

Impact of Employee Digital Competence on the Relationship between Digital Autonomy and Innovative Work Behavior: A Systematic Review

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Research Article

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Abstract

Innovation has grown up in a digital world and is far more technologically intelligent by the use of social media through the internet to keep in touch with the rest of the world. Information Technology employees are goal-oriented, work-oriented, and have rapid career advancement. Simultaneously, they also raise the value of workforce and organization structure to define a quality and productivity process for their individual benefit and that of their economy and environment. This paper presents a Systematic Literature Review (SLR) to provide a current overview of digital competence research focused on the impact of employees between the relationship of digital autonomy and innovative work behavior from 2015 to the end of 2022 in the field of digital models. By conducting a SLR, we summarize a wide range of sources based on the guidelines recently followed by other systematic review format on the domain of digital educational technology. According to the statement of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology, 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. When reviewing these studies, 18 articles were examined under relationship topics and 12 articles reported on impact topics under different tasks. Among the conclusions, the SLR findings provides answers to the questions 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.

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 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, 2015, Özduran 2019). 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 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, 2016).

The foundation of professional training over life in every field of work need a digital education (Decuyper *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-Vierheilg *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 & 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 B & Umrani. 2019). However, limited studies are reviewed on the impact DC of employee in the context of relationship between DA and IWB.

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 review are organized as below. Section 2 presents the systematic literature review. Section.3 presents the methodology reviewed in this review. On the basis of the papers chosen for this literature review, we then provide the findings and respond to the research questions in Section.4. Then

section.5 present 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. Research Materials

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. The purpose of this review is to provide a current overview of digital competence research in the impact of employee 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. To achieve these aims, we presented a SLR 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). The systematic review process consists of different criteria which are described in the following sub-sections.

2.1. Search Strategy

In this SLR, we have used Google scholar as the main scientific publication database for conducting the search terms. Other electronic databases such as Education Resources Information Center (ERIC), Scopus and Web of Science (WoS). 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.

Table 1
Search process documentation

Data source	Search process documentation
Google Scholar	<ul style="list-style-type: none"> • 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
Springer, Elsevier, Emerald, Wiley Online Library, Taylor & Francis	<ul style="list-style-type: none"> • 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 behaviour*" OR "employee self-decision*" OR "digital transformation*"))

2.2 Study Selection

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

The inclusion and exclusion criteria were established to obtain the present review research questions. In each study, the inclusion and exclusion criteria must be applied and it was validated by a set of experts such as three experts in educational technology, four university professionals, and two expert in statistics. 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 overall inclusion and exclusion criteria are summarized in the Table 3.

Table 3
Inclusion and exclusion criteria

Inclusion criteria
Research articles were published from 2015 to 2022
Research articles were collected particularly in high score index journals and conference proceedings
Research articles searching description were specified in terms of title, keywords and abstract
Research articles were focused only on English language
Research articles were associated to the domain of digital technology and education
Research articles were 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.
Exclusion criteria
Research articles were removed based on books, technical reports and doctoral thesis
Research articles were removed based on studies not involving teachers
Research articles were removed based on studies out of educational context
Research articles were removed based on published articles whose texts were not available in the papers

2.3. 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. In this review, the PRISMA flowchart is validated by a set of experts such as three experts in educational technology, four university professionals, and two expert in statistics. According to this 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 Figure.1.

4. Research Methodology

To analyze research methods, we provide a brief outlook 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 behaviour 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.4.

4.1 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 for employee competence between the interconnection of modern requirements over the past one year. This task is used to determine the evaluation of personal digital competence level 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. Hence, the diagnostic process supports a high level of employee competence. 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. The digital transformation framework is used to determine sophisticated techniques and update new company information to their employees. 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 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. 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 [2019], revealed a qualitative study to improve digital literacy skills and explore competencies among libraries under different social media. This study is used to determine employee competencies in dynamic work online platforms such as document uploading, e-mail sending and receiving, and searching skills. 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.

Periáez-Caadillas 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. This study carries professional graduates 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, followed by the 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. 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. 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. 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. 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. 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. Thus, this type of leadership approach and workplace culture also has several benefits for the company, which increase productivity and revenue. However, 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. In addition, this study 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. 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. We also look at how two different types of online social capital result in distinct mediators. The impact of employee social media competence on the citizenship of an online brand and psychological contract violation feelings. 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 P & Mrnjavac Z [2020] offered a study on the significance of policy initiatives for enhancing digital literacy by examining the relationship between employment and digital competence. 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. 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.

4.2 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. Also, this research supports new ways of work to show a positive influence between user's attempts and autonomy using the innovation of Information Technology (IT). 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.

Chik [2018], explored a qualitative study on learner autonomy using informal language constraints in the digital media. The digital practices used a broad range of digital activities to connect with learner autonomy, which are engaged for the purpose of leisure and personal events. This study provides the relationship between learner autonomy and digital practices under five dimensions such as locus of control, location, trajectory, formality, and pedagogy. By focusing on these, the autonomous learning model evaluates three new affordances beyond out-of-class learning, like "How do students use digital resources for language learning?", "How can learner autonomy help people learn languages in the digital age?", and "What effects does studying learner autonomy in digital settings have?" However, this model does not know about language in the new digital environment.

Passey et al. [2018] referred to a group of educational groups that are confident in their ability to use digital domain skills and navigation. In an agentic way, a qualitative study is presented for digital confidence that involves three elements: a digital autonomy exercise, where it knows the basic information of individual choice and actions; confidence to manage Information and Communication Technology (ICT) skills; and proficiency with a wide range of popular computer programme and software, especially using the internet. Based on these elements, digital confidence is the foundation of digital autonomy that considers how social control changes

through digital technology. 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. 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 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.

To increase the choice options, Schneider et al. [2018], discovered digital learning materials with autonomy between learning-relevant and learning-irrelevant options in the digital media. A qualitative study was conducted to examine the influence of perceived autonomy and the relevance of moderating option selection. According to Keller's ARCS-model (Attention, Relevance, Confidence, and Satisfaction mode), learning-relevant decisions may have a greater impact on a learner's autonomy than learning-irrelevant ones. However, the complexity of the learning tasks was maintained at a constant level.

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. Higher levels of autonomy and control may be available to Upwork (as a digital platform) workers when they contribute to and expand platforms. 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.

Wang et al. [2018] presented a study to look at how older adults are analyzed the social network characteristics, such as use of digital media and relational autonomy. The study shows that the older adults with networked individual's spectrum are three kinds. They are socially connected, socially constrained, and networked individuals. Since the vast majority of East Yorkers use digital media in their daily life, even those who are not networked individuals, it is not essential nor sufficient to define someone as a networked individual. Therefore, the digital media they use is highly influenced by the people in their social networks. However, there may occur some incorrect self-evaluation.

Cai et al. [2017] explored a study of empirical studies on employee creativity predictors that have been published during the last 30 years, and we present our findings 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.

Cohen et al. [2018] conducted a study that looked at how much the GCR people in South Africa live a digitally connected lifestyle and how that affects their life quality. The ideas of digital autonomy and digital access serve as the foundation for our concept of living digitally. First, one is said to be "digitally connected" once they

have access to the applications, networks, and necessary devices required to use internet-based informational services. Second, an essential factor of living in a connected digital world is digital autonomy, or access which is not constrained by place or time. Therefore, the GCR's existing social structures continue to influence how people access and use the technology that allow digitally connected lifestyle. However, the relationship between life quality and other indicators of a digitally linked lifestyle, such as Internet usage and access to broadband or Wi-Fi are not included.

Ravan *et al.* [2022] conducted a study on team autonomy in organizations undergoing digital transformation. The digital transformation's topic is brought back to the origin of autonomous teams in the organization theory history: industrial, manual work. This is done in two ways: first, by discussing how all types of work procedures will need to be transformed through permeating and digitalization. Therefore, high levels of trust between team members and supervisors. However, Insufficient organizational involvement.

Burchardt & Maisch [2018] explored a study on how contemporary development techniques like Open Innovation and Agile used to promote digital transformation and cultural change? 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. Therefore, agile elements in the organization such as autonomy, adaptability, and self-organization are strengthen, but these models are time consuming.

4.3 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 on the association of innovation behaviour between integration, centralization, organizational and formalization tested with 140 organizations and 140 managers. The results of 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. 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 between innovative behaviour and information sharing relations in terms of employee IWB tested with 756 military organization. This study 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. 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 based on knowledge sharing behaviour. Two main decisions were examined: 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. 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 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. These 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 small and medium-sized enterprises (SMEs) tested with 310 employees in Iran. There are three main purposes to be used with high-tech SMEs. By using SME leaders, the findings show a strong relationship towards employees in terms of opportunity recognition and innovation. 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. Initially, 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. 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 & Badir [2018] conducted a study on the employee learning and impact of leader-member exchange on innovative work behavior (IWB) of employees motivated by creative self-efficacy. 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. 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, due to the data's cross-sectional nature, we are unable to demonstrate causality because of cross-sectional data.

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 person-organization fit in IWB of high-tech R&D employees. It offers organizational applications as well as theoretical insights for scholars. It also provide the following inquiries about R&D personnel in high-tech companies. 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. Initially, 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. Finally, they 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.

Table 4

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 [2019],		Qualitative study	- Improve digital literacy skills and explore competencies among libraries	-Good ratings in digital literacy skills	- Complex in digital environments
Periáez-Caadillas 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

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 P & Mrnjavac Z [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
Chik [2018],		Qualitative study	-Learner autonomy using informal language constraints in the digital media.	- High level digital activities to connect with learner autonomy	- Does not know about language in the new digital environment
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

Author	Aspects	Study type	Focus	Advantages	Disadvantages
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.
Schneider et al. [2018],		Qualitative study	- Examine the influence of perceived autonomy and the relevance of moderating option selection	- Autonomy between relevant and irrelevant learning choice options are increased.	- Learning task was complex due to constant level
Jarrah <i>et al.</i> [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. [2018],		Qualitative study	- Presented how older adults are analyzed the social network characteristics, such as use of digital media and relational autonomy.	- the digital media they use is highly influenced by the people in their social networks.	- There may occur some incorrect self-evaluation.
Cai et al. [2017],		Conceptual study	- present an empirical studies on employee creativity predictors	- employee innovation is encouraged in the context of digital work.	- Poor creative outcomes.
Cohen et al. [2018],		Qualitative study	- presented how much the GCR people in South Africa live a digitally connected lifestyle and how that affects their life quality.	- the GCR's existing social structures continue to influence how people access and use the technology that allow digitally connected lifestyle	- The relationship between life quality and other indicators of a digitally linked lifestyle, are not included.
Ravan <i>et al.</i> [2022],		Mixed study	- present a team autonomy in organizations undergoing digital transformation.	- High levels of trust between team members and supervisors.	- Insufficient organizational involvement.

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Burchardt & Maisch [2018]		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
Akram and Haider [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

Author	Aspects	Study type	Focus	Advantages	Disadvantages
Atitumpong & 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 <i>et al.</i> [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
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

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, we observed that the analysis of the digital autonomy and IWB in the context of employee were described 23 out of 34 selected articles. In this reviewed articles, six published articles analyzed digital autonomy in terms of employee that identify a group of intrinsic factors like relatedness, competence, and autonomy might explain performance behaviour 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 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 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 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. Among these reviewed articles, the motivation of employee desires to promote transformation processes is influenced by their positive expectations of competence in the future workplace.

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 eight 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 eight years. Two selected articles (Ganz et al. [2018] and 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 investigates how next generation employee experience will be impacted by digital technology in the future. Then another two articles (Periáez-Caadillas et al. [2019] and 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 [2019] and Grosheva and Bondarchuk [2019]), digital literacy skills are improved and explore competencies among libraries under different social media. Two articles defines the empirical study on a relationships between tangible/intangible assets, digital technologies, and marketing competencies Foroudi et al. [2017], Yoganathan *et al.* [2021]. Also, another study

analyzes the relationship between competence of employee social media and online social capital results. Three article 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 P & Mrnjavac Z [2020].

As for digital autonomy, 11 selected articles were reviewed by examining the research purposes related to employee terms over the past eight years. Five qualitative study articles (Chik [2018], Passey et al. [2018], Chinoracky and Corejova [2019], Schneider et al. [2018], 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 (Chik [2018]). In another author of (Passey et al. [2018]), digital domain skills and navigation were used for digital confidence level. Whereas in another author of (Schneider et al. [2018]), 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. [2018], Cohen et al. [2018]. Three articles defines the conceptual study, mixed study, and cases study on autonomy in organizations undergoing digital transformation Cai et al. [2017], Ravan *et al.* [2022], Burchardt & Maisch [2018].

For IWB, 12 selected articles were reviewed by examining the research purposes related to employee terms over the past eight years. Three qualitative studies (Battistelli *et al.* [2019], Afsar [2016], Akram and Haider [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] and 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 & Badir, Woods et al. [2017], Saether [2019], Coetzer et al. [2018]. Two articles defines the conceptual study on how a desirable work necessity needs for innovation, and the effects of employees' innovative behavior Shin *et al.* [2017], De Spiegelaere et al. [2016]. Further, the relationship among autonomy in the workplace and two key employee outcomes.

4.2.2. Research methods

From the reviewed articles, seven types of research methods were categorized in the table. 5 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 behaviour. When reviewing these studies, 18 articles were examined under relationship topics and 12 articles reported on impact topics under different tasks. 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).

Table 5
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

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] and 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 (Periáez-Caadillas et al. [2019] and Varshney [2020]) present a generic concept for providing a relationship outcome between desired companies and 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 Cohen et al. [2018]. Also, by focusing a qualitative studies on digital autonomy give less redundancy in social networks Wang et al. [2018]. 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 & Badir [2017]. 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 and Haider [2016], Bagheri [2017], and 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.

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 6, we observe that 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 6.

Table 6
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 [2019],	Absence of fund allocated to support library professionals training; absence of stable internet connectivity; and absence of physical facility
Periáez-Caadillas <i>et al.</i> [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
Chik [2018]	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
Schneider et al. [2018]	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 <i>et al.</i> [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 <i>et al.</i> [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 and Haider [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.

Selected articles	Limitations
Selimovic <i>et al.</i> [2021]	Employees' desire to adopt a digital workplace are not included in the model.
Foroudi <i>et al.</i> [2017]	Limited to minimum types and number of employees
Shakina <i>et al.</i> [2021]	Absence of some particular information.
Yoganathan <i>et al.</i> [2021]	insufficient emphasis on employees' social media skills
Bejakovic P & Mrnjavac Z [2020]	Not available
Wang <i>et al.</i> [2018]	Less analytical efficiency
Cai <i>et al.</i> [2017]	lack of some digital indicators that predict employee creativity
Cohen <i>et al.</i> [2018]	Casual inferences are weak because the collected data were cross sectional
Ravan <i>et al.</i> [2022]	Not available
Burchardt & Maisch [2018]	Limited resources
Atitumpong & Badir [2018]	Lack of explanatory power
Shin <i>et al.</i> [2017]	not properly concentrated on the demand for innovation
Woods <i>et al.</i> [2017]	Limited employment tenure inside the company.
Saether [2019]	Causality cannot be evaluated
Coetzer <i>et al.</i> [2018]	decrease in performance rating
De Spiegelaere <i>et al.</i> [2016]	cross-sectional nature of the data

5. Conclusion

This systematic review gives 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. 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 eight years' worth of research on digital competence in digital autonomy and innovative work behavior. In this review, 34 papers were analyzed. 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. Therefore, the impact of employee digital competence and the relationship between digital autonomy and innovative work behavior should be evaluated and given this development the consideration it needs as a significant turning point for future generations.

Declarations

- I confirm that I understand journal *Artificial Intelligence Review* is a transformative journal. When research is accepted for publication, there is a choice to publish using either immediate gold open access or the traditional publishing route.
- 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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Figures

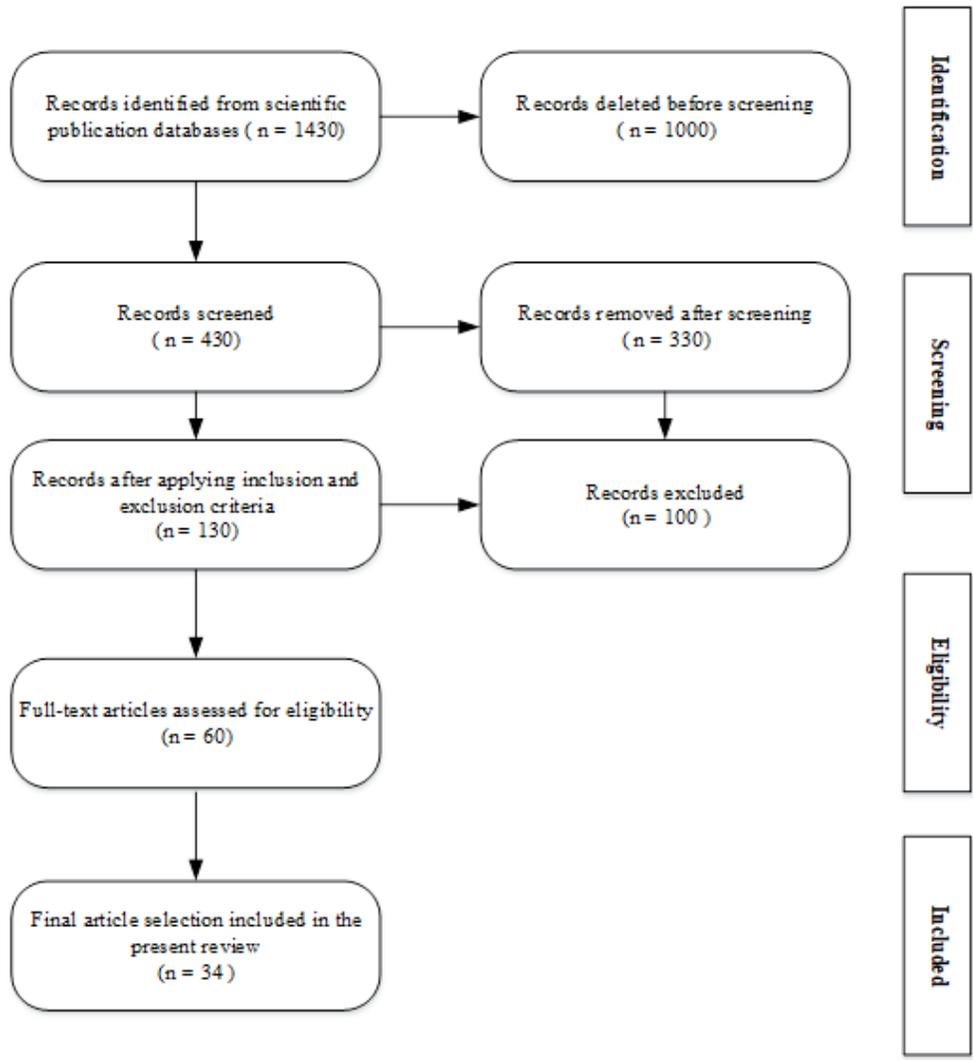


Figure 1

PRISMA flowchart