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Employee Monitoring Software, Wearable Sensor-based Devices, and Generative Artificial Intelligence and Virtual Communication and Collaboration Tools in Immersive Digital and Virtual Office Spaces

Pavol Kubala[1], Victor V. Dengov[2], and Susan Beckett[3]

ABSTRACT. This article reviews and advances existing literature concerning wearable sensor-based devices, mobile biometric and sentiment data, and workplace collaboration software. In this research, previous findings were cumulated showing that generative artificial intelligence and emotion recognition tools can streamline operational workflows, forecast job displacement, and shape talent surplus, leading to productive workplace in immersive work environments. Throughout May 2023, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "immersive digital and virtual office spaces" + "employee monitoring software," "wearable sensor-based devices," and "generative artificial intelligence and virtual communication and collaboration tools." As research published in 2023 was inspected, only 166 articles satisfied the eligibility criteria, and 49 mainly empirical sources were selected. Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: AXIS, MMAT, ROBIS, and SRDR.

Keywords: employee monitoring software; wearable sensor-based device; generative artificial intelligence; virtual communication and collaboration tools; immersive digital and virtual office space

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[1]Faculty of Operation and Economics of Transport and Communications, Department of Economics, University of Zilina, Zilina, Slovak Republic, p-kubala@hotmail.com.
[2]Faculty of Economics, Department of Economics and Economic Policy, Saint Petersburg State University, Saint Petersburg, Russia, vvdengov@mail.ru.
[3]Smart City Planning and Management Research Unit at CLI, Inverness, Scotland, susan.beckett@aa-er.org. (corresponding author)

1. Introduction

Generative artificial intelligence and emotional state prediction tools leverage real-time event analytics, body-tracking data metrics, and interoperable digital avatars in virtual work environments. The purpose of our systematic review is to examine the recently published literature on immersive digital and virtual office spaces and integrate the insights it configures on employee monitoring software, wearable sensor-based devices, and generative artificial intelligence and virtual communication and collaboration tools. By analyzing the most recent (2023) and significant (Web of Science, Scopus, and ProQuest) sources, our paper has attempted to prove that generative artificial intelligence and movement and behavior tracking tools deploy eye movement tracking devices, augmented analytics capabilities (Andronie et al., 2021; Kliestik et al., 2020; Novak et al., 2022; Popescu et al., 2020), and realistic movement simulations. The actuality and novelty of this study are articulated by addressing workplace upskilling, virtual workspaces and meetings, and automated workplace tasks, that is an emerging topic involving much interest. Our research problem is whether generative artificial intelligence and emotion recognition tools can streamline operational workflows (Andronie et al., 2023a; Lewkowich, 2022; Pop et al., 2023; Vătămănescu et al., 2022), forecast job displacement, and shape talent surplus, leading to productive workplace (Andronie et al., 2023b; Bargoni et al., 2023; Nagy et al., 2023; Popescu et al., 2017a) in immersive work environments.

In this review, prior findings have been cumulated indicating that generative artificial intelligence and simulation modeling software tools harness network visual analytics (Balcerzak et al., 2022; Nica et al., 2022; Popescu et al., 2017b; Sultana and Fernando, 2022), interoperable digital avatars, and employee engagement data (Barbu et al., 2021; Nica et al., 2023a; Peters et al., 2023; Popescu, 2018) in immersive digital and virtual office spaces. The identified gaps advance career progression, employee commitment and performance (Chaudhary et al., 2022; Gaspareniene et al., 2022; Remeikienė et al., 2020; Svabova et al., 2020), and virtual collaboration tasks. Our main objective is to indicate that generative artificial intelligence and cognitive computing systems can shape organizational retention, reduce workflow burdens, and boost employee engagement (Gura et al., 2023; Nica et al., 2023b; Poliak et al., 2023) in virtually simulated workspace environments.

2. Theoretical Overview of the Main Concepts

Generative artificial intelligence and image recognition tools can reduce unreasonable workload, enhance knowledge acquisition, and redefine employment, tasks, and jobs. Generative artificial intelligence and workplace monitoring systems can enable organizational commitment, employee reskilling and retraining, and virtual team performance. Generative artificial

intelligence and remote sensing systems can assist in team-building training simulations, in long-term talent pipelines, and in sustained productivity improvements. The manuscript is organized as following: theoretical overview (section 2), methodology (section 3), generative artificial intelligence and virtual communication and collaboration tools, wearable sensor-based devices, and mobile biometric and sentiment data in immersive digital and virtual office spaces (section 4), generative artificial intelligence and workplace tracking systems, augmented analytics capabilities, and realistic movement simulations in virtual work environments (section 5), generative artificial intelligence and algorithmic monitoring systems, physiological and behavioral biometrics, and employee monitoring software in virtual immersive workspaces (section 6), discussion (section 7), synopsis of the main research outcomes (section 8), conclusions (section 9), limitations, implications, and further directions of research (section 10).

3. Methodology

Throughout May 2023, a quantitative literature review of the Web of Science, Scopus, and ProQuest databases was performed, with search terms including "immersive digital and virtual office spaces" + "employee monitoring software," "wearable sensor-based devices," and "generative artificial intelligence and virtual communication and collaboration tools." As research published in 2023 was inspected, only 166 articles satisfied the eligibility criteria, and 49 mainly empirical sources were selected (Tables 1 and 2). Data visualization tools: Dimensions (bibliometric mapping) and VOSviewer (layout algorithms). Reporting quality assessment tool: PRISMA. Methodological quality assessment tools include: AXIS, MMAT, ROBIS, and SRDR (Figures 1–6).

Table 1 Topics and types of scientific products identified and selected.

Topic	**Identified**	**Selected**
immersive digital and virtual office spaces + employee monitoring software	57	18
immersive digital and virtual office spaces + wearable sensor-based devices	55	16
immersive digital and virtual office spaces + generative artificial intelligence and virtual communication and collaboration tools	54	15
Type of paper		
Original research	126	36
Review	24	13
Conference proceedings	12	0
Book	2	0
Editorial	2	0

Source: Processed by the authors. Some topics overlap.

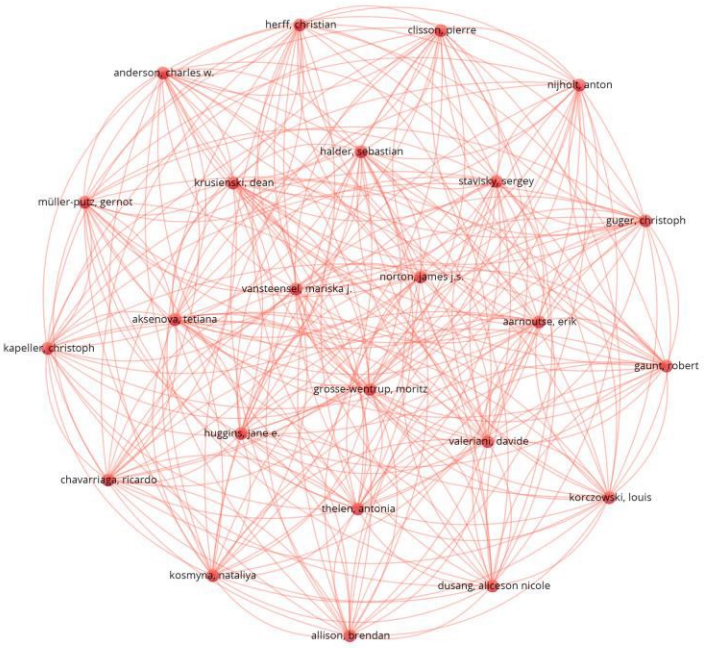

Figure 1 Co-authorship

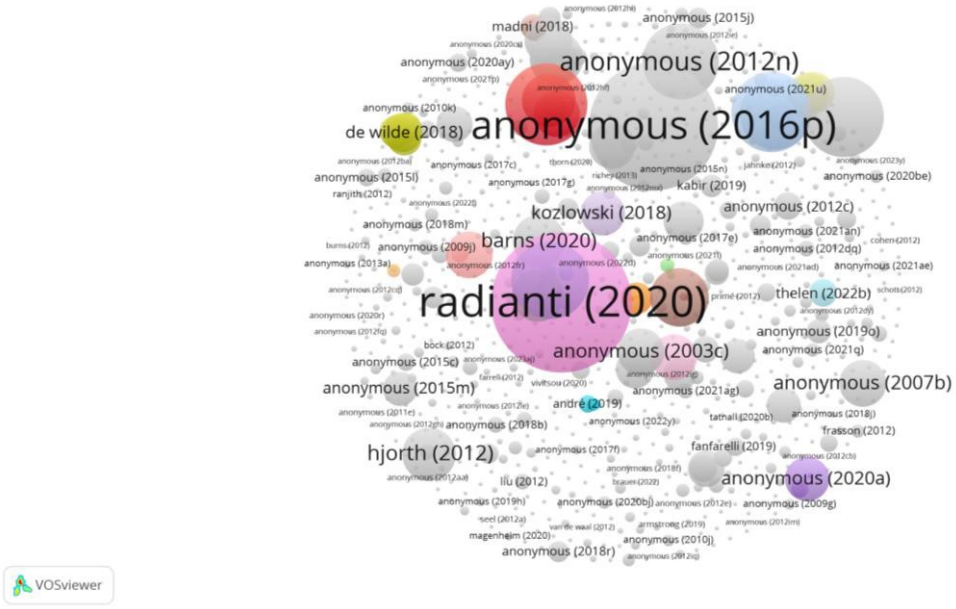

Figure 2 Citation

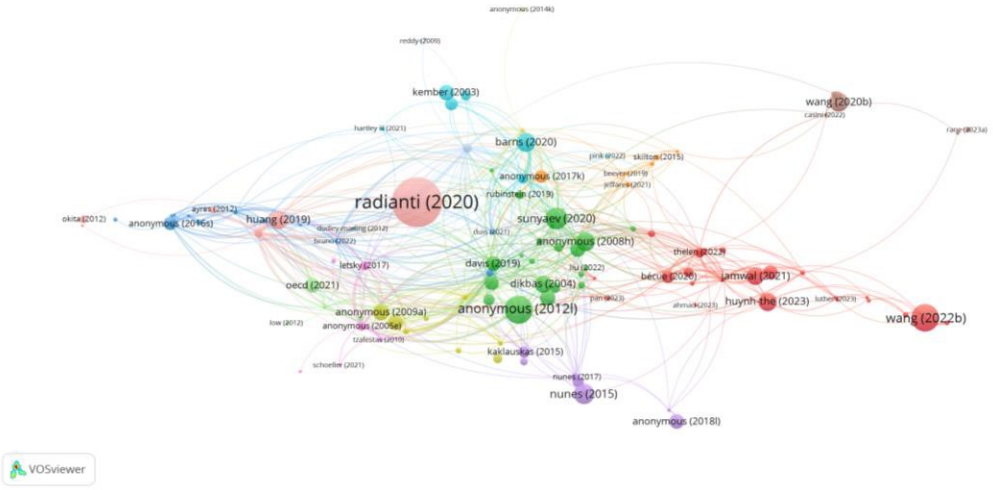

Figure 3 Bibliographic coupling

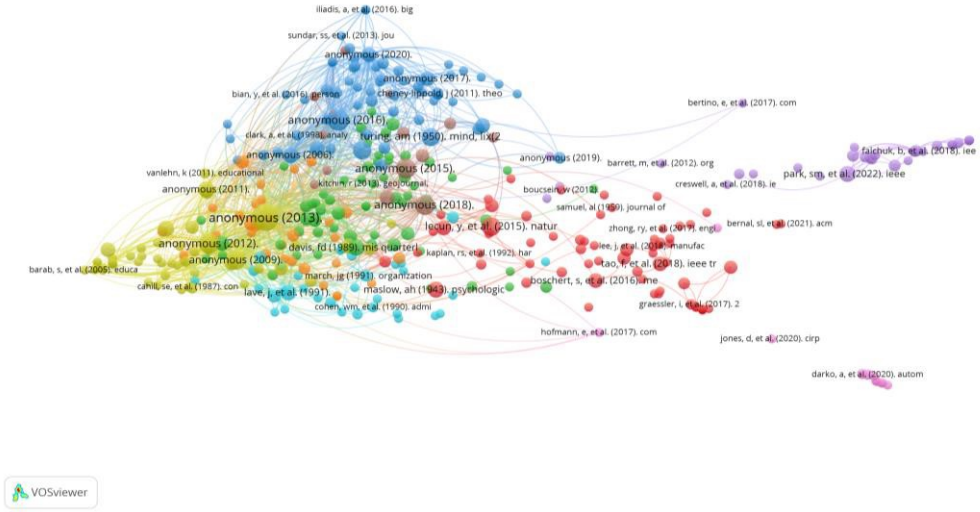

Figure 4 Co-citation

Table 2 General synopsis of evidence as regards focus topics and descriptive outcomes (research findings).

Generative artificial intelligence and learning management systems can configure career progression, employee commitment and performance, and virtual collaboration tasks.	Ali et al., 2023; Cardon et al., 2023a; Gursoy et al., 2023; Ozkaya, 2023; Simon, 2023; Zhou et al., 2023
Generative artificial intelligence and virtual communication and collaboration tools can enhance collaborative remote work, immersive job training, and flexible work arrangements.	Altrock et al., 2023; Carmel and Sawyer, 2023; Jungherr, 2023; Pan and Froese, 2023; Soto-Acosta, 2023; Zhu et al., 2023a
Digitally interactive sensory experiences can be achieved by use of generative artificial intelligence and immersive remote collaboration systems by integrating wearable sensor-based devices, mobile biometric and sentiment data, and workplace collaboration software.	Bankins et al., 2023; Chen et al., 2023; Kar et al., 2023; Pan et al., 2023; Wörsdörfer, 2023; Zhu et al., 2023b
Generative artificial intelligence and adaptive self-organizing systems can articulate employee satisfaction and engagement, workforce development, and virtual teamworks in virtual training environments.	Bilgram and Laarmann, 2023; Chou and Lee, 2023; Korzynski et al., 2023; Pandey et al., 2023; Yang and Wang, 2023; Zhu and Luo, 2023
Generative artificial intelligence and workplace tracking systems can further employee expectations and productivity, business process performance, and changing workforce needs.	Booyse and Scheepers, 2023; Demirel et al., 2023; Kulkov et al., 2023; Pérez et al., 2023; Yuan et al., 2023
Workplace upskilling, virtual workspaces and meetings, and automated workplace tasks develop on generative artificial intelligence and task collaboration tools in decentralized autonomous organizations.	Branikas et al., 2023; Dwivedi et al., 2023; Kunz and Wirtz, 2023; Ray, 2023; Yüksel et al., 2023
Measurable organizational goals, career paths, and hiring practices integrate generative artificial intelligence and remote collaboration tools in virtual immersive workspaces.	Buehler, 2023; Farina and Lavazza, 2023; Liu et al., 2023; Ruman, 2023; Zhang et al., 2023
Immersive engaging interactive experiences can be attained through generative artificial intelligence and immersive visualization systems by integrating physiological and behavioral biometrics, employee monitoring software, and employee performance parameters.	Capello et al., 2023; França et al., 2023; Madan and Ashok, 2023; Saheb and Saheb, 2023; Zhong et al., 2023
Generative artificial intelligence and algorithmic monitoring systems can optimize talent attraction and retention, labor force participation rates, and employee attraction and well-being.	Cardon et al., 2023b; Furendal and Jebari, 2023; Naz et al., 2023; Short and Short, 2023; Zhou and Kawabata, 2023

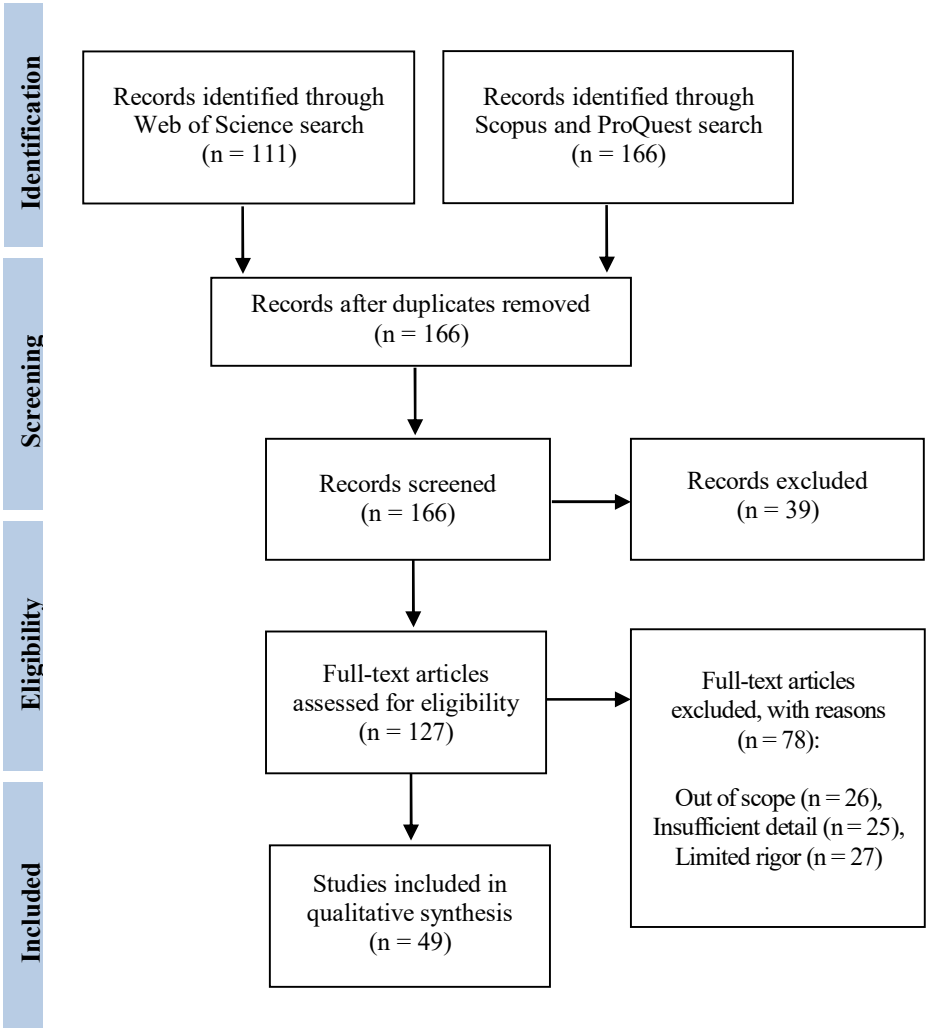

Figure 5 PRISMA flow diagram describing the search results and screening.

Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines were used that ensure the literature review is comprehensive, transparent, and replicable. The flow diagram, produced by employing a Shiny app, presents the stream of evidence-based collected and processed data through the various steps of a systematic review, designing the amount of identified, included, and removed records, and the justifications for exclusions.
To ensure compliance with PRISMA guidelines, a citation software was used, and at each stage the inclusion or exclusion of articles was tracked by use of custom spreadsheet. Justification for the removal of ineligible articles was specified during the full-text screening and final selection.

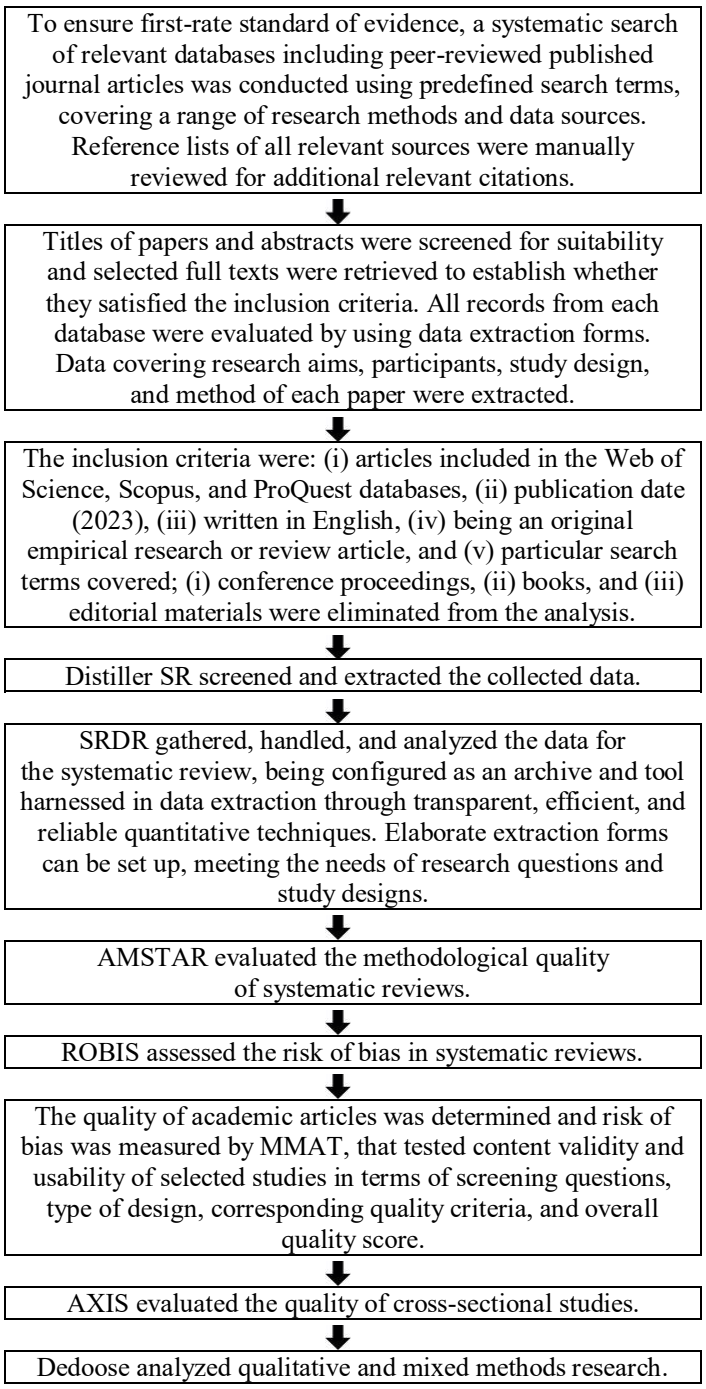

Figure 6 Screening and quality assessment tools

4. Generative Artificial Intelligence and Virtual Communication and Collaboration Tools, Wearable Sensor-based Devices, and Mobile Biometric and Sentiment Data in Immersive Digital and Virtual Office Spaces

Generative artificial intelligence and learning management systems (Ali et al., 2023; Cardon et al., 2023a; Gursoy et al., 2023; Ozkaya, 2023; Simon, 2023; Zhou et al., 2023) can configure career progression, employee commitment and performance, and virtual collaboration tasks. Generative artificial intelligence and cognitive computing systems can shape organizational retention, reduce workflow burdens, and boost employee engagement in virtually simulated workspace environments.

Generative artificial intelligence and virtual communication and collaboration tools (Altrock et al., 2023; Carmel and Sawyer, 2023; Jungherr, 2023; Pan and Froese, 2023; Soto-Acosta, 2023; Zhu et al., 2023a) can enhance collaborative remote work, immersive job training, and flexible work arrangements. Generative artificial intelligence and workplace monitoring systems can enable organizational commitment, employee reskilling and retraining, and virtual team performance.

Digitally interactive sensory experiences can be achieved by use of generative artificial intelligence and immersive remote collaboration systems (Bankins et al., 2023; Chen et al., 2023; Kar et al., 2023; Pan et al., 2023; Wörsdörfer, 2023; Zhu et al., 2023b) by integrating wearable sensor-based devices, mobile biometric and sentiment data, and workplace collaboration software. Generative artificial intelligence and simulation modeling software tools harness network visual analytics, interoperable digital avatars, and employee engagement data in immersive digital and virtual office spaces. (Table 3)

Table 3 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Generative artificial intelligence and learning management systems can configure career progression, employee commitment and performance, and virtual collaboration tasks.	Ali et al., 2023; Cardon et al., 2023a; Gursoy et al., 2023; Ozkaya, 2023; Simon, 2023; Zhou et al., 2023
Generative artificial intelligence and virtual communication and collaboration tools can enhance collaborative remote work, immersive job training, and flexible work arrangements.	Altrock et al., 2023; Carmel and Sawyer, 2023; Jungherr, 2023; Pan and Froese, 2023; Soto-Acosta, 2023; Zhu et al., 2023a
Digitally interactive sensory experiences can be achieved by use of generative artificial intelligence and immersive remote collaboration systems by integrating wearable sensor-based devices, mobile biometric and sentiment data, and workplace collaboration software.	Bankins et al., 2023; Chen et al., 2023; Kar et al., 2023; Pan et al., 2023; Wörsdörfer, 2023; Zhu et al., 2023b

5. Generative Artificial Intelligence and Workplace Tracking Systems, Augmented Analytics Capabilities, and Realistic Movement Simulations in Virtual Work Environments

Generative artificial intelligence and adaptive self-organizing systems (Bilgram and Laarmann, 2023; Chou and Lee, 2023; Korzynski et al., 2023; Pandey et al., 2023; Yang and Wang, 2023; Zhu and Luo, 2023) can articulate employee satisfaction and engagement, workforce development, and virtual teamworks in virtual training environments. Generative artificial intelligence and movement and behavior tracking tools deploy eye movement tracking devices, augmented analytics capabilities, and realistic movement simulations.

Generative artificial intelligence and workplace tracking systems (Booyse and Scheepers, 2023; Demirel et al., 2023; Kulkov et al., 2023; Pérez et al., 2023; Yuan et al., 2023) can further employee expectations and productivity, business process performance, and changing workforce needs. Generative artificial intelligence and emotional state prediction tools leverage real-time event analytics, body-tracking data metrics, and interoperable digital avatars in virtual work environments. Generative artificial intelligence and virtual collaboration tools can transform employment, tasks, and jobs, increase labor productivity, and drive productivity gains.

Workplace upskilling, virtual workspaces and meetings, and automated workplace tasks (Branikas et al., 2023; Dwivedi et al., 2023; Kunz and Wirtz, 2023; Ray, 2023; Yüksel et al., 2023) develop on generative artificial intelligence and task collaboration tools in decentralized autonomous organizations. Generative artificial intelligence and workplace monitoring systems can shape skilled labor attracting and training, performance management practices, and workforce motivation and commitment. (Table 4)

Table 4 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Generative artificial intelligence and adaptive self-organizing systems can articulate employee satisfaction and engagement, workforce development, and virtual teamworks in virtual training environments.	Bilgram and Laarmann, 2023; Chou and Lee, 2023; Korzynski et al., 2023; Pandey et al., 2023; Yang and Wang, 2023; Zhu and Luo, 2023
Generative artificial intelligence and workplace tracking systems can further employee expectations and productivity, business process performance, and changing workforce needs.	Booyse and Scheepers, 2023; Demirel et al., 2023; Kulkov et al., 2023; Pérez et al., 2023; Yuan et al., 2023
Workplace upskilling, virtual workspaces and meetings, and automated workplace tasks develop on generative artificial intelligence and task collaboration tools in decentralized autonomous organizations.	Branikas et al., 2023; Dwivedi et al., 2023; Kunz and Wirtz, 2023; Ray, 2023; Yüksel et al., 2023

6. Generative Artificial Intelligence and Algorithmic Monitoring Systems, Physiological and Behavioral Biometrics, and Team-Building Training Simulations in Virtual Immersive Workspaces

Measurable organizational goals, career paths, and hiring practices (Buehler, 2023; Farina and Lavazza, 2023; Liu et al., 2023; Ruman, 2023; Zhang et al., 2023) integrate generative artificial intelligence and remote collaboration tools in virtual immersive workspaces. Generative artificial intelligence and remote sensing systems can assist in team-building training simulations, in long-term talent pipelines, and in sustained productivity improvements.

Immersive engaging interactive experiences can be attained through generative artificial intelligence and immersive visualization systems (Capello et al., 2023; França et al., 2023; Madan and Ashok, 2023; Saheb and Saheb, 2023; Zhong et al., 2023) by integrating physiological and behavioral biometrics, employee monitoring software, and employee performance parameters. Generative artificial intelligence and data visualization tools can further organizational performance, assess workforce commitment, and shape organizational productivity.

Generative artificial intelligence and algorithmic monitoring systems (Cardon et al., 2023b; Furendal and Jebari, 2023; Naz et al., 2023; Short and Short, 2023; Zhou and Kawabata, 2023) can optimize talent attraction and retention, labor force participation rates, and employee attraction and well-being. Generative artificial intelligence and emotion recognition tools can streamline operational workflows, forecast job displacement, and shape talent surplus, leading to productive workplace in immersive work environments. Generative artificial intelligence and image recognition tools can reduce unreasonable workload, enhance knowledge acquisition, and redefine employment, tasks, and jobs. (Table 5)

Table 5 Synopsis of evidence as regards focus topics and descriptive outcomes (research findings)

Measurable organizational goals, career paths, and hiring practices integrate generative artificial intelligence and remote collaboration tools in virtual immersive workspaces.	Buehler, 2023; Farina and Lavazza, 2023; Liu et al., 2023; Ruman, 2023; Zhang et al., 2023
Immersive engaging interactive experiences can be attained through generative artificial intelligence and immersive visualization systems by integrating physiological and behavioral biometrics, employee monitoring software, and employee performance parameters.	Capello et al., 2023; França et al., 2023; Madan and Ashok, 2023; Saheb and Saheb, 2023; Zhong et al., 2023
Generative artificial intelligence and algorithmic monitoring systems can optimize talent attraction and retention, labor force participation rates, and employee attraction and well-being.	Cardon et al., 2023b; Furendal and Jebari, 2023; Naz et al., 2023; Short and Short, 2023; Zhou and Kawabata, 2023

7. Discussion

We integrate our systematic review throughout research indicating how generative artificial intelligence and workplace monitoring systems can shape skilled labor attracting and training, performance management practices, and workforce motivation and commitment. Our research complements recent analyses clarifying how Generative artificial intelligence and emotional state prediction tools leverage real-time event analytics, body-tracking data metrics, and interoperable digital avatars in virtual work environments. We elucidate, by cumulative evidence, previous research demonstrating how generative artificial intelligence and simulation modeling software tools harness network visual analytics, interoperable digital avatars, and employee engagement data in immersive digital and virtual office spaces.

8. Synopsis of the Main Research Outcomes

Generative artificial intelligence and workplace monitoring systems can enable organizational commitment, employee reskilling and retraining, and virtual team performance. Generative artificial intelligence and remote sensing systems can assist in team-building training simulations, in long-term talent pipelines, and in sustained productivity improvements. Generative artificial intelligence and cognitive computing systems can shape organizational retention, reduce workflow burdens, and boost employee engagement in virtually simulated workspace environments.

9. Conclusions

Relevant research has investigated whether generative artificial intelligence and emotion recognition tools can streamline operational workflows, forecast job displacement, and shape talent surplus, leading to productive workplace in immersive work environments. This systematic literature review presents the published peer-reviewed sources covering how generative artificial intelligence and data visualization tools can further organizational performance, assess workforce commitment, and shape organizational productivity. The research outcomes drawn from the above analyses indicate that generative artificial intelligence and movement and behavior tracking tools deploy eye movement tracking devices, augmented analytics capabilities, and realistic movement simulations.

10. Limitations, Implications, and Further Directions of Research

By analyzing only articles published in 2023 in journals indexed in the Web of Science, Scopus, and ProQuest databases, relevant sources on employee

monitoring software, wearable sensor-based devices, and generative artificial intelligence and virtual communication and collaboration tools in immersive digital and virtual office spaces may have been excluded. Limitations of this research comprise particular kinds of publications (original empirical research and review articles) discounting others (conference proceedings articles, books, and editorial materials). The scope of our study also does not move forward the inspection of employee satisfaction and engagement, workforce development, and virtual teamworks in virtual training environments.

Subsequent analyses should develop on employee expectations and productivity, business process performance, and changing workforce needs. Future research should thus investigate talent attraction and retention, labor force participation rates, and employee attraction and well-being. Attention should be directed to wearable sensor-based devices, mobile biometric and sentiment data, and workplace collaboration software.

Pavol Kubala, https://orcid.org/0009-0001-6512-2629
Victor V. Dengov, https://orcid.org/0000-0002-4665-0362
Susan Beckett, https://orcid.org/0000-0001-7425-9283

Compliance with ethical standards
This article does not contain any studies with human participants or animals performed by the authors. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement
All data generated or analyzed are included in the published article.

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Author contributions
All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication. The authors take full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclosure by the editors of record
The editors declare no conflict of interest in the review and publication decision regarding this article.

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