a daily professional routine for the development of the profession, which ranges from mechanical, strategic and tactical training to raise your game level to the limit, beyond the physical care of yourself with follow-up medical (physical activities, psychological treatment, balanced diet, physiotherapy, among others).

2.1.1 Types of E-Sports

Like any sport, E-Sports has its most varied modalities, but it has a differential that is the amount of games in the modality. You can have numerous games of the same type at a high competitive level bringing diversity to the consumer audience. The games can be played individually or collectively with numerous tactics and strategies but with the same purpose which is to be the winner. The main modalities of E-Sports are MOBA (Multiplayer Online Battle Arena), FPS (First Person Shooter), RTS (Real Time Strategy), Fighting Games (Fighting Games), Card Games (Card Games) and Simulator (Globoesporte, 2020). According to Goes (2017), the most famous modality is MOBA, which consists of an arena that is composed of 2 teams of 5 members that has the objective of destroying the enemy base, but for that he has to draw strategies, tactics and character compositions to gain objectives and territory. League of Legends and DOTA 2 are the main games of this modality and one of the most consumed games of all. We can mention the FPS and Battle Royale next, both are shooting games but with different modes of play. FPS is played on a map with 2 teams of 5 people in which you have the attacking side and the defender where the defender tries to neutralize the attacker. The main games in this modality are Counter Strike Global Offensive, Rainbow Six Siege and Overwatch.

Battle Royale consists of a map played in survival mode where the last survivor among more than 40 participants wins, it can be played individually or in a team of 4 people. PUBG, Fortnite and Free Fire are the main games in this genre.

The RTS mode was the first to be brought into the competitive scenario with the Starcraft game, which is basically a strategy game where you aim to destroy the enemy base using war strategies and tactics. And by sequence comes Cards Games which are card games played individually where the objective is to zero the opponent's life points, usually the world based on games of

this modality comes from MOBA. The case of Hearthstone is based on the same universe as DOTA and recently League of Runeterra with League of Legends. These modalities are usually played on the computer and notebook, but lately this game has been optimized for the smartphone in order to reach more the public, which is in the case of League of Legends that its smartphone is called Wild Rift, Legends of Runeterra, PUBG and Free Fire.

Finally comes the Fighting Games and Simulators modalities. They are usually played on consoles like Playstation, Xbox and Nintendo. Fighting games are fighting games played individually in 3 or 5 rounds, the best known games of this type are Street Fighter, Mortal Kombat, Tekken and Dragon Ball. The interest of this modality is that a pro player can play as many games as they want at a high level. Next comes the Simulators that basically try to reproduce existing sports in real life such as Football, Basketball and Motorsport that are played by the console and their main titles are FIFA, PES, NBA and Madden. You can see that with this variety of modalities and games it attracts a wide audience with the highest diversity of ages and tastes, ranging from causal and mechanical games to more strategic and calm games.

2.1.2 Financial Evolution of E-Sports

Over the years, as the scenario grows, there is also an increase in remuneration through sponsorships, awards and other forms for athletes and teams. Table 1 presents the top five annual awards receipts with updated data as of March 22, 2021.

Table 1 – the top five annual awards receipts

YEAR	GAME	MODE	VALUE PAID
2017	Dota 2	MOBA	\$ 38.074.599,32
	Counter - Strike : Global Offensive	FPS	\$ 19.270.081,81
	League of Legends	MOBA	\$ 12.225.701,03
	Heroes of the Storm	MOBA	\$ 5.444.449,54
	Call of Duty: Infinite Warfare	FPS	\$ 4.031.184,07
2018	Dota 2	MOBA	\$ 41.457.368,99
	Counter - Strike : Global Offensive	FPS	\$ 23.306.930,49
	Fortnite	Battle Royale	\$ 19.880.337,00
	League of Legends	MOBA	\$ 14.569.801,53

	PLAYERUNKNOWN'S BATTLEGROUNDS	Battle Royale	\$ 8.319.226,32
2019	Fortnite	Battle Royale	\$ 71.598.129,01
	Dota 2	MOBA	\$ 47.043.520,56
	Counter - Strike : Global Ofensive	FPS	\$ 21.995.191,55
	PLAYERUNKNOWN'S BATTLEGROUNDS	Battle Royale	\$ 11.327.221,08
	Overwatch	FPS	\$ 9.587.036,77

Source: Adapted from *Esportsearnings* (2021).

As shown in table 1, the financial evolution of E-Sports has been meteoric over the years. The game with the highest award in 2019 had an increase of more than 30 million dollars compared to 2017. This demonstrates the value of the product through consumption of the game over the period.

One can cite the case of the Dota 2 game, where the awards of the World Championship each year becomes the biggest in history because it is managed through the sale of the championship themed package to its users, where a percentage goes directly to the award. The prize for the 2019 World Championship surpassed the 30 million dollar barrier (*GloboEsporte*, 2021).

This is also due to the evolution of broadcasts over time, television platforms began to make room in the grid that was only for traditional sports such as Football, Basketball and Volleyball, and with the creation of championships, newspapers and interviews dedicated to the area. In addition, with the technological evolution, came the emergence of streaming platforms in which we can mention: Twitch, CubeTV, Nimo, among others. With this, a new culture about E-Sports was being shaped among the younger people. Another interesting point refers to the 'Console' platform, which had 32% of global revenue, this is due to casual gamers and which generally has the highest age group in addition to young people under 18 years old who usually consume fighting games and simulators such as FIFA and PES. The 'Computer' platform maintains its stability in the sector with about 20% of revenue, as it is already a consolidated market with MOBA and FPS games, among others, it always manages to seek some innovation in some new title. The 'Navegadores' platform has the lowest percentage with 2%, despite having a high revenue, it is the least consumed and over time it may not be consumed due to innovations in other segments and the like. But that could change if Microsoft and Sony's cloud gaming innovation pays off in the future.

2.1.3 *E-Sport Growth in Brazil*

The growth of E-Sports in Brazil is associated with the growing consumption of content on social networks and websites associated with the emergence of more accessible games for different audiences and platforms (*Terra*, 2020), thus allowing the chance of new vehicles as non-brands. endemic for advertising increase the visibility of companies active in the market. National companies such as Lupo, Gillette, Netshoes, among others, are already moving within the sector.

In addition to traditional football teams such as Flamengo, Santos, Corinthians and Cruzeiro, they are already acting with teams in several modalities to attract more audiences and obtaining satisfactory results, such as Corinthians Free Fire world champion in 2019 and Flamengo national champion of League of Legends in 2019. Such growth has given rise to new products from these companies and brands around E-Sports, such as accessories, beverages, clothing and food aimed at the public. One can mention the Loud and Fusion partnership for a

line of energy drinks and the gamer chairs in the Flamengo and DT3 partnership. The main modalities of E-Sports are MOBA (Multiplayer Online Battle Arena), FPS (First Person Shooter), RTS (Real Time Strategy), Fighting Games (Fighting Games), Card Games (Card Games) and Simulator (Globoesporte, 2020).

2.2 Investments in E-Sports

Investments in E-Sports have been increasing every year as the public's consumption increases. According to Newzoo (2019) through Figure 4, a consulting company specializing in games, it is estimated that the market will grow around 11% per year in 2022 it will move around 200 billion dollars per year and in constant growth. It should be noted that a large part of this share comes from Mobile Games (Smartphone), in which, with a more globalized society in constant movement, the convenience of the smartphone is essential for this phenomenon. Besides that they have a more affordable purchase price compared to Consoles (Playstation, Xbox and Nintendo) and Computers/Notebooks.

Thus, emerging countries such as Brazil, China, Russia, Taiwan and Indonesia are the largest consumers in this segment besides the United States. Drawing the attention of large companies, which invest in this segment with great strength in countries with large populations. Consequently, the main Mobile Games teams are from emerging countries.

Reiterating that with this pandemic that we are currently experiencing, with consumers at home due to isolation, gambling is very common to de-stress as an outlet and, in many cases, fun with friends.

According to Newzoo (2019) revenue from streams/lives related to E-Sports surpassed the 1 billion dollar barrier in 2019. With almost half of that amount coming from sponsorships and advertising in second place. It is becoming common in championships, there are advertisements from companies in the match streams such as: decisive moments replays, game goal gain, match round table, MVP (Most Valuable Player) decision of the match, among others, and at half- time.

This last point mentioned is the most focused on companies, where they show videos to publicize products aimed at the public, in addition to promoting the game itself. It is worth mentioning the events are held on large stages such as stadiums and arenas for example: the finals of the World League of Legends in 2016 and 2017 were held at the Staples Center in the United States and at the National Stadium in Beijing, respectively, causing the sale box office, products, among others at the event in person.

It became a trend in recent years, non-endemic brands invested in the sector to attract the younger audience to be their consumers. Brands such as Shell (fuel), Nike (clothing), MasterCard (Cards), Spotify (music), Kia and Toyota (Automobiles), among others, put resources in the most varied national, continental and world championships to promote their brand.

It should be noted that national companies are investing more in national and continental championships, but large international companies invest on a global scale seeking new markets and consequently their expansion. In Brazil, it can be noted that we have several examples of brands being promoted in the sector, such as: Coca Cola, Red Bull, Gillette, Kalunga, Lupo, OMO, Mercedes - Benz, among others. In particular, we can mention Vivo and Havan that have professional teams in which they are called: Vivo Keyd and Havan Liberty. They participate in numerous modalities and tournaments (FDcomunicação, 2020).

Methodology

The purpose of this study is to answer questions about the growth of E-Sports in Brazil and show the reasons why it is the newest national passion. Because of this, the type of research is descriptive, in order to describe all the reasons that motivate the sector's growth. According to Vergara (2016), descriptive research obtains particularity, attributes of a given population or phenomenon. Being able to add and distinguish links between different variables for their natural

definition. It is not committed to guaranteeing certainty of the facts, but the data collected serves as the basis for the research.

As for the approach, it was done in a quantitative way, in which the research results are translated and that has a greater understanding of the problem mentioned in the work. Quantitative research is part of the so-called positivist knowledge, which prefers the static-mathematical rational approach because it prioritizes the rationality of samples of numbers, quantities and objects observed and examined. The quantitative characteristic is the experimental analysis (Lakatos; Marconi, 2019).

Data collection was performed with a semi-structured questionnaire with 19 open and closed questions, in order to describe and quantify the profile and tastes of consumers for an audience of 200 people spread across Brazil, available on Google Forms and distributed on social networks among consumers in the sector through groups, personal contacts and disclosures via WhatsApp and Twitter for the month of May 2021. After collection, descriptive statistical techniques were used.

Results

It was found in the analyzed sample a predominantly male audience with about 73.5% (147 questionnaires), but with a growing increase in the female audience which represents 26.5% (53 questionnaires). With regard to the public by age group, the predominance of the public is between 19 and 25 years old with 56.5% (113 questionnaires), that public that has left the adolescence stage and reaches adulthood. Regarding the monthly income and the average spent on products related to the sector, there is a predominance of the middle class that has income between 1 to 3 salaries with 53% (106 questionnaires), but 27% (54 questionnaires) are those with income 1 salary, an audience that is increasing over time through the consumption of mobile games. However, 47% of the public (94 questionnaires) spend up to 300 reais on products and 11% (22 questionnaires) spend more than 1,000 reais.

The products purchased related to the sector and the games used are quite varied. Articles in the game are the most requested by the public with 62% (124 questionnaires) and then comes Peripherals; Clothing and Others between 37.5% and 38.5%. League of Legends and CSGO are the most accessed games and then comes "others" (Alternative Titles in sequence), the others come in a similar percentage.

About 46.5% (96 questionnaires) consume content daily and 57% (114 questionnaires) consume 1 to 3 hours a day. Emphasizing that the public has a certain loyalty to the sector, consuming daily even if it is a few hours a day. The main platforms used by the public are Twitch and YouTube, the most consolidated in the market. With 67.5% preferences for Twitch and 75% for YouTube. Next comes Facebook Gaming with 38.5%. The other platforms are mentioned, but in small percentages. In relation to the main brands related to E-Sports. Nike, Samsung, Coca Cola, RedBull and Intel stand out. Big players in sectors, they were rooted in the minds of consumers. And the reason for following E-Sports, was mentioned in a more varied way by the public, several mentioned that they like it, out of passion and love for this universe. Some mentioned a form of hobby and a way to ease day-to-day stress, make friends, among others.

Final considerations

As north, this article sought to analyze through a survey the growth of e-Sports in Brazil, allowing the end of the survey to verify that the growth and expansion of the public is growing over time and will reach high levels. The audience profile is young people transitioning to adulthood, taking on the next generation. The growth of the female audience is a warning sign for greater investment in this niche in search of more results, given the growing participation of women in the sector. It was discovered the preference of Brazilian games based on 3 points: Moba, FPS and Mobile. Easy accessibility games combined with technological growth, manages to capture the lowest economic classes in the country, bringing a wider audience. Strategies

should be drawn up to increase audience and public loyalty and analyze which platforms/social networks most worked and established are the most sought after. It is understood that the public's search is due more to the entertainment and fun of streamers, and also as a form of rest. It can be seen that the public is adept at games and teams when it comes to purchasing products, seeing that much of their purchases are related to in-game transactions and everyday consumables such as clothing and peripheral products, showing loyalty to the game or team.

References

GLOBOESPORTE. AS DEZ MAIORES PREMIAÇÕES DO ESPORTE ELETRÔNICO. 2021. Disponível em: <https://globoesporte.globo.com/esports/stories/2021/04/20/as-dez-maiores-premiacoes-dos-esportes-eletronicos.ghtml> Acesso em: 20 de Abril de 2021.

GLOBOESPORTE. O QUE SÃO ESPORTS? COMO SURTIRAM E OS PRINCIPAIS JOGOS COMPETITIVOS. 2020. Disponível em: <https://globoesporte.globo.com/esports/noticia/esports-o-que-sao-como-surgiram-e-tudo-sobre-o-cenario-competitivo.ghtml>. Acesso em: 23 de Fevereiro de 2021.

IBGE. USO DE INTERNET, TELEVISÃO E CELULAR NO BRASIL. 2018. Disponível em: <https://educa.ibge.gov.br/jovens/materias-especiais/20787-uso-de-internet-televisao-e-celular-no-brasil.html/>. Acesso em: 23 de Fevereiro de 2021.

JENSEN, Larissa. E-Sports: profissionalização e espetacularização em competições eletrônicas. 2017. Disponível em: <https://acervodigital.ufpr.br/handle/1884/47321>. Acesso em: 23 de Março de 2021.

LAKATOS; Eva Maria; MARCONI, Marina de Andrade,. Fundamentos de metodologia científica. – 8. ed. - [3. reimpr.]. – São Paulo : Atlas, 2019.

MARQUES, Carla Verônica Machado; CALIL, Érica; BRASIL, Gabriel. Game Inteligente: conceito e aplicação. Anais do Seminário de Jogos Eletrônicos, Educação e Comunicação, v. 1, n. 1, 2015. Disponível em: <http://revistas.uneb.br/index.php/sjec/article/view/1255/864>. Acesso em: 27 de Fevereiro de 2021.

NEWZOO. Esports in Brazil: Key Facts, Figures, and Faces | Newzoo & Esports BAR. 2018. Disponível em: <https://newzoo.com/insights/trend-reports/esports-in-brazil-key-facts-figures-and-faces/>. Acesso em: 26 de Fevereiro de 2021.

NEWZOO. Newzoo's Trends to Watch in 2019. 2019. Disponível em: <https://newzoo.com/insights/articles/newzoos-trends-to-watch-in-2019/> Acesso em: 22 de Março de 2021.

OLIVEIRA, Saulo, RIOS, José, E-Sports e a profissionalização de Jogos Eletrônicos. <http://repositorio.ufc.br/>, 2016. Disponível em: <http://www.repositorio.ufc.br/handle/riufc/44640>. Acesso em: 20 de Março de 2021.

PESQUISA Gamer Brasil. PGB 2020 7º EDIÇÃO. 2020. Disponível em: <https://www.pesquisagamebrasil.com.br/pt/pesquisa-game-brasil-2020/>. Acesso em: 22 de Fevereiro de 2021.

SARAIVA, Pedro André Cardoso. E-sports: um fenômeno da cultura digital contemporânea. 2013. Tese de Doutorado. Disponível em: <https://repositorio.iscteuiul.pt/handle/10071/7784>. Acesso em: 30 de Março de 2021.

SPORTV. Brasil segue como terceiro maior público cativo de e-sports no mundo. 2018. Disponível em: . Acesso em: 05 de Março de 2021.

SPORTV. Só o começo: China investe R\$ 1 bilhão em cidade de eSports com parque de diversão e 17 mil m². 2018. Disponível em: <https://sportv.globo.com/site/esportv/noticia/so-o-comeco-china-investe-r-1-bilhao-em-cidade-de-esports-com-parque-de-diversao-e-17-mil-m.ghtml>. Acesso em: 27 de Fevereiro de 2021.

TERRA. MERCADO DE E-SPORTS TEM CRESCIMENTO SIGNIFICATIVO NO BRASIL. 2020. Disponível em: <https://www.terra.com.br/noticias/dino/mercado-de-e-sports-tem-crecimento-significativo-no-brasil,dacbb679d422615b311718951a605d8cftn70ih0.html>. Acesso em: 25 de Fevereiro de 2021.

VIDOR, George. O mercado de games no mundo fatura mais que cinema e música, somados. 2015. O Globo. Disponível em: <https://oglobo.globo.com/economia/o-mercado-de-games-no-mundo-fatura-mais-que-cinema-musica-somados-16251427>. Acesso em: 25 de Fevereiro de 2021.

Factors Affecting Digital Transformation of Manufacturing Companies

Andrey Zyatchin, St. Petersburg State University's Graduate School of Management (zyatchin@gsom.spbu.ru), Maria Kozlova, St. Petersburg State University's Graduate School of Management

Abstract:

The goal of these research is to identify factors which affect the process of digital transformation in manufacturing companies. Based on combination of literature review and semi-structured interview with expert in DT from Gazprom Neft seven factors were chosen for further in-depth analysis: innovative push, attitude to DT and change, competition, responsiveness to customer needs and expectations, corporate technology, market condition, alignment of business & IS. Then, seven hypotheses and research model were formulated. It represents a combination of Diffusion of innovation theory (individual characteristics) and Technology, Organization, and Environment theory (technological and environmental factors) and 2 more strategic aspects described on modern theories (alignment of business and IS, costumer orientation). Based on the obtained results, strategical recommendation were formulated.

Keywords: *digital transformation, Diffusion of innovation (DOI) theory, Technology, Organization, and Environment (TOE) theory.*

1. Introduction

Digital solutions become more and more firmly embedded in everyday corporate practice: mobile apps, online shopping, big data analytics, Internet of Things, artificial intelligence etc. Data collection, monitoring, automation and optimization of all possible processes are constantly performed, which, in turn, requires more and more intelligent systems, the development of which is significantly simplified by improved algorithms, powerful computers, and cloud storage. Never before has the world been so closely connected and so digitized as it is today. Digitalization is believed to be the most meaningful technological trend, which affects not only business but society as a whole.

Digitalization leads to the digital transformation (DT) of business (transformation of business models) as new technologies, digital innovation and digitalization has changed traditional business processes, corporate structures, relationships, products and services due to inevitable efforts of companies to adjust to rapidly changing world.

Important area of research about digital transformation is investigation of drivers, barriers and success factors i.e. factors affecting digital transformation. Researchers try to answer such questions as “What force companies to adopt digital solutions?”, “What are the most crucial factors affecting digital transformation?”, “Why some companies are fail in the process of digital transformation?”, “Which capabilities and resources are essential for successful digital transformation?”, “How to conduct successful digital transformation”. These issues are covered in the works of researchers such as Rogers E. M., Liere-Netheler K., Vogelsang K., Tornatzky L., Fleischer M., Packmohr S., Osmundsen K., Iden J., Bygstad B. and many others. Today, there are existing theories about factors affecting digital transformation. However, digital transformation is a new topic that is not fully studied yet. Moreover, the development of digital technology is ongoing, not finished process and therefore, the drivers and the key success factors of digital transformation also evolve through time. From academic perspective, proposed research will provide a deeper insight into factors affecting digital transformation of companies and their impact as well as will identify implicit factors, which were not previously discussed a lot. As a result, findings of the research will contribute to the enlargement and improvement of traditional theories about factors affecting digital transformation. Moreover, revealed insights

into key success factors would be a good base for enlargement of theories about digital transformation strategies. From practical perspective, this research would be useful for business representatives who are interested in digital transformation of their companies or for those who strive to stay competitive and achieve competitive advantage. Research would propose practical and strategical recommendations for companies on how to digitally transform their business and what are the main preconditions for it.

2. Digital transformation in Russian manufacturing

Today, the Russian Federation is one of the leading powers in the world. According to its potential, the country's industry is able to establish the production of a wide range of goods that provide the most important areas of the population's life. Despite the severe systemic crisis of the 90s, accompanied by a significant decline in industrial production, since the beginning of the 2000s, a steady trend of growth and development has been recorded in manufacturing segment. Russia closes the top four, behind China, the United States and India in terms of production. The most developed branches of the Russian industry are the oil and gas sector (23% share in manufacturing industry), ferrous and non-ferrous metallurgy (17%), general, transport and equipment engineering (31%), and food production (16%).

Currently, Russian government actively support digital transformation of manufacturing. On August 5, 2020, it became known about the approval of the first standards of the digital industry in Russia. They were developed by the technical committee "Cyber-Physical Systems" on the basis of RVC with the support of the Ministry of Industry and Trade of the Russian Federation. According to the ministry, the standards are aimed at the effective implementation of digital technologies in the Russian industry, the development of high-quality and independent solutions, as well as ensuring their compatibility.

In 2020, the Digital Economy organization, together with the Ministry of Industry and Trade of Russia and the Cifra Group of Companies, conducted a study aimed at identifying obstacles to the digitalization of Russian production. Most of all, the surveyed experts noted the high cost of IT solutions for the digitalization of production processes, the insufficient level of digital maturity of business employees and the disruption of supply chains.

The companies see the high cost of digital transformation projects as the main obstacle to the digitalization of the industry. Two other pressing issues-the inherently low level of automation and digitalization, and the distrust of employees who resist change.

According to the study, training of personnel to work with digital services and improving computer skills will help to overcome the voiced problems. The second way to overcome the problems on the path of digitalization is to provide financial benefits and incentives to business from the state. The third method is the modernization of production and the creation of integrated digitalization strategies by enterprises. Amendments to the regulatory regulation as a way to solve the problems of the industry were named by 18% of respondents.

3. Methodology

Theories about factors affecting digital transformation

Most popular (mostly mentioned in researches) theories and models about drivers of digital transformation are Diffusion of Innovation Model (DOI), Technology, Organization and Environment Model (TOE).

Diffusion of Innovation theory was developed by Everett Rogers back in 1962 and expanded in 1996 by the author. Initially it was developed to explain adoption of any innovation, but later was adjusted for IT and digital technologies. This theory explains how and due to which factors technology and digital innovation is adopted by companies. Adaptation of digital technologies has direct effect on digitalization and digital transformation of organizations. Therefore, this theory could be a good base for understanding of drivers of digital transformation. According to DOI theory, main factors of digital technology adoption are individual characteristics (attitude towards change), internal organizational characteristics (these

could include level of company's formalization and centralization, company size, slack, interconnectedness and overall complexity) and external characteristics (including system openness) [Oliveira T., Martins M. F., 2011].

Technology, Organization and Environment Model was created by Tornatzky and Fleischer in 1990. As well as DOI theory, TOE model strives to explain the way how company will adopt new technological innovation based on the state of core drivers. TOE model stated that there are three main contexts influencing the digital innovation of a company: technological, organizational and external. Technological context includes internal and external technologies referred to the firm: equipment, tools and technologies used and available to the company. Organizational context includes internal characteristics similar to DOI model: size, structure, slack, communication etc. External context refers to macro and business environment of a company: industry and market conditions, governmental regulation and technology support infrastructure [Tornatzky L., Fleischer M., 1990]. According to Gillani F. et al. (2020) organizational, technological and external contexts are not separate perspectives which affect DT, but technological context is a mediator of organizational and external impacts of the company (i.e. organizational and external factors influence DT through technological factors).

Both DOI and TOE model emphasized internal organizational factors and external factors as a core drivers of digital technologies adoption by companies. However, DOI theory has also a focus on individual attitude to innovation, while TOE model pay more attention to external and technological factors. These two theories have become a base for deep investigation of organizational and external environment factors in digital technology acceptance and adoption by various researchers.

Selection of factors

To make research model more significant and characterized with high exploratory power it was decided to choose most significant factors, i.e. those which have strongest effect on digital transformation of company. In order to do so, mixed approach was used: combination of secondary data analysis (literature review of articles devoted to ranking of factors or/and estimation of their power) and primary data analysis. In order to collect primary data semi-structured interview with expert in digital transformation of manufacturing companies was chosen.

The semi-structured interview is based on the use of two types of questions: 1) mandatory, basic, which must be asked in any case; 2) Clarifying, which are used in the conversation or excluded from it by the interviewer, depending on the answers to the main questions. Thus, a certain variability of the survey is achieved, taking into account the individual characteristics of the respondents and changes in the communicative situation.

Hypotheses and research model

Based on literature review and semi-structured interview seven factors were selected for further research. In order to construct a research model, seven hypotheses were formulated:

H1: High competition in an industry, where company operates positively impacts Digital Transformation of entire company

H2: High innovative pressure and availability of technologies in an industry, where company operates positively impacts Digital Transformation of entire company

H3: Alignment of business and Information Systems in an enterprise, positively impacts Digital Transformation of entire company

H4: Positive attitude to change and digital transformation in an enterprise, positively impacts Digital Transformation of entire company

H5: Generalized and interconnected technology applied in an enterprise, positively impact Digital Transformation of entire company

H6: Instabilities in an industry, where company operates positively impacts Digital Transformation of entire company

H7: High responsiveness of an enterprise to customer needs and expectations positively impact Digital Transformation of entire company

SEM analysis was implemented to test research hypotheses.

4. Empirical results and conclusions

As a result 5 hypotheses out of 7 were accepted. Research revealed that positive effect on digital transformation have: high competition in an industry, high innovative pressure and availability of technologies, alignment of business and Information Systems in an enterprise, positive attitude to change and digital transformation, generalized and interconnected technology. The most influential factors are corporate technology and positive attitude towards change. Companies with high performance of these factors more easily and successfully go through digital transformation process.

References

- Gillani, F., Chatha, K. A., Jajja, M. S. S., & Farooq, S. (2020). Implementation of digital manufacturing technologies: Antecedents and consequences. *International Journal of Production Economics*, 229, 107748.
- Oliveira, T., & Fraga, M. (2011). Literature review of information technology adoption models at firm level.
- Tornatzky, L.G. and Fleischer, M. (1990). *The Process of Technology Innovation*. Lexington: Lexington Books.

Public Sector Issues

Factors of Citizens' Involvement in Electronic Participatory Budgeting on Municipal Level (the case of St. Petersburg)

Daria Bakalets, St. Petersburg State University's Graduate School of Management (d-bakalets@mail.ru), Anastasia Golubeva, St. Petersburg State University's Graduate School of Management, Evgenii V. Gilenko, St. Petersburg State University's Graduate School of Management (e.gilenko@gsom.spbu.ru)

Abstract:

This pilot study focuses on the factors influencing the intention of citizens to be involved in participatory budgeting (PB) on the municipal level via different electronic communication channels. Having classified such factors based on a literature review, we construct a comprehensive model of citizens' participation in electronic PB (e-PB). To empirically verify interconnections and influence of different factors on citizens' involvement in e-PB, we conducted a survey. To this end, we developed a questionnaire to poll the inhabitants of the Yuzhno-Primorskiy municipality of St. Petersburg. Using the collected information on 259 respondents, the developed model was estimated using the partial least squares structural equation modeling approach (PLS-SEM). Based on the obtained results, we provide relevant recommendations for the administration of the Yuzhno-Primorskiy municipality, which are expected to help the authorities more actively involve the citizens of the municipality in PB.

Keywords: *participatory budgeting, electronic communication, local government, structural equation modeling*

1 Introduction

Involvement of citizens in the budgetary process is a worldwide trend that reflects the transparency and openness of the information on public budgets, the increasing number of public discussions of budgets on different levels, as well as the active introduction of innovative management approaches aimed at developing both greater involvement of citizens in solving the local (municipal) issues and their greater trust in the authorities by providing the citizens with the opportunity of direct participation in public budget allocation – the PB.

Over the past few years, the rate of implementation of PB practices on the local (municipal) level in Russia has increased substantially. In particular, there has been much more PB initiatives that imply initiation and financing of projects proposed by citizens exclusively at the expense of local budgets [Romanov et al., 2020]. According to the Russian Ministry of Finance, in 2018, there were 91 practices implemented on the local level, while in 2019 this number rose to 147.

On January 1, 2021, Federal Law No. 236-FZ “On Amendments to the Federal Law «On General Principles of Organization of Local Self-Government in the Russian Federation»” came into force, creating a legal basis for application of PB on the municipal level. This Federal Law is aimed at implementing the List of Instruction of the President of the Russian Federation No. 354 (dated March 1, 2020) on increasing the share of distribution of local budgets with the participation of the population to 5% over the forthcoming three years. Thus, in connection with the declared implementation of PB practices, Russian local government entities (hereinafter, LGEs) have been facing the question of the prospects and strategies for involving citizens in the budgetary process.

But, despite of a wide range of benefits for citizens, many PB projects suffer from low citizens' involvement, thus questioning the very functioning of such projects. There is a whole bunch of reasons – both internal (related to the attitude of citizens) and external (concerning the

organization of a PB process) – capable of lowering citizens’ motivation to participate. For example, citizens’ low awareness of the PB process is one of such reasons being an obstacle for a wide implementation of PB. Surveys of citizens conducted in various countries demonstrate that people wanted to be involved in PB – they just were not aware of such option [Zepic et al., 2017, Gerlit et al., 2017]. Other obstacles are: accessibility issues; complexity of the PB process; lack of interest; under-development of communication channels with population; low trust in authorities; and some other [Švaljek et al., 2019, Golubeva, Gilenko, 2020].

The purpose of the current research is to reveal the factors influencing the intention of citizens to take part in PB projects and to provide relevant recommendations for LGEs on how to appropriately increase citizens’ involvement in PB.

To this end, we studied the opinions of citizens of the Yuzhno-Primorskiy municipality of St. Petersburg (Russia). Taking into account the freedom that the municipality has in selecting the ways of PB implementation, we decided to focus on analyzing the application of electronic means of PB implementation (e.g., web-portals). Thus, in this study we consider what is called e-PB, in which the corresponding process is organized in the online format (using electronic communication channels).

The rest of the paper is organized as follows. Section 2 illustrates the theoretical model and the research methodology for the current study, while Section 3 gives the obtained empirical results. In Section 4, based on the obtained calculation results, the relevant recommendations are provided and conclusion is made.

2 Research methodology

2.1. Development of the theoretical framework

Taking into account the theoretical approaches used in the literature, as well as their limitations, in this research we propose yet another conceptual theoretical model of citizens’ participation in PB via electronic channels (see Fig. 1). The *dependent* variable in the model is the intention of a citizens to be involved in e-PB (hereafter, *Intention*). The *independent* variables are split into **three** principal blocks: *social capital in the local community (municipality)* (hereafter, *Social capital*), *motivation to participate in e-PB* (hereafter, *Motivation*), and *attitude towards e-communication with authorities and LGEs* (hereafter, *Attitude*). The rest are control variables.

2.1.1 The “Social capital” block

The three key aspects of social capital that are widely discussed in the literature [Naranjo-Zolotov et al., 2019, Choi, Song, 2020] are: trust, social networks and civic norms. These three constitute the basis for measuring *Social capital* (latent variable) in our model. The corresponding manifest variables are: trust in local government, social trust in the local community, identification with the local community and the territory of inhabitation, interaction in the local community, commitment to the local community, and collective efficacy.

2.1.2 The “Motivation” block

This block of factors is given as a pyramid which reflects different levels of citizens’ motivation to participate in PB. This hierarchical structure allows to allocate the factors identified in the literature [Montambeault, 2016, Schneider, 2018] – from the basic awareness up to the high-level motivators (such as civic duty, desire to influence local government’s decisions, and common good orientation).

2.1.3 The “Attitude” block

This group of factors comprises the following: attitude, effort expectancy, performance expectancy, social influence, facilitating conditions (such as user-friendliness of the graphical user interface), perceived risk.

2.1.4 Control variables

The model includes such control variables (attributes of the respondent) as gender, age, children, marital status, education level, income level, economic activity, NGO membership,

interest in politics political interests, election participation, attitude towards costs of participation in civil activities.

2.2. Experiment design

At this stage of the research, based on the constructed theoretical framework, we developed our own questionnaire which consisted of 5 principal parts and included questions directly related to both the principal blocks of the theoretical model, and socio-demographic characteristics of the respondent. In total, there were more than 50 questions in the questionnaire.

The survey was conducted in spring 2021. Due to the COVID-19 situation, the survey was run *online* via the popular Russian social network “VKontakte” (vk.com). The coverage was 9 different VK-groups related to the Yuzhno-Primorskiy municipality.

In total, we collected 278 responses¹. After running an exploratory data analysis (which included removing outliers and observations with missing values from the sample), the final sample size was 259. It should be noted that, currently, sample size of more than 250 observations is considered tolerable to obtain reliable results of estimation, in particular, by PLS-SEM (see [Rossee, 2020]).

3 Empirical results

Based on the collected sample, we empirically estimated the developed theoretical model using the partial least squares structural equation modeling (PLS-SEM). This technique is a method of structural equation modeling which allows estimating complex cause-effect relationship models with latent variables. It is now widely applied in many social science disciplines. Application of PLS-SEM in the modern studies is very appealing as it allows to estimate complex models with many constructs, indicator variables and structural paths without imposing distributional assumptions on the data ([Hair, 2019]). In this study, we used the *semPLS* R-package ([Monecke, 2012]) to obtain the estimates for the coefficients of our model. The results of model estimation are given in Fig. 1.

¹ As of January 1, 2021, the official population size of the Yuzhno-Primorskiy municipality was 91,319 people. With the chosen 5% margin of error and 90% confidence level, the corresponding representative sample size is 272.

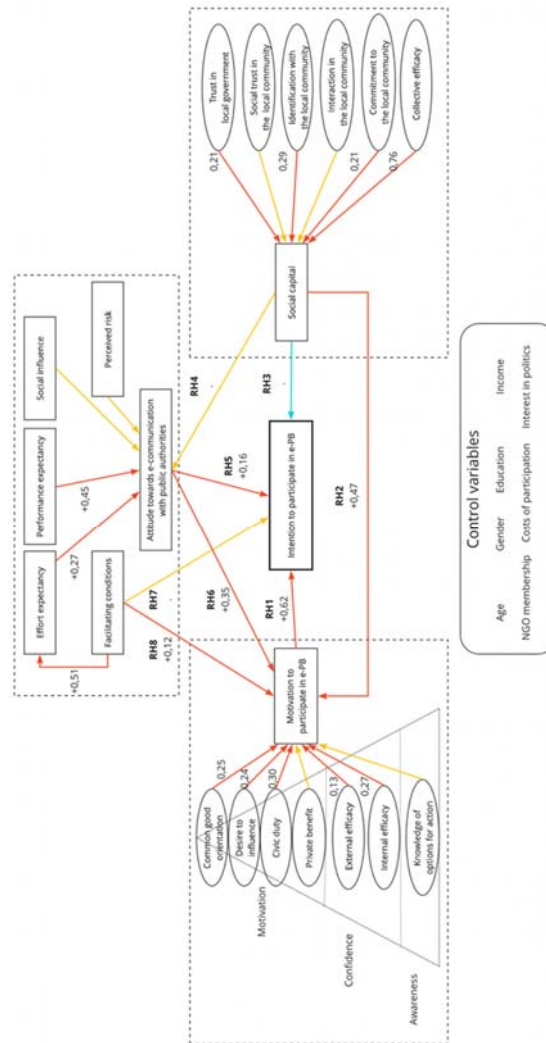


Fig. 1. Estimated model of factors of citizens' intention to participate in e-PB (only values of the coefficients that are statistically significant at least at the 10% level are given in the figure).

To address the above-mentioned questions, the obtained results allow to make conclusions on the formulated research hypotheses.

RH1 (*The greater the citizen's motivation to participate in e-PB, the greater their intention to participate in e-PB*) found its support. Moreover, it is *Motivation* that has the highest impact on *Intention*. The corresponding path coefficient is +0.62, which also reflects the highest impact of motivation on intention. The other latent variables also influence the intention to participate in e-PB, but this influence is indirect (via motivation).

RH2 (*The citizen's social capital in the local community has a positive influence on the citizen's intention to participate in e-PB*) is not supported by the calculations, while RH3 (*The citizen's social capital in the local community has a positive influence on the citizen's motivation to participate in e-PB*) found an empirical support. The corresponding path coefficient for RH3 is positive and statistically significant (+0.47), while the coefficient for RH2 turned out to be negative and insignificant. These findings reflect an important full mediation effect – the independent variable (*Social capital*) significantly influences the mediator (*Motivation*) which, in turn, has a significant impact on the dependent variable (*Intention*). This finding allows to conclude that those citizens who have higher *Motivation* and, as a result, higher *Intention*, are also characterized by a higher level of *Social capital*.

The influence of *Social capital* on *Attitude*, although positive, appeared to be statistically insignificant, so RH4 (*The citizen's social capital in the local community has a positive*

influence on the citizen's attitude towards electronic communication with public authorities) is rejected.

Speaking about RH6 (*The citizen's attitude towards electronic communication with public authorities has a positive influence on the citizen's motivation to participate in e-PB*), we can see that the corresponding coefficient is positive and statistically significant (+0.35), while the coefficient related to RH5 (*The citizen's attitude towards electronic communication with public authorities has a positive influence on the citizen's intention to participate in e-PB*) almost twice as smaller in its size (+0.16), although still positive and statistically significant. This speaks in favor of the presence of a partial mediation effect of *Motivation* on the connection between *Attitude* and *Intention*.

Speaking about *Facilitating conditions* – RH7 (*Facilitating conditions have a positive influence on the citizen's intention to participate in e-PB*) and RH8 (*Facilitating conditions have a positive influence on the citizen's motivation to participate in e-PB*) – we can say that only RH8 is supported by the calculations (RH7 is rejected). This reflects the presence of yet another full mediation effect between *Facilitating conditions* and *Intention*, where, again, the mediator is the *Motivation* variable.

4 Conclusions and recommendations

The results of empirical validation of the proposed theoretical framework clearly demonstrated that the factors of citizens' e-PB involvement, which are related to the *Motivation* block, have the highest power in explaining citizens' intention to participate in e-PB. As ranked by their relative weights, these factors are: civic duty, internal efficacy, common good orientation, desire to influence, and external efficacy.

Achieving of the desired results of PB via more active citizens' participation is impossible without a thoughtful organization of all of the steps in this practice, starting from creating and promoting of PB projects and ending with obtaining the relevant feedback on the results of their implementation. And all these steps should be based on the principal of minimization of citizens' costs with simultaneous widening of the range of their benefits. The results obtained in this research (even taking into account its certain limitations) allow to shed light on the mechanisms of creation of citizens' motivation to participate in PB.

Ultimately, successful implementation of e-PB will help increase trust in authorities, which, in turn, will help wider realization of (electronic) public services ([Golubeva, Gilenko, 2019]), more actively propelling the national economy from different crisis situations ([Gilenko, 2017]).

References

- Choi J-C., Song C. Factors explaining why some citizens engage in E-participation, while others do not // *Government Information Quarterly*. 2020. Vol. 37 (4). Article 101524.
- Gerlit R., Dapp M., Kremer H. Reasons for low Participation in German Participatory Budgeting: A Public Administration Perspective, 2017.
- Gilenko, E.V. (2017) "The sudden transition to the free floating exchange rate regime in Russia in 2014". *Journal of Reviews on Global Economics*, 6, pp. 181–192.
- Golubeva A.A., Gilenko E.V. Communication Channels in Public Policy Development and Implementation: Online or Offline? (The Case of Separate Waste Collection in St. Petersburg) // *Communications in Computer and Information Science*. 2020. Vol. 1349. P. 172–183.
- Golubeva, A.A., Gilenko, E.V (2019) "Creating public value through public e-Services development: The case of landscaping and public amenities in St. Petersburg". *Communications in Computer and Information Science*, 947, pp. 249–264.

- Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019), "When to use and how to report the results of PLS-SEM", *European Business Review*, Vol. 31 No. 1, pp. 2-24. <https://doi.org/10.1108/EBR-11-2018-0203>.
- Monecke, A. and Leisch, F. (2012), "semPLS: structural equation modeling using partial least squares", *Journal of Statistical Software*, Vol. 48 No. 3, pp. 1-32.
- Montambeault F. Participatory citizenship in the making? The multiple citizenship trajectories of participatory budgeting participants in Brazil // *Journal of Civil Society*. 2016. Vol. 12 (3). P. 282-298.
- Naranjo-Zolotov M., Oliveira T., Cruz-Jesus F., Martins J., Gonçalves, R., & Branco, F., Xavier, N. Examining social capital and individual motivators to explain the adoption of online citizen participation // *Future Generation Computer Systems*. 2019. Vol. 92. P. 302–311.
- Romanov, S., Bagdasaryan, T., Vagin, V., Shapovalova, N., Gavrilova, N., Kurakolov, M., Filippova, N., Paksivatkina, V. The report on the best practices of participatory budgeting development in the regions of the Russian Federation and municipalities // The Ministry of Finance of the Russian Federation. Moscow, 2020 (in Russian)
- Rosseel Y. (2020) Small sample solutions for structural equation modeling. In "Small sample size solutions. A Guide for Applied Researchers and Practitioners". Edited by Rens van de Schoot and Milica Miočević. Routledge, Taylor & Francis Group, London and New-York.
- Schneider S.H. Bürgerhaushalte in Deutschland. Individuelle und kontextuelle Einflussfaktoren der Beteiligung. Springer, 2018. VS. 341, S. 54, 99.
- Švaljek S., Rašić Bakarić I., Sumpor M. Citizens and the city: the case for participatory budgeting in the City of Zagreb // *Public Sector Economics*. 2019. № 43, br. 1. P. 21-48.
- Zepic R., Dapp M., Krcmar H. Participatory Budgeting without Participants: Identifying Barriers on Accessibility and Usage of German Participatory Budgeting, 2017 // Conference for E-Democracy and Open Government (CeDEM), Krems, 2017. P. 26-35.

Innovation vs. Administration: Researching Implementation in the Public Sector

Cornelia Ebadi, Bundeswehr University München (cornelia.ebadi@unibw.de), Andreas Glas, Bundeswehr University München (andreas.glas@unibw.de)

Abstract:

Present problems such as the Covid-19 crisis, demographic transition and climate change, but also megatrends, such as digitalization, point to the issue that the public sector requires the capacity to innovate. Innovativeness is far off the typical and somehow overstretched image of the public sector as a static and bureaucratic administration that hardly changes and usually fails to finish projects on time. In other words, bureaucratic routines meet the need to be innovative. Previous research has widely neglected the implementation process of innovation in the public sector, although it is seen as a crucial factor for the success of innovation. This research addresses this dilemma by reviewing public sector literature on innovation implementation. Critical success factors are summarized and an integrated framing approach, which addresses specifically innovation in the procurement process of public sector organizations, is suggested. Thereby, the paper points to a number of theoretical implications for future research.

Keywords: public procurement; implementation, innovation, literature review

1. Introduction

Public sector organizations are usually structured in a bureaucratic way, characterized by a division of labor, a hierarchical structure and a system of rules (Blau, 1956). While the bureaucracy allows to maintain control, it is often associated with inflexibility, slow and inefficient decision making and resistance to change (DiMaggio et al., 1983; Meyer & Hammerschmid, 2006; Osborne & Brown, 2008; Osborne & Brown, 2011; Osborne & Gaebler, 1992; Walker, 1969). The bigger the organization, the more challenging the bureaucratic management and the public administration of the service delivery to the citizens becomes.

To cut budgets and to increase efficiency and effectiveness in the public sector, a new school of thought has emerged in the 1980s, termed new public management (NPM), which aims at overcoming the shortcomings of bureaucratic public management by applying private sector management practices to public sector organizations (Hood, 1991, 1995). The emergence of the NPM has led to a general debate about innovation and entrepreneurship in the public sector (Osborne & Brown, 2011; Osborne & Gaebler, 1992).

While various scholars have noted deficiencies in the innovation cycle in the public sector, widely blaming them on the bureaucratic nature of government (Harris & Albury, 2009; Hartley, 2005; Moore, 2005), there is a school of thought, stating that bureaucracies could become innovative and actually have the capacity to do so (Arundel et al., 2015; Damanpour & Schneider, 2009; Meijer, 2014; Thompson, 1965). The dynamics of today's problems, such as climate change, urban congestion, refugees integration, social inequality (Torfing & Ansell, 2017), but also trends like digitalization (Greve, 2015) or the recent Covid-19 pandemic (Mazzucato & Kattel, 2020) further intensify the need for public organizations to adopt new innovations. Therefore, the old question if and how the public sector could become innovative is again a relevant research topic. It is assumed that implementation is a critical competence, thus the guiding research question is what critical success factors exist for innovation implementation.

For the purpose of synthesizing findings, a structured literature review is conducted. To further focus the topic, we frame innovation implementation and connect the topic to public procurement strategy in the next section. This is followed by a brief presentation of the methodology in the third section. The findings are presented in the fourth section. The discussion section five links the identified critical success factors with the demand for a broader research agenda on innovation /strategy implementation and public procurement in the public sector. Finally, a concluding section six summarizes this research and provides some insights into future research proposals and limitations of this study.

2. Research Framework for Innovation Implementation Considering Public Procurement Strategy

Innovation in the public sector seems to be a very broad topic, which makes it difficult to analyse it in a wholistic way. Therefore, this paper focuses on an underdeveloped research area, the implementation of innovation. This section aims at providing the conceptual foundations on innovation and implementation for the upcoming literature-based analysis. It will also connect the topic to public procurement (strategy) in order to add a functional perspective to the topic. We have chosen public procurement due to its relevance, as outlined later, but also due to its connection role with industrial suppliers. These suppliers have innovation capacity at their disposal that the public sector demands for.

Starting with innovation in the public sector, it is apparent that there is a broad field of literature regarding innovation in the public sector, yet many articles do not provide any definition of the concept (de Vries et al., 2016). A striking 75% of the papers considered in a systematic literature review by de Vries et al. (2016) did not provide any definition, while the majority of the remaining papers used a rather broad definition. For instance Crosby et al. (2017, p. 657) define innovation as “*new ways of thinking about problems and solutions and doing new things in new ways*”, while Walker (1969, p. 88) defined it as a “*program or policy which is new to [the state] adopting it*”.

Literature on innovation in the public sector has so far clustered key policy needs for the promotion of public sector innovation (Arundel et al., 2019), provided classifications of innovation types in the public sector (e.g. de Vries et al., 2016), investigated factors leading to the adoption of innovation (e.g. Hartmann et al., 2008), explained adoption (e.g. Rogers, 1995) and examined the relationship between innovation characteristics and adoption rate (e.g. Damanpour & Schneider, 2009; Tornatzky & Klein, 1982). There is also a number of studies focusing on the antecedents of innovation (e.g. de Vries et al., 2016; Korac et al., 2017) and those that report on the outcomes of the innovation (e.g. Dias & Escoval, 2013; Nählinder & Eriksson, 2019).

The innovation process has frequently been divided into three main phases by scholars: 1) the initiation, where the innovative idea is generated, 2) the adoption, as the definitive decision to apply the innovation and 3) the implementation where the innovation is put into use (Walker, 2014). While the vast majority of the existing research focuses on the number of innovations adopted (Boyne et al., 2005), the implementation process has been widely neglected by scholars, with only a few notable exceptions (e.g. Choi & Chang, 2009; Edmondson et al., 2001; Grantham, 2001). That is despite the fact, that the implementation is a better predictor for the innovation outcome than its mere adoption (Wolfe, 1994). As Klein and Sorra (1996, p. 1057) put it: “*Implementation is the critical gateway between the decision to adopt the innovation and the routine use of the innovation within an organization.*” According to Cinar et al. (2019) most barriers in the innovation process in the public sector can be traced back to the implementation

phase. A systematic literature review on innovations in the health care service delivery further found that most studies on innovation implementation were undertaken from a rather pragmatic than an academic perspective, difficult to distinguish from studies on change management and overall lacking information on the implementation process itself (Greenhalgh et al., 2007).

Public procurement plays a significant role in promoting innovation (Georghiou et al., 2013; Uyarra & Flanagan, 2010). In the EU public procurement comprises a significant proportion of overall demand for goods and services and was estimated to account for 13,3% of the combined GDP in the EU in 2017 (European Commission, 2019). Despite the importance of the topic, innovation procurement has only received limited attention in the extant literature (Rainville, 2016).

In response to these circumstances this article provides an overview on how the implementation of innovation in the public has been addressed in the literature by 1) clustering previous publications 2) reporting on the critical success factors for implementation and 3) uncovering research gaps in the literature on procuring innovation. The following figure frames the research:

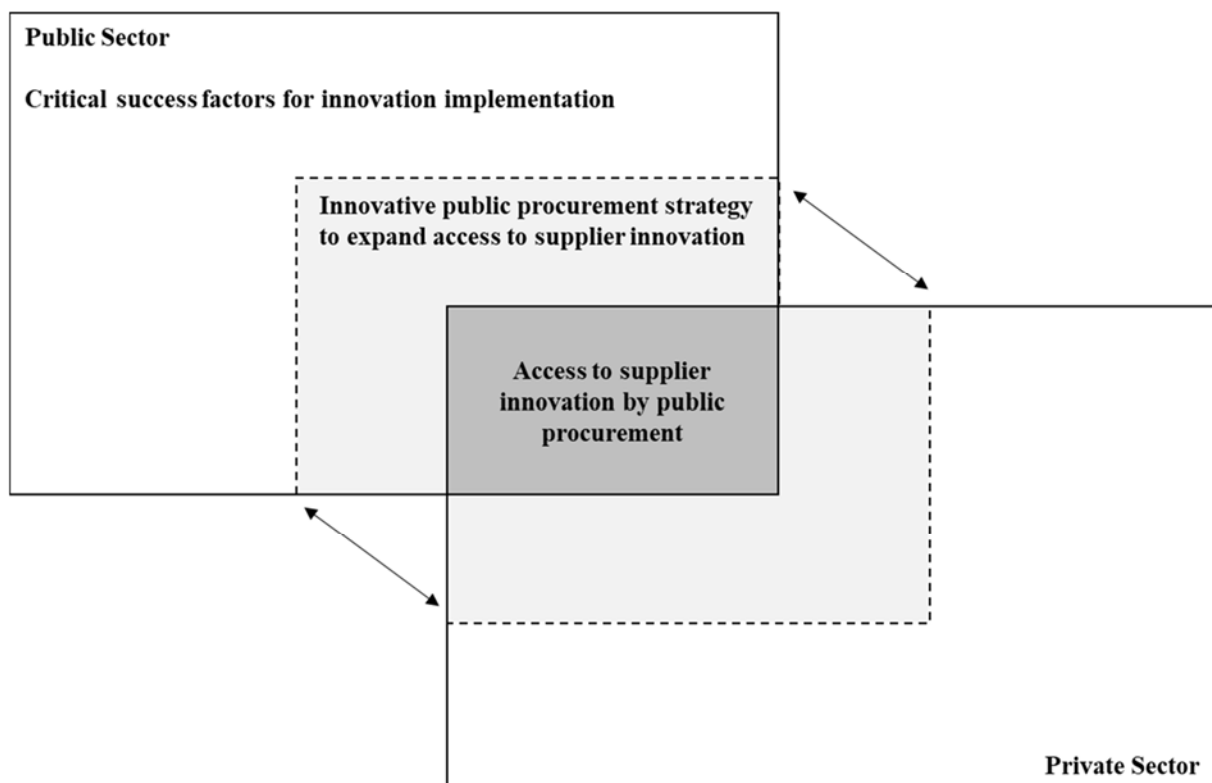


Figure 1: Research framework

3. Methodology

As mentioned earlier, the aim of this study is to synthesize findings on innovation implementation in the public sector by conducting a systematic literature review in leading public sector journals. Although there are already some literature reviews on innovation in the public sector (e.g. Cinar et al., 2019; de Vries et al., 2016), a systematic review on the innovation implementation is missing. The approach taken is based on the methodological guidelines of Durach et al. (2017).

Following the definition of the research question, selection criteria for the electronic search were determined. To ensure the quality of the included publications, the research was exclusively conducted in eight selected public sector journals, all of which are listed in the ranking VHB Jourqual 3 (Verband der Hochschullehrer für Betriebswirtschaft e.V. 2021). Two search strings were used to identify eligible papers: “*innovation AND implementation*” and “*innovate**” AND “*implement**” in abstract. Since the public sector journals by default focus on studies dealing with public sector phenomena, no additional “*public*” search string was applied. Similarly, as the publishing language of all selected journals is English, no further selection according to language was necessary. The time horizon of the research is limited to the last 20 years.

After removing duplicates, a total of 113 papers was retrieved and inserted into an Excel data base. In a second step the abstracts were read and the articles screened to ensure topicality of the papers. Only those papers were included in the final sample, that demonstrated a clear focus on the implementation of an innovation in the public sector. Only empirical papers were selected for the final sample, as the aim of the research was to identify patterns in actual implementation processes. Literature reviews were also excluded to avoid including studies twice (e.g. Cinar et al., 2019).

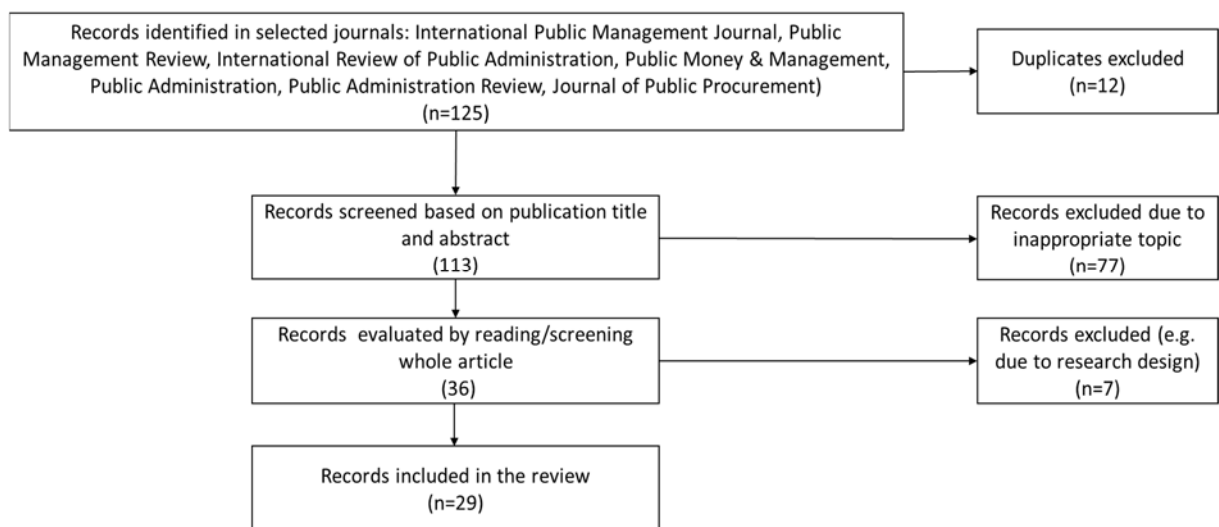


Figure 2: Research flow diagram

4. Findings

4.1 Quantitative and structure analysis of the identified articles

The analysis of the sample shows a relatively heterogenous distribution of research on implementation across the different levels of government. The largest group of innovation implementation studies was conducted on the local government level (10; 34%), followed by federal government (6; 20%) and respectively health care (6; 20%). The sample of innovation implementation papers thereby confirms the findings of de Vries et al. (2016), who reported a similar distribution for a larger sample of records on innovation itself. Qualitative research approaches clearly prevail in the sample (19; 65%). Interestingly, although the innovation implementation is the focus in all the selected papers, only very few of them (6; 20%) actually define implementation (e.g. Piening, 2011; van den Broek et al., 2014).

Content-wise the sample is very heterogeneous with no evident patterns. Theoretical foundations include leadership, diffusion, institutional logic, dynamic capabilities and rational choice theory, to name just a few. While many papers report on barriers and/or success factors in the

implementation process of innovation in the public sector (14; 48%) by either using qualitative (7, 24%) (e.g. Bello et al., 2018; Daly & Buehner, 2003; Taylor et al., 2021) or quantitative approaches (7, 24%) (e.g. Arena et al., 2020; Hansen & Nørup, 2017; Kim & Lee, 2009), other papers are mostly limited to reporting implementation outcomes (5; 17%) (e.g. Polzer & Seiwald, 2021; Turner et al., 2016) or issues related to the adoption of the innovations in the first place (Jans et al., 2018; Nasi et al., 2011). Some records (6; 20%) are also dealing with the dynamic components of the process and are drawing on comparisons between successful and unsuccessful (or delayed) implementation processes reviewing the execution to provide answers for the differences (e.g. Arnold, 2015; Piening, 2011). Almost all of these papers rely on a qualitative research approach and dive into the procedural details of the cases to draw these conclusions. Generally, many papers (10, 34%) provide very procedural approaches, reporting on the difficulties encountered in various stages of the respective projects.

4.2 Qualitative analysis: Critical success factors for innovation implementation

The literature sample shows some similarities in terms of the addressed topics that allow to draw some indicative learnings regarding critical success factors for innovation implementation in the public sector. Not all papers clearly distinguish between adoption and implementation, largely due to missing definitions of the concepts. Therefore, the two terms are used rather interchangeably in the following analysis, reflecting the terms used in the literature. However, in all cases the success factors relate to the act of putting an innovation to use, thus implementation.

Leadership

One of the most frequently addressed topics in the sample was the importance of leadership for successful innovation implementation. This aspect was mentioned in qualitative and quantitative research contributions alike. Top leadership support was identified as one of the fundamental enablers for the introduction of Public Procurement of Innovation (PPI) in a case study conducted in municipalities in Norway (Mwesiumo et al., 2019). Similarly, Daly and Buehner (2003) name leadership as one of the critical success factors for the adoption of procurement-card usage in municipalities in Florida. This is explained by the signal effect of risk-taking by the leadership, which gives procurement departments a sense of security, thus making the adoption of innovation more likely. Kim and Lee (2009) conclude on a similar note, referring to Carnevale (2001), who found that innovations in government require strong leadership commitment to assume accountability, thereby protecting employees. Innovative leadership approaches and change management additionally stimulate the adoption and implementation of innovation (Kim & Lee, 2009). The findings of Hansen and Pihl-Thingvad (2019) go in line with this argument, as they found a significant statistical relationship between transformational leadership and innovative employee behavior. At the same time transactional leadership in the form of verbal reward was positively associated with innovative employee behavior, pointing to the need to combine both leadership styles to encourage optimal employee innovative behavior (Hansen & Pihl-Thingvad, 2019). Both intrinsic (e.g. verbal reward) and extrinsic (e.g. promotions or bonuses) rewards are generally positively associated with creativity for innovation (Kim & Lee, 2009). In pilot cases of innovation implementation successful implementers were reported to pay specific attention to leadership development, aiming at encouraging new leadership styles to inspire and empower employees (Gieske et al., 2020). Interestingly, in an empirical study in Korea the experience of the leaders did not dictate the success of the innovation, but rather the willingness to take risk and generally having a fresh perspective (Kim & Lee, 2009). In a quantitative quasi-experimental research setting the effects of differences in leadership style during implementation on the performance after implementation were examined. Participative leadership that involves the employees in decisions has proven to enhance perceived performance of the innovation. (Hansen & Nørup, 2017).

Culture

Cultural circumstances can influence innovation implementation positively and negatively. Organizations that identify with innovation and do not only focus on austerity and core tasks have proven to be more successful in innovation implementation (Gieske et al., 2020). According to Bello et al. (2018) cultural differences between councils that were getting shared management senior teams and internal resistance towards this innovation were major barriers hindering the implementation. Cultural barriers can differ between different types of agencies and need to be addressed due to the fact that they can prevent or delay the adoption decisions (Mergel, 2018).

Strategic alignment

Implementation and adoption of innovation was reported to be faster if strategic and political goals were aligned. Jans et al. (2018) conducted a study examining the speed of adoption of a policy directive by the federal government in the Netherlands. Their data suggests that municipalities that were politically more aligned with the government were faster at implementing the innovation. Best practice seems to be relevant in this regard as well. The same study concluded, that if the innovation in question was already implemented in other municipalities in the same policy network, the municipality was more likely to rapidly implement the innovation itself. In a study on Dutch regional water authorities the most innovative ones were reported to have fully *“embedded innovation in their strategy, policies, work processes and internal and external communication.”* (Gieske et al., 2020, p. 348). Mwesiumo et al. (2019) emphasize the importance of an alignment between the innovation strategy and the organization strategy. Closely related to the notion of alignment is a shared understanding on different organizational level, or as Pope et al. (2006, p. 78) put it: *“The relationships between frames [of meaning] at different organizational levels shape the outcome of organizational change.”*

Resource availability

Innovation implementation can cost considerable time and resources. A multiple case study in the sample, for instance, found that differences in the implementation speed of an innovation can be traced back to financial and human resource availability (Jans et al., 2018). In unsuccessful cases of innovation implementation in a hospital setting the participants explained they were bound to resource driven restrictions, e.g. shortage of staff, which they deemed for the failure (Piening, 2011). In a case of an employee-driven innovation in the UK healthcare sector resource shortage in the form of physical space to provide the new service was perceived as a major challenge that could only be solved by extensive lobbying (Taylor et al., 2021). Authors have highlighted the positive effects of support programs on a national scale that enables innovation by providing the necessary backup and financial resources (Mwesiumo et al., 2019).

Knowledge

Especially while procuring innovation, knowledge about the topic seems to be important, because otherwise organizations are hesitant to implement them (Mwesiumo et al., 2019). Piening (2011) concluded that the differences in knowledge diffusion routines became one of the key factors that distinguished between successful and unsuccessful implementers: *“In general, users in the successful sites reported much higher satisfaction about their level of being informed and prepared.”* (Piening, 2011, p. 147). In another case study a knowledge hub for key potential implementers provided information about the innovation to foster implementation (Bello et al., 2018).

Network & Communication

Several authors have pointed out the importance of efficient networks to make innovations work. Kim and Lee's (2009) findings indicate that effective network management expands the chance

for innovation adoption and successful implementation. They especially highlight the communication via various channels with key stakeholders to ensure support. An alignment of interest with key stakeholders and the establishment of a network in employee driven innovations is emphasized by Taylor et al. (2021). Arnold (2015) blame a lack of social capital that can partly be expressed in network ties, as a key factor for the failure of a wetland management innovation in the US. According to the case the street-level entrepreneur responsible for the implementation failed to form necessary ties with the US Army Corps of Engineers regulators and front-line state officials, who could have helped rolling out the innovation (Arnold, 2015).

Organizational factors

Organizational size is seen to be negatively associated with innovation (Demircioglu, 2019). Especially complex innovations may be easier to implement in creative and decentralized workplaces, since centralized organizations might not be able to deal with the inherent uncertainties of these innovations. Creativity positively affects the outcomes of innovation implementation (Torugsa & Arundel, 2016). Kim and Lee (2009) support the notion of the relationship between creativity and the organizational structures. Their data shows that team structure plays a significant role in the implementation process. van Buuren et al. (2015) argue that successful innovation implementation requires a fit between the innovation and organizational values. This may lead to a modification of the innovation in order to facilitate the fit.

Participation

The participation of the users of the innovation implementation phase is seen as a crucial success factor as well. In a comparative case study research setting Piening (2011) found that while in all successful case examples participation was practiced, the two unsuccessful case sites did not consider this approach to be necessary. Instead the innovation implementation was only executed on the managerial level (Piening, 2011). In the Korean government employee commitment is encouraged by an active employee participation strategy in the innovation implementation. Agencies identified areas for innovation and created teams to employ problem-solving skills to barriers of innovation (Kim & Lee, 2009).

Demographic factors

Surprisingly the relationship between gender and innovation implementation has inspired a couple of records in the sample, yet with contrary results. While Demircioglu (2019) found men to be more innovative than women, Arena et al. (2020) report a positive influence of female top managers on e-Health adoption in Italy. However their evidence was mixed, since the claim was only true for female managers with legal background, whereas female managers with a technical background had a negative impact on the adoption of the innovation (Arena et al., 2020). Education is also seen as an important personal trait helping to foster innovation. In a study by Arnold (2015) on the implementation of an innovative wetland assessment tool their education and professional resources helped to give the entrepreneurs the necessary credibility (Arnold, 2015). On an individual level there is a correlation between the implementation of innovation and education and work classification. In a study conducted by Demircioglu (2019) managers were found to be twice as likely to implement innovations in the public sector.

4.3 The problem of procuring innovation

While the importance of procurement for innovation is evident, only seven records in the sample are concerned with innovation procurement. Scholars frequently differentiate between various forms of innovation procurement in the public sector, such as Innovative Public Procurement (IPP) (Edler & Georghiou, 2007), Public Procurement of Innovation (PPI) (Edquist et al., 2000)

and Pre-Commercial Innovation (PCI) (Dimitri, 2020). However, for the purpose of this research a twofold approach to the topic seems appropriate: (1) innovative public procurement strategy to increase access to supplier innovation and (2) the use of supplier innovation in the public sector via procured products or services. Typically, public procurement of innovation is focused on purchasing activities aimed at stimulating innovation at the supplier side (Lember et al., 2011). Although they might be classified as innovations in themselves, the focus is clearly on how to make innovative solutions more apprehensible for public sector purchasing departments.

However, the contributions on the topic in the literature sample are more concerned with providing access to supplier innovation by the means of alternative procurement approaches such as Crowdfunding (Mergel, 2018; Mergel & Desouza, 2013), E-procurement (Svidronova & Mikus, 2015) and Pre-Commercial Procurement (Selviaridis, 2020), thus relate to the first dimension of the phenomenon. Mergel and Desouza (2013) report on the learnings derived from introducing a crowdsourcing for innovation concept to the government, to improve access to innovative solutions for encountered challenges. They conclude that the definition of the challenges to be posted on the crowdsourcing platform is a tricky task and the problem formulation needs to be as clear as possible to get the desired results. Furthermore, they note that there was no real need for the intervention in the first place and it was a rather politically driven approach that was implemented in a top down way (Mergel & Desouza, 2013). Crowdsourcing solutions remain challenging for governments, since they require them to leave the formalized innovation acquisition process and instead rely on amateur problem solvers (Mergel, 2018). Svidronova and Mikus's (2015) study on e-procurement implementation in Slovakia concluded that the prices for e-auctions between the two case examples varied to a great degree. Furthermore, the intention of the electronic procurement system was to address existing transparency issues in the procurement process, yet, citizens and even enterprises still questioned the legitimacy of the results of the procurement process. Selviaridis (2020) focused on improved access for public organizations to expertise and novel ideas through a Pre-Commercial Procurement approach. The aim of the study was to develop knowledge on Pre-Commercial Procurement in the context the UK small business research initiative (SBRI) using a systems-of-innovation approach. The findings suggest improvements in connectivity and cooperation thorough the implementation of the SBRI in the UK.

While these four contributions investigate very specific phenomena within the field of innovation implementation, but can clearly be assigned to the first aspect of public procurement and innovation, a strategy to increase access to supplier innovation, two other papers approaches the topic on a more general level. Mwesiumo et al. (2019) identify several enablers, drivers, key success factors, barriers and pitfalls for the implementation of PPI. Again, the research is more focused on changes in the procurement process, as the aim of PPI is for public organizations to act as a customer for innovative goods and services. The implementation of the innovative solutions procured via PPI is only marginally considered. Enablers, drivers and success factors for instance include a supportive leadership, national support programs, favorable laws and regulations, the need for new solutions, an organizational focus on innovation and a clear strategy. Barriers and pitfalls may be lacking knowledge, resource constraints, inflexibility and unwillingness to experiment with new solutions (Mwesiumo et al., 2019). On a similarly general note, Talebi and Rezania (2020) approach the governance of PPI projects. The starting hypothesis of the research is that the governance of these projects fundamentally differs from traditional procurement projects, since PPI requires a more cooperative process and usually does not entail a clear definition of the desired end-product. The authors continue to identify different stages in these projects and demonstrate the governance changes at each stage (Talebi & Rezania, 2020). By describing the whole process of the implementation including the procurement and the subsequent implementation of the selected innovative solution the paper covers both aspects of innovation procurement outlined earlier.

The last paper in the sample with a focus on procurement by Alhola and Nissinen (2018) investigates the diffusion of clean technology through public procurement and summarizes crucial success factors for each stage of the procurement process. Findings suggest that relatively little effort was dedicated to success factors targeting the post-contractual implementation phase, although the phase is considered to be crucial. It is emphasized that the inherent risk in disruptively new cleantech technology needs to be accepted for the procurement decision. Altogether this case study targets clean technology as a very specific kind of innovation. Yet, similarly to Talebi and Rezaei (2020) the process covers the implementation of the alternative procurement process as well as the implementation of procured solution itself.

5. Discussion: Is there a need for a new research agenda?

The review demonstrates clearly the heterogeneity of the existing body of research on innovation implementation in the public sector. This section tries to take a broader look at the topic. Firstly, it is evident that the extant literature provides a quite mature picture of success factors that enable innovation implementation in the public sector in general. Success factors encountered in the literature of innovation implementation include supportive leadership, balancing cultural differences, strategic alignment, resource availability, knowledge diffusion, network and communications management, participation and potentially specific organizational and demographic factors.

Secondly, the literature on innovation implementation also acknowledges strategies that foster the ability to gain access to supplier innovativeness. Explicitly named strategies are crowdfunding, pre-commercial procurement or e-procurement. It seems as if there might be other relevant procurement strategies to promote innovation as well, some of which already find application in the public sector, while others have been investigated in private sector settings. These strategies include strategic partnerships (Baloh et al., 2008), Performance Based Contracting (Sumo et al., 2016), and collaborative procurement (Eriksson et al., 2019). However, the respective contributions seem to be more concerned with controlling the outcome of applying these procurement strategies, e.g. if the application of the alternative approach increased the efficiency and innovation (Eriksson et al., 2019). The implementation is often not at the core focus of the research.

In light of these findings, we make the following research proposition:

Proposition 1: Future research should focus on the implementation of alternative procurement strategies that aim to foster innovation.

While the importance of procurement in promoting innovation has developed into a widely accepted political consensus (Uyarra & Flanagan, 2010), relatively few contributions are concerned with the implementation of innovation procurement in the public sector and even less address the implementation of innovative solutions after successful procurement, at least within the sample of this literature review. The management of the interface between innovation implementation and public sector procurement could clearly profit from enhanced research effort, especially since all of the contributions inherent in this review that deal with the topic are qualitative and mostly case studies, thus limited to the circumstances of the cases. This notion is further emphasized by the fact, that the papers identified for the sample showed a focus on very specific topics (Crowdfunding, E-Procurement) in single project settings, that do not necessarily allow for generalizations regarding their implementation lessons. Only one contribution (Mwesiumo et al., 2019) summarized success factors for innovation implementation in public procurement on a general level. Additionally, Uyarra and Flanagan (2010) note that the vast majority of research on how procurement promotes innovation is focused on a limited set of

examples dealing with high-end technological innovations, thus excluding most of the day-to-day procurement operations. As already concluded this applies to most of the contributions in the (limited) sample at hand.

In summary the few contributions that are fundamentally dedicated to the question of implementation are almost stand-alone research papers, which of course need a broader empirical basis.

The following research propositions are made to address these shortcomings:

Proposition 2: Future research needs to address the interrelation between the implementation process of the procured innovation and the procurement strategy, thus testing the efficiency/efficacy of the strategy

Proposition 3: More scholarly attention for the implementation of a once procured innovative solution is necessary. Thus, literature that focuses less on the procurement process itself, but rather on the post-contractual stage in which the organizational structures need to be adopted in order to put the innovation to work.

Proposition 4: The innovation implementation literature (in the context of public procurement) requires a more quantitative perspective to test the credibility of previous research on success factors empirically and produce more generalizable findings.

The following framework shows the relations between the research propositions, placing them into a bigger context.

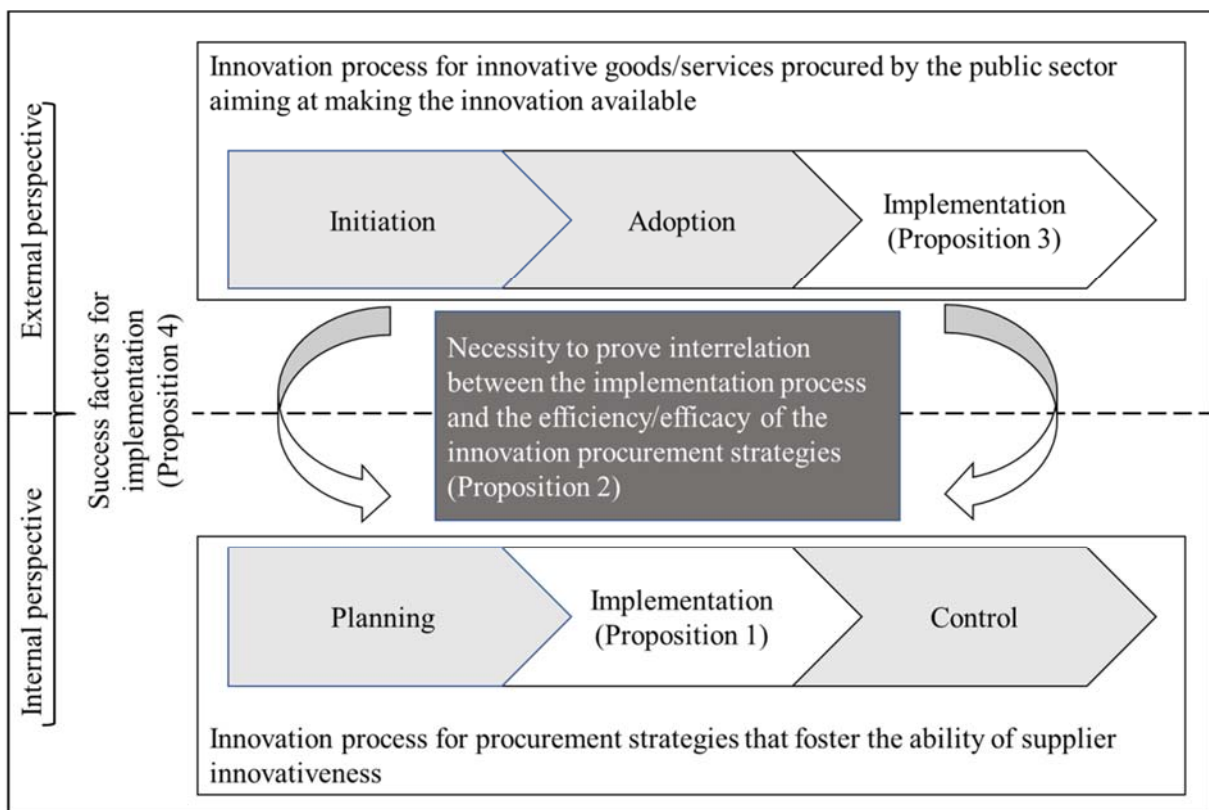


Figure 3: Framework for future research agenda

6. Conclusions and limitations

This study aims to be a starting point for future research on the implementation of innovation, specifically in the context of procurement in the public sector. However, it must be noted that due to the preselection of applicable journals and the resulting small number of records included in the sample the scope of the study is somewhat limited. This so-called retrieval bias may affect the representativity of the findings (Durach et al., 2017). Yet, the journals were selected according to strict quality criteria as outlined in the methodology section. At the same time, for instance, findings on the distribution of papers across government levels matched previous findings of a much larger literature review on innovation in the public sector (de Vries et al., 2016). We do acknowledge, however, that the sample should be broadened, since valuable insights could result from an extended search in journals from other disciplines such as Innovation or Policy. To shed more light on the issue of innovation implementation in the context of public procurement than the limited nature of this research can, a focused literature review in academic databases such as Web of Science is recommendable. While we are aware of these limitations, the purpose of this paper is rather to start a discussion on the issue than to provide a complete picture.

References

- *References included in the systematic literature review. Note that not all of the records in the review have been cited in the article.
- *Alhola, K., & Nissinen, A. (2018). Integrating cleantech into innovative public procurement process – evidence and success factors. *Journal of Public Procurement*, 18(4), 336–354.
- *Arena, C., Catuogno, S., Saggese, S., & Sarto, F. (2020). The adoption of e-health in public hospitals. Unfolding the gender dimension of tmt and line manager. *Public Management Review*, 1–27.
- *Arnold, G. (2015). Street-level policy entrepreneurship. *Public Management Review*, 17(3), 307–327.
- Arundel, A., Bloch, C., & Ferguson, B. (2019). Advancing innovation in the public sector: Aligning innovation measurement with policy goals. *Research Policy*, 48(3), 789–798.
- Arundel, A., Casali, L., & Hollanders, H. (2015). How European public sector agencies innovate: The use of bottom-up, policy-dependent and knowledge-scanning innovation methods. *Research Policy*, 44(7), 1271–1282.
- Baloh, P., Jha, S., & Awazu, Y. (2008). Building strategic partnerships for managing innovation outsourcing. *Strategic Outsourcing: An International Journal*, 1(2), 100–121.
- *Bello, B., Downe, J., Andrews, R., & Martin, S. (2018). Does austerity drive public service innovation? Evidence from shared senior management teams in local government. *Public Money & Management*, 38(2), 131–138.
- Blau, P. M. (1956). *Bureaucracy in modern society*. Crown Publishing Group/Random House.
- *Bommert, Ben (2010). Collaborative Innovation in the Public Sector. *International Public Management Review*, 11(1), 15–33.
- Boyne, G. A., Gould-Williams, J. S., Law, J., & Walker, R. M. (2005). Explaining the adoption of innovation: An empirical analysis of public management reform. *Environment and Planning C: Government and Policy*, 23(3), 419–435.
- Carnevale, D. (2001). Leadership, innovation, and organizational change in public organizations. *American Review of Public Administration*, 31(2), 218–244.
- Choi, J. N., & Chang, J. Y. (2009). Innovation implementation in the public sector: An integration of institutional and collective dynamics. *The Journal of Applied Psychology*, 94(1), 245–253.

- Cinar, E., Trott, P., & Simms, C. (2019). A systematic review of barriers to public sector innovation process. *Public Management Review*, 21(2), 264–290.
- Crosby, B. C., Hart, P., & Torfing, J. (2017). Public value creation through collaborative innovation. *Public Management Review*, 19(5), 655–669.
- *Daly, J. L., & Buehner, M. A. (2003). P-card utilization in municipal government: Advantages and concerns. *Journal of Public Procurement*, 3(1), 75–94.
- Damanpour, F., & Schneider, M. (2009). Characteristics of innovation and innovation adoption in public organizations: Assessing the role of managers. *Journal of Public Administration Research and Theory*, 19(3), 495–522.
- de Vries, H., Bekkers, V., & Tummers, L. (2016). Innovation in the public sector: A systematic review and future research agenda. *Public Administration*, 94(1), 146–166.
- *Demircioglu, M. A. (2019). The effects of organizational and demographic context for innovation implementation in public organizations. *Public Management Review*, 22(12), 1852–1875.
- Dias, C., & Escoval, A. (2013). Improvement of hospital performance through innovation: Toward the value of hospital care. *The Health Care Manager*, 32(2), 129–140.
- DiMaggio, P. J., Powell, & Walter W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160.
- Dimitri, N. (2020). Budget allocation design in the EU pre-commercial procurement for innovation. *Journal of Public Procurement*, 20(1), 88–96.
- Durach, C. F., Kembro, J., & Wieland, A. (2017). A new paradigm for systematic literature reviews in supply chain management. *Journal of Supply Chain Management*, 53(4), 67–85.
- Edler, J., & Georghiou, L. (2007). Public procurement and innovation—resurrecting the demand side. *Research Policy*, 36(7), 949–963.
- Edmondson, A. C., Bohmer, R. M., & Pisano, G. P. (2001). Disrupted routines: Team learning and new technology implementation in hospitals. *Administrative Science Quarterly*, 46(4), 685–716.
- Edquist, C., Hommen, L., & Tsipouri, L. (Eds.). (2000). *Public technology procurement and innovation. Public technology procurement and innovation theory*. Springer.
- Eriksson, P. E., Volker, L., Kadefors, A., Lingegård, S., Larsson, J., & Rosander, L. (2019). Collaborative procurement strategies for infrastructure projects: A multiple-case study. *Proceedings of the Institution of Civil Engineers - Management, Procurement and Law*, 172(5), 197–205.
- European Commission. (2019). *Public Procurement Indicators 2017*.
- Georghiou, L., Edler, J., Uyarra, E., & Yeow, J. (2013). Policy instruments for public procurement of innovation: Choice, design and assessment. *Technological Forecasting and Social Change*, 1–12.
- *Gianakis, G.; McCue, C. (2012). Supply Management concepts in local government: Four Case Studies. *Journal of Public Procurement*, 12(1), 109–141.
- *Gieske, H., Duijn, M., & van Buuren, A. (2020). Ambidextrous practices in public service organizations: Innovation and optimization tensions in Dutch water authorities. *Public Management Review*, 22(3), 341–363.
- Grantham, A. (2001). How networks explain unintended policy implementation outcomes: The case of UK rail privatization. *Public Administration*, 79(4), 851–870.
- Greenhalgh, T., Robert, G., Bate, P., Macfarlane, F., & Kyriakidou, O. (2007). *Diffusion of Innovations in Health Service Organisations: A systematic literature review*. Blackwell Publishing Ltd.

- Greve, C. (2015). Ideas in public management reform for the 2010s. Digitalization, value creation and involvement. *Public Organization Review*, 15(1), 49–65.
- *Hansen, J. A., & Pihl-Thingvad, S. (2019). Managing employee innovative behaviour through transformational and transactional leadership styles. *Public Management Review*, 21(6), 918–944.
- *Hansen, M. B., & Nørup, I. (2017). Leading the implementation of ict innovations. *Public Administration Review*, 77(6), 851–860.
- Harris, M., & Albury, D. (2009). *The innovation imperative*. London.
- Hartley, J. (2005). Innovation in governance and public services: Past and present. *Public Money & Management*, 25(1), 27–34.
- Hartmann, A., Reymen, I. M. M. J., & van Oosterom, G. (2008). Factors constituting the innovation adoption environment of public clients. *Building Research & Information*, 36(5), 436–449.
- Hood, C. (1991). A public management for all seasons? *Public Administration*, 69(1), 3–19.
- Hood, C. (1995). The "new public management" in the 1980s: Variations on a theme. *Accounting, Organisation and Society*, 20(2/3), 93–109.
- *Jans, W., Need, A., van Gerven, M., & Denters, B. (2018). Youth policy innovation in the Netherlands: The realization of centers for youth and families by municipalities. *International Public Management Journal*, 21(3), 346–368.
- *Kim, S. E., & Lee, J. W. (2009). The impact of management capacity on government innovation in Korea: An empirical study. *International Public Management Journal*, 12(3), 345–369.
- Klein, K. J., & Sorra, J. S. (1996). The challenge of innovation implementation. *The Academy of Management Review*, 21(4), 1055–1080.
- Korac, S., Saliterer, I., & Walker, Richard, M. (2017). Analysing the environmental antecedents of innovation adoption among politicians and public managers. *Public Management Review*, 19(4), 566–587.
- Lember, V., Kalvet, T., & Kattel, R. (2011). Urban competitiveness and public procurement for innovation. *Urban Studies*, 48(7), 1373–1395.
- Mazzucato, M., & Kattel, R. (2020). Covid-19 and public-sector capacity. *Oxford Review of Economic Policy*, 36(1), 256–269.
- Meijer, A. J. (2014). From hero-innovators to distributed heroism: An in-depth analysis of the role of individuals in public sector innovation. *Public Management Review*, 16(2), 199–216.
- *Mergel, I. (2018). Open innovation in the public sector: Drivers and barriers for the adoption of Challenge.gov. *Public Management Review*, 20(5), 726–745.
- *Mergel, I., & Desouza, K. C. (2013). Implementing open innovation in the public sector: The case of Challenge.gov. *Public Administration Review*, 73(6), 882–890.
- Meyer, R., & Hammerschmid, G. (2006). Public management reform: An identity project. *Public Policy and Administration*, 21(1).
- Moore, M. H. (2005). Break-through innovations and continuous improvement: Two different models of innovative processes in the public sector. *Public Money and Management*, 25(1), 43–50.
- *Mwesiumo, D., Olsen, K. M., Svenning, G. A., & Glavee-Geo, R. (2019). Implementing public procurement of innovations in an organization: Lessons from Norway. *Journal of Public Procurement*, 19(3), 252–274.
- Nählinger, J., & Eriksson, A. F. (2019). Outcome, process and support: Analysing aspects of innovation in public sector organizations. *Public Money & Management*, 39(6), 443–449.

- *Nasi, G., Frosini, F., & Cristofoli, D. (2011). Online service provision: Are municipalities really innovative? The case of larger municipalities in Italy. *Public Administration*, 89(3), 821–839.
- Osborne, D. E., & Gaebler, T. (1992). *Reinventing government: How the entrepreneurial spirit is transforming the public sector*.
- Osborne, S. P., & Brown, L. (2011). Innovation, public policy and public service delivery in the UK: The word that would be king? *Public Administration*, 89(4), 1335–1350.
- Osborne, S. P., & Brown, K. (2008). *Managing change and innovation in public service organizations. Routledge masters in public management series*.
- *Piening, E. P. (2011). Insights into the process dynamics of innovation implementation. *Public Management Review*, 13(1), 127–157.
- *Polzer, T., & Seiwald, J. (2021). Gender-responsive budgeting in Austria: The narrow line between implementation and confirmation. *Public Money & Management*.
- *Pope, C., Robert, G., Bate, P., Le May, A., & Gabbay, J. (2006). Lost in translation: A multi-level case study of the metamorphosis of meanings and action in public sector organizational innovation. *Public Administration*, 84(1), 59–79.
- Rainville, A. (2016). From whence the knowledge came: Heterogeneity of innovation procurement across Europe. *Journal of Public Procurement*, 16(4), 463–504.
- Rogers, E. M. (1995). *Diffusion of innovations*. Simon and Schuster.
- *Selviaridis, K. (2020). Effects of public procurement of R&D on the innovation process: Evidence from the UK small business research initiative. *Journal of Public Procurement*.
- Sumo, R., van der Valk, W., van Weele, A., & Bode, C. (2016). Fostering incremental and radical innovation through performance-based contracting in buyer-supplier relationships. *International Journal of Operations & Production Management*, 36(11), 1482–1503.
- *Svidronova, M. M., & Mikus, T. (2015). E-procurement as the ICT innovation in the public services management: Case of Slovakia. *Journal of Public Procurement*, 15(3), 317–340.
- *Talebi, A., & Rezaei, D. (2020). Governance of projects in public procurement of innovation a multi-level perspective. *Journal of Public Procurement*, 20(2), 187–206.
- *Taylor, R., Fuller, A., Halford, S., Lyle, K., & Teglborg, A. C. (2021). Translating employee-driven innovation in healthcare: Bricolage and the mobilization of scarce resources. *Public Money & Management*, 41(5), 376–386.
- Thompson, V. A. (1965). Bureaucracy and innovation. *Administration Science Quarterly*, 10(1), 1–20.
- Torfiing, J., & Ansell, C. (2017). Strengthening political leadership and policy innovation through the expansion of collaborative forms of governance. *Public Management Review*, 19(1), 37–54.
- Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management* (1), 28–45.
- *Torugsa, N., & Arundel, A. (2016). Complexity of innovation in the public sector: A workgroup-level analysis of related factors and outcomes. *Public Management Review*, 18(3), 392–416.
- *Turner, S., Lourenço, A., & Allen, P. (2016). Hybrids and professional communities: Comparing UK reforms in healthcare, broadcasting and postal services. *Public Administration*, 94(3), 700–716.
- Uyarra, E., & Flanagan, K. (2010). Understanding the innovation impacts of public procurement. *European Planning Studies*, 18(1), 123–143.

- *van Buuren, A., Eshuis, J., & Bressers, N. (2015). The governance of innovation in Dutch regional water management: Organizing fit between organizational values and innovative concepts. *Public Management Review*, *17*(5), 679–697.
- *van den Broek, J., Boselie, P., & Paauwe, J. (2014). Multiple institutional logics in health care. *Public Management Review*, *16*(1), 1–20.
- Walker, J. L. (1969). The diffusion of innovations among the American states. *The American Political Science Review*, *63*(3).
- Walker, R. M. (2014). Internal and external antecedents of process innovation: A review and extension. *Public Management Review*, *16*(1), 21–44.
- Wolfe, R. A. (1994). Organizational innovation: Review, critique and suggested research directions. *Journal of Management Studies*, *31*(3), 405–431.
- *Young, M. M. (2020). Implementation of Digital-Era Governance: The Case of Open Data in U.S. Cities. *Public Administration Review*, *80*(2), 305–315.

Dependence between Sovereign Debt and Bank Non-performing Loans before and during the COVID-19 Pandemic: a Copula-based Approach

Evgenii Gilenko, St. Petersburg State University's Graduate School of Management (e.gilenko@gsom.spbu.ru), Danil Andreev, St. Petersburg State University's Graduate School of Management

Keywords: *sovereign debt; bank non-performing loans; causality; tail dependence; copulas*

The focus of this research is on interdependence of certain macro-financial indicators in several countries of the Eurasian Economic Union (such as Belarus, Kazakhstan and Russia) before and during the COVID-19 pandemic.

The current COVID-19 pandemic has put both the global economy, and national economies into a very difficult position: a significant decline in the incomes of people, broken supply chains and other related problems have propelled the need for substantial financial support for the economies. This forced the governments to collect extra financial resources, in particular, via increasing the size of sovereign debt. According to the International Monetary Fund, in July 2020, due to the coronavirus pandemic, the total sovereign debt of advanced economies hit a record and rose to 128% of global gross domestic product (in 1946, it came to 124%).

All these things come at a price, of course. On the one hand, changes in the size of the sovereign debt in a lot of cases force re-estimation of the country's financial position (for example, via changing of its global ratings). And, on the other hand, increasing the size of sovereign debt may have an adverse effect on the national economy via different channels. The latter include: slower economic growth in the long-term due to the need to cover the debt; increasing socio-economic inequality; and some other.

What is unobvious is that a sovereign debt distress may influence, in particular, the level of bank non-performing loans (NPL), which is especially important during the current pandemic. In a crisis, like the current one, people and organizations are forced to take quite a lot of extra loans for different reasons – have the needed financial resources, buy becoming more and more expensive houses and apartments (both for living and renting), etc.

This, on the one hand, certainly helps the banking sector in the country make serious profits. For example, as of mid of 2021, the Russian banking sector got a record profit of more than 1 bln rubles (with the projection for the whole 2021 year being more than 2 bln rubles – a 25% increase compared to 2020). A similar situation is in Kazakhstan: the net profit of Kazakh banks in the 1st quarter of 2021 comprised 283 bln tenge – a 7% increase YoY; in Belarus a similar indicator rose by 58%.

But, on the other hand, the level of NPLs, as well as the level of small and medium commercial bank liquidations, is also usually sky-rocketing during a major crisis. For instance, as of mid of 2021, the amount of consumer NPLs in Russia totaled 1 bln rubles – a 16% increase YoY. In Kazakhstan, this increase is 7.1%, while in Belarus it is almost 47%.

As of mid of 2021, Russia and Kazakhstan have been slowly increasing, and Belarus – decreasing, their sovereign debts while managing to keep their global investment ratings: over the first half-year of 2021, Russia's debt increased by 0.9% (Fitch's rating – BBB Stable); Kazakhstan's debt rose by 5% (Fitch's rating – BBB Stable); while Belarus's debt decreased by 2.5% (Fitch's rating – B Negative).

Still, the economy-wide risks preserve for these countries. This is why, in the light of analysis of what is called tail dependence between sovereign debt distress and bank non-performing loans, in our study, using modern techniques of quantitative analysis (such as

copulas), we draw more accurate connections between the considered indicators and provide appropriate policy recommendations.

Measuring Organizational Performance of Saint-Petersburg Public Hospitals in Providing Medical Care to Patients with a Novel Coronavirus Infection (COVID-19)

Kazimir Iablonskii, ANO “Moscow Centre for Innovative Healthcare Technologies” (kazzz.125@gmail.com), Yuri Fedotov, St. Petersburg State University's Graduate School of Management (fedotov@gsom.spbu.ru), Petr Yablonskiy, St. Petersburg State University, Olga Sokolova, St. Petersburg State Research Institute of Phthisiopulmonology

Abstract:

There is a huge flow of academic and practical publications on various aspects of COVID-19 pandemic. Most numerous classes of research papers represent results of epidemic studies and assessment of effectiveness COVID-19 treatment protocols. There are no or, at the very best, few publications on performance measurement of healthcare organizations' (HCOs) treating COVID-19 patients. The paper represents an assessment of the organizational performance of Saint-Petersburg public hospitals which were treating COVID-19 patients in 2020 (hereafter – COVID hospitals).

The study suggests assessment of organization's multifaceted performance based on application of the Neely's concept of Performance Prism (PP). It relies on multi-input and multi-output description of production activity, multidimensional nature of organizational activities and multi-subject evaluation of organization's attributes and its performance (3M-performance measure). Applied PP considers city administration and management of COVID-19 hospitals, COVID-19 patients, doctors and nurses participating in treatment of COVID-19 patients as the stakeholders of 19 Saint-Petersburg public (city and federal) hospitals to assess their performance in 2020.

The COVID-19 hospitals' performance assessment employed both quantitative (reported performance indices) and qualitative (obtained from the surveys) data. The qualitative data on the organization's performance attributes is quantified through application of aggregated preference indices system (APIS).

The results of performance assessment of COVID-19 hospitals provide numerous valuable insights for policy making by city authorities and medical professionals dealing with a novel coronavirus infection (COVID-19).

Keywords: *healthcare organizations, performance measurement, COVID-19.*

1. Introduction

The COVID-19 pandemic and efforts to reduce virus transmission substantially affected health services in Russian Federation as well as worldwide. Various medical, economic, political issues of COVID-19 vaccine supplies and immunization of population are in the focus of both academic research and policy debates. It is quite natural that in current situation epidemic studies and assessment of effectiveness of COVID-19 treatment protocols are dominating the bulk of research publications (ИМЕ, COVID-19 publications; Hussain et al., 2021; Всемирная организация здравоохранения, 2021). Policy research is mostly focused on the issues related to the effectiveness of national governmental policies (Haug et al., 2020). Surprisingly, we could not find international publications on performance measurement of hospitals providing treatment of COVID-19. That looks, especially, strange because development and implementation of performance measurement systems for hospitals are recognized to be an effective tool for the improvement of the quality of medical care. It also enables governments and management of

healthcare organizations (HCOs) to identify the directions of organizational changes needed in national and local healthcare systems (Zidarov et al., 2014).

The geographical scope of publications on COVID-19 is mostly global. It is noteworthy, that there are few international publications about situation in Russian Federation. Thus, this paper represents original results of the assessment of Russian public hospital's performance in COVID-19 curing.

2. Methodological framework.

The study employs multifaceted performance measure to assess performance of HCOs based on the Neely's concept of Performance Prism (Neely & Adams, 2002). It relies on multi-input and multi-output description of production activity, multidimensional nature of organization's operation and multi-subject evaluation of organization's attributes and its performance (3M-performance measure). According to Performance Prism, the following groups of stakeholders are introduced in operational model of the HCO: patients, doctors, nurses, hospital's management and city administration (Iablonskii et al., 2020). In case of COVID-19 hospital the 3M-performance measure considers its technical efficiency of COVID-19 curing as the assessment criteria for the stakeholder identified as hospital management and city administration. For other stakeholders (COVID-19 patients, doctors and nurses involved in treatment of COVID-19 patients) COVID-19 hospital's performance is measured as a satisfaction quantified from the survey data. The 3M-performance measure suggests taking into account not only consumer's (patient's) perspective, but also other key stakeholders: doctors, nurses and city administration. The questionnaires designed for COVID patients, doctors and nurses provides comprehensive coverage of aspects to assess the satisfaction of respective stakeholder's group. The 3M-performance measure implies assigning weight coefficient assignment and aggregation based on aggregated preference indices system (APIS), that provide clear-cut exposition of coefficients obtained from the ordinal information on the attributes of the COVID-19 hospital's performance meaningful for each stakeholder (Колесов et al., 2004).

Technical efficiency of COVID-19 hospital is estimated with DEA (Data Envelopment Analysis) method (Cooper et al., 2007). To measure technical efficiency of the COVID-19 hospitals from available data on resources and outputs the CCR – Output model is applied. The COVID-19 hospital's technical efficiency estimates then used to construct the Overall Performance Index (hereafter – OPI) for each hospital. It specifies the 3M performance measure of the COVID-19 hospital which accounts for perception of organizational performance by different stakeholders identified in the study.

Thus, the OPI formula for public hospital “ i ” (H_i) looks as follows:

$$OPI(H_i) = \alpha TE(H_i) + \beta PS(H_i) + \gamma DS(H_i) + \delta NS(H_i),$$

where we $TE(H_i)$ is a measure of the hospital's i (H_i) technical efficiency; $PS(H_i)$ – measure of patients' satisfaction with services of hospital i ; $DS(H_i)$ – measure of doctors' satisfaction with performance of hospital i ; $NS(H_i)$ – measure of nurses' satisfaction with performance of hospital i ; $\alpha, \beta, \gamma, \delta$ – the weights' of stakeholders' satisfaction measures. $\alpha > 0, \beta > 0, \gamma > 0, \delta > 0, \alpha + \beta + \gamma + \delta = 1$.

3. Variables and data.

The empirical database of the study includes qualitative and quantitative information of performance St. Petersburg public COVID-19 hospitals in 2020.

The quantitative data of 14 COVID-19 hospitals was collected from the unified information system of compulsory medical insurance (hereafter – CMI) of St. Petersburg. It employs the panel data on inputs and outputs and used for estimation technical efficiency.

The inputs are:

- labor costs (wages and salaries of doctors and nurses annual in part compensated from CMI fund);

- COVID-adjusted material costs (medical supplies, food, bedding, linens, etc.).
Adjustment of material costs was done as follows:

$$MC^{COVID}(H_i) = MC(H_i) * \frac{P_{covid}(H_i)}{P_{all}(H_i)} * (1 + \frac{P_{severe\ covid}(H_i)}{P_{covid}(H_i)}),$$

where $MC^{COVID}(H_i)$ – COVID-adjusted material costs; $MC(H_i)$ – all material costs; $P_{all}(H_i)$ – number of all treated patients; $P_{covid}(H_i)$ – number of COVID-19 patients; $P_{severe\ covid}(H_i)$ – number of treated severe COVID-19 patients.

The outputs are:

- number of properly treated COVID-19 patients (properly means that the bill for payment was accepted by medical insurance company);
- mortality of severe COVID-19 patients (a COVID-19 patient assumed “severe” if corresponding CMI tariff was billed for payment).

Unfortunately, there was no available data on variables necessary to estimate technical efficiency of federal HCOs.

The qualitative data of 11 COVID-19 hospitals was collected through questionnaires that were distributed to COVID-19 hospitals. The questions are formulated so that answers reflect the stakeholder’s perception on the hospital’s performance in COVID-19 treatment.

Medical staff (doctors and nurses) assessed the following 6 attributes:

- COVID-19 education quality;
- epidemiological safety;
- satisfaction by compensation for treatment of COVID-19 patients;
- fulfilment of infectious safety requirements;
- fulfilment of healthcare delivery rules;
- fulfilment of algorithms by personnel.

Patients assessed the following 6 attributes:

- satisfaction with accommodation;
- relation of nurses;
- relation of doctors;
- satisfaction with the result of treatment;
- does patient feel better after treatment;
- if patient will recommend the HCO where he (she) got healthcare.

At the time when survey was conducted there were only 11 HCOs reprofiled for treatment COVID-19 patients. Because of this fact some data was calculated through extrapolation taking into account number of treated COVID-19 patients and mortality of severe COVID-19 patients.

4. Results

As the result 19 COVID-19 hospital were ranked by their performance assessment of COVID-19 treatment. The first five HCOs represented by children’s hospital, city and federal infectious hospitals and two other city multi-profile hospitals. The common parameter of these HCOs is that the amount of COVID-19 patients in them was relatively small.

Interestingly, that federal HCOs are distributed in the ranking evenly: 2, 7, 12, 14, and 18 places. Despite cutting-edge technologies and high specialization of federal HCOs not all of them could demonstrate high performance in treating COVID-19 patients.

One of the minor findings is that mortality of COVID-19 patients in not fully correlates with mortality of severe COVID-19 patients (correlation coefficient equals 0,86). It means that the structure of treated patients is rather distinct and qualification of medical personnel also differentiates in the analyzed HCOs. Therefore, straightforward compare HCOs by mortality of COVID-19 patients would not reflect real performance of COVID-19 hospitals in the aspect of quality of healthcare.

The result of the performance assessment showed that mortality of COVID-19 patients is only one of several important variables that influences HCO's performance in COVID-19 treatment. Low performance can be a consequence of disproportionately higher costs or dissatisfaction of stakeholders (medical personnel, patients).

List of References

- Cooper W.W., Seiford L.M., Tone K. 2007. Data envelopment analysis: A comprehensive text with models, applications, references and DEA-Solver Software. 2nd edition. – New York: Springer, 490 p.
- Haug N., Geyrhofer L., Londei A., Dervic E., Desvars-Larrive A., Loreto V., Pinior B., Thurner S., Klimek P. 2020. Ranking the effectiveness of worldwide COVID-19 government interventions. // *Nature Human Behaviour*, Vol 4, 1303–1312.
- Hussain M.S., Farrukh K., Iqbal T., Fatima A., Mughis Z., Hussain H.A. 2021. Effectiveness of various treatment strategies in COVID-19 patients having Solid Organ Transplant: A Systematic Review. // *Journal of Rawalpindi Medical College (JRMC)*; 25 COVID-19 Supplement-1, 37-43.
- Iablonskii K., Fedotov Y., Yablonskiy P. 2020. Performance assessment of healthcare organizations: the issue of methodology // *Annual GCOM Emerging Markets Conference 2020*, 339-341.
- Institute for Health Metrics and Evaluation (IHME). COVID-19 publications. <http://www.healthdata.org/covid/publications>
- Neely, A., & Adams, C. 2002. Perspectives on Performance: The Performance Prism. *Encyclopedia of Social Measurement*, Elsevier, 3, 41-48.
- Zidarov D., Poissant L., Sicotte C. 2014. Healthcare executives' readiness for a performance measurement system: a rehabilitation hospital case study. *Journal of Hospital Administration* 3 (4): 157-172.
- Всемирная организация здравоохранения. 2021. Оценка эффективности вакцины против COVID-19: временное руководство. // WHO reference number: WHO/2019-nCoV/vaccine_effectiveness/measurement/2021.1, vii + 70 p.
- Колесов Д.Н., Михайлов М.В., Хованов Н.В. 2004. Оценивание сложных финансово-экономических объектов с использованием системы поддержки принятия решений АСПИД-3W – СПб.: Изд-во СПбГУ, 2004.

Analytical Assessment of the Availability of Medicines for the Treatment of Cardiovascular Diseases in the Region (Based on the Materials of the Sverdlovsk Region)

Elena Kalabina, Ural State University of Economics (kalabina@mail.ru), Svetlana Begicheva, Ural State University of Economics

Abstract:

The purpose of the study was to analyze the availability of medicines for the treatment of cardiovascular diseases in 2011 and 2017 to assess their assortment, financial and logistical availability as the basis for the rational construction of a regional health system.

A comparative and structural analysis of the availability of medicines for the treatment of diseases of the cardiovascular system was carried out according to data for 2011 and 2017 in the Sverdlovsk region, including using the methodology of the World Health Organization and the International non-governmental organization "Action Program for Health and Healthcare" (Health Action International, HAI) and (WHO/HAI). The availability and prices of 71 names of medicines in the hospital and outpatient segments of the Sverdlovsk region were revealed and the direct costs of patients for medicines for the treatment of arterial hypertension in 2017 were estimated. For each name, we studied the prices for the original branded drug and its generic analogue at the lowest price. Drug prices were compared with international reference prices for 2011 and 2017 from the International Index of Drug Prices of the organization Management Sciences for Health and expressed in medians the ratio of prices to reference prices. Prices for generic drugs in both the public and private sectors decreased in 2017 compared to reference prices in 2011. In 2011, one third of drugs were purchased in the form of original brands, and in 2017, almost all medicines were purchased in the form of generics with a significant price reduction. As a result of the conducted research, according to the data from 2011 to 2017, there was a general decrease in prices relative to reference prices for generic drugs for the treatment of cardiovascular diseases. To ensure the rational construction of the regional health system, additional price studies and pharmacoeconomical analyses are needed, taking into account changing prices on the pharmaceutical market.

Keywords: *medicine prices, availability of medicines, procurement price, pharmacy, WHO/HAI*

Increasing the availability of modern effective and safe medicines is one of the key tasks of success in achieving the goals of the national project "Healthcare". Modernization of the drug supply system for citizens as a multifaceted process is in the focus of attention of the economy, the state and society.

A special place among the issues of reforming the system of drug provision for citizens is occupied by the problem of availability of medicines for the treatment of cardiovascular diseases due to a number of circumstances.

The prevalence of cardiovascular diseases in the population is the reason for the negative economic impact and significant costs of public health systems for their treatment throughout the world. The basis of economic losses is the mortality from cardiovascular diseases and the incidence of them in the working-age population, which leads to significant losses of human capital. According to experts, the total amount of economic damage from cardiovascular diseases can reach indicators on the scale of Russia of more than 2% of the gross domestic product [Yagudina R., 2019].

In addition, it is obvious that cardiovascular diseases have an exceptional social importance due to their leading position in the structure of causes of death. Therefore, close attention to the treatment of cardiovascular diseases is quite justified and relevant.

It is known that the system of medical care for the treatment of cardiovascular diseases is represented by several interrelated stages: the outpatient stage (because of polyclinics, consultative and diagnostic centers, etc.), the stage of emergency medical care, the hospital stage (including in a day hospital), and the rehabilitation stage. At each stage, in accordance with the established diagnosis and for medical reasons, the necessary drug therapy is carried out, the financing of which is carried out in accordance with the structure of the state drug supply system at both the federal and regional levels.

The financial burden of treatment of cardiovascular diseases is imposed on the subjects of the Russian Federation within the framework of the implementation of territorial programs of state guarantees of free medical care to citizens, which contain, in addition to the allocated funds from the state budget, additional types and conditions of its provision, as well as additional volumes. However, to date, there are no clear criteria for the formation of regional drug supply systems for patients with cardiovascular diseases.

The analysis of medicines included in the list of regional programs of preferential drug provision for the subjects of the Russian Federation (2019) showed that the average number of medicines intended for the treatment of cardiovascular diseases in the regional context was 50, and in particular in the Sverdlovsk region - 25. At the same time, among the subjects of the Russian Federation, the Sverdlovsk Region ranks 23rd (when ranking from the best to the worst) in terms of the overall morbidity of the entire population, while in recent years there has been an increase in the morbidity of the entire population compared to the average long-term level in 2019 by 35.0%. In the structure of morbidity of the adult population of the Sverdlovsk region, diseases of the circulatory system are leading, accounting for 18.1% of the total number of morbidity of the adult population of the Sverdlovsk region (2017).

Thus, the problem of assessing the availability of medicines intended for the treatment of cardiovascular diseases at all stages of providing medical care to citizens for similar social groups in the regions of Russia is being updated.

The construct availability of medicines is understood by us as the possibility of obtaining the necessary medicine by the patient at the necessary time and at an acceptable price for him or on preferential terms.

Based on this, the key elements of the availability of medicines are:

- * Assortment availability of medicines as their availability in sufficient volume and variety in accordance with the stage and type of treatment
- * Financial availability of medicines as an acceptable price and / or preferential conditions for obtaining
- * Logistical availability of medicines as the timeliness of their receipt and delivery in accordance with the stage and type of treatment

The purpose of the presented work was to screen the availability of medicines for the treatment of cardiovascular diseases in the region to develop recommendations for improving the efficiency of the regional health care system (based on the materials of Monitoring the assortment and prices for VED in the Sverdlovsk region).

Among the tasks of the study, the following were considered:

- analytical evaluation of the product availability of drugs on the basis of changes of the range of drugs for the treatment of cardiovascular diseases in outpatient and hospital segments of the pharmaceutical market in the Sverdlovsk region for 2011 - 2017;
- analytical evaluation of financial inclusion on the basis of changes in the prices of medicinal products for the treatment of cardiovascular diseases in outpatient and hospital segments of the pharmaceutical market in the Sverdlovsk region for 2011 - 2017;
- analytical assessment of logistics availability based on the study of the conditions and consequences of import substitution of medicines for the treatment of cardiovascular diseases in the outpatient and hospital segments of the pharmaceutical market of the Sverdlovsk region for 2011-2017.;

Research methodology. Econometric and statistical analysis of the average values of prices, trade margins and assortment of medicines (retail price of one package of a medicinal product) for the treatment of cardiovascular diseases in the outpatient segment and the average price of one package by trade name by dosage form for the hospital segment in the Sverdlovsk region for 2011-2017.

The information base of the study was the data of Monitoring the assortment and prices for vital and essential medicines (VED) in the Sverdlovsk region for the period 2011-2017.

More than 200 thousand accounts entered by the subject of the Russian Federation were entered into the database, most of which (from 80 to 88%) belong to the outpatient-monitoring segment and from 20 to 12% to the hospital segment.

In addition, we used the results of in-depth and semi-structured interviews with experts (representatives of medical organizations and pharmacies, the Ministry of Health of the Sverdlovsk Region, Roszdravnadzor in the Sverdlovsk region).

In contrast to the existing studies on this issue, the paper attempts to assess the availability of medicines for the treatment of cardiovascular diseases in the region in order to develop recommendations for improving the efficiency of the regional health care system (based on the materials of the Sverdlovsk region).

Thus, having carried out an analytical assessment of the availability of medicines for the treatment of cardiovascular diseases in the Sverdlovsk region, the following conclusions were made: drug provision at the outpatient stage is carried out at the expense of the state for socially unprotected groups of the population, in turn at the hospital stage - at the expense of the territorial fund of compulsory medical insurance from the list of VED, there is no continuity in the formation of the list for the hospital and outpatient stages of medical care, which reduces the overall level of availability of health care.

References

- Cameron A.M., Ewen M., Ross-Degnan D., et al. Medicine prices, availability, and affordability in 36
Günther G., Gomez GB., Lange C. et al. Availability, price and affordability of anti-tuberculosis drugs
in Europe: a TBNET survey. *Eur Respir J.* 2015; 45(4):1081-88. doi:10.1183/09031936.00124614.
- Gong S., Wang Y., Pan X., Zhang L. et al. The availability and affordability of orphan drugs for rare diseases in China. *Orphanet J Rare Dis.* 2016; 11:20. doi:10.1186/s13023-016-0392-4.
- Babar Z.U., Ibrahim M.I., Singh H. et al. Evaluating Drug Prices, Availability, Affordability, and Price Components: Implications for Access to Drugs in Malaysia. *PLoS Med.* 2007; 4(3):82. doi:10.1371/journal.pmed.0040082.
- Sharma A., Rorden L., Ewen M. et al. Evaluating availability and price of essential medicines in Boston area (Massachusetts, USA) using WHO/HAI methodology. *J Pharm Policy Pract.* 2016 ; 9:12. doi:10.1186/s40545-016-0059-5.
- Wirz V.J., Hogerzeil H.V., Gray A.L. et al. (the Lancet Commission on Essential Medicines) Essential medicines for universal health coverage. *Lancet.* 2016;389(10067):403-76. doi:10.1016/S0140-6736(16)31599-9.

The Sphere of Donor Blood Circulation Before & During Covid-19

Tatyana Sklyar, St. Petersburg State University's Graduate School of Management (sklyar@gsom.spbu.ru), Mariia Kotlyarova, St. Petersburg State University's Graduate School of Management

Abstract:

This paper investigates the situation in the sphere of donor blood circulation. The main problems and the trends in this sphere are reviewed. In order to analyze the state regulation the measures of social support of donors are identified. A survey of donors on the basis of the Blood Center of the Belgorod region was conducted, as well as an interview with the chief doctor of the Center. A social portrait of a donor is compiled. Based on the research results, recommendations for improving the activities of the blood service are provided.

Keywords: *donor blood Service, state regulation, social support*

Introduction

The blood Service is a structure uniting medical institutions and their structural subdivisions throughout the country, the main activity of which is the procurement, processing, storage and safety of donor blood and its components. The blood Service is the link between the donor and the patient who needs a transfusion of blood and its components.

The main statutory act regulating relations in the sphere of blood donation is the Federal Law of 20.07.2012 N 125-FZ "On Donation of Blood and its Components" [2]

The tasks of the Blood Service are to provide medical institutions with blood components, technical modernization of blood institutions in Russia, and the development of voluntary blood donation in Russia [1]

The report arises the research question: which are the main trends the sphere of donor blood circulation? In order to answer this question a situation in this sphere is analyzed,

1. Analysis of the administration system in the sphere of donor blood circulation

State regulation of relations in the field of circulation of donor blood and its components shall be carried out by means of:

- 1) state control in the sphere of circulation of donor blood and (or) its components;
- 2) establishment in technical regulations, normative-legal acts and legislative acts of requirements of safety of blood, its products at their procurement, storage, transportation and clinical use;
- 3) maintaining a unified database on the implementation of measures related to the safety of donor blood and its components, the development, organization and promotion of donation of blood and its components.]

The functions of organization, management and control of activities in the field of blood donation are concentrated in the Federal Medical and Biological Agency (FMBA of Russia). These functions are carried out by the Department of Blood Service Organization of FMBA of Russia [3].

Let us consider the generalized structure of revenues and expenditures of funding for blood service institutions. Funding for blood service organizations is provided from the federal or regional budget in the form of a subsidy to fulfill the state task of procuring, storing, transporting and ensuring the safety of donor blood and its components, as well as from income from profit-making activities (such as the provision of clinical and diagnostic services). The budget funds are used to support the basic activities of the institutions and to promote donorism. Income from paid services is used to pay employee bonuses, purchase new equipment and other purposes.

The sale of donor blood to other states is prohibited. Imports and exports are carried out only when humanitarian aid is provided by decision of the Government of the Russian Federation.

2. Social support measures for donors

Social support measures are provided only for donors who donate blood.

Measures of social support for donors are:

- 1) On the day of blood donation the donor is provided with free meals
- 2) The right to priority purchase of discounted vouchers for health resort treatment at the place of work or study for donors who have donated blood and (or) its components in the amount equal to two maximum allowable doses of blood and (or) its components during the year is provided.

Measures of social support for persons awarded with the badge "Honorary Donor of Russia" and "Honorary Donor of the USSR":

- (1) provision of an annual paid leave at a convenient time of the year for them in accordance with labor legislation;
- 2) priority provision of medical care in medical organizations of the state health care system ;
- 3) acquisition of preferential vouchers for sanatorium and health resort treatment on a priority basis at the place of work or study;
- 4) provision of an annual cash payment.

The amount of the annual cash payment is indexed each year by the inflation rate. The amount of the annual cash payment in 2021 is 15,109.46 rubles.

In the subjects of the Russian Federation, the authorities independently decide on additional benefits for donors.

To analyze attitudes towards measures of state social support at the federal level, a survey of the population was conducted on the basis of the Blood Center of Belgorod Oblast. 101 blood donors took part in the survey. A large proportion of donors surveyed (79.2%) said that donor support measures were insufficient and significant.

3. Analysis of trends in the sphere of donor blood circulation

Based on the results of an in-depth interview with the chief physician of the Belgorod Oblast Blood Center, an analysis of statistical data, and a survey of the population, negative trends in the sphere of donor blood circulation were identified. There are following.

- (1) Increased incidence of HIV and hepatitis in Russia
- (2) Covid-19 negatively affects the total number of donors and the volume of donated blood.
- (3) Lack of full-scale advertising of blood donation
- (4) Failure to fulfill guarantees and compensations from the employer in case of blood donation by employees.

4 . Social portrait of a blood donor

In order to improve the state policy in this sphere it is necessary to build a social portrait of a blood donor. It should be noted that the social portrait of a blood donor may differ in different subjects of the Russian Federation, this may be due to demographic and socio-economic differences of the regions.

Let us consider the social portrait of a blood donor in Belgorod region as an example. The study was conducted on the basis of the Blood Center of the Belgorod region [4]. Statistical data were analyzed using the method of principal components.

On the basis of the study (Fig. 1) the following conclusions can be made:

- As the age increases, people are more likely to give blood;
- predominantly men donate blood repeatedly;
- people who see advertising more often are more likely to donate blood repeatedly;

- The lower the level of education, the more likely a person is to go to donate blood, Accordingly, people with higher education are more likely to donate blood once.
- The following professional groups are more likely to donate blood and its components once: military personnel, students/students, medical workers, and the unemployed;
- financial status and marital status do not influence whether people donate blood once or more times.

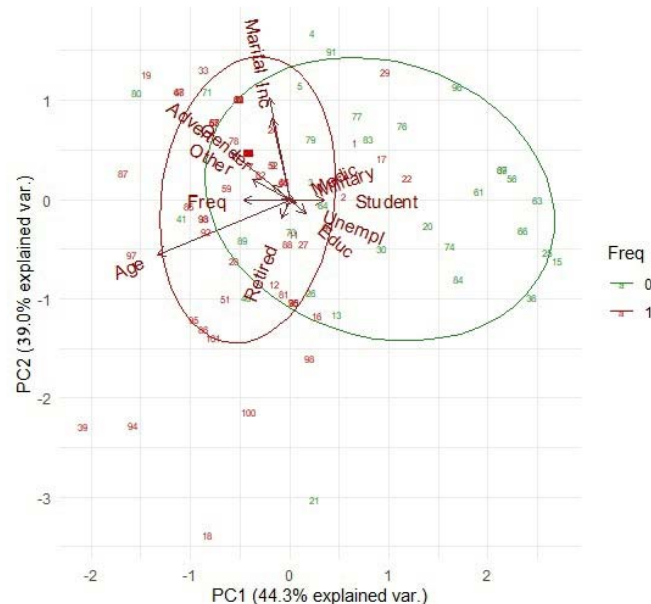


Fig. 1 Results obtained using the principal component method

As a result of the study it was found that in Belgorod region the social portrait of the donor of blood and its components is a man aged 35-44 years, with specialized secondary education, who has donated blood 2 or more times.

5. Recommendations

On the basis of the analysis, the following recommendations have been developed.

(1) Transfer to the jurisdiction of the Federation and centralization of the blood service

Institutions of the blood service are under the jurisdiction of the subjects of the Russian Federation and are financed from the regional budgets. According to 2019 data, there are 50 subjects of Russia with a surplus budget, in these regions blood service institutions are financed in full from the regional budget. However, 35 subjects of the Russian Federation have a budget deficit, so many of them use subsidies from the federal budget to finance institutions. This leads to the impossibility to update the production base, suspension or absence of studies of quality control and safety of donor blood and its components, clinical and diagnostic studies.

The federalization of the blood service will also solve the inter-regional interaction. The belonging of blood service institutions to different subjects of the Russian Federation makes the blood service heterogeneous from a technological point of view. The range of blood components provided varies in different regions.. Such a situation has developed, for example, with the use of whole blood platelets. Whole blood platelets are produced only in a few subjects, although this component is becoming increasingly in demand due to the development of oncohematological care. A significant obstacle to the provision of the same level of transfusion care is also the lack of unified intralaboratory quality control. As a result, the level and quality of molecular biological examination of donors is different and depends on the subject of the Russian Federation.

(2) Development of the system of social support for donors

It has been revealed that from the donors' point of view, social support measures at the federal level are not sufficient, which demonstrates the need for changes in the existing system .

For example, discounts on utility bills or public transport fares can be used as additional benefits

(3) Improving the effectiveness of social marketing

Information about important events held (e.g., Donors Day) is often not reflected in the media. In order to increase the number of donors, replenish the blood bank and raise public awareness about the issue of donation, more effective marketing activities are needed. It is necessary to expand the list of marketing channels, for example, by adding advertising in social networks.

Also, public organizations, such as the Red Cross, could be involved in active promotion. Analysis of international experience has shown that, as a rule, the Red Cross is actively involved in donor promotion.

Drawing a social portrait of a donor could also adjust marketing activities to improve their effectiveness by identifying the least attracted segments of the population. The example of Belgorod region shows that targeted advertising should reach young people (18-24 years old), for example, by adding blood donor advertising in social networks, and citizens who are 45-59 years old.

- (4) Development of a system of sanctions for employers in case of non-compliance with the of Article 186 of the Labor Code of the Russian Federation "Guarantees and compensations to employees in case of donation of blood and its components".

One of the negative trends is non-compliance with the norms stipulated in the Labor Code of the Russian Federation. To reduce the cases of violation of the law, a system of sanctions should be developed, for example, by adding an article on the administrative responsibility of employers.

- (5) Expanding the range of locations for mobile blood collection teams

Comparative analysis of international experience has shown that in some countries (e.g. USA and Japan) blood and blood components collection points are often located in places of mass accumulation of people: at metro stations, in shopping centers, public squares, in front of supermarkets and in clubs. In the Russian Federation there is a practice of visiting blood collection teams at large private organizations and educational institutions, but the list of places for visiting teams is limited.

References

About Blood Service. <https://yadonor.ru/about/>

Federal Law of July 20, 2012 N 125-FZ "On the donation of blood and its components". <https://rg.ru/2012/07/23/donorstvo-dok.html>,

Organization of the blood service. <https://fmba.gov.ru/deyatelnost/osnovnye-napravleniya-deyatelnosti/sluzhba-krovi/organizatsiya-deyatelnosti-sluzhby-krovi/organizatsiya-sluzhby-krovi/>,

Public Report of the Belgorod Oblast Blood Center. <http://donor-bel.belzdrav.ru/otchet/otchet.php>

The Relationship between Socio-demographic Characteristics and Reasons for not Seeking Medical Care in Russia

Elena Taraskina, HSE University (etaraskina@hse.ru), Evguenii Zazdravnykh, HSE University

Abstract:

This study examines the association between the socio-economic characteristics of an individual and the reasons why he cannot get a needed medical care. We suppose that people with higher levels of education and income living in urban areas are less likely to unmet their needs for health care. In order to discuss this relationship, it is used the micro-level data about Living Standards conducted by the Federal State Statistics Service. The analysis of this data estimates the proportion of people who cannot satisfy their needs for the medical care. In addition, there are calculated the proportions of respondents who cannot get the medical care because of long waiting time and the absence of necessary specialists, lack of the sufficient amount of money, and other reasons. The results of the study show that income does not systematically influence the likelihood of not seeking health care. In addition, the use of different approaches to assessing the availability of health services leads to different results in terms of changes in the proportion of respondents reporting on the problems under consideration, compared to 2011.

Keywords: *unmet needs; reasons for unmet needs; Heckman selection model; healthcare system.*

1. Introduction

The improvements of the public health requires an easy and fast access to the health care. Recent publications stress that in low- and middle-income countries people have worsen access to health care than that of high-income economies. While the access to health care in developing economies is worse than that of rich countries, but the reasons of it are not well understood (Vahedi et al., 2021; Collins, 2003).

The investigation of the access to health care always deals with a measurement problem: the assessment of the access to health care is a complicated task and different studies rely on various and competing methods of measuring how easy is to get the medical care. One of the most widely-used ways among recent studies is a subjective evaluation of unmet needs in health care because it allows to identify reasons of unmet needs which is important for the design of the health care policy (Fjær et al., 2017; Vahedi et al., 2021; Fiorillo, 2020).

In this study, we discuss the unmet needs in health care for Russia and pay attention to the reasons of unmet needs to investigate the relationships between reasons for unmet needs of healthcare services and socio-demographic characteristics of respondents in Russia. Russia has very diverse regions with different level of investments in the health care sector and large differences in the availability and quality of this care. However, there is a lack of studies examining how easy is to get a medical care in Russia and why people cannot get it in time. This information could help the public bodies in the development and optimization of the health care system. Thus, this project focuses on the reasons for unmet needs for healthcare that respondents face when they need medical care (subjective assessment), using data from the Complex Monitor of Living Conditions Survey from 2011 to 2020.

2. Background

The Behavioral model of health services use (hereinafter - Andersen model) establish a theoretical framework for studies about the access to medical care (Aday, Andersen, 1974; Andersen, 1978; Andersen, Newman, 1973). The authors of this model provide the definition for term ‘access to health care’. They state that people have the access to the medical care when they can easily receive the necessary care when they need it, and this care can prevent illnesses, or it can improve their health.

The Anderson model also stresses that while a poor health is an essential reason for seeking the medical help, but the socio-economic context also matters. That is, this model identifies the enabling factors, which include the personal or household income of an individual, as well as the availability of health insurance and the presence of the necessary doctors, hospitals, and clinics in the place of residence. Further, the mentioned model identifies the factors of the need for a doctor's assistance (needs factors), which reflect the state of health and the severity of the disease. The Andersen model demonstrates that the decision to visit a doctor depends on the social context, namely, on the individual's predisposition to seek medical help and his ability to receive the necessary treatment.

The empirical studies contributes the Anderson model identifying reasons of unmet needs on health care. They stress that there are accessibility reasons meaning that the person cannot get a care because of high price of a treatment or medication; availability reasons related to timely delivery of health care, waiting time, the presence of available specialists; and acceptability reasons related to personal attitudes and circumstances (Pappa et al. 2013; Fjær et al., 2017; Vahedi et al., 2021).

3. Method

3.1. Unmet needs and reasons for unmet needs

In order to study the relationship between the individual characteristics of individuals and the reasons why they did not seek for medical care we use micro-level data from the Complex Monitor of Living Conditions survey for 2011-2020 years; this data is collected by the Federal State Statistics Service (Rosstat). In this sample there are 60 thousand households, and the survey data is representative at the level of the regions of the Russian Federation since 2014. The survey is conducted in order to collect information about the living conditions of Russian households and their needs to ensure a safe and favorable living environment, a healthy lifestyle, the upbringing, and development of children, to increase labor, professional and social mobility, improve living conditions, establish and develop socio-cultural ties¹²³⁴⁵.

In this study, the access to health care is measured using two approaches. The first is that to the question: “Did you have cases this year when you were needing medical care or visiting a physician, but you didn’t visit the health care institution?” the respondent answered “Yes”. In this case, the variable reflecting the unmet need for medical care (UN₁) equals 1, that is the self-treatment means the unmet need. The second approach implies that self-treatment means met needs in health care (UN₂).

If the respondent answers that he has not met needs in the health care, the interviewer asks questions about reasons of the unmet needs. In this study, the reasons of unmet needs are grouped to create four variables:

¹ Complex monitoring of living conditions survey 2011 // Federal State Statistics Service [website]. URL: https://gks.ru/free_doc/new_site/KOUZ/survey0/index.html (date of access: 30.08.2021).

² Complex monitoring of living conditions survey 2014 // Federal State Statistics Service [website]. URL: https://gks.ru/free_doc/new_site/KOUZ14/survey0/index.html (date of access: 30.08.2021).

³ Complex monitoring of living conditions survey 2016 // Federal State Statistics Service [website]. URL: https://gks.ru/free_doc/new_site/KOUZ16/index.html (date of access: 30.08.2021).

⁴ Complex monitoring of living conditions survey 2018 // Federal State Statistics Service [website]. URL: https://gks.ru/free_doc/new_site/KOUZ18/index.html (date of access: 30.08.2021).

⁵ Complex monitoring of living conditions survey 2020 // Federal State Statistics Service [website]. URL: https://gks.ru/free_doc/new_site/GKS_KOUZH-2020/index.html (date of access: 30.08.2021).

1. accessibility (RUN₁) equals 1 if the reason was that the necessary treatment could be obtained only on a paid basis;
2. availability (RUN₂) equals 1, if the respondent does not expect effective treatment, he is not satisfied with the work of the medical institution, or the respondent does not have information where to get the necessary assistance. This variable includes reasons such as not having the right specialists or medicines, long queues, or poor admission conditions;
3. acceptability (RUN₃) equals 1 if the respondent did not have time to seek for medical help;
4. proximity (RUN₄) equals 1 if the reasons why the respondent did not seek medical help were the inaccessibility of a medical organization or problems in getting to a medical facility without assistance.

In order to explain the reasons of unmet needs in health care we use the variables that reflect the individual characteristics of the respondents, as well as the external situation: year and federal district.

The vector of variables reflecting the socio-economic status of the respondent includes the level of education (basic or high school; vocational training; tertiary training), gender, marital status, age (only individuals over 18 years old are included in the analysis), total household income (less than 20 thousand rubles, from 20.1 to 75 thousand rubles, more than 75.1 thousand rubles) and the number of members in household to which the respondent belongs, as well as the type of settlement (urban or rural) in which the respondent resides. The inclusion of variables for the year and the federal district is due to the need to take into account external factors reflecting the regional situation with the availability of medical services.

3.2. Data description

The final dataset is a cross-section data which has 315 838 observations and after the selection we have 105 644 respondents following the first approach and around 60 000 – using the second approach.

Tables 1 and 2 provide the descriptive statistics for the variables used in the analysis. If we assume that self-treatment means unmet needs in health care, then 12.8% of adult Russians could not met needs in health care because of its high cost; 42.3% refused to go to a medical institution because of doubts about the quality of the services provided; 18.8% of respondents did not have time to seek help; 8.5% experienced difficulties in getting to a medical facilities. Note, that the percentage of respondents mentioning the listed reasons for not seeking medical care increased in 2020 compared to 2011. The strongest growth is observed in availability (from 27% to 45%). Table 1 shows descriptive statistics and tests for equality of proportions and means for the first approach.

Statistical analysis showed that among those who did not seek medical care due to the high cost and proximity, the share of respondents with higher education is higher than the share of respondents who did not experience these problems. The opposite is true for availability and acceptability. Females and respondents of higher age more often report about acceptability. Also, individuals with poor or average health, chronic diseases are more likely to face the problem of inaccessibility of medical care in comparison with healthy individuals.

Table 1. Descriptive statistics (self-medication means **unmet** needs).

	Accessibility		Availability		Acceptability		Proximity	
	No	Yes	No	Yes	No	Yes	No	Yes
Basic or high school	0.2549	0.2556	0.2409	0.2662***	0.1635	0.2768***	0.4945	0.2333***
Tertiary training	0.2468	0.2653***	0.2700	0.2577***	0.3761	0.2368***	0.1159	0.2766***
Less than 20 thous rubles	0.0022	0.0033*	0.0028	0.0034	0.0027	0.0032	0.0039	0.0031
From 20.1 thous rubles to 75 thous rubles	0.0296	0.0278	0.0272	0.0286	0.0239	0.0290***	0.0435	0.0266***
Female, yes=1	0.6791	0.6366***	0.6499	0.6363***	0.5941	0.6531***	0.7407	0.6329***

Married, yes=1	0.5619	0.5948***	0.5928	0.5890	0.6701	0.5722***	0.3505	0.6129***
Age	54.2719	52.5317***	53.7470	52.0271***	42.8905	55.0320***	69.3343	51.2159***
HH size	2.3136	2.3624***	2.3151	2.3863***	2.5526	2.3108***	2.0488	2.3847***
Urban, yes=1	0.7214	0.7035***	0.7597	0.6663***	0.7384	0.6983***	0.5549	0.7198***
Northwestern FD	0.1003	0.1082**	0.1041	0.1094**	0.1222	0.1037***	0.0981	0.1080**
Southern FD	0.0025	0.0036*	0.0019	0.0046***	0.0020	0.0038***	0.0038	0.0034
Volga FD	0.2200	0.2229	0.2162	0.2272***	0.2231	0.2224	0.2424	0.2207***
Ural FD	0.0838	0.0916**	0.0909	0.0904	0.0906	0.0906	0.0733	0.0922***
Siberian FD	0.1141	0.1351***	0.1354	0.1302*	0.1198	0.1353***	0.1266	0.1330
Far Eastern FD	0.0577	0.0627*	0.0659	0.0593***	0.0718	0.0598***	0.0490	0.0633***
Southern FD	0.1186	0.0769***	0.1005	0.0689***	0.0621	0.0869***	0.0939	0.0812***
North Caucasian FD	0.0740	0.0435***	0.0442	0.0498***	0.0430	0.0484**	0.0395	0.0481***
Good	0.1729	0.2725***	0.2173	0.2908***	0.4078	0.2255***	0.0429	0.2798***
Bad	0.2299	0.1624***	0.1930	0.1550***	0.0450	0.2002***	0.5817	0.1330***
Chronical diseases, yes=1	0.5240	0.4186***	0.4774	0.3989***	0.2934	0.4641***	0.7452	0.4030***
The drugstore is far from home, yes=1	0.2038	0.1982	0.1897	0.2057***	0.1730	0.2049***	0.3470	0.1852***
Observations	13545	92099	44701	60943	19814	85830	8973	96671

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

If we consider the second approach meaning that self-treatment is a met needs in care, we see that on average, 24.3% of respondents did not seek medical help because of high cost of treatment, 67.8% - because of the quality of services, 33.5% due to lack of time and 16.5% due to the inaccessibility of the institution. Unlike the first approach, there is no growth in the percentage of respondents who reported the above reasons. On the contrary, the shares of respondents declined for all reasons except the high cost. The descriptive statistics of variables is presented in Table 2.

	Accessibility		Availability		Acceptability		Proximity	
	No	Yes	No	Yes	No	Yes	No	Yes
Basic or high school	0.2549	0.2597	0.2409	0.2832***	0.1635	0.2883***	0.4945	0.2227***
Tertiary training	0.2468	0.2805***	0.2700	0.2754	0.3761	0.2385***	0.1159	0.2989***
Less than 20 thous rubles	0.0022	0.0031	0.0028	0.0034	0.0027	0.0030	0.0039	0.0029
From 20.1 thous rubles to 75 thous rubles	0.0296	0.0264*	0.0272	0.0279	0.0239	0.0286***	0.0435	0.0250***
Female, yes=1	0.6791	0.6387***	0.6499	0.6430	0.5941	0.6626***	0.7407	0.6324***
Married, yes=1	0.5619	0.5844***	0.5928	0.5665***	0.6701	0.5534***	0.3505	0.6160***
Age	54.2719	52.9717***	53.7470	52.3210***	42.8905	56.6143***	69.3343	50.7616***
Age-sq/100	31.9829	31.1090***	31.5914	30.6136***	20.0972	34.9328***	50.3546	28.3670***
HH size	2.3136	2.3518**	2.3151	2.3930***	2.5526	2.2782***	2.0488	2.3899***
Urban, yes=1	0.7214	0.7111*	0.7597	0.6474***	0.7384	0.7064***	0.5549	0.7362***
Northwestern FD	0.1003	0.1105***	0.1041	0.1113**	0.1222	0.1034***	0.0981	0.1111***
Southern FD	0.0025	0.0018	0.0019	0.0020	0.0020	0.0020	0.0038	0.0016***
Volga FD	0.2200	0.2087**	0.2162	0.2092*	0.2231	0.2072***	0.2424	0.2030***
Ural FD	0.0838	0.0864	0.0909	0.0828***	0.0906	0.0841**	0.0733	0.0876***
Siberian FD	0.1141	0.1408***	0.1354	0.1275**	0.1198	0.1400***	0.1266	0.1384**
Far Eastern FD	0.0577	0.0631*	0.0659	0.0581***	0.0718	0.0592***	0.0490	0.0637***
Southern FD	0.1186	0.0837***	0.1005	0.0735***	0.0621	0.1014***	0.0939	0.0898
North Caucasian FD	0.0740	0.0459***	0.0442	0.0601***	0.0430	0.0536***	0.0395	0.0530***
Good	0.1729	0.2448***	0.2173	0.2594***	0.4078	0.1749***	0.0429	0.2581***
Bad	0.2299	0.2093***	0.1930	0.2203***	0.0450	0.2700***	0.5817	0.1566***
Chronical	0.5240	0.4721***	0.4774	0.4677*	0.2934	0.5418***	0.7452	0.4424***

diseases, yes=1								
The drugstore is far from home, yes=1	0.2038	0.2090	0.1897	0.2324***	0.1730	0.2192***	0.3470	0.1889***
Observations	13545	42219	44701	21236	19814	39305	8973	45092

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

3.3. Methodology

This study employs an econometric analysis to assess the relationship between the socio-economic characteristics of respondents and the reasons why they do not seek for medical care when it is necessary. Note, that there is self-selection of respondents, since only those of them who did not seek for medical help are considered. Thus, it is necessary to use the Heckman methodology, which involves the assessment of the selection equation, which includes variables characterizing individual factors: self-assessed health and the presence of chronic diseases, external: the remoteness of pharmacies, as well as the previously listed variables reflecting the socio-demographic characteristics of individuals, years and federal districts.

Due to the specificity of the dependent variables, which are binary, a number of probit regressions were built, which are estimated by the maximum likelihood method to estimate the probability that the dependent variable is equal to 1. Thus, we obtain the probabilities of a positive answer to questions about certain reasons why the respondent did not apply for medical help.

The following equations are estimated using Heckman method:

$$P(RUN_{1,2,3,4} = 1 | Y, X, D, UN_1 = 1) = \beta_0 + \beta Y + \gamma X + \delta D + \varepsilon_i \quad (1)$$

$$P(RUN_{1,2,3,4} = 1 | Y, X, D, UN_2 = 1) = \beta_0 + \beta Y + \gamma X + \delta D + \varepsilon_i \quad (2)$$

where Y is the year of the survey;

X - individual characteristics of the respondent;

D - federal district in which the respondent lives.

This approach is used because of the specifics of the dependent variables and the objectives of the study, and it is also consistent with the studies related to the assessment of the availability of medical services (Lee et al., 2015; Vahedi et al., 2021).

4. Empirical results and conclusion

4.1. Results and discussion

This work is devoted to the study of the relationship between the socio-economic characteristics of respondents and the reasons why they do not seek medical care when they need it in Russia from 2011 to 2020. If we consider the approach implying that self-medication means unmet needs, then the likelihood of a positive answer to questions about the previously mentioned reasons for not going to the doctor increased compared to 2011 (for all reasons). When self-medication means met needs, the likelihood of not visiting a doctor because of a paid basis for the provision of services and lack of time increased, while the likelihood of a positive answer to questions about availability and proximity decreased compared to 2011.

The results of evaluating probit models by the Heckman method are presented in Tables 3 and 4. Table 3 shows that the probability of not applying due to the high cost of necessary services is lower for women, respondents who are married, have higher education and live in urban areas. In addition, the older the respondent, the lower the likelihood of not seeking medical attention due to cost. The difference between the results for the second approach is that basic education also reduces the likelihood, and the effect of age is quadratic.

The factors under consideration equally affect the likelihood of not seeking medical help due to lack of time: people with basic education are less likely to encounter this reason, and

people with higher education who are married are more likely. The difference is the effect of household size - in the second approach, it increases the probability.

Women, respondents who are married, living in urban areas who do not self-medicate are more often dissatisfied with the quality of services provided, and basic and higher education reduces the likelihood of not seeking medical care due to availability.

Finally, respondents with higher education, women, respondents who are married, living in urban areas are less likely to encounter inaccessibility of an institution.

Table 3. Reasons for unmet needs (self-medication means **unmet** needs) – probit coefficients.

	Accessibility		Availability		Acceptability		Proximity	
Basic or high school	0.00740	(0.0109)	-0.0189*	(0.00924)	-0.102***	(0.0130)	0.149***	(0.00997)
Tertiary training	-0.0360***	(0.0106)	0.0118	(0.00881)	0.188***	(0.0110)	-0.0736***	(0.0120)
Less than 20 thous rubles	-0.139 ⁺	(0.0842)	-0.0608	(0.0653)	-0.173*	(0.0863)	0.0893	(0.0698)
From 20.1 thous rubles to 75 thous rubles	-0.00971	(0.0261)	-0.0292	(0.0222)	-0.0369	(0.0299)	0.0520*	(0.0233)
Female, yes=1	-0.0326***	(0.00978)	-0.0583***	(0.00812)	-0.0442***	(0.0107)	-0.101***	(0.00953)
Married, yes=1	-0.0664***	(0.00953)	0.0148 ⁺	(0.00806)	0.0406***	(0.0105)	-0.143***	(0.00955)
Age	0.0115***	(0.00167)	0.00929***	(0.00136)	0.0449***	(0.00208)	-0.0422***	(0.00154)
Age-sq/100	-0.0133***	(0.00155)	-0.00876***	(0.00126)	-0.0714***	(0.00218)	0.0498***	(0.00142)
HH size	-0.00652 ⁺	(0.00378)	-0.0146***	(0.00315)	0.00719 ⁺	(0.00402)	-0.00157	(0.00376)
Urban, yes=1	0.0465***	(0.00984)	0.255***	(0.00870)	-0.00963	(0.0109)	-0.274***	(0.00924)
Northwestern FD	-0.0376*	(0.0158)	-0.0361**	(0.0131)	0.0383*	(0.0168)	-0.0588***	(0.0156)
Southern FD	0.248**	(0.0851)	-0.1000	(0.0699)	-0.0659	(0.0958)	0.0645	(0.0760)
Volga FD	-0.0131	(0.0127)	-0.0173	(0.0106)	0.00807	(0.0139)	-0.0782***	(0.0122)
Ural FD	-0.0659***	(0.0170)	-0.00893	(0.0140)	-0.0320 ⁺	(0.0183)	-0.153***	(0.0171)
Siberian FD	-0.0681***	(0.0150)	0.0472***	(0.0123)	-0.114***	(0.0164)	-0.0913***	(0.0143)
Far Eastern FD	-0.0144	(0.0194)	0.0995***	(0.0161)	0.0342 ⁺	(0.0203)	-0.0839***	(0.0197)
Southern FD	0.257***	(0.0162)	0.295***	(0.0144)	-0.174***	(0.0200)	0.000352	(0.0164)
North Caucasian FD	0.379***	(0.0198)	0.108***	(0.0181)	-0.123***	(0.0241)	0.00542	(0.0217)
year=2014	0.437***	(0.0305)	0.462***	(0.0215)	0.359***	(0.0295)	0.341***	(0.0263)
year=2016	0.481***	(0.0305)	0.399***	(0.0215)	0.402***	(0.0297)	0.304***	(0.0264)
year=2018	0.552***	(0.0304)	0.411***	(0.0215)	0.375***	(0.0295)	0.270***	(0.0263)
year=2020	0.669***	(0.0301)	0.575***	(0.0213)	0.0895**	(0.0300)	0.297***	(0.0263)
Constant	-1.002***	(0.0669)	-0.420***	(0.0525)	-1.753***	(0.0654)	0.598***	(0.0546)
Wald	1919.66***		2681.25***		5952.55***		4181.74***	
N_selected	105644		105644		105644		105644	
N_nonselected	210194		210194		210194		210194	
N	315838		315838		315838		315838	
Wald test	914.43***		841.92***		87.98***		2245.97***	

Standard errors in parentheses

⁺ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4. Reasons for unmet needs (self-medication means **met** needs) – probit coefficients.

	Accessibility		Availability		Acceptability		Proximity	
Basic or high school	-0.0271 ⁺	(0.0145)	-0.0795***	(0.0132)	-0.113***	(0.0133)	0.159***	(0.0132)
Tertiary training	-0.120***	(0.0140)	-0.0878***	(0.0126)	0.160***	(0.0113)	-0.163***	(0.0157)
Less than 20 thous rubles	-0.184	(0.112)	-0.114	(0.0930)	-0.157 ⁺	(0.0899)	0.117	(0.0923)
From 20.1 thous rubles to 75 thous	0.0241	(0.0348)	0.00302	(0.0319)	-0.0214	(0.0308)	0.0832**	(0.0307)

rubles								
Female, yes=1	0.0541***	(0.0128)	0.0397***	(0.0115)	-0.00240	(0.0105)	-0.0318*	(0.0126)
Married, yes=1	-0.0611***	(0.0127)	0.0631***	(0.0115)	0.0480***	(0.0108)	-0.164***	(0.0126)
Age	0.0331***	(0.00216)	0.0369***	(0.00185)	0.0440***	(0.00207)	-0.0348***	(0.00206)
Age-sq/100	-0.0318***	(0.00200)	-0.0311***	(0.00172)	-0.0683***	(0.00220)	0.0482***	(0.00190)
HH size	-0.00544	(0.00506)	-0.0209***	(0.00452)	0.00996*	(0.00417)	0.000963	(0.00500)
Urban, yes=1	0.0589***	(0.0131)	0.374***	(0.0117)	-0.00986	(0.0112)	-0.368***	(0.0124)
Northwestern FD	-0.00991	(0.0209)	0.0339+	(0.0186)	0.0604***	(0.0172)	-0.0353+	(0.0205)
Southern FD	0.407**	(0.129)	-0.0573	(0.122)	-0.0504	(0.112)	0.118	(0.114)
Volga FD	0.0834***	(0.0168)	0.123***	(0.0151)	0.0488***	(0.0142)	0.0154	(0.0161)
Ural FD	0.0236	(0.0226)	0.138***	(0.0202)	0.000450	(0.0188)	-0.0553*	(0.0226)
Siberian FD	-0.0683***	(0.0197)	0.149***	(0.0175)	-0.105***	(0.0168)	-0.0736***	(0.0188)
Far Eastern FD	0.00213	(0.0257)	0.176***	(0.0230)	0.0382+	(0.0209)	-0.0720**	(0.0259)
Southern FD	0.253***	(0.0213)	0.318***	(0.0203)	-0.216***	(0.0200)	-0.0762***	(0.0215)
North Caucasian FD	0.368***	(0.0262)	-0.0189	(0.0249)	-0.199***	(0.0239)	-0.118***	(0.0284)
year=2014	-0.00410	(0.0450)	-0.145***	(0.0373)	0.124***	(0.0336)	-0.249***	(0.0385)
year=2016	0.110*	(0.0450)	-0.180***	(0.0373)	0.185***	(0.0336)	-0.234***	(0.0386)
year=2018	0.189***	(0.0450)	-0.141***	(0.0373)	0.156***	(0.0336)	-0.283***	(0.0385)
year=2020	0.165***	(0.0445)	-0.118**	(0.0368)	-0.211***	(0.0337)	-0.423***	(0.0384)
Constant	-1.158***	(0.0937)	-0.806***	(0.0788)	-1.746***	(0.0654)	1.233***	(0.0756)
Wald	927.11***		1912.61***		4037.42***		2783.35***	
N selected	55764		65937		59119		54065	
N nonselected	260074		249901		256719		261773	
N	315838		315838		315838		315838	
Wald test	173.58***		7.09**		1001.13***		1374.89***	

Standard errors in parentheses

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.2. Conclusion

To sum up, we identified factors that affect the likelihood of not getting a needed medical care due to the high cost of services, dissatisfaction with the quality of services offered, lack of time to contact a medical facility, and because of the inaccessibility of health care institutions. Household income has little effect on the likelihood of not getting a needed medical care, and more educated people in Russia are less likely to refuse to see a doctor because the cost of services, but more often they don't have enough time. Note, that some of the reasons have become more common, while others have faded into the background, compared to 2011. Specifically, individuals are more likely to face the high cost of services and the inaccessibility of medical institutions, but less often they experience dissatisfaction with the quality of services and a lack of time.

References

- Aday, L. A., & Andersen, R. (1974). A framework for the study of access to medical care. *Health Services Research*, 9(3), 208.
- Andersen, R. (1978). Health status indices and access to medical care. *American Journal of Public Health*, 68(5), 458–463.
- Collins, T. (2003). Globalization, global health, and access to healthcare. *The International Journal of Health Planning and Management*, 18(2), 97–104.
- Fiorillo, D. (2020). Reasons for unmet needs for health care: The role of social capital and social support in some Western EU countries. *International Journal of Health Economics and Management*, 20(1), 79–98.
- Fjær, E. L., Stornes, P., Borisova, L. V., McNamara, C. L., & Eikemo, T. A. (2017). Subjective perceptions of unmet need for health care in Europe among social groups: Findings from the European social survey (2014) special module on the social determinants of health. *The European Journal of Public Health*, 27(suppl_1), 82–89.
- Lee, S.-Y., Kim, C.-W., Kang, J.-H., & Seo, N.-K. (2015). Unmet healthcare needs depending on employment status. *Health Policy*, 119(7), 899–906.
- Pappa, E., Kontodimopoulos, N., Papadopoulos, A., Tountas, Y., & Niakas, D. (2013). Investigating unmet health needs in primary health care services in a representative sample of the

Greek population. *International Journal of Environmental Research and Public Health*, 10, 2017–2027.

Vahedi, S., Torabipour, A., Takian, A., Mohammadpur, S., Olyaeemanesh, A., Kiani, M. M., & Mohamadi, E. (2021). Socioeconomic determinants of unmet need for outpatient healthcare services in Iran: A national cross-sectional study. *BMC Public Health*, 21(1), 1–9.

Dialogue on Smart City Strategy: Case of Saint Petersburg

Olga Trunova, University of Bologna (olga.trunova2@unibo.it), Igor Khodachek, Russian Academy of National Economy and Public Administration, Aleksandr Khodachek, Higher School of Economics

Abstract:

This study describes and analyzes how different actors in a dialogue centered on strategic planning documents for Saint Petersburg, Russia, framed a smart city vision and then made it calculable. We conduct a case study based on a documentary analysis with ethnography elements, analyzing smart city conceptual proposals, the approved city strategy, and the artifacts of expert discussions leading to the strategy implementation plan. Through the lenses of dialogue theory, we investigate the creation of a techno-centric smart city strategy, which arose despite an initial human-centric vision. The transformation from the initial human- to techno-centric strategy was a result of the dialogue dominated by government actors. A natural gap between a human-centric smart city vision and a capacity to ground this vision in calculations requires human-oriented elements to be secured throughout the calculating process, while the organization of the dialogue on smart city strategy must enable various voices.

Keywords: *smart city, visualizing and calculating, dialogue*

1. Introduction

The global trend toward developing smart cities (SCs) promises to enhance the quality of life for the citizens through smart technologies (Manville et al., 2014). Public authorities are becoming more interested in adopting the ‘SC approach’ to the urban problems, i.e., using information and communication technology (ICT) in public management systems to monitor and manage everyday city life in an ‘intelligent’ manner (Wirtz & Müller, 2021). Despite the growing interest, the SC landscape remains fragmented due to the current range of SC interpretations (Fernandez-Anez *et al.*, 2017). For instance, a city can adopt a strategy in which technology leads the way (Mora, Deakin, & Reid, 2019) in creating the SC framework or follow a more human-centric approach that concentrates on active roles for citizens first. In this regard, little is known about how and why certain SC visions are established by public authorities. While existing studies have critically analyzed the prevalent techno-centric approach to conceptualizing SC (e.g., Grossi & Pianezzi, 2017; Hollands, 2015; Kitchin, 2015), there is limited empirically-based evidence on how this perspective unfolds in practice and what processes accompany the creation of this SC strategy.

This lack of understanding becomes even more distinct since SC planning and implementation presupposes the involvement of multiple actors (government, academia, business, and non-profit organizations) reminding ‘a complex organization’ (Argento et al., 2019). Thus, it is important to capture the roles of these actors in outlining the conceptual framework for a SC and its realization in the long-term strategic vision of the city.

In this study, we dig deeply into the development of SC strategy and investigate how SC visions are conveyed through the theoretical framework of dialogue. In particular, we demonstrate how the government, academics, entrepreneurs, and other actors contribute to the formation of an SC strategic vision (Lapsley, Miller, & Panozzo, 2010) through dialogue while inscribing SC in the performance indicators for the city’s strategy implementation plan. While visualizing and making cities calculable has its roots in the New Public Management (NPM) agenda (Cristofoli,

Ditillo, Liguori, Sicilia, & Steccolini, 2010; Lapsley et al., 2010), this study takes a step forward by investigating the next generation of public sector reforms associated with ICT, known under the digital government agenda (Dunleavy et al., 2006).

Using the case of Saint Petersburg, which has recently embarked on an SC agenda, we show how the dialogue between city officials and other actors from academia and the private sector occurs in practice and frames discrete techno-centric SC indicators based on an initially holistic human-centric SC vision and assigns them to separate strategic priorities.

2. Literature review

2.1. Smart city strategy: Technology-led or human-oriented?

The SC concept emerged as a remedy for the consequences of urbanization, as it was motivated by environmental concerns (Yigitcanlar et al., 2018). A growing body of SC research demonstrates a rich, yet fragmented field of knowledge (Meijer & Bolívar, 2016) where the researchers are not always in agreement (Caragliu, del Bo, & Nijkamp, 2011; Fernandez-Anez et al., 2017). In clarifying this vague concept (Vanolo, 2014), scholars have designed diverse typologies to reach a systematic understanding of smartness. Mora et al. (2019) suggest that one stream in the literature follows a techno-centric perspective, placing technology at the center of an SC strategy (Rabari & Storper, 2015). According to this perspective as the *technology-led strategy*, a city will be transformed into “an urban environment permeated with ICTs, where all physical infrastructures are interconnected” (Mora et al., 2019, p. 11). In opposition to the techno-driven approach, a human-centric approach focuses on the relationships among local governments, citizens, and community entities and emphasizes the active role they all play in enhancing urban smartness (Argento et al., 2019; Tomor, 2020; Vanolo, 2016). In this study, we utilize the ‘human-centric perspective’, as a representation of the human-oriented approaches to SCs that draw considerable attention to the role of citizens. In a similar manner, the ‘techno-centric perspective’ will cover the multiple technology-oriented approaches. Although both perspectives were covered by the literature, they have been limitedly explained in terms of framing urban policies and empirically based evidence on *how the techno-centric SC strategy unfolds in practice and what the processes are that accompanying this unfolding*.

2.2. Visualizing the smart city and making it calculable

Apart from their explicit reliance on ICT, cities adopt various tools of governance and management that the literature attributes to NPM when they mimic large corporations (Lapsley et al., 2010) and engage in strategizing and *accountingization* (Power & Laughlin, 1992). Lapsley et al. (2010) conceptualize this situation as governing a city via twin processes - visualizing the future and making the city calculable. A city thus becomes involved in diverse activities to create a desirable image and paves the way for the public management transformations required for the embodiment of this image. Hence, while images express the future of a city and require commitment from the actors involved for preventing conflicts, they should be compatible with reality (financial constraints within the government system and the necessity of delivering public services). This need for compatibility generates tensions between visualization and calculation, i.e., ambitious plans must be aligned with both operational and financial restrictions, highlighting the “paradoxical relationship between the future and the present” (Brorström, 2018, p. 18). Eventually, a city must bring its plans within calculative norms, measurements, and standards (Lapsley et al., 2010) while harmonizing visualization and calculation, which, in practice, can be a very challenging task for a city government. We drive this argumentation further and address the visualization of an SC in terms of a city’s long-term strategy and implementation plan while focusing on the dialogue concerning strategy and performance indicators and how it leads to a techno-centric SC strategy.

2.3. Dialogue on smart city strategy

Accounting has been recognized important in formulating a city strategy (Kornberger & Carter, 2010), since the strategic plans and ‘visions’ that a city puts forth are fundamental elements in the emerging collaborative forms of urban governance, which grasp the multidimensionality and complexity of contemporary cities (Lapsley et al., 2010). While inclusivity remains crucial for improving the quality, efficiency, and effectiveness of decisions (Linnerooth-Bayer, Scolobig, Ferlisi, Cascini, & Thompson, 2016), there are many nuances to stakeholder input (Yosie & Herbst, 1998), which can be addressed through a dialogue framework proposed in accounting literature (e.g., Brown, 2009; Bebbington et al., 2007). The dialogue framework is rooted in ideas of Mikhail Bakhtin, a Russian philosopher and literary critic who defined dialogue as the “verbal process (participial modifiers) that their (various processes) force is most accurately sensed” (Bakhtin, 1981, p. 426). In this paper we examine how a dialogue among various stakeholders, including experts, academics, and public officials, may lead to different outcomes in terms of SC visualization and making it calculable, building a dialogue framework based on Brown (2009) and Bebbington et al. (2007). Five elements of dialogue become themes to focus on throughout the empirical data analysis: purpose of the dialogue, main actors involved in the dialogue, organization (material context and power dynamics), outputs and outcomes.

3. Method and research setting

To address the implications of a techno-centric SC vision empirically, we employ a case study strategy (Eisenhardt, 1989; Eisenhardt & Graebner, 2007), exploring a two-year city strategizing exercise in which an SC concept became part of the long-term strategy of Saint Petersburg, Russia, as well as its implementation plan.

3.1. Research setting: Smart Saint Petersburg

Saint Petersburg is the world’s most northern megapolis, characterized by federal jurisdiction and significant autonomy in terms of public budgeting and organization, being known for its advanced government innovation policies. Local studies revealed the growing interest and willingness of the city government to pursue an SC strategy (Vidiasova, Vidiasov, & Tensina, 2019), together with aspiration of citizens to be involved in city governance that was promoted through the idea of public participation within SC agenda (Sovershaeva, 2019), recognizing a potential for human-centric SC vision to emerge.

3.2. Methods

The empirical evidence of this study is based on a document analysis and ethnographic notes covering the period from July 2017 to December 2019. The variety of data sources provide a rich understanding of the phenomenon, i.e., how the SC concept emerged in the strategic agenda. While the document analysis served as the main source, it happened that one of the co-authors became engaged in expert group discussions, allowing to build an ethnographic narrative. We examined different texts, e.g., official transcripts of relevant public discussions, budget messages, concept papers, policy documents, and methodological guidelines, in addition to the documents related to the expert discussions held from January 2019 to March 2019, in which one of the co-authors participated. We examined the documents and protocols of internal meetings, then we revealed missing parts and addressed them by creating ethnography notes that arose from discussions among the co-authors, later being used as additional materials to support the case study. We present our empirical findings as a two-phase case study: the first phase focuses on the dialogue used to make the SC concept visible in the long-term strategy for Saint Petersburg, while the second phase concerns including the SC vision in the city budget, i.e., making it calculable. Afterwards, we compare how the dialogue among various actors was

organized in these two phases and suggest a way of seeing how the initial SC vision turned into SC calculations.

4. Empirical findings

We assign the two phases to two expert groups: the project office (PO), and the working group (WG). The groups were charged with including the SC concept in the discourse concerning the city's strategy and the strategic planning documents, respectively. For each phase, we address the composition of the group, its dynamics, key activities, and its outputs, including descriptions of the dialogue outcomes observed in the city's strategy (in the case of the PO), and the strategy implementation plan indicators (in the case of the WG).

4.1. Phase 1: Visualizing a smart city

4.1.1. Purpose

The first phase included articulating a vision of smartness for the city and started in 2017 when the governor initiated concept development through establishing a close collaboration with one of the leading public IT universities (hereafter, the University). The University became responsible for creating a conceptual vision of an SC, taking a role of the initiator and coordinator of the so-called 'smart city project office' (PO). The PO was charged with creating a smart vision and included experts with a broad range of expertise from the city government, academia, and business, providing a platform for discussions and dialogue concerning this vision. It is apparent that this group possessed a reflexive understanding (Brown, 2009) of what an SC strategy is and how to apply it.

4.1.2. Key actors in the dialogue

Two groups of experts, i.e., key actors in the dialogue, were involved in developing the SC vision. The governor approved a core team of 31 members, while the extended group was comprised of 97 external members plus the core team, in which government officials became prevalent. Academics, public officials, politicians, and businesspeople provided different perspectives of what SC could be, thus constructing a wide-ranging dialogue (Brown, 2009) and comprehension of SC through appeals to foreign experience, i.e., smart initiatives in Amsterdam, Barcelona, Songdo, etc.

4.1.3. Organization (material context and power dynamics)

Within Phase 1, the key actors were mainly the appointed representatives of the University who established the PO. The rector of the University headed the PO, and the meetings of the group were entirely on campus, organizing all interactions among participants directly at the University, highlighting "the context within which meaning is produced" (Bebbington *et al.*, p. 367).

4.1.4. Outputs

Ultimately, the outputs of the PO's collaborative work, i.e., the results produced by a consensus among experts (Brown, 2009), were delivered in spring 2018. First there was introduced the Concept of Smart Saint Petersburg (the Concept) and then the so-called Priority Program Smart Saint Petersburg (the Program), indicating more precise directions of smartness. Further implementation of the Concept was organized through several working groups for coordination and organizational, methodological, and project assistance within the PO. When presenting the Concept, the PO office representative referred extensively to the importance of citizens' voices and their active participation in bringing up 'problems, expectations, and suggestions' in defining the SC (citizens were asked to evaluate the smart initiatives to be put forth for

implementation), while the experts were responsible for bringing ‘perspectives’, and the representatives from business were to share ‘problems and suggestions’. However, in October 2018 the governor unexpectedly resigned, and a new acting governor was appointed by the Kremlin. Although the acting governor supported the previous efforts and the SC concept remained a strategic priority, the Concept and Program’s ambitious plans were shelved. Nevertheless, in December 2018, the acting governor approved a comprehensive long-term city strategy that was to remain operational until 2035 (Strategy 2035).

4.1.5. Outcome – SC vision

The SC vision was formulated as a comprehensive framework of components to address citizens’ needs and included such items as ecological improvements, a comfortable urban environment, healthcare, evidence-based city governance, reducing traffic congestion, and citizens’ engagement in developing the city (PO: Current Results of Activity 2017-2018). There was a clear focus on citizens and mechanisms by which to engage them. Located as it was at the core of the SC concept and listed as a ‘desired change’, this dialogic process was desired and eventually promoted (Brown, 2009). Thus, the Program outlined one of the key indicators to be achieved in 2020 as “Share of citizens positively evaluating projects selected and enacted to realization – not less than 50%” (the Program, p. 4).

4.2. Phase 2. Making the smart city calculable

4.2.1. Purpose

In 2019, the acting governor initiated a revision of the city’s budget programs and the development of the strategy implementation plan with the aim of explaining the main directions of the prospective city development to the citizens using simple and understandable language. He established a WG of experts to implement the strategy through the revision of budget programs. The purpose was to articulate the SC idea to citizens using a comprehensive approach and simple language and connect it to budget programs with bureaucratic language, as a technical answer to a predetermined goal was perceived as “exogenous and given” (Brown, 2009). While the strategy approved in 2018 mentioned the SC agenda, the new ambition was to make it a top strategic and political priority. Thus, SC became one of the four major priorities in the new strategic vision, along with an open, a social, and a comfortable city (TASS, 2018). The open city vision was clearly oriented toward engaging citizens and empowering them to develop particular areas of urban life. The social city vision pertained mainly to public services and healthcare, while the comfortable city vision was focused on safety and infrastructure, e.g., transport and roads, and public places.

4.2.2. Key actors

The WG included experts with a wide range of backgrounds. Like the earlier PO, this WG consisted of two teams: the core team (14 members), and the external experts (82 members). Essentially, the main actors were government representatives who invited experts from different fields to participate based on their sectoral backgrounds and research interests, potentially adding perspectives (Brown, 2009) and a multiplicity of views to the discussion in order to avoid it being dominated by privately owned ICT corporations (Grossi & Pianezzi, 2017). In total, 18 expert subgroups (commissions) were created according to their particular areas of expertise, e.g., tourism, industry, public administration, entrepreneurship, fast-moving consumer goods market, and ecological and environmental protection.

4.2.3. Organization (material context and power dynamics)

Via city government decree, two vice-governors became co-leaders of the WG, as a special-purpose body to discuss and analyze aligning the four strategic priorities and the budget and suggest changes in the content and indicators of government programs and the strategy

implementation plan. WG members were authorized to request and analyze documents from institutions and public bodies at the local and regional levels and to engage other members of the scientific and expert communities or other public organizations to participate in discussions. One of the vice-governors took the role of manager or coordinator to plan and control the group activities and set the agendas for meetings. The experts became the subordinates in this hierarchy, reflecting the power dynamics (Bebbington et al., 2007). Yet, all decisions were to be made collegially, through majority voting. While a dialogic essence emphasizing the plurality of expert knowledge (Brown, 2009) and discussion (Bebbington et al., 2007) was formally in place, in practice, it was a monologue organized in small government circles to produce an SC vision relevant to the government actors. In terms of organization and context (Brown, 2009), the experts' meetings and discussions first took place in a city government office. Then some were held at various experts' offices. Finally, they moved back to the government office.

4.2.4. Output

The WG was established in March 2019 and initiated discussions among participants in April. Experts were assigned to commissions or thematic groups to align the goals, expected results, and relevant indicators for specific areas. Public sector representatives joined the discussions to help the commissions deal with the complex budget programs. Eventually, the WG presented their detailed notes as an overview in May 2019, suggesting amendments to the budget programs and the content for the strategy implementation plan. In October, the acting governor approved the strategy implementation plan, which included a wide set of indicators under the umbrella of the SC framework. Following the logic of this list of indicators, the concept was given a technology-oriented focus involving the widespread implementation of ICT in different areas of city life (Mora et al., 2019). In this case, the essence of smartness was primarily limited to the digitalization of various public services in the areas of healthcare, environment, culture, and governance and thereby focused on enhancing the so-called 'digital skin' of the city. Here, technology was seen as a better lens for viewing and managing the city, while the role of citizens narrowed mainly to that of 'consumers' of this advanced digitalization. Moreover, the human-centric elements were substantially reduced to engaging citizens in urban environmental projects and approving government initiatives. Although they supported citizens' engagement, it was an exception.

4.2.5. Outcomes

Thus, the strategic vision of the city was not re-defined, it was refined in terms of correspondence with the decrees of the president and the four priorities – smart, comfortable, open and social city. The human-centric perspective conveyed in the Concept (developed by the University in 2018) was included in the 'open city' priority. The open city activities were mainly dedicated to establishing feedback mechanisms regarding particular urban environmental issues. However, when the initial holistic SC vision was divided between 'smart' and 'open city', its human-centric elements were further reduced to limits imposed by bureaucrats, who were mainly seeking enhanced feedback. Despite the initial human-centric SC vision of the PO, citizen were given a rather limited role in the SC framework. Furthermore, citizen engagement came up primarily through digitalization: social networks, websites, electronic resources, public services, and so on.

5. Concluding discussion

Recognized as an ambiguous concept in the literature (Fernandez-Anez et al., 2017), SC can be interpreted in multiple ways as it is adopted in a certain empirical setting. In this study we distinguished two main perspectives on smartness: first, the techno-centric perspective that perceives SC through the lens of the implementation of technology into the urban infrastructure,

and the second one is the human-centric perspective that draws attention to the role of citizens in developing an SC initiative while highlighting their needs and engagement in city functions (Tomor, 2020). We generalized these approaches as the ‘techno-centric’ and ‘human-centric’ perspectives. Although both general perspectives have been investigated extensively in the SC research, especially the techno-centric perspective as the subject of criticism for placing considerable focus on ICT implementation, there remained lack of understanding as to how these perspectives actually emerge in practice and which processes underline the articulation of a techno-centric SC strategy.

This paper attempted to fill this gap, capturing the development of an SC vision in Saint Petersburg. A case study approach (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) enabled the authors to investigate how a techno-centric SC strategy emerged in the city’s strategy-planning documents. The processes that created these documents were divided into visualizing and calculating practices that have been “intrinsically linked and increasingly prominent in the multitude of representations of contemporary cities” (Lapsley *et al.*, 2010, p. 309). A number of studies have analyzed local government initiatives through the prism of this dual process (e.g., Brorström, 2018, 2021; Czarniawska, 2010; Lapsley *et al.*, 2010), showing that there may be a “gap between plans and declarations and their visible results” (Czarniawska, 2010, p. 435). So, we continued this line of research by directing our focus on the implementation of technological solutions under the conceptual umbrella of an SC. Moreover, since the SC concept presupposes the involvement of actors from the public and private sectors (Argento *et al.*, 2019), we applied a theoretical framework of dialogue to capture these interactions, which outcomes resulted in first human-oriented and then in the techno-oriented SC conceptual path within two phases of development. The first phase in visualizing an SC started when the former city governor initiated the development of the SC framework through a collaboration with the University. The University set up a project office on campus that included different experts (from government, academia, business, and the media), who worked together to create an SC vision. Considerable efforts were put into gathering feedback from citizens and engaging them in the design of the SC strategy, thereby illustrating the human-centric perspective.

Nevertheless, this vision was not achieved in practice due to resignation of the former governor that symbolized the beginning of the second phase – making the SC ‘calculable’. Among the first actions of the new governor was the approval of a new strategy for the city. The SC vision was not entirely forgotten but divided among four separate priorities in the strategy implementation plan. A group of experts from academia and non-profit organizations was appointed for providing recommendations concerning the insertion of these priorities into the freshly designed strategy implementation plan. The ambitious human-centric vision of an SC had to put “into close contact with the materiality of operational and financial constraints” (Lapsley, *et al.*, 2010, p. 308), making this SC vision ‘calculable’ and thus transforming it into a techno-centric one.

Depending on stakeholder roles there can be produced diverse conclusions in SC research (Grossi *et al.*, 2020). In this paper, we illustrated it by showing how a human-centric SC vision developed by a PO was not successful and did not survive a change in city leadership. We therefore witnessed how a government-appointed WG was rather successful in inserting a techno-centric SC vision into the strategy implementation plan and isolating human-centric elements in the ‘open city’ strategic priority, reducing them to the feedback mechanisms and the digitalization of public services. This offers a novel view on the origins of a techno-centric SC strategy as it may be connected to the organization of dialogue around an SC strategy. Specifically, when government actors dominate the dialogue around an SC strategy, it may turn into a monologue put forth by public officials leading to a techno-centric approach to a city’s strategic planning documents.

References

- Argento, D., Grossi, G., Jääskeläinen, A., Servalli, S., & Suomala, P. (2019). Governmentality and performance for the smart city. *Accounting, Auditing and Accountability Journal*, 33(1), 204–232. <https://doi.org/10.1108/AAAJ-04-2017-2922>
- Bakhtin, M. (1981) *The Dialogical Imagination*, Austin: University of Texas Press.
- Bebbington, J., Brown, J., Frame, B., & Thomson, I. (2007). Theorizing engagement: The potential of a critical dialogic approach. *Accounting, Auditing and Accountability Journal*, 20(3), 356–381. <https://doi.org/10.1108/09513570710748544>
- Brorström, S. (2018). How numbers of the future are shaping today: The role of forecasts and calculations in public sector strategic thinking. *Financial Accountability and Management*, 34(1), 17–29. <https://doi.org/10.1111/faam.12133>
- Brorström, S. (2021). The sustainability shift: The role of calculative practices in strategy implementation. *Financial Accountability and Management*, (March), 1–15. <https://doi.org/10.1111/faam.12289>
- Brown, J. (2009). Democracy, sustainability and dialogic accounting technologies: Taking pluralism seriously. *Critical Perspectives on Accounting*, 20(3), 313–342. <https://doi.org/10.1016/j.cpa.2008.08.002>
- Caragliu, A., del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology*, 18(2), 65–82. <https://doi.org/10.1080/10630732.2011.601117>
- Cristofoli, D., Ditillo, A., Liguori, M., Sicilia, M., & Steccolini, I. (2010). Do environmental and task characteristics matter in the control of externalized local public services?: Unveiling the relevance of party characteristics and citizens' offstage voice. *Accounting, Auditing and Accountability Journal*, 23(3), 350–372. <https://doi.org/10.1108/09513571011034334>
- Czarniawska, B. (2010). Translation impossible? Accounting for a city project. *Accounting, Auditing and Accountability Journal*, 23(3), 420–437. <https://doi.org/10.1108/09513571011034361>
- Dunleavy, P., Margetts, H., Bastow, S., Tinkler, J., Dun, P., Esvy, /, ... Er, /. (2006). New Public Management Is Dead-Long Live Digital-Era Governance. *Journal of Public Administration Research and Theory: J-PART*, 16(6), 467–494. Retrieved from <http://www.jstor.org/stable/3840393>
- Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management*, 14(4), 532–550.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building from Cases : Opportunities and Challenges. *Organizational Research Methods*, 50(1), 25–32. <https://doi.org/10.1177/0170840613495019>
- Fernandez-Anez, V., Fernández-Güell, J. M., & Giffinger, R. (2017). Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. *Cities*, (November). <https://doi.org/10.1016/j.cities.2017.12.004>
- Grossi, G., Meijer, A., & Sargiacomo, M. (2020). A Public Management Perspective on Smart Cities: 'Urban Auditing' for Management, Governance and Accountability. *Public Management Review*, (1), 1–15. <https://doi.org/10.1080/14719037.2020.1733056>
- Grossi, G., & Pianezzi, D. (2017). Smart cities: Utopia or neoliberal ideology? *Cities*, 69(July), 79–85. <https://doi.org/10.1016/j.cities.2017.07.012>

- Hollands, R. G. (2015). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society*, 8(1), 61–77. <https://doi.org/10.1093/cjres/rsu011>
- Kornberger, M., & Carter, C. (2010), "Manufacturing competition: How accounting practices shape strategy making in cities", *Accounting, Auditing & Accountability Journal*, Vol. 23 No. 3, pp. 325–349.
- Lapsley, I., Miller, P., & Panozzo, F. (2010). Accounting for the city. *Accounting, Auditing & Accountability Journal*, 23(3), 305–324. <https://doi.org/10.1108/09513571011034316>
- Linnerooth-Bayer, J. A., Scolobig, A., Ferlisi, S., Cascini, L., & Thompson, M. (2016). Expert engagement in participatory processes: translating stakeholder discourses into policy options. *Natural Hazards*, 81(1), 69–88. <https://doi.org/10.1007/s11069-015-1805-8>
- Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Thaarup, R. K., ... Kotterink, B. (2014). *Mapping Smart cities in the EU*. Retrieved from http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET%282014%29507480_EN.pdf
- Meijer, A., & Bolívar, M. P. R. (2016). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, 82(2), 392–408. <https://doi.org/10.1177/0020852314564308>
- Mora, L., Bolici, R., & Deakin, M. (2017). The First Two Decades of Smart-City Research : A Bibliometric Analysis The First Two Decades of Smart-City Research : A Bibliometric. *Journal of Urban Technology*, 24(1), 3–27. <https://doi.org/10.1080/10630732.2017.1285123>
- Mora, L., Deakin, M., & Reid, A. (2019). Strategic principles for smart city development: A multiple case study analysis of European best practices. *Technological Forecasting and Social Change*, 142(July), 70–97. <https://doi.org/10.1016/j.techfore.2018.07.035>
- Power, M., & Laughlin, R. (1992), “Critical theory and accounting”, *Critical Management Studies*, Vol. 21 No. 5, pp. 441-465.
- Rabari, C., & Storper, M. (2015). The digital skin of cities: urban theory and research in the age of the sensed and metered city, ubiquitous computing and big data. *Cambridge Journal of Regions, Economy and Society*, 8, 27–42. <https://doi.org/10.1093/cjres/rsu021>
- Sovershaeva L. (2019), "Saint Petersburg - "Smart, open city 2035", *Economic Development of Territories*, Vol. 1 No. 13, pp. 38–42.
- Strategy 2035 (2018). The law of Saint Petersburg ‘About social and economic strategy of Saint Petersburg for the period to 2035’ enacted 19.12.2018 by the legislative assembly of Saint Petersburg.
- TASS Information Agency, "Beglov determined four strategic priorities of Saint Petersburg development". Available at: <https://tass.ru/obschestvo/6434971>.
- The Concept (2018) the Concept of development of Saint Petersburg through smart technologies ‘Smart Saint Petersburg’ prepared by the Project office and enacted by the city governor.
- The Program (2018) the draft of Priority program ‘Smart Saint Petersburg’ for the period 01.01.2019 to 31.12.2023
- Tomor, Z. (2020). Citizens in the Smart City. *International Journal of Public Administration in the Digital Age*, 7(1), 1–16. <https://doi.org/10.4018/ijpada.2020010101>
- Vanolo, A. (2014). Smartmentality: The Smart City as Disciplinary Strategy. *Urban Studies*,

51(5), 883–898. <https://doi.org/10.1177/0042098013494427>

- Vanolo, A. (2016). Is there anybody out there? The place and role of citizens in tomorrow's smart cities. *Futures*, 82, 26–36. <https://doi.org/10.1016/J.FUTURES.2016.05.010>
- Vidiasova, L. A., Vidiasov, E. Y., & Tensina, I. D. (2019). A study of social trust in information technology in the provision of electronic public services and the use of electronic participation portals (case study of St. Petersburg, Russia). *Monitoring Obshchestvennogo Mneniya: Ekonomicheskie i Sotsial'nye Peremeny*, 153(5), 43–57. <https://doi.org/10.14515/monitoring.2019.5.03>
- Wirtz, B. W., & Müller, W. M. (2021). A Meta-Analysis of Smart City Research and Its Future Research Implications. *International Public Management Review*. *International Public Management Review*, 21(2), 18–39.
- Yigitcanlar, T., Kamruzzaman, M., Buys, L., Ioppolo, G., Sabatini-Marques, J., Moreira da Costa, E., & Joseph Yun, J. (2018). Understanding “smart cities”: Intertwining development drivers with desired outcomes in a multidimensional framework. *Cities*, (November 2017), 1–0. <https://doi.org/10.1016/j.cities.2018.04.003>
- Yosie, T. F., & Herbst, T. D. (1998), “Using stakeholder processes in environmental decision making. An evaluation of lessons learned, key issues and future challenges”, pp. 1–72.

Third countries and the EU: Recent Developments in the Field of Public Procurement

Georgia Aimilia Voulgari, National and Kapodistrian University of Athens
(voulgariyouli@gmail.com)

Abstract:

The paper presents the actions the EU has undertaken in the recent years and the latest developments in terms of regulation, in relation to third countries, in the field of public procurement. In this context the paper presents and critically assesses the main elements of the draft International Procurement Instrument as well as of the European Commission’s proposal for a Regulation to address potential distortive effects of foreign subsidies in the Single Market, including public procurement.

Keywords: *public procurement, foreign subsidies, International Procurement Instrument, third countries*

1. Introduction

1.1 The factual background

Third country bidders, goods and services are not necessarily subject to state aid rules, similar to those applicable in the EU, nor always bound by the same, or equivalent, environmental, social or labour standards as those applicable to EU economic operators⁶. Third countries, even under negotiations to join the WTO GPA⁷, often provide state aid in exports which would be illegal if granted by EU Member States and assessed under EU State aid rules⁸; in addition, they often apply market intervention practices⁹ which do not allow the development of a truly competitive environment in the global market, contrary to the WTO’s objectives. However, EU State aid rules apply only to public support granted by EU Member States, while subsidies granted by third country authorities fall outside their scope.

Such discrepancies (may) put EU bidders, goods and services at a two-fold disadvantage: on one hand, they enjoy, to a certain extent, restricted or no access in third countries public procurement markets, due to market intervention practices, the lack of transparency and the lack of competitive market-based and market-oriented rules, while third country bidders, goods and

⁶ European Commission Communication “Guidance on the participation of third country bidders and goods in the EU procurement market” (24.7.2019 C(2019) 5494 final), p. 3

⁷ For example, China began negotiations to join the WTO GPA in 2007; through the years it has submitted six offers, all falling short of the parties’ requests. While GPA parties continue to press it to complete its accession by addressing their outstanding concerns, most parties already provide China with access to their procurement markets, with the exception of USA, which has an outright prohibition against purchasing from China in federal procurement (except for goods or services not available in the U.S. or from GPA or Free Trade Agreement partners). In other words, non-GPA members are able to participate in GPA-covered procurement without opening their own procurement markets (Jean Heilman Grier, Do open markets decrease China’s incentive to join GPA?, posted in PERSPECTIVES ON TRADE, 2.11.2017).

⁸ The European Court of Auditors, in its report “The EU’s response to China’s state-driven investment strategy”, Review 03 (2020), has found that certain subsidies granted by the Chinese state would constitute State aid if granted by an EU Member State, which, according to the E.C.A., constitutes a difference in treatment capable of distorting competition in the Single Market.

⁹ For example, the Buy Chinese policy; see also the European Commission Staff Working Document on significant distortions in the economy of the Peoples Republic of China for the purposes of trade defence investigations, dated 20.12.2017 (SWD(2017) 483 final/2).

services benefit from an open EU public procurement market¹⁰ operating under the principles of transparency and equal treatment (international/external dimension); on the other, foreign subsidies incompatible to the EU state aid rules often result in distortions of competition created in the EU public procurement market (Single Market dimension).

1.2 Existing regulation in the field of Public Procurement

Public procurement accounts for approximately 14% of the EU's GDP¹¹, rendering it one of the largest public procurement markets of the world. The principles governing public procurement in the EU, namely non-discrimination and equal treatment, proportionality and transparency, derive from the founding Treaties, are repeated in the TFEU and apply in every procedure for the award of a public contract, regardless of the thresholds set in the Directives¹². Their aim is to secure open access to public procurement within the EU, under equal terms, for economic operators of all member states, eliminating protectionism and favouritism of national economic operators. The ultimate goal is to ensure (large-scale and undistorted) competition, to the benefit of economic operators and of the contracting authorities / entities: undertakings benefit from fair access to public contracts and contracting authorities benefit from fair competition.

The *acquis communautaire*, which applies to all economic operators based in the EU and the EEA¹³, extends to economic operators from countries which have undertaken similar obligations in bilateral or multilateral agreements, under the principle of reciprocity. According to the identical provisions of art. 25 Directive 2014/24/EU and art. 43 Directive 2014/25/EU:

“In so far as they are covered by Annexes 1, 2, 4 and 5 and the General Notes to the European Union's Appendix I to the GPA and by the other international agreements by which the Union is bound, contracting authorities [contracting entities in the context of Directive 2014/25/EU] shall accord to the works, supplies, services and economic operators of the signatories to those agreements treatment no less favourable than the treatment accorded to the works, supplies, services and economic operators of the Union”.

In addition, article 85 of Directive 2014/25/EU (the Utilities Directive)¹⁴ allows EU contracting authorities to either reject third countries (i.e., non-EU countries with which the Union has not concluded, whether multilaterally or bilaterally, an agreement ensuring comparable and effective access for Union undertakings to their markets¹⁵) bids (in tenders covering products¹⁶ originating in third countries), where the proportion of goods originating in such countries exceeds 50% of the total value of the products constituting the tender, or give preference to the EU bid(s), if prices are equivalent (as such considered the ones within a 3% margin). Moreover, EU contracting authorities are allowed to retain the right to suspend or restrict the award of service contracts to undertakings from third countries where no reciprocal access is granted. Article 86 of the same Directive confers competence upon the Commission to act when informed by member states of any general difficulties, in law or in fact, encountered and reported by their undertakings in securing the award of service contracts in third countries (para. 1), while reminding that *“this Article shall be without prejudice to the commitments of the Union in*

10 the EU has estimated that it is the most open of all procurement markets, for the “de jure” openness of the EU procurement markets is 85%, while for example the U.S. is only at 32%, in Dawar, Kamala (2016) The 2016 EU International Procurement Instrument's amendments to the 2012 buy European proposal: a retrospective assessment of its prospects. *Journal of World Trade*, 50 (5)

11 https://ec.europa.eu/info/sites/default/files/file_import/european-semester_thematic-factsheet_public-procurement_en_0.pdf; the estimate does not include utility procurement; according to former estimates, including utility procurement, the figure rises to 19%.

12 Commission Interpretative Communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives (2006/C 179/02), p. 2 – 7

13 C-324/1998, *Telaustria*, 7.12.2000, para. 60

14 Though both provisions had been included in Directive 2004/17/EU, as well, there is very limited feedback and no relevant case – law of the CJEU regarding their application.

15 See Regulation (EU) No 952/2013 of the European Parliament and of the Council as well as art. 86 para 6 of the GATT/GPA

16 works, services and economic operators are not covered

relation to third countries ensuing from international agreements on public procurement, particularly within the framework of the WTO” (para. 6).

The said provisions apart, the EU public procurement Directives do not regulate third – country economic operators’ access to EU / member states public procurement, leaving discretion to contracting authorities / contracting entities, to be exercised on an ad hoc basis.

2. The two-fold approach of the EU and the corresponding recent actions

2.1 The international (external) dimension

The rationale behind the aforementioned provisions of art. 25 Directive 2014/24/EU and art. 43 Directive 2014/25/EU is provided in Recital 17 of Directive 2014/24/EU and Recital 27 of Directive 2014/25/EU, respectively:

“... The aim of the GPA is to establish a multilateral framework of balanced rights and obligations relating to public contracts with a view to achieving the liberalization and expansion of world trade. For contracts covered by Annexes 1, 2, 4 and 5 and the General Notes to the European Union’s Appendix I to the GPA as well as by other relevant international agreements by which the Union is bound, contracting entities should fulfil the obligations under those agreements by applying this Directive to economic operators of third countries that are signatories to the agreements”.

The EU is committed to global market openness and adheres to the position that its prerequisite is the existence of a level playing field, ensuring fair competition. Due to an imbalance indicated by figures between the open EU public procurement market and the problems EU economic operators confront in accessing some third countries markets¹⁷, the European Commission adopted, on 21 March 2012, a proposal for a “*Regulation of the European Parliament and of the Council on the access of third-country goods and services to the Union*” (COM (2012) 124 final), to unilaterally regulate the access of third-country goods and services to the EU’s public procurement market. The long-term aim was to encourage greater reciprocity on the part of trading partners, in relation to public procurement contracts, while the short and medium-term aim was to initiate serious negotiations with third countries, to achieve opening their markets to EU-based bidders. In addition, since 2017, the EU is actively engaged in pursuing WTO modernisation¹⁸, including industrial subsidies¹⁹.

Currently, the aforementioned provisions of art. 85 & 86 Directive 2014/25/EU (in particular art. 86) have an “external” dimension, since they refer to the adoption of implementing acts where EU undertakings have difficulties in accessing third country public procurement markets. Recital 111 of the said Directive states that: *“Having regard to current discussions on horizontal provisions governing relations with third countries in the context of public procurement, it is appropriate to maintain for an interim period the status quo of the regime which applies to the utilities sector pursuant to Articles 58 and 59 of Directive 2004/17/EC. Consequently, those provisions should be kept unchanged, including the provision for the adoption of implementing acts where Union undertakings have difficulties in accessing third country markets. Under these circumstances, those implementing acts should continue to be adopted by the Council”.*

Recital 111 of Directive 2014/25/EU clearly implies the International Procurement Instrument (currently, under process of re-drafting), the adoption of which shall replace both articles 85 and 86.

2.2 In particular, the (draft) International Procurement Instrument

The International Procurement Instrument (I.P.I.), as named, is a Regulation, under process of being adopted, focused on (EU and International) public procurement, aiming at improving the conditions under which EU businesses compete for public contracts in third countries and, thus,

¹⁷ Andreas Padafora, “The EU International Procurement Instrument (IPI)”, 9.3.2017, in <https://andreaspadafora.com/2016/03/09/the-eu-international-procurement-instrument-ipi/>

¹⁸ European Commission, Concept paper: WTO modernization (September 2018)

¹⁹ Annex to the Commission Communication, Trade Policy Review – An Open, Sustainable and Assertive Trade Policy (COM(2021) 66 (final))

achieve larger public procurement market penetration, similar to the degree of public procurement market penetration enjoyed by third countries economic operators in the EU.

The 2012 proposal introduced two distinct procedures to restrict access of foreign products to the EU procurement market, whenever there was a substantial lack of reciprocal opening of the public procurement market in the originating country:

- (i) the “decentralized procedure” in which the initiative and the decision to exclude a foreign tender was a competence of the procuring entity, after securing the Commission’s approval.
- (ii) the “centralized procedure” in which the Commission directly investigated the situation in the foreign market and negotiated with the 3rd country; if necessary, the Commission could adopt a restrictive measure, being either market closure or a price adjustment measure which would be applied by procuring authorities.

The Proposal created a mixed reaction by Member States and the Council: it raised (a) concerns about closing down the EU market or affecting the status of the EU as an adherent of open markets and (b) fears about the risk of retaliation, (c) strong support, due to the ‘unfair’ treatment suffered in some third country procurement markets and (d) worries about the imposition of an undue or disproportionate administrative burden upon both businesses and public buyers. Nonetheless, all agreed on the imbalance existing between the openness of the EU procurement market and third countries procurement markets.

On 2016, the Commission presented a revised proposal²⁰, which aimed at simplifying the procedures, shortening investigations and reducing the number of actors involved, careful enough to abide by EU’s obligations under the WTO/GATT and the WTO/GPA, though not without negative critics²¹. Under the amended proposal, the IPI regulates only non-covered procurement, covered by the EU Directives, in relation to goods or services procured only for governmental purposes²², only the centralized procedure applies and market closure is not be an option. However, the European Parliament considered the Proposal as insufficient, while Member States manifested mixed reactions. Since March 2019, the co-legislators have been engaged in constructive discussions on the I.P.I., on the basis of the 2016 amended proposal.

2.3 The Single Market dimension

In parallel to the discussions on the I.P.I. and to pursuing WTO modernization, the Commission, in 2019, issued a Communication offering “*Guidance on the participation of third country bidders and goods in the EU procurement market*”²³, which focused mostly on the tools available to contracting authorities / entities to deal with abnormally low tenders, on choosing the most appropriate quality requirements, on ensuring compliance with environmental, social and labour obligations and on the public buyers’ competence to determine the third country bidders’ access to the EU public procurement market.

In 2020 the European Commission launched *A new industrial strategy for Europe*²⁴, in the context of which it committed to explore the most efficient way to strengthen the EU’s anti-subsidy mechanisms and tools. The European Council had previously²⁵ engaged the Commission to identify new tools to address the distortive effects of foreign subsidies on the Single Market,

²⁰ COM(2016) 34 final 2012/0060 (COD) “Amended proposal for a Regulation of the European Parliament and of the Council on the access of third-country goods and services to the Union’s internal market in public procurement and procedures supporting negotiations on access of Union goods and services to the public procurement markets of third countries”

²¹ Dawar, Kamala (2016) The 2016 EU International Procurement Instrument’s amendments to the 2012 buy European proposal: a retrospective assessment of its prospects. *Journal of World Trade*, 50 (5)

²² i.e. not for goods purchased with a view to commercial resale or with a view to use in the production of goods for commercial sale, as well as not for services purchased with a view to commercial resale or with a view to use in the supply of services for commercial sale

²³ EC Communication 24.7.2019 C(2019) 5494 final

²⁴ COM(2020) 102 final, as updated in 2021

²⁵ Conclusions of the meeting on 21 and 22 March 2019

while the European Parliament asked the Commission²⁶ to ‘investigate the option to add a pillar to EU competition law that gives the Commission appropriate investigative tools in cases where a company is deemed to have engaged in distortionary behaviour due to government subsidies...’.

2.4 The White Paper²⁷

In this context, the European Commission published the White Paper with a view to address distortions caused by foreign subsidies in the internal market. The White Paper identifies a number of incidences where foreign subsidies distort the internal market by undermining the level playing field, such as foreign direct investment, state aid and competition and public procurement.

EU rules on competition, public procurement and trade defence instruments play an important role in ensuring fair conditions for companies operating in the Single Market; none of them applies to foreign subsidies, such as zero-interest loans and other below-cost financing, unlimited State guarantees, zero-tax agreements or direct financial grants, which often provide their recipients with an unfair advantage when operating in the Single Market (i.e. by acquiring companies, participating in public procurements or engaging in other commercial activities).

The White Paper initiated a broad consultation, on the most appropriate way - including a new legal instrument - to effectively address the distortions created in the internal market in general, by foreign subsidies, not confined to public procurement. According to its findings specifically regarding public procurement, distortions are caused by the fact that companies benefiting from foreign subsidies may be able to make more advantageous offers, deterring non-subsidised companies from submitting a bid or winning contracts at the expense of non-subsidised, more efficient companies; public buyers are often inclined to benefit from lower prices in tenders, due to budget constraints, being unwilling or not authorized to investigate the origin of such low tenders, by recipients of foreign subsidies. The White Paper assessed the importance of ensuring a level playing field in EU public procurements for subsidised and non-subsidised companies, alike and concluded that existing rules are insufficient or inadequate to address such distortions.

3. The European Commission’s proposal on a new Regulation to address potential distortive effects of foreign subsidies in the Single Market

3.1 General overview

Based on the input received from the consultation initiated by the White Paper, the European Commission proposed, on 5.5.2021, a new instrument²⁸, meticulously designed to effectively tackle foreign subsidies that cause distortions and harm the level playing field in the Single Market, in any market situation. The proposed instrument aims at preserving openness of the Single Market, while ensuring fairness²⁹; it supplements the existing regulatory framework on State aid and distortive subsidies granted by Member States, while enhancing international competition³⁰ and is a key element of the (new) EU Industrial Strategy.

The proposal fills the gap spotted in EU rules on competition and State aid, public procurement and trade defence, regarding foreign subsidies that cause distortions, horizontally, without being sector oriented: as explicitly stated [art. 1(1)], the Regulation lays down rules and procedures for

²⁶ report on competition policy 2020

²⁷ European Commission White Paper on levelling the playing field as regards foreign subsidies (17.6.2020 COM(2020) 253 final)

²⁸ Commission’s Proposal for a Regulation of the European Parliament and of the Council on foreign subsidies distorting the internal market, COM(2021) 223 final

²⁹ According to Margrethe Vestager’s statement, “openness requires fairness” (https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1982).

³⁰ According to Valdis Dombrovskis’s statement, “Unfair advantages accorded through subsidies ... distort markets and provide competitive advantages on the basis of the support received, rather than on the quality and innovativeness of the products concerned. Today’s proposal complements our international efforts in this regard. ...” (https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1982).

investigating foreign subsidies that distort the internal market in relation to any economic activity³¹ and for redressing such distortions. A distortion exists under two (2) conditions: the competitive position of an undertaking improves due to a foreign subsidy³² and in doing so, it actually or potentially affects negatively competition in the Single Market; this is to be assessed under certain criteria, an indicative list of which is provided (art. 3). Its main objective regarding public procurement is to level the playing field within the Single Market (while the (draft) IPI's main objective is to improve access of EU businesses to third countries public procurement markets³³). The competence to act is entrusted to the Commission alone, to ensure the uniform application of the Regulation. A balancing test is proposed, as a manifestation of the principle of proportionality: following the establishment of the existence of a distortive, foreign subsidy, the Commission shall consider whether the possible positive effects of such subsidy balance the negative effects caused by the distortion. Last, there are provisions to remedy the distortion (commitments / redressive measures).

3.2 Main features

(a) definition of the notion of “foreign subsidy”

Three elements, cumulatively required, define the notion (art. 2) of “foreign subsidy”: “foreign subsidy” is any financial contribution³⁴ granted by a third country (central government or government authorities, foreign public entities as well as private entities whose actions can be attributed to the third country), which confers a benefit to an undertaking and which is selective, that is, it applies to one or several undertaking(s) or industry(ies).

(b) assessment methodology

An assessment methodology of the possible distortive effect of a foreign subsidy is provided, by applying specific indicators of a distortion and by specifying categories of the most likely distortive foreign subsidies. More specifically, a foreign subsidy is considered to be distortive when it improves the competitive position of an undertaking in the Single Market and, in doing so, it actually or potentially affects competition negatively in the Single Market. A distortive foreign subsidy in a public procurement procedure in particular, is one that enables an undertaking to submit a tender that is unduly advantageous in relation to the works, supplies or services concerned and the assessment shall be limited to the specific public procurement procedure (art. 26). A non-exhaustive list of indicators, to assess the distortive or not nature of a foreign subsidy, is provided (art. 3), such as the amount, nature and purpose of the subsidy, the situation of the undertaking or of the markets concerned and the level of economic activity of the undertaking in the EU. In addition, categories of most likely distortive subsidies are identified, such as a subsidy to ailing an undertaking without a restructuring plan, an unlimited guarantee and the submission of an unduly advantageous bid.

Following the establishment of a distortive foreign subsidy, a balancing test has to be applied by the Commission, to assess the negative and the possible positive effects of the foreign subsidy; redressive measures are not imposed where the positive effects outweigh the negative effects, while, otherwise, they are taken into account when deciding on the redressive measures or the commitments.

(c) remedies

To remedy the distortion actually or potentially caused by a foreign subsidy, two types of measures are established (art. 6):

³¹ in particular in concentrations and public procurement procedures

³² The proposal provides for a rebuttable presumption, that a foreign subsidy of a total amount of 5 million euros over a consecutive period of 3 fiscal years is unlikely to distort the internal market [art. 3(2)]

³³ Dawar, Kamala (2016) The 2016 EU International Procurement Instrument's amendments to the 2012 buy European proposal: a retrospective assessment of its prospects. *Journal of World Trade*, 50 (5)

³⁴ An indicative list, that includes interest-free loans, unlimited guarantees, capital injections, preferential tax treatment, tax credits and grants, is provided.

- the undertaking may offer commitments³⁵, which – if they are effective – may be accepted by the Commission, by a decision, to make them binding upon the undertaking
- the Commission may impose redressive measures

Either, shall “fully and effectively” [art. 3(2)] remedy the distortion. An indicative list is provided, which includes structural measures (divestment of assets), behavioural measures (offering access under fair and non-discriminatory conditions to infrastructure, reduction of market share, publication of results of R&D), repayment of subsidy, the prohibition of the transaction (regarding concentrations and public procurement)

(d) investigation mechanisms

Two investigation mechanisms are established³⁶:

- an ex officio review by the Commission, as a general screening tool, for any market situation (art. 7-16), and
- a specific ex-ante notification obligation, regarding, only concentrations and public procurement above a certain threshold, to prevent any detrimental effects of distortions³⁷

- (i) The Commission has the competence to conduct an ex officio review of foreign subsidies regarding any market situation (general screening tool).

The review is conducted in two phases, the preliminary review (art. 8) in the context of which the Commission seeks information (art. 11) and conducts inspections in and outside³⁸ of the EU (art. 12) and the in-depth investigation (art. 9) - initiated when the findings of the preliminary review establish sufficient indications that an undertaking has been granted a foreign subsidy that distorts the internal market - in the context of which the Commission further assesses the foreign subsidy. The Commission may find that a foreign subsidy distorts the internal market and impose redressive measures or accept commitments offered by the undertaking [art. 9(3)] or that the distortion is outweighed by positive effects or that the preliminary assessment is not confirmed. A decision may be taken by the Commission on the basis of the facts available, in case an undertaking concerned or a third country are not cooperating (art. 14), while fines and periodic penalty payments may be imposed in cases where an undertaking furnishes incorrect or incomplete information, under the terms provided in detail in art. 15. Interim measures may be adopted (art. 10) in case there are indications that a financial contribution constitutes a foreign subsidy and distorts the internal market and there is a serious risk of substantial and irreparable damage to competition.

- (ii) The Commission has competence to act following the obligation of an undertaking for ex ante notification, a tool available only regarding large concentrations³⁹ (art. 17-25) and large public procurement.

35 Including the repayment of the subsidy with an interest rate [art. 9(3)]

36 If under the information gathered the Commission considers that a reasonable suspicion exists that foreign subsidies in a particular sector, for a particular type of economic activity or based on a particular subsidy instrument may distort the internal market, it may conduct a market investigation into the particular sector, the particular type of economic activity or into the use of the subsidy instrument concerned [art. 34(2)].

37 Explanatory Memorandum of the Proposal, p. 4; in art. 28(6) it is provided, in particular regarding public procurement procedures, that where the Commission suspects that an undertaking may have benefitted from foreign subsidies in the three (3) years prior to the submission of the tender or request to participate, it may request the notification of the foreign financial contributions received by that undertaking in any public procurement procedure, even below the threshold applying under the present proposal; once the Commission has requested the notification of such a financial contribution, it is deemed to be a notifiable foreign financial contribution in a public procurement procedure.

³⁸ An aspect of the extraterritorial effect of EU law

³⁹ Of 500 million euros and above

More precisely, focusing on public procurement, an obligation is inflicted upon any undertaking submitting a tender or a request to participate in a public procurement procedure, under penalty of not being awarded the contract, to either notify to the contracting authority / entity all foreign financial contributions received in the three years preceding that notification or confirm in a declaration that they did not receive any foreign financial contributions within the same time frame. The obligation applies for public procurement⁴⁰, of a value of 250 million euros and above. An important aspect of the procedure is that the obligation of notification applies to economic operators, groups of economic operators, main subcontractors and main suppliers [art. 28(2)], that is where their participation ensures key elements of the contract performance and, in any case, where their contribution exceeds 30% of the estimated value of the contract.

The contracting authority / entity shall transfer the notification to the Commission without delay. The steps to be followed (art. 29) by the Commission are similar to the ones in the ex officio procedure, regarding the preliminary review and the in-depth investigation, however strict deadlines apply: the preliminary review shall be concluded within 60 days from receipt of notification, while the in-depth investigation within 200 days from receipt of notification, with a possibility for extension, following consultation with the contracting authority / entity, in exceptional circumstances. The powers of the Commission to start an in-depth investigation are subject to a limitation period of ten (10) years, starting on the day on which a foreign subsidy is granted to the undertaking concerned (art. 35).

Where the investigation establishes that an undertaking benefits from a distortive foreign subsidy and the undertaking concerned offers commitments that fully and effectively remove the distortion on the internal market, a decision is adopted; in case no commitments are offered or the ones offered are inappropriate or insufficient, the Commission adopts a decision prohibiting the award of the contract to the undertaking concerned (art. 30).

During the preliminary review and the in-depth investigation evaluations of bids may continue (art. 31); however, the contract shall not be awarded before the expiry of the corresponding time limits. Any investigation shall not result in the contracting authority / entity treating the undertaking concerned in a way that is contrary to the principles governing public procurement, including proportionality, non-discrimination, equal treatment, and transparency. The contract may be awarded to an undertaking submitting a declaration of not having received any foreign financial contributions in the three years preceding the declaration before the Commission takes any of the decisions referred to in Article 30 or before the time limit of 200 days elapses only if the tender evaluation establishes that the undertaking in question has in any case submitted the most economically advantageous tender. The contracting authority / entity shall inform the Commission of any decision relating to the outcome of the public procurement procedure.

The Commission may impose fines and periodic payments, as provided for under the ex officio review procedure. In addition, it may impose a fine (a) not exceeding 1 % of the undertaking's aggregate turnover in the preceding business year, in case of intentional or negligent supply of incorrect or misleading information and (b) not exceeding 10 % of its aggregate turnover in the preceding business year, in case of intentional or negligent failure to notify a subsidy. The powers of the Commission to impose such fines and periodic penalty payments are subject to a limitation period of three (3) years while its powers to enforce such decisions are subject to a limitation period of five (5) years (art. 35).

⁴⁰ that is (art. 27), procurement falling in the scope of Directives 2014/24/EU, 2014/25/EU and 2014/23/EU, as well as procurement procedures for concessions (art. 10(4)(a) of Directive 2014/23/EU), public contracts & design contracts (art. 9(1)(a) of Directive 2014/24/EU) and contracts & design contests (art. 20(1)(a) of Directive 2014/25/EU) obliged to be organised with procedures established by a legal instrument creating international law obligations, such as an international agreement concluded in conformity with the TFEU between a Member State and one or more third countries or subdivisions thereof and covering works, supplies or services intended for the joint implementation or exploitation of a project by their signatories. Procurement in the fields of defence and security, under the Directive 2009/81/EC is excluded

Last, when publishing the Commission decisions in the Official Journal of the European Union (art. 36), the legitimate interests of undertakings in the protection of their business secrets and other confidential information shall be taken into due account.

4. Conclusions

The relation of the EU and third countries regarding public procurement is two-dimensional, within the Single Market and outside the EU, though based on one principle, common to both dimensions: open access to public procurement under equal terms. As declared early enough⁴¹, *“the rejection of protectionism at home must be accompanied by activism in creating open markets and fair conditions for trade abroad”*⁴², a position confirmed recently, with the New Industrial Strategy (10.3.2020), that indicates the steady commitment of the EU to the openness of markets, while pursuing, among others, to shape the system of global economic governance. The issue is not a matter of national discrimination (i.e. discrimination on the basis of nationality / origin); it is rather a matter of commonly shared and applied values, principles and rules, in order to avoid distortions of competition, both within the Single Market and in international public procurement.

The EU has been engaged, in the recent years, in parallel actions striving to tackle distortions of competition, at times related by practices applied by third countries, among others, in the field of public procurement, both within the Single Market and internationally. The 2016 amended Commission’s proposal on the International Procurement Instrument and the 2021 Commission’s proposal for a Regulation on foreign subsidies distorting the internal market, though both under process of being adopted, show the commitment of the EU to address the issue effectively. Both proposals include provisions on specific procedures to be followed and provide for remedies. In particular the provisions of the 2021 Commission’s proposal for a Regulation on foreign subsidies distorting the internal market are consistent with the EU’s commitment to open markets while aiming at establishing a level playing field in the internal market for subsidized and non-subsidised undertakings. Their final content and performance remain to be seen and assessed in the (near) future.

References

Papers

Borlini, Leonardo (2016) Subsidies Regulation beyond the WTO: substance, procedure and policy space in the “New Generation” EU Trade Agreements, in *The Global Community, Yearbook of International Law and Jurisprudence*, ed. Giuliana Ziccardi Capaldo, Oxford University Press, p. 145 et seq.

Dawar, Kamala (2016) The 2016 EU International Procurement Instrument’s amendments to the 2012 buy European proposal: a retrospective assessment of its prospects. *Journal of World Trade*, 50 (5)

Padafora, Andreas (2017) “The EU International Procurement Instrument (IPI)”, 9.3.2017, in <https://andreaspadafora.com/2016/03/09/the-eu-international-procurement-instrument-ipi/>

Public documents

European Commission Staff Working Document on significant distortions in the economy of the Peoples Republic of China for the purposes of trade defence investigations, dated 20.12.2017 (SWD(2017) 483 final/2),

⁴¹ European Commission, *Global Europe: Competing in the world— A contribution to the EU’s Growth and Jobs Strategy*, Communication from the Commission, COM(2006) 567 final, 4.10.2006.

⁴² Leonardo Borlini, *Subsidies Regulation beyond the WTO: substance, procedure and policy space in the “New Generation” EU Trade Agreements*, in *The Global Community, Yearbook of International Law and Jurisprudence*, 2016, ed. Giuliana Ziccardi Capaldo, Oxford University Press, p. 145 et seq.

European Court of Auditors, in its report “The EU’s response to China’s state-driven investment strategy”,
Review 03 (2020)
https://www.eca.europa.eu/Lists/ECADocuments/RW20_03/RW_EU_response_to_China_EN.pdf

European Commission Communication “Guidance on the participation of third country bidders and goods in the EU procurement market” (24.7.2019 C(2019) 5494 final)

Commission Interpretative Communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives (2006/C 179/02)

European Commission , Concept paper: WTO modernization (September 2018)

Annex to the Commission Communication, Trade Policy Review – An Open, Sustainable and Assertive Trade Policy (COM(2021) 66 (final)

COM(2016) 34 final 2012/0060 (COD) “Amended proposal for a Regulation of the European Parliament and of the Council on the access of third-country goods and services to the Union’s internal market in public procurement and procedures supporting negotiations on access of Union goods and services to the public procurement markets of third countries”

EC Communication 24.7.2019 C(2019) 5494 final

COM(2020) 102 final, as updated in 2021

European Commission White Paper on levelling the playing field as regards foreign subsidies (17.6.2020 COM(2020) 253 final)

Commission’s Proposal for a Regulation of the European Parliament and of the Council on foreign subsidies distorting the internal market, COM(2021) 223 final

European Commission, Global Europe: Competing in the world— A contribution to the EU’s Growth and Jobs Strategy, Communication from the Commission, COM(2006) 567 final, 4.10.2006.

Links

https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1982 (press release)

https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1982

https://ec.europa.eu/info/sites/default/files/file_import/european-semester_thematic-factsheet_public-procurement_en_0.pdf;

<https://data.consilium.europa.eu/doc/document/ST-1-2019-INIT/en/pdf>

https://www.europarl.europa.eu/doceo/document/A-9-2020-0022_EN.pdf