Impact of employee digital competence on the relationship between digital autonomy and innovative work behavior: a systematic review

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Abstract

With the advent of the COVID-19 pandemic, the level of concern regarding employee digital competence has increased significantly. Several studies provide different surveys, but they cannot describe the relationship between digital autonomy and innovative work behaviour concerning the impact of employee digital competence. Hence, it is necessary to conduct a survey that provides a deeper understanding of these concerns and suggests a suitable study for other researchers. Using scientific publication databases and adhering to the PRISMA statement, this systematic literature review aims to offer a current overview of employee digital competence impact on the relationship between digital autonomy and innovative work behaviour from 2015 to 2022, covering definitions, research purposes, methodologies, outcomes, and limitations. When reviewing the selected articles, 18 articles were examined under relationship topics, and 12 articles reported on impact topics under different tasks. The main findings highlight the significance of digital competence and autonomy in promoting employee creativity, learning, and sharing knowledge. According to the review findings, employees with greater digital autonomy are more likely to engage in innovative work, leading to improved job performance and empowerment. Therefore, the development of digital autonomy prioritizes organizations by providing access to digital tools, training, and a supportive work environment. Overall, the current review indicates a strong positive correlation between digital autonomy, innovative work behaviour, and employee impact. This underscores the importance for organizations to not only participate in digital competence and skills, but also to create a culture that values autonomy, creativity, and innovation among its employees.

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1 Introduction

In the recent years, the term "digital" carries the meaning of technology-related skills by transforming ways of accessing information, working, spending leisure time and communication under the technical aspects of Information and Communication Technology (ICT) or Information Technology (IT) in society and economy (Vilhelmson et al. 2017; Yu et al. 2017). With the rapid growth of ICT, international companies/educational institutions have started to evaluate their objectives and procedures in the context of digitalization (Kalimullina et al. 2021). To define quality and productivity process, the workforce and organization structure requires digital transformation. The process of transforming the majority of a company's commercial activities to internet or other computerized mediums is known as digital transformation, which is sometimes time-consuming and impossible to complete entirely due to the continual development of new digital technologies (Brunetti et al. 2020; Vial et al. 2021). It is essential to highlight that to recognize and fully use the potential offered by digital technologies in terms of improving the competitiveness of companies, the employee must change mentality to use them (Keating and Heslin 2015; Özduran and Tanova 2017). The efficient use of different media and communications platforms, and services is another factor that frames the digital participation gap in addition to access to computers and the internet (Killian and McManus 2015; Duffett 2017). Minor digitization processes are currently being accelerated by the COVID-19 pandemic, with many companies moving into home offices, integrating business software into complex IT systems, and starting to use new tools for employee-customer communication such as Webex, Zoom, Teams, etc. (Almeida et al. 2020; Zou et al. 2020). The level of digital readiness of companies in such a sudden global event is highly dependent on the digital literacy of their workforce. The influence of advanced digital technology on the employee training required for success in this evolving work environment (Armstrong et al. 2018), however, only partially addressed by studies. In policy-related papers, Digital Competence (DC), Digital Autonomy (DA), Innovative Work Behaviour (IWB) are the main key terms used in different work and contexts for employee individual benefit, economy and environment (Bornmann et al. 2016).

The diagnostic task on the digital transformation is used to determine the evaluation of personal digital competence level for employee competence between the interconnection of modern requirements over the past 1 year. Hence, the diagnostic process supports a high level of employee competence (Grosheva and Bondarchuk 2019). Two different types of online social capital results in distinct mediators. The impact of employee social media competence on the citizenship of an online brand and psychological contract violation feelings (Yoganathan et al. 2021). Under social media, the employee competencies were appeared in dynamic work online platforms such as document uploading, e-mail sending and receiving, and searching skills (Okeji et al. 2019). Professional graduates are carried under five dimensions as digital competencies using three qualitative data-gathering processes in business studies. Four dimensions are influenced for suitably posting information, such as safety, communication, problem solving, and content creation (Periáñez-Cañadillas et al. 2019). Further, the impact of digital disruption focused on what work shows an influence on the future of work. It enables real-time employee engagement scale to collaborate with organizations in digital technology. This index has been extended to future digital workforce plans under six dimensions (Ludike 2018). The digital transformation framework is used to determine sophisticated techniques and update new company information to their employees

(Varshney 2020). In the context of digital transformation, the dimensions of the workplace (work tools, management, work tasks, skills) are changed according to the study of Industrie 4.0 (Ganz et al. 2018). The goal of employees to support transformation processes is influenced by their positive expectations for performance and well-being in the future workplace, which are mostly dependent on interpersonal relationships. Additionally, managers should promote employee engagement, collaboration, and connection among employees in order to help them do their job in addition to promoting digital skills and fluency. A higher level of employee satisfaction can be strongly influenced by interpersonal interaction (Selimovic et al. 2021).

The relationships between tangible/intangible assets, digital technologies, and marketing competencies emphasizes how service convenience and its origins (integrated data access, customer service, and order fulfilment) along with service quality and its origins (information about integrated promotion, transactions, and product pricing,) offer a better understanding of the impact of digital technology on innovation and design (Foroudi et al. 2017). The growth of digital literacy helps to make our knowledge-based society stronger. Participants in digital literacy learning receive the basic training necessary to develop agile technological abilities, and it helps learners' ongoing learning skills, which will aid in their career navigation. Making sure that every citizen has the necessary digital literacy, knowledge and skills as well as making sure that they are connected to the internet in contemporary society is a critical task for all peoples involved in the online world (Bejakovic and Mrnjavac 2020).

The need of autonomy towards digital workplace transformation supports new ways of work to show a positive influence between user's attempts and autonomy using the innovation of IT (Meske and Junglas 2021). Digital confidence is the foundation of digital autonomy that considers how social control changes through digital technology. In an agentic way, digital confidence that involves three elements: a digital autonomy exercise, where it knows the basic information of individual choice and actions; confidence to manage ICT skills; and proficiency with a wide range of popular computer programme and software, especially using the internet (Passey et al. 2018). Higher levels of autonomy and control may be available to Up work (as a digital platform) workers when they contribute to and expand platforms (Jarrahi et al. 2020). Based on the skill level of jobs, a large degree of autonomy is changed and less skilled work could be terminated dramatically for labour market employees and employers in the domain of digital transformation (Chinoracky and Corejova 2019). Contemporary development techniques like Open Innovation and Agile used to promote digital transformation and cultural change. Agile elements in the organization such as autonomy, adaptability, and self-organization are strengthen (Burchardt and Maisch 2019).

The employee IWB (EIWB) used three factors, such as organizational commitment, work-based learning, and challenging tasks. Also, it focuses on the individual impact of employee attitudes and behaviour between innovative behaviour and information sharing relations (Battistelli et al. 2019). The impact of EIWB was examined into three stages, such as idea promotion, idea realization, and idea generation. The idea of promotion actually gives more strength to the ideas produced and pushes them beyond organizational constraints. So the idea realization phase is where the ideas are developed, pushed and made real. The measures taken to improve new goods, services, or organizational procedures can be included in the idea generation phase (Akram et al. 2016). The model of organizational justice was attempted on two dimensions (spatial and temporal justice). Then it combines the impact of organizational forms into the EIWB. Also, it mediates the relationship of knowledge sharing between IWB and organizational justice (Akram et al. 2020).

The innovation behaviour was associated between integration, centralization, organizational and formalization. This inquiry can assist organizational management in better understanding the types of structural aspects that should be handled to increase employee levels of inventive behaviour, which in turn promotes organizational innovation performance (Dedahanov et al. 2017). Two main decisions were examined based on knowledge sharing behaviour: first, proactive behaviour cannot be based on the IWB of workers; second, individuals can share information with their co-workers with a high level of IWB, organizational behaviour and organizational creativity (Afsar 2016). By using small and medium-sized enterprise (SMEs) leaders, the findings show a strong relationship towards employees in terms of opportunity recognition and innovation (Bagheri 2017). Management can set up leadership training for managers so that they can learn in what way to give respect to employees, how to discover their development, and how to give feedback on these needs in order to enhance the quality of relationships between employees and leaders (Atitumpong and Badir 2018). It offers organizational applications as well as theoretical insights for scholars. The relationship between self-determination theories and the person-organization (PO) fit in IWB also provide the inquiries about R&D personnel in high-tech companies (Saether 2019). JE theory is applied by establishing a connection between employee enactment and job embeddedness of IWB. Then, JE theory is extended by demonstrating the relationship among employee enactment and job embeddedness of IWB (Coetzer et al. 2018).

The foundation of professional training over life in every field of work need a digital education (Decuypere et al. 2021). Distance and ongoing training are becoming more required and practicable as businesses and society as a whole become more globalized (Bokek-Cohen 2018; Spante et al. 2018). This prompts to view digital competencies as a necessary component. Digital competence is a concept that refers to a set of skills for efficiently utilizing technology in our daily lives (Hubschmid-Vierheilig et al. 2020; Petrova et al. 2019). Therefore, digital competence has become one of the most important and vital skills, and it has many benefits for both the organization and the employees (Cetindamar et al. 2021). Those who work remotely put in longer hours and work harder, which makes them more productive but also makes them feel more lonely and worn out (Cahen and Borini 2020). Then employees working in remote area, features like relatedness, employee autonomy, and well-being become more significant than they would in a typical workplace, and they should fit the new method of working to improve performance and well-being (Bikse et al. 2021). Although creativity is an important part of innovative behavior. IWB is a multi-stage behavior that aims to enhance processes, products, or procedures and concludes in the adoption of a novel concept in a work role, group, or organization (Krpálek et al. 2021). In particular, IWB includes searching for issues and/or solutions, developing new ideas, supporting ideas, and putting ideas into practice (Afsar and Umrani 2019). From the overall studies, some research has been conducted on the relationship between DA and IWB among employees in the past few years, but there are still several research gaps that require further investigation. These include the definition and measurement of DA, limited research on the impact of DC on organizational performance, limited research on the relationship between DC and job performance, and the mechanisms through which DA affects IWB. Additionally, the role of individual and organizational factors and the impact of DA on different types of innovation require further exploration. Furthermore, only limited studies are reviewed, and recent studies are not reviewed in this study area. To fill these research gaps, there is a need for a survey to examine the impact of employee digital competence on the relationship between digital autonomy and innovative work behavior with respect to definitions, purposes, methods, outcomes, and limitations.

Motivated by the above facts, this paper presents a Systematic Literature Review (SLR) to systematize the approaches by focusing on impact and relationship among the variables following the PRISMA methodology. The aim of the SLR is to provide a current overview of digital competence research in the impact of employees on digital autonomy and innovative work behavior from 2015 to the end of 2022 regarding the digital competence definition, research purposes, methodologies, results, and limitations. The present systematic review raises three research questions:

RQ1: How is digital competence defined regarding employee's digital autonomy and innovative work behavior?

RQ2: What have been the main research aims, methodologies and results in digital competence studies in the context of digital autonomy and innovative work behavior over the past eight years?

RQ3: What limits exist in research on the digital competence of employee in the context of digital autonomy and innovative work behavior?

The remaining portions of this article are organized as follows: Sect. 2 presents the study design for a systematic literature review. Section 3 presents the synthesis methods based on the recent techniques published between 2015 and the end of 2022 are surveyed. On the basis of the papers chosen for this literature review, the findings and responses to the research questions are then provided in Sect. 4. Then Sect. 5 presents the conclusions and suggestions for further investigation on the impact of employee digital competence on the relationship between digital autonomy and innovative work behavior.

2 Study design for a systematic literature review

The Systematic Literature Review (SLR) were established based on the guidelines recently followed by other systematic review format on the domain of digital educational technology. To achieve these aims, a SLR is presented by following the PRISMA methodology. Four phase flowchart and checklist both involves supplementary materials and components according to PRISMA statement (Valverde-Berrocoso et al. 2022; Liberati et al. 2009; Zawacki et al. 2020). This SLR follows methodological approaches published in previous studies without conducting meta-analysis. The systematic review process consists of different criteria which are described in the following sub-sections.

2.1 Sources of information and search strategy

In this SLR, three types of databases (data sources) were used for conducting the search terms, as illustrated in Table 1. Mainly, the search terms were carried out integrating the Boolean operations in terms of title, keywords, text and abstract (TITLE-KEY-TEXT-ABS), which was referred in the articles (Chadegani et al. 2013). The search process documentation and search terms are listed in the Tables 1 and 2.

2.2 Selection criteria

The study selection process was carried out in four stages with different activities followed by iterative and incremental process (García-Peñalvo et al. 2017). The initial search

Table 1 Search process documentation

Data source	Search process documentation
Google Scholar	Search date: 9 June 2022 – 29 June 2022
	Defined keywords are used in preliminary search (shown in Table 2)
	All search results are saved and reserved in the Google Scholar Library
	High ranked literatures are mostly cited; initial searched results are arranged significantly
Other electronic databases	Education Resources Information Center (ERIC) and Scopus and Web of Science (WoS)
Springer, Elsevier, Emerald, Wiley Online Library, Taylor & Francis (academic databases)	Review and recover abstract with respect to inclusion criteria
	Review and recover whole text with respect to inclusion criteria
	Final set of studies are added based on characteristics of contents

Table 2 Search terms

Search terms
TITLE-KEY-ABS ((" digital competence*" OR "digital skill*" OR "digital literacy*") AND ("digital autonomy*"OR "employee*" OR "impact*") AND (" innovative work behavior*" OR "employee self-decision*" OR "digital transformation*"))

strategy were resulted for 1430 articles against inclusion and exclusion criteria. This search was established to obtain the recent trends of various research articles on employee digital competence, digital autonomy and innovative work behavior related to digital technology.

2.2.1 Eligibility criteria

The inclusion and exclusion criteria were established to obtain the present review research questions. The inclusion and exclusion criteria were validated by a group of experts in educational technology, statistics and university professionals. The inclusion and exclusion criteria are described as follows.

For the inclusion criteria, the research articles were selected based on: (1) published from 2015 to 2022; (2) collected particularly in high score index journals and conference proceedings; (3) searching description were specified in terms of title, keywords and abstract; (4) English language; (5) associated to the domain of digital technology and education; (6) addressed the impact of employee digital competence on the relationship between digital autonomy and innovative work behavior at any stage of computer and education related to digital technology, selected either in terms of title, keywords and abstract.

As for the exclusion criteria, the research articles were removed based on: (1) books, technical reports and doctoral thesis; (2) studies not involving teachers; (3) studies out of educational context; (4) published articles whose texts were not available in the papers. This results 110 research articles were indicated as duplicates.

The eligible terms describing the study population were used to group the studies. In cases where multiple terms were used in a single study, the study was categorized under each term. The eligibility criteria for defining the impact of employee digital competence were categorized into employee impact, employee self-decision, digital autonomy, and digital competence. These criteria were then compared to the descriptions outlined in the search terms (Table 2). The term digital autonomy was used in studies, and there was a primary consistency across studies in the eligibility criteria used to define the expected study population. However, studies that employed specific terms such as innovative work behavior tended to converge on similar features such as relatedness, employee autonomy, and employee self-decision, resulting in a greater degree of agreement on the eligibility criteria used. Specifically, digital competence relates to the key component of digital literacy, which is the broader ability to use technology to access, evaluate, and create information. Hence, a focus was expected on the impact of digital competence under the digital autonomy and innovative work behavior relationship-related eligibility criteria.

2.3 Study risk of bias assessment

The Joanna Bridges Institute (JBI) scale (Aromataris and Munn 2020) was employed to appraise the methodological quality and potential risk of bias in a variety of studies, including qualitative, empirical, conceptual, cross-sectional, mixed, comprehensive, and case studies. The assessment was conducted by a team of experts consisting of three specialists in educational technology, two experts in statistics, and four university professionals who were available to resolve any uncertainties or discrepancies.

2.4 Data extraction and analysis

The study's fundamental information and methodology were gathered, which includes the first author's name, publication year, study type, research focus, study benefits, limitations, and significant findings. This information involves definitions, objectives, methodologies, outcomes, and limitations. The study's essential information and methodologies were extracted, including the authors' names and publication year, study type, objectives, and primary findings presented in each study. The main results should be categorized based on the research's objective, as determined by the analysis of the chosen articles. To summarize the findings, specific information was collected using an extraction sheet. The data was extracted by two experts, and subsequently, verified by another expert to ensure accuracy.

2.5 PRISMA flowchart

From the overall search, the systematic literature reviewed and retrieved 1430 articles were determined based on the article domain, index, time period, and language from the scientific publication databases. According to the evaluated PRISMA flowchart process, 1000 articles were initially removed before screening and retained 430 articles after screening. After applying inclusion and exclusion criteria, 130 articles were determined and 100 articles were excluded in the screening phase. After reporting, 60 articles were assessed for eligibility. At the end of the final process, 34 articles were selected for the present review analysis and answer the research questions. The PRISMA flowchart of the literature selection process is shown in Fig. 1.
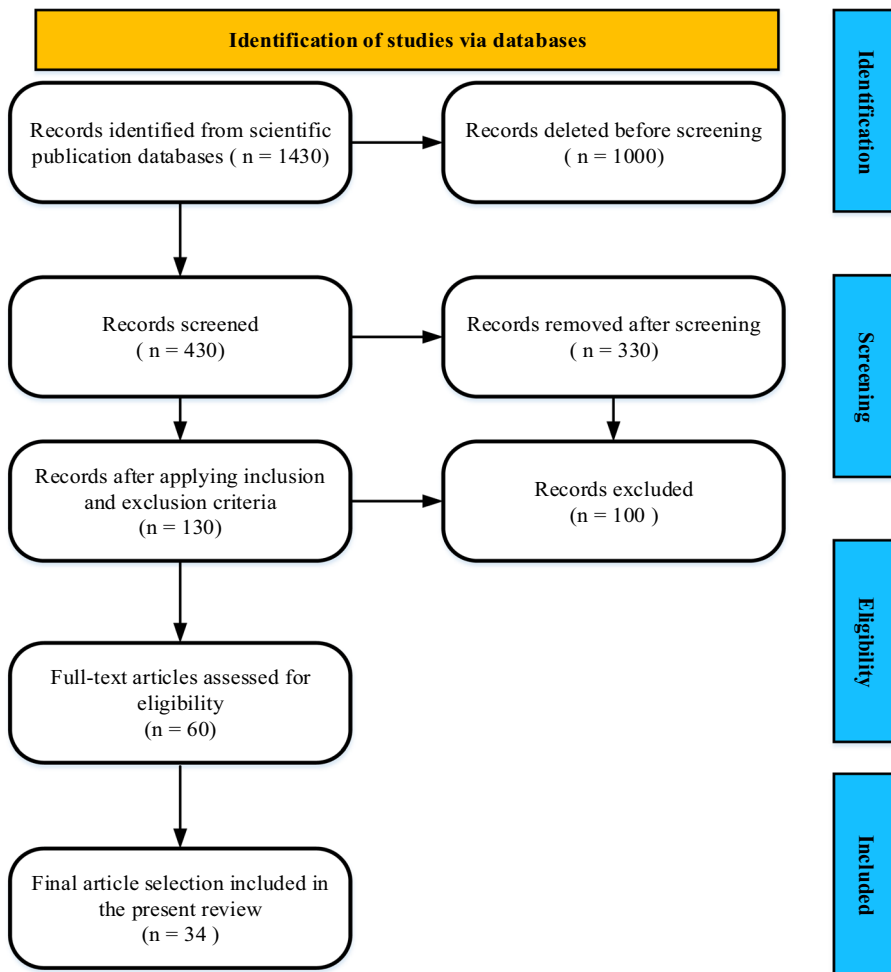
Fig. 1 PRISMA flowchart

3 Synthesis methods

To analyze research methods, a brief outlook is provided on the recent techniques published between 2015 and the end of 2022 are surveyed. Resources were chosen according to the important topics of impact and relationship approaches. The literature survey can be divided into three sub-sections namely employee digital competence, digital autonomy and innovative work behavior according to the field of digital educational technology systems The work done carried out in terms of study type, focus, advantages and its disadvantages are briefly discussed and also a summary table is provided at the end of each sub-sections, shown in the Table.3.

Table 3 Summary of past studies on employee digital competence, digital autonomy and innovative work behavior

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Grosheva and Bondarchuk (2019)	Employee Digital Competence	Comprehensive study	Personal digital competence level between the interconnection of modern requirements	Easy to take decisions Supports high level of employee competence	Highly competitive in new market Cannot process continuously
Varshney (2020)		Empirical study	Encourage and develop employees by selecting most new companies in the context of the digital transformation	Employees resistance are reduced	Primary data attribute has not yet been collected
Ganz et al. (2018)		Conceptual study	Digitalization and its effect of new competences from employees under the world of work	Supports human-decision making	Less flexible in distributed environment
Okeji et al. (2019)		Qualitative study	Improve digital literacy skills and explore competencies among libraries	Good ratings in digital literacy skills	Complex in digital environments
Periáñez-Cañadillas et al. (2019)		Empirical study	Analyze digital competencies in digital skills from the perspective of potential employers	Generic in digital skills for business studies and economists	Variables are not observed due to lack of digital information
Ludike (2018)		Conceptual study	Design how the next generation employee experience will be impacted by digital technology in the future	Improves team skills	Work of the future and the future of work still needs primary and secondary information
Selimovic et al. (2021)		Conceptual study	Present the involvement, support, and well-being of employee for the workplace digital transformation	Increase productivity and revenue	not flexible

Table 3 (continued)

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Foroudi et al. (2017)		Empirical study	Offered a relationships between tangible/intangible assets, digital technologies, and marketing competencies	Improve comprehension	Limited to the specific sectors and locations
Shakina et al. (2021)		Analysis study	Present an innovation in digital technologies according to skill-biased and competence-based technical change models	Enhance the employee training	Lack of some particular information
Yoganathan et al. (2021)		Empirical study	Presented the relationship between competence of employee social media and online social capital results	Emphasize the significance of developing online ties between employees and employers in the framework of employer marketing	Social media competency of employees across various cultures is not fully understood
Bejakovic and Mrnjavac (2020)		Qualitative study	Offered the significance of policy initiatives for enhancing digital literacy by examining the relationship between employment and digital competence	To identify requirements and issues in digital environments	Strong partnerships between stakeholders are missing
Meske and Junglas (2021)	Digital autonomy	Empirical study	Expected autonomy at the digital workplace	Autonomy increases its positive impact on enjoyment	Actual behaviour is still uncertain
Nevado-Peña et al. (2019)		Qualitative study	Possible relationship between a territory's ICT, and assessment of quality of life in the digital media	High level digital activities to access with autonomy	Does not know about language in the new digital environment

Table 3 (continued)

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Passey et al. (2018)		Qualitative study	Ability to use digital domain skills and navigation for digital confidence	Individual's choice with autonomy and confidence	Digital confidence is difficult and multilayered
Chinoracky and Corejova (2019)		Qualitative study	To define the potential impact of digital technologies in digital transformation	Large degree of autonomy is changed	High risk of automation in the context of the percentage of jobs
Schlomann et al. (2020)		Qualitative study	Web-connected ICT reported lower levels of loneliness and anomie, and higher levels of autonomy	Autonomy between relevant and irrelevant options are increased	Task was complex due to constant level
Jarrahi et al. (2020)		Qualitative study	Worker flexibility and autonomy based on the structure of platforms in freelance work	Provide large resources to the workers	More complex in processing
Wang et al. (2020)		Qualitative study	Focused on intellectual conversation across different disciplines, including organizational behavior, management information systems, and computer-mediated communication	ICT use affects employees through shaping key work design aspect of job autonomy	There may occur some incorrect self-evaluation
Cai et al. (2020)		Conceptual study	present an empirical studies on employee creativity predictors	employee innovation is encouraged in the context of digital work	Poor creative outcomes

Table 3 (continued)

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Viete and Erdsiek (2020)		Qualitative study	Mobile ICT further advances and proliferates work organization based on high employee autonomy over the time and location of work	Provided large-scale empirical evidence on the organizational complements to mobile ICT	The relationship between life quality and other indicators of a digitally linked life-style, are not included
Bošković (2021)		Empirical study	Effects of autonomy on engagement is provided, as individual effects on the three dimensions of engagement	Possible to include additional indicators of autonomy as a variable so as to include the other aspects	Insufficient organizational involvement
Burchardt and Maisch (2019)		Case study	Presented how contemporary development techniques like Open Innovation and Agile used to promote digital transformation and cultural change	Agile elements in the organization such as autonomy, adaptability, and self-organization are strengthen	But these models are time consuming
Dedahanov et al. (2017)	Innovative work behavior	Empirical study	Associate innovation in terms of employee behaviour	High innovation in terms of employee behaviour	Cannot support the connection between organization and integration innovation
Battistelli et al. (2019)		Qualitative study	Relationship between innovative behaviour and information sharing relations in terms of employee IWB	Perceived employee learns from various tasks	Still innovative behaviour relationship is complex
Afsar (2016)		Qualitative study	Impact of Person-Organization (P-O) fit and IWB based on knowledge sharing behaviour	P-O and IWB improves relationships among employees	Some information was misplaced in order to make the IWB decision

Table 3 (continued)

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Akram et al. (2016)		Cross-sectional study	Impact of EIWB using relational leadership from an IT company in China	Positive results for the whole EIWB	Collected dataset is not accessible to all employees
Bagheri (2017)		Qualitative study	Impact of entrepreneurial leadership for opportunity recognition and IWB on employees using high-SME	Positive impact on employee IWB	Cannot examine the other leadership styles
Akram et al. (2020)		Cross-sectional study	Determine the impact of knowledge sharing and organizational justice on the EIWB in china	Better relationship between independent and dependent variables	Limited in casual relationship for all variables
Atitumpong and Badir (2018)		Qualitative study	Presented a study on the employee learning and impact of leader-member exchange on IWB of employees	Self-efficacy development is high	Unable to demonstrate causality
Shin et al. (2017)		Conceptual study	Offered how a desirable work necessity needs for innovation, and the effects of employees' innovative behavior	The innovations have high intrinsic interest	Reward contingencies are not measured for the requirements of innovation
Woods et al. (2017)		Qualitative study	Conducted a study on how traits interact with context on IWB	Highly conscientious workers,	Could not replicate their findings in various industries
Saether (2019)		Qualitative study	Present a study on IWB of high-tech R&D employees	Autonomous work motivation is higher	They are dependent on cross-sectional self-report measurements
Coetzer et al. (2018)		Qualitative study	Discovered a study on knowledge of IWB	Easy to take decisions	But less flexible

Table 3 (continued)

Author	Aspects	Study type	Focus	Advantages	Disadvantages
De Spiegelaere et al. (2016)		Conceptual study	Offered a study on the relationship among autonomy in the workplace and two key employee outcomes	Work time autonomy improves IWB and work engagement	All the topics in this analysis are measured using a single technique

3.1 Employee digital competence

Digital Competence (DC) is the foundation of digital literacy to navigate the digital world securely and successfully. This involves confident and critical use of participation in society, self-development, learning, and ICT for employment. It provides the necessary context of attitude, skills, and knowledge for working and learning in the knowledge society. Several studies have been carried out on employee DC, which are reviewed as follows.

Grosheva and Bondarchuk (2019), offered a comprehensive study of diagnostic task on the digital transformation of the cyber economy using a three-stage algorithm. In the first stage, a strategic plan is used to develop the company's assessment of digitalization. Secondly, a digital solution is used to intermediate the company's profile based on the company's activity assessment. Lastly, the personal competence is assessed in relation to strategic development and the present activity of digitalization. However, there is a need to improve digital competencies for continuous processes. Varshney (2020), presented an empirical study to encourage and develop employees by selecting most new companies in the context of the digital transformation process. Following this process, the employee's digital skills are improved and they absorb new learning styles to keep their career safe in digitalization. By doing so, the employees are ultimately transformed into digital natives. But the embedded employees focused only on the technical dimensions of digitization.

Ganz et al. (2018), described a conceptual study on digitization and its effect on employees' new competencies in the world of work. This study investigates employee demand by determining professional profile through digital tools and assistance systems. In this regard, a drastic change is contingent on employment and the working environment. Hence, the new dimensions of competence provide a new way of making decisions between humans and technology. Okeji et al. (2019), revealed a qualitative study to improve digital literacy skills and explore competencies among libraries under different social media. Focused on this way, the competencies move from "what" to "how" an employee must undertake the necessary tasks which were assigned with the need of organization from the employer standpoint. Thus, digital literacy gains knowledge and competency based on ratings. However, this study does not work on complex digital environments.

Periáñez-Cañadillas et al. (2019) conducted an empirical study to analyze digital competencies in relation to desired companies and developed training centers from the perspective of potential employers using Partial Least Square (PLS) procedure. Thus, the concept is generic in digital skills for business studies and economists. However, the relationship among the variables' information was not properly observed. Ludike (2018), recommended a conceptual study to design how next generation employee experience will be impacted by digital technology in the future. This study aims to improve team skills by determining future proofing employee retention and molding employee experience in the digital communication bias. However, the overall work of the future and the future of work still needs primary and secondary information.

Selimovic et al. (2021), presented a study of employee well-being, support, and involvement for the workplace digital transformation. This study has significant implications for hiring managers. An organization must fulfil its employees' basic psychological requirements in order to improve their performance and wellbeing. Thus, this type of leadership approach and workplace culture also has several benefits for the company,

which increase productivity and revenue. However, this study was not flexible. Foroudi et al. (2017) offered a study to assess the relationships between tangible/intangible assets, digital technologies, and marketing competencies in order to better understand the variables influencing growth of SMEs in the UK. The relationship between service convenience, tangible/intangible assets, core competencies, digital technology, marketing capability, and information quality will be examine using the resource-advantage hypothesis. The study is to improve comprehension by examining employees' assessments of how marketing and digital technology influence a company's financial competency. The study is limited to the specific sectors and locations.

Shakina et al. (2021) presented a study of all innovation in digital technologies according to skill-biased and competence-based technical change models. Initially, the data collecting methodology is focused on text-mining technologies and its most well-researched method is confirmatory content analysis. The second stage enables the discovery of an innovation diffusion cycle. Based on the VAR estimator, the third step tackles the digital skills and cycles of digital advances demand. This method enhance the employee training, however, lack of some particular information. Yoganathan et al. (2021) presented a study on the relationship between competence of employee social media and online social capital results. Therefore, this study emphasize the significance of developing online ties between employees and employers in the framework of employer marketing. However, the social media competency of employees across various cultures is not fully understood. Bejakovic and Mrnjavac (2020) offered a study on the significance of policy initiatives for enhancing digital literacy by examining the relationship between employment and digital competence. Therefore, this study helps to identify requirements and issues, and to address conceptual issues and problematic circumstances in digital environments. However, strong partnerships between stakeholders are missing at the European and national levels in order to reduce the gap of digital skills.

3.2 Digital autonomy

Digital confidence is the foundation of Digital Autonomy (DA). This describes an individual's sense of choice in initiating and regulating one's separate actions. The regulation of social changes brought about by the usage of digital technology is achieved through digital autonomy. Several studies have been carried out on DA, which are reviewed as follows.

Meske and Junglas (2021), investigated an empirical study to initiate the need of autonomy towards digital workplace transformation. This study increases the performance of the individual learning works. From the overall analysis, the autonomy increases its positive impact on enjoyment related to the work. Hence the study deserves group of options to protect significant information at the digital workplace. Nevado-Peña et al. (2019), investigated the factors that Europeans consider important for achieving a higher quality of life by analyzing data from Flash Eurobarometer 419 and Eurostat on ICT. The findings indicate a strong link between technology and quality of life. Individuals who identify as digital citizens report greater levels of happiness and place high value on residing in regions or cities with advanced technological capabilities, a focus on research and development, and a commitment to sustainable growth.

Passey et al. (2018) referred to a group of educational groups that are confident in their ability to use digital domain skills and navigation. A qualitative study is presented for digital confidence that involves three elements: a digital autonomy exercise, manage Information and Communication Technology (ICT) skills; and proficiency. To navigate

such technology, the individual's choice requires mind-sets, skills, and dispositions with autonomy and confidence. However, digital confidence is difficult and multilayered. Chinoracky and Corejova (2019), conducted a qualitative study to define the potential impact of digital technologies in the domain of digital transformation. To determine the workforce, three scenarios are presented: medium skill, medium autonomy; low skill, high autonomy; and high skill, high autonomy; obtained from the statistical databases. In the overall scenarios, the environmental sectors are potentially changed, and the significant risk of change is greater than the high risk of automation in the context of the percentage of jobs.

In the study of Schlomann et al. (2020), the main emphasis was on examining three distinct domains of subjective well-being in older adults, namely loneliness, anomie, and autonomy. These domains were chosen because they provide a comprehensive and pertinent overview of subjective well-being in advanced age and their potential association with technology use among the oldest-old population. The research found that there were significant correlations between the use of web-connected information and communication technology (ICT) and all three domains of subjective well-being. Specifically, the utilization of web-connected ICT was found to be significantly related to loneliness, anomie, and autonomy. Jarrahi et al. (2020), offered a qualitative study on digital platforms for worker flexibility and autonomy based on the structure of platforms in freelance work. This study provides suitable tools and large resources to the workers that will help to better understand and theorize about platform management. However, from the perspective of gig workers, a more complex and coherent platformic management is required.

In the interdisciplinary review of Wang et al. (2020), the primary emphasis is on work design as a core explanatory mechanism for investigating how individual usage of ICT influences the effectiveness and well-being of employees, with a total of 83 empirical studies being examined. The results indicate that the use of ICT influences employees by shaping three key aspects of work design: job demands, job autonomy, and relational aspects. The use of ICT can augment employees' autonomy, particularly their scheduling autonomy, through the provision of teleworking or online collaboration support. However, such effects on job autonomy can be negative for individuals who prefer to separate work and home life or have poor time management abilities. Cai et al. (2020) explored a study of empirical studies on employee creativity predictors in accordance with the Ability-Motivation-Opportunity (AMO) theory. Initially, job autonomy encourages employee's responsibility for problem-solving to promote innovation. Second, organizations have to provide workers with additional assistance, as indicated by the organizational environment and culture. Finally, the desired teamwork qualities provide an environment where workers can access new viewpoints and creative ideas. Therefore, employee innovation is encouraged in the context of digital work. However, there are less interactions in our work that lead to poor creative outcomes.

Viete and Erdsiek (2020) explored whether the benefits of utilizing mobile ICT in the workplace are dependent on granting employees greater control over the structure of their workday, as facilitated by trust-based work time arrangements (TBW). The findings support the idea that with the continuous advancement and widespread adoption of mobile ICT, there will be a growing preference for work organization that prioritizes high levels of employee autonomy in terms of when and where work is performed. As a result, there will likely be a higher utilization of such organizational strategies in the future. Bošković (2021), presented a research study that demonstrates how autonomy plays a crucial role in fostering employee engagement in the digital environment, particularly in the context of remote work. The empirical research conducted in this study confirms that autonomy has a positive impact on two key dimensions of employee engagement, namely, vigor and

dedication. The findings provide strong evidence that autonomy has a beneficial effect on employee engagement, highlighting the importance of granting employees greater control and flexibility over their work. Burchardt and Maisch (2019) explored a contemporary development techniques without making the entire organization agile, agility also can be implemented in hierarchical structures in certain areas. Hierarchical features are utilized in the agility context to help traditionally organized businesses, which becomes more adaptable and flexible. But these models are time consuming.

3.3 Innovative work behavior

Innovative work behaviour (IWB) is defined as the actualization, implementation, origination, and production of ideas. Several studies have been carried out on IWB, which are reviewed as follows.

Dedahanov et al. (2017), presented an empirical study was tested with 140 organizations and 140 managers. Hence, the study demonstrates that the link between organization innovation and structural factors associates high innovation in terms of employee behaviour. But the performance signifies that innovative behaviour cannot support the connection between organization and integration innovation. Battistelli et al. (2019), described a qualitative study was tested with 756 military organization. The study signifies a positive relationship between information learning and innovative behaviour that leads to high innovation among employees. The findings show that the perceived employee learns from various tasks. However, the innovative behaviour relationship is complex. Afsar (2016), conducted a qualitative study test for the positive impact of Person-Organization (P-O) fit and IWB. From these facts, the result shows that the P-O and IWB improve relationships among employees. Also, it improves the outcome of positive work and organizational behaviour. However, some information was misplaced in order to make the IWB decision.

Akram and Haider (2016), investigated the impact of Employee IWB (EIWB) using relational leadership testing with 261 organizational employees from an IT company in China. The three stages were used to understand the interaction between dependent and independent variables. Hence, the study determines that relational leadership has positive results for the whole EIWB. However, the collected dataset is not accessible to all employees. Bagheri (2017), investigated a significant impact of entrepreneurial leadership for opportunity recognition and IWB on employees using high technology in SMEs tested with 310 employees in Iran. There are three main purposes to be used with high-tech SMEs. Among these facts, SME-based entrepreneurial leadership has a positive impact on employee IWB. Further, it is significantly important to develop employees in the context of high-tech business. However, the development of leadership is still critically needed for innovation.

Akram et al. (2020), attempted to determine the impact of knowledge sharing and organizational justice on the EIWB test with 345 respondents in China under practical and theoretical knowledge. Hence, the study obtains a 23% variation in the relationship between independent and dependent variables. Also, it suggests that the employees were implemented efficiently based on temporal justice when doing their tasks. Atitumpong and Badir (2018) conducted a study on the employee learning and impact of leader-member exchange on IWB of employees motivated by creative self-efficacy. Additionally, managers are aware of the value of employees based on their commitment to learning. Therefore, leaders must recognize that IWB cannot be developed through good interactions and a learning attitude,

self-efficacy development is a significant factor. However, the cross-sectional nature of the data prevents the demonstration of causality.

Shin et al. (2017), discovered a study on how a desirable work necessity needs for innovation, and the effects of employees' innovative behavior. The relationship between innovative behavior and external requirements was found to be dependent on qualities of the employee such as intrinsic interest. So, the innovations have high intrinsic interest, but reward contingencies are not measured for the requirements of innovation. Woods et al. (2017), examined a study to investigate empirically how traits interact with context on IWB, and it is based on a robust theoretical framework. In total, 146 employees of a financial organization in the UK answered questionnaires regarding openness and conscientiousness, and their line supervisor also graded them on three IWB components (promotion, concept generation, and realization). Each participant was enrolled in a graduate programme. To examine the tenure moderating effects on the relationships between the self-reported attributes and the outcomes of supervisor-rated IWB. Therefore, they discovered that highly conscientious workers, however, they could not replicate their findings in various industries.

Saether (2019), offered a study that examines the relationship between self-determination theory's forms of motivation and the idea of PO fit in IWB of high-tech R&D employees. Therefore, autonomous (intrinsic and identified) work motivation is higher among individuals with high of PO fit, and autonomously inspired employees participate in more IWB. However, they are dependent on cross-sectional self-report measurements. Coetzer et al. (2018), discovered a study on knowledge of IWB, which is essential for the domain of individual innovation. This offer preliminary proof that influences of gender IWB and that job satisfaction has a negative correlation with IWB. Therefore, this study is easy to take decisions, but less flexible. De Spiegelaere et al. (2016), offered a study on the relationship among autonomy in the workplace and two key employee outcomes: IWB and work engagement. Initially, it makes an effort to distinguish between several dimensions of autonomy, either conceptually and practically. Then, the outcomes of employees are focused on the advantages of the employees and the advantages of the IWB. Therefore, work time autonomy improves IWB and work engagement, but all the topics in this analysis are measured using a single technique.

4 Results and discussions

By presenting the SLR findings, this section provides answers to research questions based on the analysis of selected articles in accordance with the modelled questions.

4.1 How is digital competence defined regarding employee's digital autonomy and innovative work behavior?

To define the digital competence, the analysis observes that digital autonomy and IWB in the context of employee were described 23 out of 34 selected articles. In this reviewed articles, six published articles (Bejakovic and Mrnjavac 2020; Yoganathan et al. 2021; Shakina et al. 2021; De Spiegelaere et al. 2016; Coetzer et al. 2018; Saether 2019) analyzed digital autonomy in terms of employee that identify a group of intrinsic factors like relatedness, competence, and autonomy might explain performance behavior and well-being perceptions in digital workplace environments, as well as employees willingness

to embrace various digital technologies. This provides a significant anchor point for self-determination. Further, competence is used to choose the relevant resources related to knowing one needs in digital literacy. Throughout the influence of education, digital competence were defined as a possible relationship of category-concerned terms. Among these reviewed articles, the digital technology interconnects modern requirements and supports a high level of employee competence using strategic plans. Another four reviewed articles (Bagheri 2017; Akram et al. 2020; Akram et al. 2016; Bagheri 2017) shows a strong relationship towards employees in terms of opportunity recognition and innovation. Also, it determine the impact of knowledge sharing and organizational justice relationship between independent and dependent variables in terms of EIWB. Five publications (Ganz et al. 2018; Okeji et al. 2019; Grosheva and Bondarchuk 2019; Varshney 2020; Shin et al. 2017) mainly focused on digitization and its effect on employee new competencies in the world of work. New dimension of competence such as work tools, management, work tasks, skills provides a new way of making decisions between humans and technology.

Five publications (Varshney 2020; Bejakovic and Mrnjavac 2020; Selimovic et al. 2021; Shakina et al. 2021; Yoganathan et al. 2021), analyzed the idea of digital competence in terms of relationships among subordinates, leaders, and employees. Further, the review describes a creative efforts and interactions between organizational and technical elements in terms of employee. Social media competence may be a significant factor in the creation of an online network that benefits employer branding. Four publications mentioned the concept of EIWB in terms of the creation and use of innovative concepts for products, processes, and services. Also, EIWB is the relationship between tenure and personality traits at work. Further, innovation with respect to the creation of new ideas, and individuals who create, exchange, respond to, alter, and execute ideas. Moreover, employees who generate and propose innovative thinking at work in digital transformation. While digital competence is important, some studies have found that digital autonomy also plays a significant role in promoting innovative work behavior. Employees who have more autonomy to make decisions about how they use digital tools and technologies may be more likely to experiment and find new and innovative ways to do their work. While there is a positive relationship between digital competence, digital autonomy, and innovative work behavior, the relationship is complex and may be influenced by individual and organizational factors. For example, some studies have found that the relationship between digital autonomy and innovative work behavior is stronger for employees who have higher levels of digital competence. Overall, these study results suggest that organizations should prioritize building digital competence and digital autonomy among employees if they want to promote innovative work behavior. Additionally, organizations should consider how individual and organizational factors may impact the relationship between these variables.

4.2 What have been the main research aims, methodologies and results in digital competence studies in the context of digital autonomy and innovative work behavior over the past 8 years?

4.2.1 Research purposes

From the analysis of digital competence, 12 selected articles were reviewed by examining the research purposes related to employee terms over the past 8 years. Two selected articles (Ganz et al. 2018; Ludike 2018), defines conceptual study on digitalization and its impact of new competences from employees under four workplace dimensions such as work tools,

management, work tasks, skills. Also, another study (Ludike 2018) investigates how next generation employee experience will be impacted by digital technology in the future. Then another two articles (Periáñez-Cañadillas et al. 2019; Varshney 2020) defines empirical study to improve digital skills and update new company information to their employees in the context of digital transformation. Similar to the purpose of another two studies (Okeji et al. 2019; Grosheva and Bondarchuk 2019), digital literacy skills are improved and explore competencies among libraries under different social media. Two articles (Foroudi et al. 2017; Yoganathan et al. 2021) defines the empirical study on a relationships between tangible/intangible assets, digital technologies, and marketing competencies. Also, another study analyzes the relationship between competence of employee social media and online social capital results. Three articles defines the conceptual study, analysis study, and qualitative study on the involvement, support, and well-being of employee for the workplace digital transformation (Selimovic et al. 2021; Shakina et al. 2021; Bejakovic and Mrnjavac 2020).

As for digital autonomy, 11 selected articles were reviewed by examining the research purposes related to employee terms over the past 8 years. Five qualitative study articles (Nevado-Peña et al. 2019; Passey et al. 2018; Chinoracky and Corejova 2019; Schlomann et al. 2020; Jarrahi et al. 2020), were investigated that the autonomy connects digital practices under learner dimensions such as locus of control, location, trajectory, formality, and pedagogy in the digital environment (Nevado-Peña et al. 2019). In another author of (Passey et al. 2018), digital domain skills and navigation were used for digital confidence level. Whereas in another author of (Schlomann et al. 2020), learning-relevant decisions were used to increase the choice options in digital learning materials. Moreover, worker flexibility and autonomy structure is significant for digital platforms. Finally, one article investigates the performance of the individual learning works towards digital workplace transformation (Meske and Junglas 2021). Two articles defines the qualitative study on how older adults are analyzed the social network characteristics, such as use of digital media and relational autonomy. Further, how much the GCR people in South Africa live a digitally connected lifestyle and how that affects their life quality (Wang et al. 2020; Viete and Erdsiek 2020). Three articles (Cai et al. 2020; Bošković 2021; Burchardt and Maisch 2019), defines the conceptual study, mixed study, and cases study on autonomy in organizations undergoing digital transformation.

For IWB, 12 selected articles were reviewed by examining the research purposes related to employee terms over the past 8 years. Three qualitative studies (Battistelli et al. 2019; Afsar 2016; Akram et al. 2016), examined research purposes on knowledge sharing behaviour between innovative behaviour and information sharing relations in terms of employee IWB. Also, these studies focuses on positive impact of P-O and IWB among employees and investigate the impact of EIWB using relational leadership under three stages idea promotion, idea realization, and idea generation. Further, (Bagheri 2017) study investigates a significant impact of entrepreneurial leadership for opportunity recognition and IWB on employees. Another two articles (Dedahanov et al. 2017; Akram et al. 2020) focused to determine the impact of knowledge sharing and organizational justice on the EIWB as well as to associate innovation in terms of employee behaviour. Four articles defines the qualitative study on the employee learning and impact of leader-member exchange on IWB of employees. Also, conducted a study on how traits interact with context on IWB, IWB of high-tech R&D employees, and knowledge of IWB (Atitumpong and Badir 2018; Woods et al. 2017; Saether 2019; Coetzer et al. 2018). Two articles (Shin et al. 2017; De Spiegelaere et al. 2016) defines the conceptual study on how a desirable work necessity needs for innovation, and the effects of employees' innovative behavior. Further, the relationship

among autonomy in the workplace and two key employee outcomes. Overall, these studies demonstrate the importance of digital competence and autonomy in promoting creativity, self-regulated learning, and knowledge sharing behavior among employees. These behaviors are important for achieving organizational goals related to innovation and continuous improvement, and suggest that organizations should prioritize the development of employees' digital competence and provide them with autonomy in their use of digital tools to support these behaviors.

4.2.2 Research methods

From the reviewed articles, seven types of research methods were categorized in the Table. 4 that presents research methods were used in the selected articles. In this, 16 qualitative studies were investigated on the digital competence of employees in the context of digital autonomy and innovative work behavior. During the review process, the researchers analyzed 18 articles that covered relationship topics and 12 articles that discussed the impact of various tasks on different topics. Following these topics, five articles used different methods like strategic planning, sophisticated techniques, the Partial Least Square (PLS) procedure, Keller's ARCS-model, and Vector Auto Regression Analysis (VAR). Overall, these studies demonstrate the importance of using diverse research methods to examine the relationship between digital competence, digital autonomy, and innovative work behavior. Mixed-methods and structural equation modeling approaches were used to provide insights into the complex relationships between these variables, and to identify the mechanisms through which they impact innovative work behavior. These findings highlight the importance of using rigorous research methods to develop a deeper understanding of how digital competence and autonomy can be leveraged to promote innovation and achieve organizational goals.

4.2.3 Research outcomes

Based on the analysis of selected articles, the research outcomes should be presented by study categories in accordance with the purpose of the research.

From the evaluation of selected articles, two conceptual study articles (Ganz et al. 2018; Ludike 2018) report on digitization and its effect on employees' ability to provide a new way of making decisions and improve team skills between humans and technology. Furthermore, two other studies (Periáñez-Cañadillas et al. 2019; Varshney 2020) present a generic concept for providing a relationship outcome between desired companies and

Table 4 Research methods	Research methods	Number of studies
	Qualitative study	16
	Empirical study	6
	Conceptual study	6
	Cross-sectional study	2
	Mixed study	2
	Comprehensive study	1
	Case study	1

developed training centers. In terms of digital competence, a comprehensive study evaluates a high level of personal digital competence using a diagnostic task (Grosheva and Bondarchuk 2019). In the study on digital autonomy, (Meske and Junglas 2021) achieved a positive impact on enjoyment related to the workplace transformation. To define the potential impact of digital technology, (Chinoracky and Corejova 2019) found that the significant risk of environmental change is greater than the high risk of automation based on the skill level of jobs. Moreover, the digital learning materials with autonomous performance outcomes increase the variety of choice options.

By focusing a conceptual study on digital competence give better worker satisfaction, which can be related in large part to interpersonal connectedness (Selimovic et al. 2021). Furthermore, investigating an empirical study on digital competence gives high social media competences bridging and bonding (Yoganathan et al. 2021). By analyzing a qualitative study on digital autonomy give higher scores to digitally connected people on metrics of quality of life than those without access (Viete and Erdsiek 2020). Also, by focusing a qualitative studies on digital autonomy give less redundancy in social networks (Wang et al. 2020). By investigating a qualitative study on IWB shows that it improve workers' active and observational mastery, thus increasing their innovation and creative self-efficacy (Atitumpong and Badir 2018). Further, focusing a conceptual study in IWB give high performance reward expectancy (Shin et al. 2017). Then, analyzing a qualitative study in IWB yields higher level of autonomous motivation in terms of high PO fit levels (Saether 2019). Six articles (Dedahanov et al. 2017; Battistelli et al. 2019; Afsar 2016; Akram et al. 2016; Bagheri 2017; Akram et al. 2020) focus on the study of IWB and report the positive impact of P-O, IWB, and EIWB on the outcome of positive work and organizational behaviour based on knowledge sharing. Furthermore, these studies also indicate a positive relationship between information learning and innovative behaviour that leads to high innovation among employees in the context of high-tech business. Among these reviewed articles, high levels of relationships were achieved between independent and dependent variables. Overall, these studies demonstrate that digital competence and autonomy are important factors that contribute to the achievement of various research outcomes such as innovativeness, innovation capabilities, and job performance. The studies suggest that organizations should invest in the development of employees' digital competence and provide them with autonomy to leverage digital tools and promote innovation and job performance.

4.3 What limits exist in research on the digital competence of employee in the context of digital autonomy and innovative work behavior?

As illustrated in the Table 5, the research studies were mainly focused on qualitative studies for the execution of the data collection process and the size of the type reviewed out of 34 selected articles. The absence of primary data collection, lack of sample data, and limited resource collection were not reliable for some articles ($n = 15$). There was only one limitation that occurred for 24 out of 34 articles. Among the selected articles, seven reviewed articles demonstrate that no limitations exist in the selected research articles. The limitations of the selected articles on the digital competence of employees in the context of digital autonomy and innovative work behaviour, are listed in the Table 5. Overall, these studies demonstrate that there are some limitations in the research on digital competence, digital autonomy, and innovative work behavior. Common limitations include absence of primary data collection, small sample sizes, reliance on self-reported measures, and limited generalizability of findings. To address these limitations, future studies could use

Table 5 Limitations of the selected articles

Selected articles	Limitations
Grosheva and Bondarchuk (2019)	Not available
Varshney (2020)	Absence of primary data collection
Ganz et al. (2018)	Not available
Okeji et al. (2019)	Absence of fund allocated to support library professionals training; absence of stable internet connectivity; and absence of physical facility
Periáñez-Cañadillas et al. (2019)	Implemented scales were not absolutely reliable
Ludike (2018)	Not available
Meske and Junglas (2021)	Absence of a positive attitude and supporting intents thus reduces the theoretical possibility of behaviour
Nevado-Peña et al. (2019)	Not available
Passey et al. (2018)	Frequent monitoring and refocusing, which cannot be easily achieved with a straightforward adoption over time
Chinoracky and Corejova (2019)	Not available
Schlomann et al. (2020)	Scarifying external validity results in variations in the impacts on autonomy and motivation, and faked choice may cause unfavorable emotional responses and reduce learners' performance
Jarrahi et al. (2020)	Lack of multiple sources and forms of data
Dedahanov et al. (2017)	Gathered data might not be applicable to company activities in various contexts and industries
Battistelli et al. (2019)	Self-rating biases may have an impact on IWB; The sample data only includes male data; Organization did not grant authorization to gather data on respondents' connections with units
Afsar (2016)	P-O fit only determines independent variable from the sample data
Akram et al. (2016)	Sample data were not accessible to all employees and only short time data were collected
Bagheri (2017)	Innovation is impacted by entrepreneurial leadership in business of all sizes and types
Akram et al. (2020)	Due to financial and access restrictions, it was impossible to obtain all personnel data
Selimovic et al. (2021)	Employees' desire to adopt a digital workplace are not included in the model
Foroudi et al. (2017)	Limited to minimum types and number of employees
Shakina et al. (2021)	Absence of some particular information
Yoganathan et al. (2021)	insufficient emphasis on employees' social media skills
Bejakovic and Mrnjavac (2020)	Not available
Wang et al. (2020)	Less analytical efficiency
Cai et al. (2020)	lack of some digital indicators that predict employee creativity
Viete and Erdsiek (2020)	Casual inferences are weak because the collected data were cross sectional
Bošković (2021)	Not available
Burchardt and Maisch (2019)	Limited resources
Atitumpong and Badir (2018)	Lack of explanatory power
Shin et al. (2017)	not properly concentrated on the demand for innovation
Woods et al. (2017)	Limited employment tenure inside the company
Saether (2019)	Causality cannot be evaluated
Coetzer et al. (2018)	Decrease in performance rating

Table 5 (continued)

Selected articles	Limitations
De Spiegelaere et al. (2016)	Cross-sectional nature of the data

larger and more diverse samples, objective measures of digital competence and innovative work behavior, and include a wider range of industries and contexts. Additionally, longitudinal studies could be conducted to establish the causal relationships between digital competence, digital autonomy, and innovative work behavior over time.

In summary, the review of digital competence in the context of digital autonomy and innovative work behavior has yielded some interesting findings. Here is an overview of the main results: There is still some ambiguity and inconsistency in the definition and measurement of digital competence and digital autonomy, which can limit the comparability and generalizability of research findings. The review on digital competence, digital autonomy, and innovative work behavior has aimed to explore the relationship between these constructs and various outcomes such as innovativeness, innovation capabilities, and job performance. It has also aimed to identify the mechanisms and factors that mediate or moderate this relationship. Further, this review has used various methods, such as qualitative and case studies. This has shown that digital competence and autonomy are important factors that contribute to the achievement of various research outcomes such as innovativeness, innovation capabilities, and job performance. Besides, the review has some limitations, such as the absence of primary data collection, small sample sizes, reliance on self-reported measures, limited generalizability of findings, and a lack of longitudinal studies. Overall, the results suggest that digital competence and autonomy are important factors that organizations should consider when promoting innovative work behavior and improving performance outcomes. However, further investigation is needed to better understand the definition and measurement of digital competence and autonomy, the mechanisms through which they affect innovative work behavior, and the factors that mediate or moderate this relationship. Additionally, future studies should aim to address the limitations of existing research by using larger and more diverse samples, objective measures, and longitudinal designs.

5 Conclusion

This SLR provides an overview of recent research on employee digital competence on the relationship between digital autonomy and innovative work behavior including research objective, methodologies, results, and limitations over the period of 2015 to 2022. By conducting a SLR, a wide range of sources are summarized based on the guidelines recently followed by PRISMA methodology. In this review, 34 articles were selected from 1430 screened articles by applying inclusion and exclusion criteria. Seven types of research methods were categorized from the selected articles. It also discusses how the concept of digital competence is defined on relationship between digital autonomy and innovative work behavior. It outlines the developments and patterns in the past 8 years' of research on digital competence in digital autonomy and innovative work behavior. Based on this extensive review, it can be concluded that the highly committed workers tended to be less creative, the longer they were in their position, but very open employees produced more ideas over time. Among the conclusions, the SLR findings provides detailed discussion based

on the analysis of selected articles in accordance with the modelled questions. Thus, the in-depth analysis of this review indicates a better understanding of the impact of employees on the relationship between digital autonomy and innovative work behaviour, and this research will benefit for future researchers to determine an appropriate solution for their needs. Besides, the overall review advances the understanding of the interplay between digital competence, autonomy, and innovative work behavior in the workplace, and provides useful insights for managers and policymakers seeking to foster innovation in their organizations.

The current review process provides the state of the art through validated studies, but there are some limitations. Some weakness were found in our search findings under research materials and methods. The state of art studies is a description of research that has been included in three databases called Google Scholar, ERIC, and WoS over the past 8 years (2015–2022). Firstly, this review examined only the publications from the three selected databases, implying that not all publications available on the subject were considered. Secondly, it is important to note that only searched for publications between 2015 and 2022 to emphasize recent findings (i.e., focused on recent results only). Additionally, the publications are only written in English, and as a result, articles published in other languages that explore the connection between digital autonomy and innovative work behaviours' impact on employees were not included. In future systematic literature reviews, it is advisable to have a minimum of two experts utilize the evaluation criteria to assess papers.

Furthermore, the overall selection of articles has some limitations. The most frequent limitations observed in these selected articles were related to the methods of data collection (i.e., the absence of primary data collection) and the size of the samples. One potential limitation related to data collection methods is the potential for errors in self-reported data. Employees may overestimate their level of digital competence, or they may not accurately report their level of autonomy or innovative work behaviour. To address this limitation, researchers can use objective measures of digital competence, such as skill assessments or performance evaluations. Additionally, researchers can use multiple sources of data, such as surveys, interviews, and observations, to triangulate their findings. Cross-cultural differences can cause differences in digital competence, digital autonomy, and innovative work behaviour across cultures and contexts. Therefore, using the same data collection methods across different cultural groups may result in inaccurate results. To address this limitation, researchers can use culturally-sensitive measures and adjust their data collection methods to accommodate cultural differences. Regarding sample size, small sample sizes can limit the generalizability of the findings to a larger population. Studies with small sample sizes may lack statistical power, making it difficult to identify significant relationships or detect differences among subgroups. On the other hand, studies with large sample sizes may be resource-intensive and require a significant investment of time and money. Overall, researchers should be mindful of the limitations of their data collection methods and sample size when examining the relationship between digital competence, digital autonomy, and innovative work behaviour among employees. By using multiple sources of data, culturally-sensitive measures, and carefully selecting an appropriate sample size, researchers can help mitigate these limitations and increase the validity and generalizability of their findings.

The findings of research on the relationship between digital competence, digital autonomy, and innovative work behaviour among employees have important implications for practice, policy, and future research. From a practical standpoint, the findings suggest that organizations should invest in providing training and development opportunities for their employees to enhance their digital competence. This can include training on the use of

digital tools and technologies as well as developing digital literacy skills. Additionally, organizations should create an environment that supports digital autonomy and encourages employees to use their digital skills in innovative ways. By doing so, organizations can foster a culture of innovation and increase employee engagement and productivity. From a policy standpoint, the findings suggest that policymakers should consider the importance of digital competence and autonomy in the workplace. Policies that promote digital literacy and support the development of digital skills can help improve the competitiveness of the workforce and stimulate economic growth. Additionally, policies that support the use of digital technologies and encourage innovation can help create a more productive and dynamic economy. In terms of future research, there is a need for more studies that examine the relationship between digital competence, digital autonomy, and innovative work behaviour across different industries and contexts. Additionally, more research is needed to explore the mechanisms that underlie these relationships and identify the factors that can enhance or inhibit the development of digital competence and autonomy. Finally, longitudinal studies that track changes in digital competence, digital autonomy, and innovative work behaviour over time can help provide insight into the long-term impact of these factors on employee performance and organizational outcomes.

Declarations

Conflict of interest I declare that the authors have no competing interests as defined by Springer, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

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