Journal of Entrepreneurship, Management and Innovation (2026)
Volume 22 Issue 3: 13-46

DOI: https://doi.org/10.7341/20262232
JEL Codes: M15, M41, I25

Determinants of the perceived readiness of accounting department employees to work in a digitalized environment

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Abstract

PURPOSE: *Digitalization of accounting processes has become integral to contemporary professional practice. Accountants are now required to possess digital competencies. This study addresses a research problem concerning the self-assessment of accounting department employees' perceived readiness to work in a digitalized environment. The aim is to identify and assess the impact of selected demographic factors, organizational characteristics, work environment factors, and informal online education in modern information technologies on perceived readiness to work in a digitalized environment.* ***METHODOLOGY:*** *This study surveyed employees of the accounting department in Poland. The questionnaire included questions on the digitalization of accounting and education in information technology. The analysis used Mulder's competence model to examine demographic, organizational, work environment, and educational determinants. Statistical analyses included logistic regression, odds ratios, confirmatory factor analysis, structural equation modeling, and visualization methods.* ***FINDINGS:*** *The results extend knowledge on the determinants shaping the perceptions of accounting department employees in Poland regarding their perceived readiness. The perceived readiness of the surveyed employees varied by demographic factors, enterprise organizational characteristics, work environment factors, and educational determinants. Respondents' gender, enterprise size, and the presence of foreign capital significantly influenced their perceived readiness. The highest level of declared readiness was observed among men employed in other enterprises (including large enterprises) with foreign capital. The intensity of using informal online education in modern information technologies plays an important role in the relationship between gender and work environment factors supporting the digitalization process, particularly the degree of workplace digitalization, the frequency of contact with IT specialists, and perceived readiness. More frequent use of online knowledge sources was associated with higher perceived readiness, while the partial attenuation of the gender effect indicated differentiated learning patterns among women and men.* ***IMPLICATIONS:*** *From a business management perspective, the findings indicate that effectively increasing employees' readiness to work in a digitalized environment requires strengthening the digitalized work environment, ensuring continuous IT support, and consciously integrating informal online education into human resource development strategies. Practical implications also include revising the format of internal training programs and implementing communication and educational initiatives to reduce*

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Received 12 August 2025; Revised 14 December 2025, 8 February 2026, 15 March 2026; Accepted 25 March 2026.
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employees' concerns about digitalization, thereby fostering the perception of technology as a tool that supports work performance.
ORIGINALITY & VALUE: *This study contributes to the literature by providing empirical evidence of the factors influencing the perceived readiness of accounting department employees to work in a digitalized environment. The added value of this study lies in incorporating informal online education as a variable in the relationships between gender, work environment factors, and perceived readiness to function under conditions of digitalization. The findings confirm the contextual nature of digital competencies, which are shaped by interactions with technology, organizational settings, and educational processes, in line with Mulder's competence model.*
Keywords: *accounting digitalization, digital competencies, perceived digital readiness, accounting professionals, informal online learning, workplace digitalization, technology acceptance, IT support, lifelong learning, future of accounting*

INTRODUCTION

The process of introducing information technologies in accounting proceeds in stages associated with successive generations of hardware and evolving technologies that enable access to new sources of information (Hogianto, 2023; Imene & Imhanzenobe, 2020; Arnaboldi et al., 2017). Implementing these solutions poses new challenges for enterprises and accounting department employees (Hogianto, 2023; Chan et al., 2012). Digitalization is a key area of this process and poses a particular challenge for the accounting profession.

Digitalization affects accounting and the work of accountants, both technically and socially (Knudsen, 2020; Hogianto, 2023). It enhances accounting practice, inter alia, by blurring the boundaries of accounting, creating new relationships within organizations and with their external environment, and generating the information necessary for decision-making (Knudsen, 2020; Hogianto, 2023).

Accountants constitute a professional group that is particularly affected by this process (Hall, 2008; Biyikli & Çetin, 2023). They operate within a changing accounting system, adapting to an increasingly digitalized environment that demands appropriate competencies and technological skills (Hall, 2008; Taib et al., 2022). Solutions such as Big Data, cloud computing, and artificial intelligence are fundamentally transforming the "world of accountants" (Hogianto, 2023).

Competence theories hold that development involves becoming aware of knowledge gaps and addressing them through education (Mulder, 2017; Kravetz, 2008; Boyatzis, 1982; Argyle, 1991). Competences have both an individual dimension and a dimension aligned with the expectations of the work environment (Willis & Todorov, 2006). In the case of accountants, these two dimensions converge, as competence assessment also encompasses the ability to function in a digitalized environment, which corresponds to employers' expectations (Cordoș & Tiron-Tudor, 2023).

Research indicates that despite progressing digitalization, accountants' technological knowledge and qualifications do not increase proportionately, which limits their professional competencies and affects their working conditions, task scope, and relationships with managers and other employees (Taib et al., 2022).

This raises the question of which factors influence the professional preparedness of accounting department employees to work in a digitalized environment. According to the authors, it is particularly important to consider this issue from the perspective of accountants themselves – whether, as a professional group, they feel prepared for the changes brought about by the digitalization of accounting. These changes are consistent with the concept of lifelong learning, which is a characteristic of the accounting profession (Taib et al., 2022). Simultaneously, the pace and scope of these changes raise doubts about whether accountants, without adequate support, can independently update their knowledge and competencies, and whether they are aware of the importance of these competencies in the new work environment. In this context, the authors formulated the following research question (RQ):

RQ: Which demographic factors, organizational characteristics of enterprises, work environment factors, and educational factors related to modern information technologies shape the perceived readiness of accounting department employees to work in a digitalized environment?

To operationalize the main research question and enable empirical verification, research hypotheses were formulated and subjected to statistical analysis. In addition, the study included descriptive auxiliary questions (Q1-Q2) that allowed for a better understanding of the research context and complemented the interpretation of the results obtained in the hypothesis testing process:

RQ1: Do accounting department employees in Poland accept the digitalization of their work environment, and what potential benefits and threats do they perceive in this process?
RQ2: How do accounting department employees in Poland assess their readiness to work in a digitalized environment in the context of formal and informal online education?

The answers to the auxiliary questions provide interpretive context for the results of the empirical analysis and enable more in-depth inferences regarding the determinants of perceived readiness to work in a digitalized environment. RQ2 provided a descriptive assessment of respondents' educational preparedness, including formal education, which was not subject to statistical verification but served as interpretive context for the empirical analysis.

About the theoretical foundations of the studied issue, reference to competence theories is particularly important, especially Mulder's concept, which emphasizes educational, professional, and adaptive competencies. This perspective enables a multidimensional analysis of the respondents' competence resources and the identification of conditions shaping their readiness to function in an environment characterized by the intensive use of modern technologies.

The enterprise information system, of which the accounting system is a component, constitutes a key area of digitalization (Hasin et al., 2022). The effective implementation of this process requires appropriate employee attitudes, awareness of the need to use digital technologies, and acceptance of continuous skill development in this area. Accountants' attitudes and their self-assessment of readiness to work in a digitalized environment remain a relatively underexplored area of empirical research. As noted by Grosu et al. (2023), the literature still lacks sufficient studies on accountants' perceptions of digitalization. According to available sources, studies that simultaneously consider determinants of accountants' perceptions of the work environment (e.g., gender, age, professional experience, workplace, or degree of workplace digitalization) and refer to competence concepts, particularly Mulder's approach, have not yet been conducted on a broader scale in Poland.

Despite the growing number of studies on the digitalization of accounting and accountants' skills, the literature still lacks comprehensive empirical research on the extent to which accounting department employees feel prepared to work in a digital environment. In particular, the determinants of this readiness – encompassing demographic, organizational, work environment, and educational factors, including the role of informal online education – remain insufficiently explored. This research gap is especially evident in studies conducted in the Polish context and in approaches drawing on competence theories, particularly Mulder's concept of competence.

This study contributes to the literature by empirically addressing a research gap by identifying and assessing the determinants of accounting department employees' perceived readiness to work in a digitalized environment. The study aims to identify and evaluate the impact of selected demographic factors, enterprise organizational characteristics, work environment factors, and informal online education in modern information technologies on employees' perceived readiness. The analysis enables a comprehensive examination of both individual employee resources and organizational and educational conditions that shape readiness for work in a digital environment. The article adopts a classification of determinants of perceived readiness, which is further developed in the literature review. These determinants comprise four groups of factors:

1) Demographic factors (gender, age, level, and field of education).
2) Organizational characteristics of enterprises (workplace, enterprise size, and presence of foreign capital).
3) Work environment factors include:
   a) structural conditions of work performance (job position, professional experience, work system);
   b) supporting the digitalization process (degree of workplace digitalization, organization of internal IT-related training, access to ongoing IT support, and frequency of contact with IT specialists).
4) Educational factors related to modern information technologies include formal education and informal online education.

Professional experience was classified as a work environment characteristic, as it influences the scope of assigned tasks, organization of work, and level of employee autonomy in using information technologies at the workplace. The selection of determinants was based on an original survey questionnaire designed as a research tool with a broader scope of application. For this study, only questions directly related to the adopted research objective and formulated research questions were used. In particular, the analysis included questions from Section A (Respondent characteristics: A1–A10), questions C1 and C3–C5 from Section C (Digitalization of the accounting profession), and question B7 from Section B

(Accountants' knowledge). Other elements of the questionnaire were excluded from the analysis because they fell outside the publication's thematic scope. The identified determinants relate to digital competencies, professional development, and employees' functioning in the context of advancing digitalization. The adopted approach enables a coherent and focused examination of selected aspects of readiness to work in a digital environment, considering both individual resources and organizational and educational conditions.

The statistical analysis of the survey data employed logistic regression models (GLM), odds ratios, confirmatory factor analysis (CFA), structural equation modeling (SEM), and visualization. The results of this study extend the knowledge of the determinants shaping accountants' perceptions of their readiness to work in a digitalized environment. They highlight the complexity of the factors influencing this perception and emphasize the importance of the idea of lifelong learning in the context of the digitalization of the accounting profession.

This article consists of six sections. The Introduction introduces the topic of digitalization in accounting and its impact on accountants' work, presents the main research objective and questions, and classifies the determinants. The Literature review comprises four elements: the relationship between digitalization and accountants' competences; the theoretical framework of digital competences (Mulder's model); the presentation of determinants and perceived readiness to work in a digitalized environment; and the formulation of hypotheses and the components of digital competences. The Research Methods section describes the data used in the study and the analytical methods applied. The Results section presents the findings along with their interpretation, while the Discussion relates them to the existing literature, focusing on the determinants that significantly differentiate perceived readiness. The Conclusions section presents the main conclusions, practical implications, and recommendations, and outlines the limitations of the study.

LITERATURE REVIEW

Digitalization and accountants' competences

Digitalization is perceived as a key factor shaping the methods through which economic entities create value and gain competitive advantage (Kotarba, 2018). In the development strategies of accounting professionals, the implementation of modern digital technologies plays a particularly important role (Melnyk et al., 2020), as it enables greater efficiency while simultaneously reducing workload and errors. New technologies influence how accountants work and think, introducing significant changes in the profession's performance (Janvrin & Watson, 2017; Gulin et al., 2019). In response to these requirements, specialists in accounting departments are obliged to continuously upgrade their skills in digitalization and increasingly use advanced information technologies in their daily work (Borrego et al., 2020). This is largely made possible by automating internal corporate business and operational processes (Ribeiro et al., 2021).

Research on digitalization in the context of the accounting profession and accounting systems focuses on three main areas. The first area concerns the mechanisms of implementing new digital technologies in organizations and their impact on accountants' work (Granlund & Mouritsen, 2003; Lutfi et al., 2022). Vitali and Giuliani (2024) indicate that technologies such as Robotic Process Automation (RPA) and artificial intelligence (AI) are changing the daily operations of audit firms, generating new requirements for IT and analytical competencies, which younger employees most often possess. Simultaneously, these technologies deepen the competitive advantage of large firms over smaller entities. Studies on the digitalization of accounting systems analyze its impact on the organization and functioning of accounting within organizations (Bhimani & Willcocks, 2014; Hiebl & Mayrleitner, 2019; Zhang et al., 2020) and forecast future changes in the accounting profession (Herbert et al., 2016; Kokina & Davenport, 2017; Sheldon, 2018; Melnyk et al., 2020). The implementation of digitalization in financial and accounting systems has radically transformed accountants' work and continues to evolve, becoming increasingly dependent on modern technology (Awang et al., 2022).

The second area addresses perceptions of the opportunities and threats associated with the digitalization of the accounting profession, as well as the factors influencing these perceptions among current and future accountants (Awang et al., 2022). The work of accountants requires creativity, interpersonal interaction, and continuous professional development; therefore, it is unlikely to be fully automated in the near future. However, repetitive tasks that do not require high qualifications or interpersonal communication can be easily automated by AI. Awang et al. (2022) applied the Technology Acceptance Model (TAM), demonstrating that users' willingness to adopt new systems increases their engagement in learning and technological adaptation. In the TAM framework, two key factors determine technology acceptance: perceived ease of use and perceived usefulness. These findings confirm that accountants' attitudes toward

new technologies significantly influence the development of their digital competencies and their self-assessed readiness to work in a digitalized environment. Accounting information systems focus on processing, storing, and disseminating data and supporting managerial decision-making through modern hardware and software (Ratmono & Zuhrohtun, 2023; Laudon & Laudon, 2020; Sarwar et al., 2021). Empirical studies on accountants' digital competencies consider technological conditions, training needs, implementation challenges, and benefits such as automation and efficiency gains (Hasin et al., 2022). The literature also examines the impact of demographic variables on perceptions of digitalization and job satisfaction (Biyikli & Çetin, 2023; Grosu et al., 2023), levels of acceptance of new technologies (Awang et al., 2022; Steens et al., 2024), and preparedness to work in a digitalized environment (Santonastaso & Macchioni, 2022).

The third area focuses on identifying and assessing factors influencing accountants' behavioral intentions regarding technology acceptance, including expected performance, perceived ease of use, social influence, innovativeness, and discomfort (Mohd Faizal et al., 2022). Technological progress has transformed the role of accountants, generating new competence requirements, while the global digital revolution has reshaped the labor market (Al-Htaybat et al., 2018; Jackson et al., 2022, 2023). In this context, accountants' attitudes toward digitalization processes and their self-assessment of their readiness to work in a digitalized environment become particularly important.

Theoretical framework in the context of digital competences: Mulder's model

In light of these changes, not only accountants' acceptance of technology but also their level of digital competence, which determines their readiness to work in a digitalized environment, becomes crucial. To capture the competence dimension, it is appropriate to refer to Mulder's (2017) competence model, which describes the integrated nature of professional competences.

Competence theories have been developed since the 1970s (McClelland, 1973; Boyatzis, 1982; Spencer & Spencer, 1993) and subsequently evolved toward integrated and contextual approaches, leading to the contemporary understanding of competencies proposed by Mulder (2017). In this approach, competencies are holistic in nature and strongly embedded in professional and educational contexts (Eraut, 1994; Cheetham & Chivers, 1996). They encompass not only knowledge and skills but also attitudes, values, the ability to critically reflect, self-regulation, and lifelong learning (Mulder, 2016, 2017, 2019).

A key element of Mulder's approach is the assumption that competences develop through interaction between individual characteristics and the work and educational environment, and that their level and structure are determined by the requirements of a specific professional context (Mulder 2001, 2017). About professional competencies, including digital competencies, this implies the need to consider components such as contextuality, self-regulation, self-assessment, organizational frameworks, and the integrated nature of knowledge, skills, and attitudes (Mulder, 2016, 2017, 2019).

Mulder (2017) distinguishes three generations of competencies. Competences 1.0 are rooted in a behaviorist approach and focus on observable skills and task-specific activities. Competences 2.0 are integrated and include interconnected elements of knowledge, skills, and attitudes embedded in a specific professional context. Competences 3.0 refers to future-oriented forms of action, such as creativity, innovativeness, and the ability to cope with new and unpredictable tasks. This study adopts the Competences 2.0 perspective, which enables the analysis of digital competencies as an integrated potential of individuals functioning in a specific work environment.

From the perspective of the accounting profession, this concept is supported by Boritz and Carnaghan (2017), who analyze the education and professional certification of accountants in Canada and the United States. They argue that contemporary competence frameworks in accounting integrate expert knowledge, practical skills, and attitudes necessary to perform the profession in a changing work environment. Although they do not explicitly refer to Mulder's model, their approach to professional competencies is consistent with the integrated Competences 2.0 paradigm and may serve as a starting point for analyzing digital competencies.

Georgieva (2019), analyzing accountants' digital competences in the context of the Fourth Industrial Revolution, emphasizes that they cannot be limited solely to technical skills related to the operation of IT tools. Digital competencies simultaneously encompass specialized knowledge, practical skills in using information technologies, and attitudes that enable adaptation to a dynamically changing professional environment. The digitalization of accounting processes shifts the focus from routine tasks to activities that require the analysis, interpretation, and critical evaluation of data, underscoring the contextual and dynamic nature of digital competencies. Georgieva (2019) also highlights the contextual nature of digital competencies, noting that their scope and level vary across professional roles within accounting. Chief accountants are expected to have different digital competencies than operational accountants or employees responsible for document

recording. This differentiation supports the validity of conceptualizing digital competencies as a category embedded in a specific work context.

Van der Klink and Boon (2003) indicate that Mulder's model is useful for assessing workplace competences, particularly in the context of lifelong learning and adaptation to a changing technological environment. In the case of digital competencies, this model enables the capture of how technical knowledge, practical skills, and employee attitudes interact with work environment conditions, enabling the effective use of digital tools and continuous competence development in response to dynamic technological changes.

Adopting Mulder's Competences 2.0 model as the theoretical framework enables a comprehensive analysis of accountants' digital competencies, encompassing knowledge, skills, attitudes, and professional context. The model provides a foundation for diagnosing accountants' level of preparedness to work in a digitalized environment and the determinants influencing this preparedness.

Determinants and perceived readiness to work in a digitalized environment

Age

A review of the literature indicates that the development of digital competences within the population is uneven and strongly conditioned by demographic factors. Age is one of the most important predictors of differences in digital competences, which in turn shape perceived readiness to work in a digitalized environment.

Younger individuals typically demonstrate higher levels of technological proficiency and more frequently use online forms of learning (Helsper & Eynon, 2010; van Deursen & van Dijk, 2011). However, Helsper and Eynon (2010) question the universality of the "digital natives" hypothesis, according to which younger generations automatically possess higher digital competences. Research shows that age or generational affiliation constitutes only one of many factors influencing technological proficiency, while experience, frequency of internet use, level of education, and gender play a key role. The authors distinguish between "being" a digital native and "doing" digital activities, emphasizing that digital competences result more from activity and practice than from age alone. This suggests that intergenerational differences can be reduced within educational environments.

Research by Steens et al. (2024) among senior controllers in the Netherlands found that older professionals often possess technological competencies below those required at work. Although respondents were aware of the need to learn, they did not always accurately anticipate future competence requirements. Moreover, the greater their existing knowledge, the more strongly they expressed the need to further develop digital skills. In turn, Novelidhawaty et al. (2023) emphasize that developing technical skills among older employees requires support in digital tools, data security, and analytical competencies, while barriers to implementing new technologies may stem from resistance to change and organizational culture. These findings clearly indicate that older users require both education and practical support to fully exploit the potential of digitalization.

Van Deursen and van Dijk (2011) highlight that age is a significant predictor of digital competences, influencing both access to technology (the first digital divide) and levels of operational, informational, and strategic skills, which are often constrained by lack of experience and adaptive difficulties. This differentiation deepens the second digital divide, related to the quality, effectiveness, and efficiency of internet use, underscoring the important role of age not only in access but also in the quality of digital interactions.

Gender

Gender is an important predictor of digital competences, particularly influencing self-assessment of technological skills and confidence in using modern tools (Cooper, 2006). Women more often report lower self-assessments of their technological abilities and are less likely to engage in advanced digital activities, mainly due to socio-cultural factors such as stereotypes and prior experiences rather than biological predispositions. Education, practice, and support in learning how to use digital tools can effectively reduce these differences, increasing digital competencies regardless of gender. Gender may indirectly influence self-assessed digital competences and perceived readiness to work in a digitalized environment, although these differences can be mitigated through appropriate educational support and practical experience.

Awang et al. (2021) examined gender differences among students in terms of technological knowledge and readiness for the accounting profession in a digitalized environment. Their findings indicate that future accountants (Generation Z) exhibit similar levels of technological knowledge and readiness for digitalization regardless of gender, suggesting a gradual equalization of digital competencies among younger cohorts. Furthermore, Awang et al. (2022) investigated how "future accountants" perceive the digitalization of the profession as a developmental opportunity or as a risk. Their survey of accounting students and interns showed that respondents recognized both benefits (task automation, increased efficiency) and challenges (longer working hours, pressure of constant availability). Importantly, no statistically significant gender differences were observed in the assessment of benefits and threats, suggesting that gender does not determine young professionals' attitudes toward digitalization.

Studies by Santonastaso and Macchioni (2022) revealed gender- and region-based differences in Italian accountants' assessments of professional preparedness in the digital era. Men reported digital competences more frequently in their professional profiles than women, which may reflect women's lower self-assessment (Gorbacheva et al., 2016). Accountants from northern Italy were more likely to report digital competencies than those from central and southern regions, which may be linked to significant economic and technological disparities across Italian regions.

Lenard et al. (2010) examined self-assessed computer skills among participants (women and men) in an Accounting Information Systems (AIS) course. Among women, a significant increase in self-assessed skills was observed after completing the course, while no significant change was found among men. Women achieved higher average scores than men, and a strong correlation was identified between confidence in computer skills and self-assessed competence. The AIS course effectively built confidence and computer competencies, particularly among women, which may influence their career decisions. Positive self-perception and awareness of one's skills may encourage women to further develop careers in accounting and information systems.

Demographic differences in perceptions of digitalization are also confirmed by Biyikli and Çetin (2023). Age, gender, tenure, and professional title significantly influence assessments of the effects of digital transformation in the accounting profession. Age emerged as a particularly strong predictor, with similar trends observed for tenure – longer experience was associated with lower acceptance of digitalization. Gender differences were also noted, with women reporting higher levels of dissatisfaction with digitalization and technological tools than men. Professional title, partially reflecting education level and hierarchical position, was another important differentiating factor.

Education and professional experience

Level of education and professional experience are further determinants influencing digital competences, which condition readiness to work in a digitalized environment.

Research shows that individuals with higher education levels are more likely to engage in online self-learning and possess more advanced information-processing skills (Hargittai & Shafer, 2006). These authors demonstrate that actual internet skills are largely determined by education level and experience using computers at work. Individuals with higher education and regular exposure to technology performed better in tasks related to online navigation and information retrieval. At the same time, gender remains a significant predictor of perceived digital competences, as women tend to rate their skills lower than men, even when actual competence levels are comparable.

Professional experience in technology-intensive environments promotes competence development and positively affects self-assessed readiness to work in a digitalized environment (van Laar et al., 2017; Park, 2012). Fitria and Sari (2023) showed that employees' technical skills and professional experience significantly enhance the effectiveness of accounting information systems, whereas formal education does not moderate these relationships. These findings highlight the importance of practical training and professional experience as key determinants of preparedness for digital work. In contrast, Hinterhuber and Pavone (2020) identified a positive correlation between education level and digital maturity among accounting professionals, suggesting that educational predispositions strengthen readiness to adopt digital tools.

Job position

Job position is an important factor differentiating levels of digital competences within the accounting profession. Stoica and Ionescu-Feleagă (2021) note that the nature of one's role determines both the range of IT tools used and the degree of involvement in digitalization processes. Similar conclusions are drawn by Pargmann et al. (2023), who indicate

that as the level of professional responsibility increases, so does the demand for more advanced technological skills, particularly in highly digitalized organizations. Taib et al. (2023) further demonstrate that managers and higher-level employees exhibit significantly higher digital competencies than operational staff, due to both the nature of their tasks and access to specialized training. These results clearly indicate that job role constitutes an important determinant of variation in accountants' digital competences.

Workplace and organizational size

Workplace characteristics and organizational size are important determinants of accountants' digital competences, reflecting readiness to work in a digitalized environment. Stoica and Ionescu-Feleagă (2021) demonstrated that organizational size significantly differentiates the range of technologies used. Micro and small enterprises are typically limited to basic applications, whereas large organizations and capital groups implement advanced systems with high levels of automation. Pargmann et al. (2023) confirm that the degree of organizational digitalization directly affects the scope of required competences and the nature of the tasks performed. Competence differences arise primarily from the level of digitalization and the role performed within the organization.

Taib et al. (2023) observed that accounting firms and large enterprises have the highest expectations for employees' technological skills, making the work environment one of the most important factors in determining accountants' digital preparedness. Kotowska and Sikorska (2023) analyzed the impact of workplace characteristics on the development of accountants' digital competences, studying employees and owners of accounting firms. They found that organizational specificity – particularly in accounting firms intensively implementing technologies – significantly shapes both the scope of digital tool use and awareness of the need to enhance technological competencies. At the same time, competence gaps often become apparent precisely in the workplace, confirming its crucial role as a determinant of digital skill development.

Mohd Faizal et al. (2022) further indicate that willingness to engage in further digital training is largely determined by workplace expectations and beliefs about the importance of digital competences for effective job performance.

Foreign capital participation

The presence of foreign capital in an enterprise is an important factor influencing accountants' competencies and can be considered from the perspective of organizational training practices. Bloom et al. (2012) found that enterprises with foreign capital participation are more likely to implement advanced management practices, including activities that support employee competence development, particularly in the areas of information and digital technologies. This results from higher management standards and international requirements, which foster an organizational environment that actively promotes the development of digital competence. In the context of this study, this observation justifies including foreign capital participation as a factor differentiating the level of accounting employees' preparedness to work in a digitalized environment.

Training and perceived readiness to work in a digitalized environment

Research by Quraishi et al. (2025) indicates that the work environment and the level of organizational digitalization constitute an important context shaping the digital competences of accounting department employees. The authors also emphasize the importance of education and IT-related training, confirming the need to develop both formal and informal learning forms to effectively prepare employees for work in a digitalized environment. At the same time, the study identifies financial, technical, and competence-related barriers that may limit the effectiveness of digitalization, justifying the inclusion of determinants such as professional experience, organizational support, and training availability in the research model.

Pargmann et al. (2023) emphasize that the development of analytical and technological competences in the accounting profession is strongly linked to access to workplace training. Taib et al. (2023) show that managers and higher-level employees who participate in regular technology-related training achieve higher levels of digital competencies than operational staff, highlighting the important role of informal education and organizational support in adapting to digitalization. Hasin et al. (2022) stress that providing adequate training support is a key condition for the effective functioning of accountants in a digitalized environment. Access to modern digital tools must be complemented by training aimed at developing

technological competencies. In their view, developed frameworks of accountants' digital competences should serve as a basis for designing training programs and development activities aligned with digitalization requirements. Digitalization offers numerous opportunities to improve work processes, but simultaneously requires accountants to continuously upgrade their qualifications through technology-oriented training.

Degree of workplace digitalization and IT support as determinants of perceived readiness to work in a digitalized environment

The degree of workplace digitalization and access to IT support are key determinants of employees' perceived readiness to function in a digitalized environment. This readiness is understood as a set of predispositions enabling effective use of digital technologies and adaptation of new tools in the workplace, encompassing technological competences, attitudes toward technology, and the level of organizational support in the implementation for digital innovations (Abdul Hamid, 2022).

The degree of workplace digitalization, access to technical support, and opportunities for training and development of digital competence create a context that either facilitates or hinders technology adoption. An OECD report (2019) emphasizes that access to training and opportunities to develop digital competences directly influence perceived readiness to work in a digitalized environment.

Limited access to digital infrastructure, insufficient technical support, or inadequate training can significantly reduce the effectiveness of digital tools and negatively affect perceived readiness to use them. In contrast, regular contact with IT specialists fosters greater trust in technology and a greater willingness to use it in everyday work (Tarafdar et al., 2015). In this context, IT support functions as a factor reducing uncertainty and technological strain, thereby strengthening subjective readiness to function in a digitalized environment.

Safi et al. (2024) likewise confirm that a high degree of workplace digitalization and easy access to IT support foster greater comfort in using technology, enhance self-confidence, and increase readiness to undertake tasks in a digitalized environment. The development of employees' digital competences is a crucial factor in shaping digital work readiness, and possessing these skills is associated with higher perceived readiness to work in a digitalized environment (Suhada et al., 2026). Both individual competences and attitudes toward technology, as well as organizational conditions – including access to infrastructure, technical support, and training – constitute key determinants of perceived readiness to work in a digitalized environment.

Hypotheses and the structure of digital competence components indicating readiness to work in a digitalized environment

The literature review indicates that the development of digital competences largely depends on individuals' personal characteristics, their professional and educational experiences, and organizational conditions. Accordingly, the analysis focused on determinants of perceived readiness to work in a digitalized environment, encompassing demographic factors, enterprise organizational characteristics, work environment factors, and educational factors.

Research hypotheses were formulated to examine the effects of selected demographic factors, organizational characteristics of enterprises, work environment factors, and educational factors on the perceived readiness of accounting department employees to work in a digitalized environment:

H1: Respondents' gender and organizational characteristics of enterprises (enterprise size and the presence of foreign capital) are significantly associated with the level of perceived readiness to work in a digitalized environment.
H2: The intensity of using informal online education sources related to modern information technologies is significantly associated with the level of perceived readiness to work in a digitalized environment, while accounting for respondents.
H3: Respondents' gender and work environment factors supporting the digitalization process (degree of workplace digitalization and frequency of contact with IT specialists) are significantly associated with perceived readiness to work in a digitalized environment.

The formulated hypotheses assume the existence of relationships between selected factors and the level of perceived readiness to work in a digitalized environment. Hypothesis H1 addresses the direct impact of selected demographic and organizational enterprise characteristics on self-assessed readiness. Hypothesis H2 incorporates an educational factor in the form of informal online education in modern information technologies, analyzed as an additional explanatory construct associated with perceived readiness to work in a digitalized environment, while accounting for respondents'

gender and work environment factors supporting the digitalization process. Hypothesis H3 focuses on the direct impact of gender and work environment factors supporting digitalization on perceived readiness to work in a digitalized environment. In this hypothesis, the role of informal online education is considered an accompanying factor that reflects individual engagement in acquiring digital knowledge and skills.

Although the same work environment factors supporting digitalization are included in both hypotheses H2 and H3, these hypotheses refer to different analytical perspectives. Hypothesis H2 emphasizes the role of informal online education in explaining perceived readiness to work in a digitalized environment, whereas Hypothesis H3 concentrates on the direct relationships between work environment factors and perceived readiness. Including these variables in both hypotheses enables a more comprehensive interpretation of the relationships between individual characteristics, workplace conditions, and readiness to function in a digitalized work environment.

Different sets of determinants are included in hypotheses H1–H3 because each hypothesis focuses on a distinct aspect of digital competences influencing perceived readiness to work in a digitalized environment. Within the hypotheses, three complementary components of digital competences are analyzed:

1) Technical component – encompassing practical skills in using modern information technologies in professional work. It is operationalized through self-assessed readiness to work in a digitalized environment and constitutes the component analyzed in all hypotheses H1–H3.
2) Educational component – encompassing modes of acquiring technological knowledge through informal online education (Hypothesis H2).
3) Organizational component – related to enterprise characteristics (Hypothesis H1) and work environment conditions supporting the digitalization process (Hypotheses H2 and H3).

The digital competence components distinguished in the study are consistent with the competence framework proposed in Mulder's model, which conceptualizes competences as an integrated set of skills, knowledge, and organizational and contextual conditions manifested in professional practice. The components adopted in this study constitute a selective operationalization of this model, focusing on technical, educational, and organizational aspects that are particularly relevant to work in a digitalized environment.

This triad of components enables a comprehensive assessment of technical skills, modes of developing technological knowledge, and organizational conditions influencing the use of technology. Such an approach allows for simultaneous examination of the effects of informal online education in modern information technologies and the work environment on accountants' self-assessed readiness to work, representing a significant and novel contribution to the analysis of digital competences among accounting department employees operating in a digitalized environment.

RESEARCH METHODS

Empirical data were collected using an original survey questionnaire (Appendix B). The questionnaires were addressed to accountants (members) of the Association of Accountants in Poland from regional branches in Kraków, Katowice, and Wrocław, as well as to participants and graduates of Executive MBA programs at the Wrocław University of Economics, the University of Warsaw, SGH Warsaw School of Economics, Gdańsk University of Technology, and the Poznań University of Economics and Business. The survey was conducted in two stages: October 2023 and March 2024.

The questionnaire entitled "Sustainable development of accountants in the areas of knowledge – digitalization – ethics" consists of the following sections: (A) respondent characteristics, (B) knowledge of the accountant/manager, (C) digitalization of the accounting/managerial profession, and (D) ethics of the accounting/managerial profession. Section D of the questionnaire was excluded from the analysis because the ethics topic falls outside the scope of this article.

A non-random, non-representative research sample was selected through accidental (convenience) sampling (Szreder, 2004), and the conclusions drawn from the study apply only to the surveyed respondents. Empirical data were collected using an online questionnaire administered via a web-based form. A total of 333 questionnaires were collected, of which 332 were included in further analysis. Some of the questionnaires contained missing data. Missing responses to selected questions were addressed using statistical data imputation.

Multivariate imputation by chained equations (MICE) was applied. This method is an iterative algorithm based on a chain (sequence) of regression equations, in which each step corresponds to a subsequent variable (van Buuren, 2018).

The MICE algorithm predicts missing values (estimates their probabilities) based on observed values of multiple variables using a range of regression models. To assess the quality of the multiple imputation performed in the study, the following measures were used: RIV – Relative Increase in Variance (values close to 0 indicate a small impact of missing data on estimation uncertainty), FMI – Fraction of Missing Information (values below 0.20 indicate very good imputation quality), and RE – Relative Efficiency (values above 0.95 indicate efficient imputation) (Rubin, 1987; van Buuren, 2018). The values of all measures indicate very good quality in missing-data imputation across all four sections of the questionnaire. For sections A and C, from which the questions used in this article were drawn, the values were as follows: A – RIV = 0.03, FMI = 0.03, RE = 0.99; C – RIV = 0.17, FMI = 0.14, RE = 0.97.

The statistical analysis of the survey data employed logistic regression models (GLM), odds ratios (OR), confirmatory factor analysis (CFA), structural equation modeling (SEM), and visualization methods. All analyses were conducted using the R software environment and the following packages: epade, DescTools, lmtest, caret, questionr, finalfit, MASS, sjPlot, vcd, vreg, lavaan, and psych (R Development Core Team, 2026; Aitkin et al., 2009; Fox, 2002; Rosseel, 2012).

Logistic regression was used to analyze binomial data (Agresti, 2002; Long, 1997; Cameron & Trivedi, 2005). Such data often include binary variables when the dependent variable takes one of two values (e.g., yes/no responses in a questionnaire). The logistic regression model takes the form $f(x) = \frac{e^x}{1+e^x}$.

This model allows estimating the probability p_i of selecting one of the two options (yes/no) depending on the value of the explanatory variable x (or explanatory variables), based on the formula:

$$p_i = \frac{exp(\beta_0+\beta_1 x_i)}{1+exp(\beta_0+\beta_1 x_i)}, \text{ where } 0 < p_i < 1$$

To estimate the parameters β of the logistic regression model, the concept of Generalized Linear Models (GLM), proposed in the article by Nelder & Wedderburn (1972) and developed in the monograph by McCullagh & Nelder (1989), was applied. Generalized linear models, in which the dependent variable follows a distribution other than normal (e.g., binomial), are estimated using maximum likelihood and iterative optimization algorithms (appropriate R functions are available for these purposes).

When interpreting the logistic regression model, the sign of the parameter $(+\beta \text{ or } -\beta)$ indicates the direction of influence of the explanatory variable on the dependent variable in terms of probability. The assessment of the impact of explanatory variables is also performed using odds ratios. The expression $\Omega = \frac{\pi}{1-\pi}$ describes the odds of an event occurring with π probability (how many times an event occurs relative to not occurring). The odds ratio (OR = Θ) compares two odds: $\Theta = \frac{\Omega_1}{\Omega_2} = \frac{\pi_1/(1-\pi_1)}{\pi_2/(1-\pi_2)}$ (Agresti, 2002, p. 44). The values of the odds ratios are computed based on the exponential expression e^{β}, where β is the estimated parameter. If the value of an explanatory variable increases by one unit, the odds of the dependent variable taking the value of 1 change (increase or decrease) by the factor of . The interpretation is as follows:

- if $e^{\beta} > 1$, the influence on choosing "yes" is positive (an increase in odds);
- if $e^{\beta} < 1$, the influence is negative (a decrease in odds);
- if $e^{\beta} = 1$, the influence is neutral (odds unchanged).

The dependencies between variables in the logistic regression model are more easily interpreted using advanced visualization techniques. In this article, the visreg() function from the visreg package was used (Breheny & Burchett, 2017).

Structural Equation Modeling (SEM) is an advanced statistical method used to analyze the relationships between observed and latent variables, as well as the dependencies among latent variables (Bollen, 1989; Hair et al., 2019; Jöreskog et al., 2016). SEM consists of two components: the measurement model and the structural model. A common preliminary step before estimating SEM models is conducting the Exploratory Factor Analysis (EFA). Its aim is to uncover the underlying structure of factors without imposing theoretical assumptions. EFA allows for dimensionality reduction and the identification of the groups of variables that measure common constructs. The measurement model in EFA can be expressed as: x=Λf+ϵ, where denotes the vector of observed variables (indicators), Λ – the matrix of factor loadings, f – the vector of latent factors, and – error terms. Based on EFA results, Confirmatory Factor Analysis (CFA) is conducted to test whether the adopted factor structure (e.g., based on EFA) fits the empirical data. In CFA, the number of factors and the assignment of indicators to factors are predetermined. The CFA measurement model is expressed as: x=Λη+ϵ, where η denotes the latent factor vector. Structural Equation Modeling (SEM) extends CFA by incorporating a structural model

that describes the dependencies among latent variables and predictors (both latent and observed). The structural model is expressed as: $\eta=B\eta+\Gamma\xi+\zeta$ where η represents the latent dependent variables, ξ – latent (or observed) explanatory variables, B – the matrix of relations among latent variables, Γ– the matrix of predictor effects, and ζ – error terms. SEM enables simultaneous modeling of measurement errors, relationships among constructs, and the influence of predictors on latent constructs.

RESULTS

The survey data analysis included 332 respondents, whose characteristics are presented in Table A1 (Appendix A) and the codebook of variables used in the analysis is presented in Table A2 (Appendix A). Women predominate in the sample, accounting for 254 respondents (77%). The respondents represent a diverse age structure, classified into four age groups corresponding to the generations to which they belong: Baby Boomers (up to 1964), Generation X (1965–1980), Generation Y – Millennials (1981–1994), and Generation Z (after 1995). The most numerous groups in the study are Generation Y (41%) and Generation X (35%), which are characterized, inter alia, by a high level of knowledge, experience, and professional competencies, as well as an awareness of the need for continuous learning in the accounting profession.

As many as 96% of respondents hold a higher education degree, including 75% with a master's degree, 12% with a bachelor's degree, and 6% with a doctoral degree or higher. The results concerning generational affiliation and type of education are consistent with the characteristic features of these generations – for example, master's degrees are predominantly represented among Generations X and Y, while bachelor's degrees are more typical of Generation Z. The vast majority of respondents (78%) identified their field of education as economics.

The most frequently held job positions among respondents are accountant (62%) and financial/accounting (controlling) manager (19%). Accountants constitute the dominant professional group in the sample; therefore, subsequent conclusions and analyses focus primarily on this group. Respondents were also asked about their workplace. The largest share (44%) are employees of enterprises, while 27% work in accounting firms. Professional experience varied across respondents: 40% reported 0-10 years, 29% reported 11–20 years, and 21% reported 21–30 years.

The COVID-19 pandemic led to the introduction of remote work arrangements, which continue to be applied in various forms of employment. As their preferred work system, 51% of respondents indicated a hybrid model combining on-site and remote work, while 41% preferred exclusively on-site work. The sizes of the enterprises in which respondents are employed are diverse. A substantial group is represented by other entities (medium-sized and large enterprises), accounting for 34%, while micro and small enterprises together account for 42%. A total of 67% of respondents declared that they work in enterprises without foreign capital participation.

Given the size and sampling method of the study, the results should be interpreted solely as about the surveyed group and should not be generalized to the entire population of accounting department employees in Poland. At the same time, the sample's structure, consisting of individuals actively engaged in the profession, provides valuable insights into practitioners' perceptions and attitudes toward the digitalization of the work environment and the use of formal and informal education in digital competencies.

The respondents are individuals employed in financial and accounting departments who perform professions that require lifelong learning and preparedness to work in a digitalized environment. Some of them have used several forms of education which, at different stages of their professional development, contributed to increasing their knowledge and skills, i.e., their intellectual capital. Among the most popular forms of formal education, respondents indicated courses and training organized by the Association of Accountants in Poland (220 responses), courses and training provided by commercial entities (188 responses), postgraduate studies in accounting (119 responses), and ACCA (Association of Chartered Certified Accountants) programs (68 responses). MBA (Master of Business Administration), CIMA (Chartered Institute of Management Accountants), and IMA (Institute of Management Accountants) programs were selected much less frequently, which may be explained by the high proportion of accountants among the respondents.

The main reasons (multiple responses were allowed) that motivated respondents to undertake formal education in the indicated forms were: expanding and supplementing theoretical and practical knowledge (281 responses), increasing knowledge, skills, and competences (so-called intellectual capital) (274 responses), and efforts to achieve professional advancement (106 responses). Less frequently, respondents indicated the following motivations: the need to learn modern methods, tools, and software applicable to professional practice (96 responses), achieving prestige and recognition in the professional community (72 responses), and mandatory training requirements (30 responses).

In response to question B3 – "Did the education undertaken in the selected form meet your expectations to a satisfactory degree?" – as many as 87% of respondents answered "yes," positively evaluating their experience with the selected form of formal education. Respondents stated that their expectations had been met to a satisfactory extent. Moreover, 82.2% of respondents declared that they are well prepared to work in a digitalized environment, which may result from their engagement in lifelong learning, for example, through courses and training. It is also worth emphasizing that 79.5% of respondents confirmed the need to upgrade qualifications in modern technologies, while simultaneously stating that education related to their application should be mandatory.

Responses to question B4 – "Does the educational offer you use include topics related to the application of modern information technologies?" – were almost evenly distributed (48.5% "yes" and 51.5% "no"), which reflects respondents' use of various forms of education with curricula differing in thematic scope. It can be inferred that formal education offerings (e.g., courses and external training) related to modern information technologies prepare slightly less than half of respondents (48.5%) to work in a digitalized environment.

Education in modern information technologies was included in the survey questionnaire as a factor shaping respondents' digital competences, encompassing both formal education and informal online education. Formal education was subjected only to descriptive analysis, as it did not show statistical significance in preliminary analyses, whereas informal online education was included in further modeling and subjected to statistical verification.

To identify factors differentiating perceived readiness to work in a digitalized environment (dependent variable C2, responses: yes/no), a logistic regression model was estimated using the generalized linear model (GLM) framework with a logit link function. The model allows for assessing the impact of selected demographic and organizational characteristics (predictors) on the probability of providing a positive ("yes") response to question C2.

The dependent variable C2 – "Are you well prepared to work in a digitalized environment?" – is a dichotomous variable (1 – yes, 0 – no). Given the binary nature of the dependent variable, a binomial distribution was used. Three explanatory variables were included in the model (one demographic variable and two organizational variables related to the enterprise):

- A1 – Gender of the respondent. Dichotomous demographic variable (1–reference category: women; 2–comparison category: men);
- A9 – Enterprise size. Polytomous organizational variable (reference category: 1–micro-enterprises; comparison categories: 2–small enterprises, 3–other enterprises, 4–capital groups);
- A10 – Foreign capital participation. Dichotomous organizational variable (reference category: 1 – yes; comparison category: 2–no).

Other demographic variables (age, education) and organizational enterprise variables (workplace) were not included in the GLM modeling because they were not statistically significant. Reference levels were selected so that the regression coefficients could be interpreted as differences relative to the most typical response options. Table 1 presents the results of the logistic regression model estimation, while Figures 1 and 2 illustrate the odds ratios and regression relationships between variable C2 and variables A1, A9, and A10.

The analysis of the model estimation results indicates that the explanatory variables (A1, A9, A10) are statistically significant and differentiate the probability of a positive response to question C2. For variable A9 (due to having three degrees of freedom), a Wald test was conducted ($F = 5.93$, $p = 0.003$), confirming the statistical significance of this categorical variable.

The model as a whole significantly improves the fit to the data compared with the null model, as confirmed by goodness-of-fit tests and information criteria (AIC).

Table 1. Logistic regression model and odds ratios (C2 – explained variable)

Variable	Coefficient	Std. error	z-value	p-value	Odds ratio
(Intercept)	3.015	0.566	5.327	0	–
A1 [2]	1.038	0.435	2.387	0.017	2.823
A9 [2]	–1.257	0.470	–2.675	0.007	0.285
A9 [3]	–0.834	0.461	–1.808	0.071	0.434
A9 [4]	–1.276	0.575	–2.218	0.027	0.279
A10 [2]	–1.090	0.425	–2.567	0.010	0.336

Note: Model fit assessment: McFadden pseudo-$R^2 = 0.06$ (moderately good fit of the logistic regression model), likelihood ratio chi-square $G^2 = 20.06$ with df = 5 and $p < 0.001$ (the model with predictors is significantly better than the null model), AIC = 302.62.

Variable A1 (gender) is statistically significant. Gender differentiates the probability of a positive self-assessment of readiness to work in a digitalized environment. Compared with women, men are significantly more likely to declare readiness to work in a digitalized environment (OR ≈ 2.8, $p < 0.05$).

Variable A9 (enterprise size) shows significant differences across categories of enterprise size (micro, small, other, capital group). Enterprise size significantly differentiates readiness to work in a digitalized environment. In particular, employees of small enterprises (OR ≈ 0.28, $p < 0.05$) and capital groups (OR ≈ 0.28, $p < 0.05$) are significantly less likely to declare such readiness than employees of large enterprises. The effect of the "other enterprises" category is also negative with respect to responses to question C2, but the effect is weaker and at the margin of statistical significance (OR ≈ 0.43, $p \approx 0.07$).

Variable A10 (foreign capital participation) is statistically significant. The presence of foreign capital is associated with a significantly different level of declared readiness to work in a digitalized environment. Respondents employed in enterprises without foreign capital participation (OR ≈ 0.34, $p < 0.05$) report lower readiness to work in a digitalized environment than those employed in enterprises with foreign capital participation.

Figure 1 presents the odds ratios with 95% confidence intervals estimated from the logistic regression model predicting readiness to work in a digitalized environment (C2). Odds ratios greater than one indicate an increase in the probability of a positive self-assessment relative to the reference category, whereas odds ratios below one indicate a decrease in this probability. The vertical reference line at OR = 1 indicates no effect.

Regarding variable A1, men have approximately 2.8 times the odds of declaring readiness to work in a digitalized environment than women. The analysis of variable A9 indicates that, compared with the reference category (micro-enterprises), the odds of a positive self-assessment of readiness to work in a digitalized environment are lower for small and other enterprises as well as for capital groups. For variable A10, the absence of foreign capital reduces the odds of a positive response to question C2 compared with enterprises with foreign capital participation (the reference category).

Figure 2 presents the predicted probability of a positive response to the question assessing readiness to work in a digitalized environment (C2), estimated using the logistic regression model. The panels illustrate the effects of gender (A1), enterprise size (A9), and foreign capital participation (A10), with predicted values shown on the probability scale. The left panel shows that male respondents have a higher predicted probability of being ready to work in a digitalized environment than female respondents. This pattern is consistent with the positive and statistically significant gender coefficient observed in the logistic regression model. The middle panel shows substantial variation in predicted probabilities across different enterprise size categories. Compared with the reference category, employees in small and other enterprises (including large enterprises) and in capital groups display lower predicted probabilities of a positive self-assessment, indicating that enterprise size is an important contextual factor influencing perceived digital readiness. Not all enterprise size categories differ significantly from the reference level, suggesting a non-linear relationship between enterprise size and perceived readiness. The right panel shows that respondents employed in enterprises without foreign capital participation exhibit a lower predicted probability of being ready to work in a digitalized environment than those employed in enterprises with foreign capital participation.

Figures 1 and 2 are complementary from an interpretative perspective. The odds ratios (Figure 1) indicate how many times the odds of a positive response to question C2 change relative to the reference levels of predictors A1, A9, and A10, whereas the predicted probability plots (Figure 2) show the magnitude of change in the predicted probability of a positive self-assessment of readiness to work in a digitalized environment across the predictor categories.

The results of the logistic regression model estimation (Table 1) and the visualizations (Figures 1 and 2) support Hypothesis H1, as they indicate that gender, enterprise size, and foreign capital participation significantly differentiate the level of perceived readiness to work in a digitalized environment. The highest probability of a positive self-assessment is observed among men employed in other enterprises (including large enterprises) with foreign capital participation, which may reflect greater access to technological resources, training, and a more advanced digital environment.

The specific nature of respondents' professions requires familiarity with current legal regulations and the appropriate use of instruments. To meet these requirements, respondents engage in lifelong learning and, in addition to organized forms of education, use other sources to acquire up-to-date, practical knowledge in preparation for work in a digitalized environment. These sources are selected individually based on their capabilities and needs. Respondents answered question B7 – "For the purpose of acquiring up-to-date knowledge (including practical knowledge), which forms do you use?" – using a four-point Likert scale (forced-choice scale) (Table 2). The results confirm that respondents very often or often use online publications and online training.

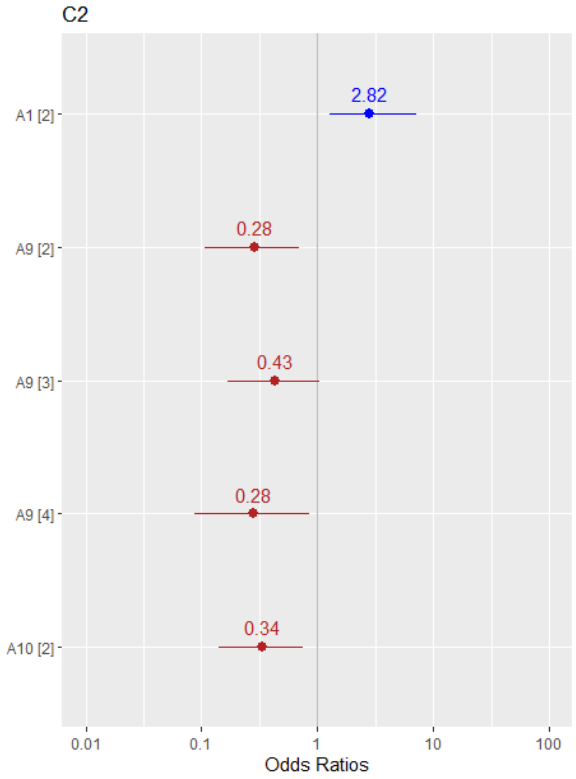


Figure 1. Odds ratios for predictors A1, A9, A10 of perceived readiness to work in a digitalized environment (C2)

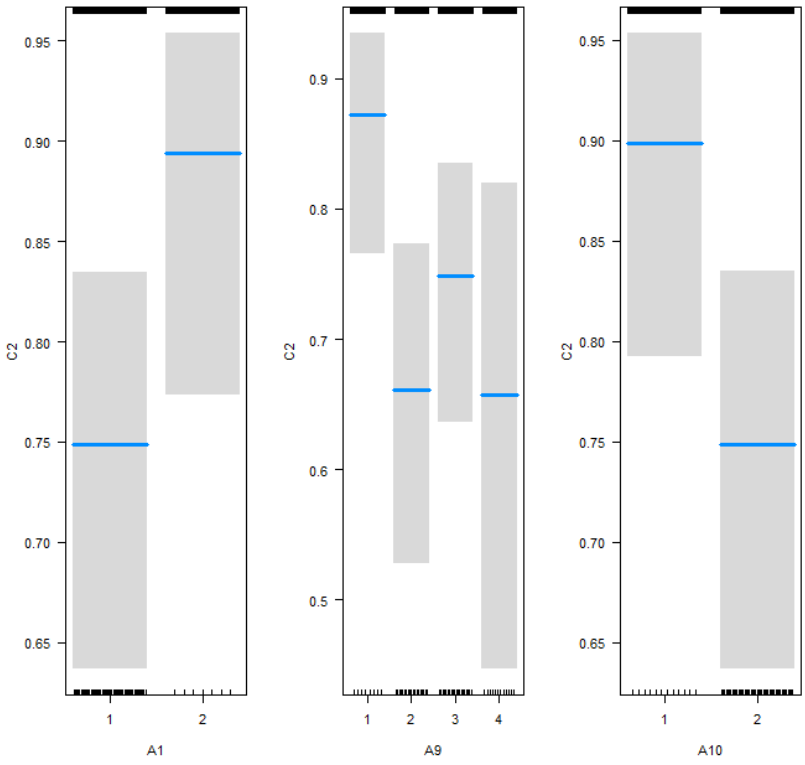


Figure 2. Predicted probabilities of a positive self-assessment of readiness to work in a digitalized environment (C2) by gender (A1), firm size (A9), and foreign capital participation (A10)

Table 2. Responses to Question B7

Options in question B7	Online forms of acquiring up-to-date (practical) knowledge	Very often	Often	Rarely	Never
B7_1	Social media, including: WhatsApp, Messenger, Facebook, LinkedIn	74	103	88	67
B7_2	Online publications	148	161	21	2
B7_3	Webinars	105	112	93	22
B7_4	E-learning	66	105	112	49
B7_5	Online training	115	138	65	14
B7_6	Media broadcasts	32	120	121	59
B7_7	Emails and chats with acquaintances	48	90	129	65
B7_8	Audio or audio/video communication tools (e.g., Skype, ClickMeeting, Zoom, Microsoft Teams)	69	114	102	47
B7_9	File-sharing platforms (e.g., Google Drive, OneDrive)	34	70	130	98
B7_10	Virtual whiteboard	3	19	90	220

To simultaneously account for relationships between observed variables and the latent variable describing the intensity of using informal online education in modern information technologies, structural equation modeling (SEM) was applied. This method enables the concurrent estimation of a measurement model, specifying the relationships between scale indicators and the latent construct, and a structural model, describing the effects of demographic and work environment variables on perceived readiness to work in a digitalized environment.

In this study, the latent variable (B7K) was operationalized using Likert-scale items measuring the frequency of use of informal online educational forms (Table 2, items B7_1–B7_10) and subsequently used as a predictor in the structural model. Estimation was conducted using the WLSMV estimator, which is appropriate for dichotomous and ordinal data, allowing for reliable parameter estimates and model fit indices. The model was estimated based on polychoric correlations (for Likert-scale items) and tetrachoric correlations (for binary variables).

In the first stage of the analysis, the measurement model was estimated using confirmatory factor analysis (CFA) to verify the unidimensionality of the latent variable describing the intensity of informal online education in modern information technologies (B7K). The latent construct was initially operationalized using ten four-point Likert-scale items (B7_1–B7_10). An analysis of standardized factor loadings (Table 3) indicated that item B7_1 exhibited a low loading (Std.all < 0.40), suggesting a weak association with the underlying construct (B7K). Consequently, this item was removed from further analyses, and the final measurement model included nine items (B7_2–B7_10).

In the subsequent stage, the structural model (SEM) was estimated, in which the latent variable B7K was included as a predictor of perceived readiness to work in a digitalized environment (C2), alongside selected demographic and work environment variables: gender (A1), degree of workplace digitalization (C1), and frequency of contact with IT specialists (C5). Other demographic variables (age, education) and work environment variables (job position, professional experience, work system, organization of internal training, and access to ongoing IT support) were not included in the SEM modeling because they were not statistically significant. The results of the structural model estimation after removing indicator B7_1 from the measurement model are presented in Table 4 and Figure 3.

Table 3. Standardized factor loadings and indicator evaluation for the latent variable B7K in the measurement model (CFA)

Indicator (options in question B7)	Estimate	Std. Err	z-value	p-value	Standardized loading (Std. all)	Evaluation
B7_1	1.000	–	–	–	0.240	weak – excluded
B7_2	1.737	0.432	4.020	0.000	0.436	acceptable
B7_3	2.932	0.699	4.191	0.000	0.736	very good
B7_4	3.074	0.731	4.206	0.000	0.772	very good
B7_5	2.868	0.711	4.035	0.000	0.720	very good
B7_6	2.487	0.614	4.051	0.000	0.624	good
B7_7	2.149	0.485	4.426	0.000	0.539	acceptable
B7_8	2.641	0.633	4.171	0.000	0.663	good

Indicator (options in question B7)	Estimate	Std. Err	z-value	p-value	Standardized loading (Std. all)	Evaluation
B7_9	2.518	0.585	4.303	0.000	0.632	good
B7_10	2.571	0.629	4.085	0.000	0.645	good

Note: Standardized factor loadings (Std.all) are reported. Loadings ≥ .70 were interpreted as very good, 0.50–0.69 as good, 0.40–0.49 as acceptable, and < .40 as weak. Indicator B7_1 was excluded from further analyses due to a weak loading.

Table 4. Predictors of perceived readiness to work in a digitalized environment (C2) – structural model (SEM)

Predictor	Estimate	Std. Error	z-value	p-value	Std. all
B7K (latent variable)	0.456	0.195	0.019	0.019	0.174
A1 (gender)	0.431	0.215	2.003	0.045	0.163
C1 (digitalized workplace)	–1.815	0.324	–5.607	0.000	–0.375
C5 (contact with IT specialist)	0.523	0.215	2.433	0.015	0.219

Note: Estimates after excluding indicator B7_1.

The overall model fit was assessed using standard fit indices (CFI, TLI, RMSEA, SRMR), the values of which are reported in Table 5. The obtained indices indicate an acceptable fit of the model to the data, and the model meets the criteria recommended for SEM analyses with ordinal data estimated using the WLSMV method.

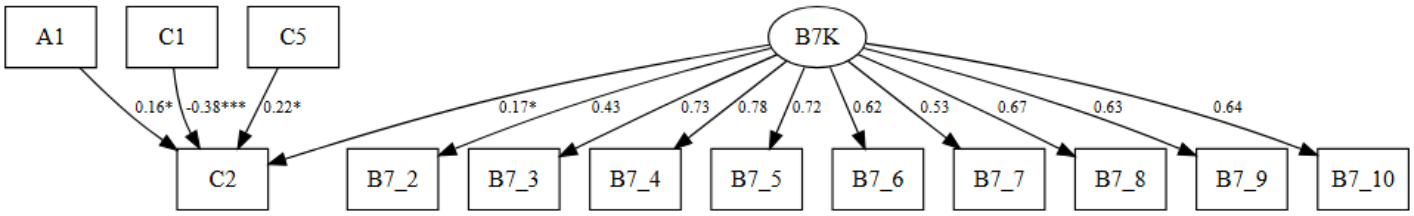
Table 5. Assessment of SEM model fit

Indicator	Indicator value	Criterion	Assessment
χ^2 (df)	χ^2 (62) = 218.57, p < .001	p > 0.05 (rare with large N)	acceptable
CFI	0.944	≥ 0.95 very good; ≥ 0.90 acceptable	good
TLI	0.959	≥ 0.95 very good; ≥ 0.90 acceptable	very good
RMSEA	0.087	≤ 0.05 very good; ≤ 0.08 good	acceptable
SRMR	0.084	≤ 0.05 very good; ≤ 0.08 good	acceptable

The obtained fit indices indicate an acceptable fit of the model to the data. Despite the statistically significant chi-square test, which is typical of models estimated from large samples, the CFI and TLI values were good. The RMSEA and SRMR indices are at the threshold of acceptability, suggesting a moderate yet permissible model fit. Overall, the results confirm the correctness of both the measurement and structural model specifications.

The results of the structural model estimation indicate that self-assessed preparedness to work in a digitalized environment (C2) is shaped primarily by work environment factors, such as the degree of workplace digitalization (C1) and the frequency of contact with IT specialists (C5). The intensity of informal online education (B7K) plays a significant supportive role, while gender (A1) differentiates the level of declared readiness to a moderate extent. Taken together, these findings confirm that the development of readiness to work in a digitalized environment is a multidimensional process that combines work environment conditions with individual learning strategies.

Figure 3 presents the structural equation model, including the measurement model for the latent variable B7K and the structural paths predicting perceived readiness to work in a digitalized environment (C2). Standardized SEM regression coefficients are reported. The model illustrates the direct effects of selected work environment variables (C1 and C5), the demographic variable (A1), and the latent construct representing informal knowledge acquisition (B7K) on perceived readiness to work in a digitalized environment (C2). Although the initial conceptual framework assumed a mediating role of informal online education (B7K), the estimated indirect effects were not statistically significant, and their confidence intervals included zero. Therefore, the mediating mechanism was not empirically supported.



Note: Standardized estimates are shown after excluding indicator B7_1. Asterisks denote statistically significant regression paths ($p < 0.05$).

Figure 3. Structural equation model of perceived readiness to work in a digitalized environment

The latent variable B7K, reflecting the intensity of informal online education in the field of information technologies, shows a statistically significant, positive effect on self-assessed preparedness to work in a digitalized environment (C2). This means that individuals who more frequently use various online knowledge sources – such as online publications, webinars, e-learning, online training, media content, emails and chats, online communication tools, file-sharing platforms, and virtual whiteboards – are more likely to report a higher level of readiness to function in a digitalized environment. Although this effect is moderate, it remains statistically significant after controlling for work environment factors supporting the digitalization process and demographic characteristics, indicating that self-directed and informal learning play a genuine supporting role in the development of digital competences. Among online knowledge sources, respondents most frequently use e-learning (0.78), webinars (0.73), and online training (0.72).

Respondent gender (A1) differentiates the level of declared readiness to work in a digitalized environment. The positive regression coefficient indicates that one gender group (according to the adopted coding, men) more frequently declares a higher level of preparedness. This effect is moderate in magnitude but remains significant even after accounting for work environment factors supporting the digitalization process and the use of informal online education. This result may reflect differences in professional experience, the scope of tasks performed, or exposure to information technologies, without implying actual differences in competencies. However, the effect of gender on perceived readiness to work in a digitalized environment is attenuated after including informal knowledge acquisition (B7K – intensity of using online knowledge sources) and work environment factors supporting digitalization in the model. This indicates that part of the differences between women and men in declared readiness results from differences in the use of online knowledge resources and work environment conditions, rather than from gender alone.

The variable describing the "degree of workplace digitalization" (C1) exhibits the strongest effect among all analyzed predictors. The direction and magnitude of the effect indicate that everyday work contact with information technologies significantly shapes the sense of readiness to work in a digital environment. In practical terms, this means that respondents employed in positions that intensively use IT tools are more likely to report a high level of self-assessed preparedness, regardless of gender or type of further education. This finding confirms the key importance of "learning by doing" in the development of digital competences.

The "frequency of contact with IT specialists" (C5) has a significant and positive effect on perceived readiness to work in a digitalized environment. This suggests that ongoing technical support and the possibility of consulting with IT experts increase the sense of security and competence in using information technologies. This effect highlights the role of technological support as a factor strengthening the subjective assessment of preparedness to work in a digitalized environment, complementing the effect of the degree of workplace digitalization itself.

To analyze relationships among demographic factors, enterprise organizational characteristics, work environment factors, and educational factors, and perceived readiness to work in a digitalized environment, two complementary models were applied: logistic regression (GLM) and structural equation modeling (SEM). The logistic regression model (GLM) was used to test the direct relationships between selected respondent characteristics (A1, A9, A10) and the binary dependent variable (C2), reflecting respondents' self-assessment of their preparedness to work in a digitalized environment. Structural equation modeling (SEM) was employed to test theoretical assumptions. In the SEM framework, the latent variable B7K represents the intensity of using informal online sources to acquire up-to-date knowledge, while variables A1, C1, and C5 represent demographic and work environment factors that support the digitalization process and influence responses to question C2.

The logistic regression model (GLM) and structural equation modeling (SEM) applied in this study do not compete with one another but rather address different levels of hypothesis verification. The GLM identifies direct differences in

the probability of declaring readiness to work in a digitalized environment, answering the question of which respondent groups are more likely to report a positive self-assessment of preparedness. In contrast, the SEM explains the structure of these relationships by reconstructing the links between demographic and work environment factors supporting digitalization and perceived readiness to work in a digitalized environment, while accounting for the latent variable B7K, which represents the intensity of use of informal online sources of up-to-date knowledge. Thus, the results of both approaches are complementary: logistic regression indicates that "who" is more frequently the one who declares readiness to work in a digitalized environment, whereas structural equation modeling explains "why" and in what organizational and cognitive contexts this readiness develops, highlighting the role of the intensity of use of online knowledge sources.

Below, the results of the verification of hypotheses H1–H3 regarding the determinants of perceived readiness to work in a digitalized environment are presented using GLM and SEM models. Both the direct effects of demographic, organizational, and work environment factors and the indirect effects of informal online education were analyzed. A detailed summary of the results of hypothesis testing for H1–H3 is provided in Table 6.

Table 6. Verification of hypotheses H1–H3 using GLM and SEM models (C2 – dependent variable)

Hypothesis	Model	Predictor	Effect direction	Effect size	p-value	Conclusion
H1	GLM	A1 (gender)	positive	OR=2.82	< 0.05	supported
H1	GLM	A9 (firm size)	negative	OR=0.28–0.43	< 0.05	supported
H1	GLM	A10 (foreign capital)	negative	OR=0.34	< 0.05	supported
H2	SEM	B7K (latent variable)	positive	β=0.17	< 0.05	supported
H3	SEM	A1 (gender)	positive	β=0.16	0.045	supported
H3	SEM	C1 (digitalized workplace)	negative	β=−0.38	< 0.001	supported
H3	SEM	C5 (contact with IT)	positive	β=0.22	< 0.05	supported

Note: GLM = Generalized Linear Model (logistic regression). SEM – Structural Equation Modeling. OR – odds ratio. β – standardized regression coefficient. Statistical significance was evaluated at $p < 0.05$. Predictor B7K represents a latent construct measured by Likert-scale indicators capturing the intensity of internet-based knowledge acquisition.

Hypothesis H1 posits relationships among selected demographic factors, enterprise organizational characteristics, and the level of perceived readiness to work in a digitalized environment. The verification of Hypothesis H1 was conducted using a logistic regression model (GLM). The results indicate that respondents' gender (A1), enterprise size (A9), and foreign capital participation (A10) significantly differentiate the probability of providing a positive response to question C2, which asks about self-assessment of being well prepared to work in a digitalized environment. The obtained findings confirm Hypothesis H1 and demonstrate that perceived readiness to work in a digitalized environment is not solely an individual employee characteristic but is, to a significant extent, conditioned by the enterprise's organizational context.

Hypothesis H2 assumes that the intensity of using informal online education in modern information technologies is associated with respondents' perceived readiness to work in a digitalized environment, while accounting for demographic characteristics, particularly gender, and work environment factors supporting the digitalization process (degree of workplace digitalization and frequency of contact with IT specialists).

The verification of Hypothesis H2 was supported by structural equation modeling (SEM) results, as logistic regression does not allow for modeling relationships involving latent variables. The SEM results indicate a significant positive relationship between the latent variable B7K, representing the intensity of informal online education use, and perceived readiness to work in a digitalized environment (C2). This means that more frequent use of online knowledge sources is associated with higher perceived readiness for work in digitally transformed workplaces. At the same time, the effect of gender (A1) on C2 becomes weaker after B7K and work environment factors are included in the model. This result suggests that differences in perceived readiness to work in a digitalized environment may partly reflect different patterns of informal knowledge acquisition from various online sources.

Overall, the obtained results support Hypothesis H2 and highlight the important role of informal learning and access to online knowledge sources in shaping employees' readiness to work in a digitalized environment.

Hypothesis H3 assumes significant relationships between respondents' gender and work environment factors supporting the digitalization process, including the degree of workplace digitalization, the frequency of contact with IT specialists, and perceived readiness to work in a digitalized environment. Hypothesis H3 was verified primarily based on the results of the structural equation model (SEM), which enabled the simultaneous assessment of the effects of gender

(A1) and work environment characteristics – particularly the level of workplace digitalization (C1) and more frequent contact with IT specialists (C5) – on perceived readiness to work in a digitalized environment (C2), while accounting for the intensity of using online knowledge sources (B7K). The logistic regression model provides only complementary information on direct differences between groups and does not test the underlying mechanisms of these relationships. The results confirm Hypothesis H3 and indicate that the readiness of accounting department employees to work in a digitalized environment is shaped by both gender and the degree of workplace digitalization, as well as the frequency of contact with IT specialists.

Table 7 presents the distribution of respondents' answers to question C17 on a five-point Likert scale: "What opportunities and threats for accountants/managers arise from the development of the digital economy?" Among the most important opportunities, respondents indicated, inter alia, the elimination or minimization of routine and repetitive accounting tasks, improved work organization and information flow within enterprises, and increased attention to data security and compliance with principles of data processing, analysis, and storage. A key challenge for respondents is undoubtedly continuous training in the use of new information technologies. The main threat identified by respondents was the potential loss of employment, cited by 42.5%.

Table 7. Responses to Question C17

Options in Question C17	Opportunities and threats for the respondents resulting from the development of the digital economy	Strongly YES				Strongly NO
		5	4	3	2	1
C17_1	The development of new technologies has a positive impact on the work of an accountant/manager	134	136	50	9	3
C17_2	Greater attention to data security and compliance with rules for data processing, analysis, and storage	118	146	57	10	1
C17_3	Improved organization of work and information flow within the enterprise	150	123	48	8	3
C17_4	The use of IT technologies has reduced errors and distortions in accounting information	118	130	54	22	8
C17_5	Elimination or minimization of routine and repetitive accounting activities	153	111	51	10	7
C17_6	Possibility of placing greater emphasis on soft skills, e.g., building interpersonal relationships within the enterprise	83	95	97	36	21
C17_7	Improved efficiency of the accountant's/manager's work	119	135	66	7	5
C17_8	Greater creativity in task execution, as well as financial and business decision-making	74	127	96	19	16
C17_9	Greater possibilities of intentional influence on information presented in financial statements	73	118	97	32	12
C17_10	Continuous education in the use of modern information technologies	115	137	60	16	4
C17_11	Greater attention to data security and compliance with the rules for data processing, analysis, and storage	142	123	50	12	5
C17_12	Reduction of the costs of maintaining finance and accounting departments in enterprises	74	102	92	33	31
C17_13	Possibility of job loss	80	61	100	51	40

Modern information technologies, which underpin the digital economy, significantly influence changes in respondents' work. While working in a digitalized environment that requires appropriate competences and skills in the use of information technologies, respondents are aware of the need to continuously expand their knowledge in this area through ongoing learning, the use of support from IT specialists, and access to appropriate information technology tools.

DISCUSSION

Develi et al. (2022) divided the determinants of job satisfaction into individual factors (age, gender, position, professional experience, education) and organizational factors (job description, remuneration, employee rights, work environment, motivation). In the literature on the digitalization of the accounting profession, both categories have been examined to varying extents. Our study indicates that both individual and organizational factors significantly influence the perceived readiness of accounting employees to work in a digitalized environment. The findings of Grosu et al. (2023), in turn,

indicate that readiness to develop digital competences depends on perceived necessity, benefits, and awareness of the effort required to acquire such skills, as well as on situational factors such as organizational culture and regulatory policies. This implies that employees' decisions to enhance their digital competences are motivated not only by personal predispositions but also by the organizational context and access to appropriate educational resources.

The discussion focuses on selected determinants that significantly influenced perceived readiness to work in a digitalized environment. The analysis considered factors that demonstrated statistically significant and differentiated effects on perceived readiness, in particular, gender, enterprise size, foreign capital participation, degree of workplace digitalization, frequency of contact with IT specialists, and informal online education in modern information technologies.

The analysis revealed significant differences in perceived readiness depending on respondents' gender. According to the results, men declared approximately 2.8 times higher odds of a positive self-assessment of perceived readiness compared with women. This finding is consistent with previous observations concerning gender differences in self-assessed digital competences (Santonastaso & Macchioni, 2022; Gorbacheva et al., 2016). The literature emphasizes that lower self-assessments of digital competences among women stem mainly from socio-cultural factors, such as stereotypes regarding women's technological abilities or limited access to earlier technological experiences, rather than from biological predispositions (Lenard et al., 2010; Awang et al., 2021).

At the same time, the results indicate that part of the differences in declared readiness to work in a digitalized environment between women and men is explained by the use of informal online knowledge sources. The intensity of self-directed learning in modern technologies increased the level of self-assessed professional preparedness, and its inclusion in the model attenuated the direct effect of gender. This suggests that differences in perceived readiness are not determined solely by gender but also depend substantially on how technological knowledge and experience are acquired. In this sense, the present study confirms the observations of Lenard et al. (2010), according to which education and digital practice effectively increase women's confidence in computer-related competences, and at the same time highlights the role of informal online education in shaping digital readiness.

The results also confirm that women more frequently use online forms of education, consistent with studies indicating their greater propensity to engage in developmental activities in the area of digital competences (Awang et al., 2021). At the same time, men more often declare high readiness to work in a digitalized environment, which, according to the literature, does not necessarily reflect actual levels of digital skills (Cooper, 2006; Santonastaso & Macchioni, 2022). Studies by Biyikli and Çetin (2023) further show that women more frequently report difficulties and lower satisfaction with the technologies used. These findings suggest that observed differences in readiness to work in a digitalized environment may primarily result from differing patterns of self-assessment of technological competences.

The organizational context of the enterprise also plays a significant role in shaping readiness to work in a digitalized environment among the surveyed employees. Both enterprise size and foreign capital participation significantly differentiate the probability of declared readiness. Employees of small enterprises and capital groups exhibited lower readiness than employees of other enterprises (including large ones), while micro-enterprises had the highest predicted probability of a positive self-assessment in this regard. In microenterprises, greater employee autonomy and the need to use digital tools independently may foster higher self-assessed technological competencies. In small enterprises, digitalization is often fragmented, and limited organizational support may reduce the subjective sense of readiness. In capital groups, lower declared readiness may result from a high degree of formalization, complexity of IT processes, and limited employee autonomy. These interpretations are explanatory in nature and require further in-depth research. Higher readiness in enterprises with foreign capital participation may, in turn, reflect a more developed digital environment and broader use of advanced information systems. These findings are consistent with the conclusions of Stoica and Ionescu-Feleagă (2021), who demonstrated that enterprise size differentiates the scope of technologies used, as well as with observations by Taib et al. (2023) and Kotowska and Sikorska (2023), which emphasize the role of organizational specificity in shaping awareness of the need to develop technological competences.

Among all analyzed predictors, the degree of workplace digitalization exerted the strongest influence on perceived readiness to work in a digitalized environment. This result confirms the importance of everyday, direct contact with information technologies for building a sense of preparedness to function in a digital environment. Respondents employed in positions that intensively use IT tools more often declared high self-assessed readiness, regardless of gender or forms of further education. This observation confirms the importance of learning by doing and highlights the contextual nature of digital readiness, shaped through interactions between individual competences and organizational and technological conditions (Abdul Hamid, 2022; Tarafdar et al., 2015).

The frequency of contact with IT specialists also emerged as a significant and positive predictor of readiness. Access to ongoing technical support and the possibility of consulting IT experts reduces uncertainty and technological strain, strengthening the sense of competence and security in using technologies (Tarafdar et al., 2015). This result is consistent with the findings of Safi et al. (2024) and Suhada et al. (2026), who emphasize the importance of IT support as a key organizational factor facilitating technological adaptation.

The study also confirms the significant role of informal online education in shaping readiness to work in a digitalized environment. At the same time, the level of formal education did not prove to be a significant predictor of this readiness. Although the literature suggests that higher education fosters the development of information-processing skills and the use of online resources (Hargittai & Shafer, 2006; Hinterhuber & Pavone, 2020), the results indicate that, in a professional context, current and practical sources of knowledge, as well as direct support from IT experts, are of key importance. The intensive use of online knowledge sources was associated with higher perceived readiness to work in a digitalized environment and helped explain some gender-related differences in self-assessed preparedness, suggesting that formal education alone is limited in enhancing the subjective sense of preparedness for work.

The limited role of internal training as a factor differentiating readiness to work in a digitalized environment is one of the study's more complex findings. Although the literature emphasizes the importance of training in developing the digital competences of accounting employees (Pargmann et al., 2023; Hasin et al., 2022), the results revealed an effect that was the opposite of expectations. The organization of internal training was associated with lower declared readiness to work in a digitalized environment. This phenomenon may result from the general or incidental nature of such training, its misalignment with rapidly changing competence needs, or the fact that training increases awareness of competence gaps and the complexity of IT tools, leading respondents to make more critical self-assessments. It should also be noted that training may be organized in response to previously identified knowledge and skill deficits, meaning that its frequent implementation does not necessarily stimulate development but rather signals existing problems in technological preparedness. These results do not undermine the importance of training as a competence development tool but instead point to the complex and contextual nature of its impact on digital readiness assessment, which depends on both the quality of training programs and their implementation within enterprises.

The lack of a significant effect of age on perceived readiness to work in a digitalized environment may be attributed to the specificity of the studied sample. Respondents were professionally active employees in the financial and accounting sector, operating in environments with high demands for continuous learning and adaptation to technological change. Under such conditions, intergenerational differences may be flattened, as workplace pressure forces the development of digital competencies regardless of age. These results are consistent with those of Steens et al. (2024), indicating that as technological awareness increases, so does the reported need for further learning.

In summary, the readiness of the surveyed accounting department employees to work in a digitalized environment is shaped by complex interactions among demographic, organizational, work environment, and educational factors. The study results indicate that effective support for digital readiness requires not only technological investments but also the creation of an environment conducive to informal learning and the provision of easy access to IT support.

CONCLUSION

The study aimed to identify and assess the impact of selected demographic factors, enterprise-related organizational factors, work environment characteristics, and informal online education in modern information technologies on the perceived readiness of accounting department employees to work in a digitalized environment.

Regarding the main research question (Q), it was found that the perceived readiness of the surveyed accounting department employees to work in a digitalized environment is shaped by a variety of demographic, enterprise-related organizational factors, work environment–related factors, and informal online education factors. The significant determinants include respondents' gender, enterprise size, participation in foreign capital, degree of workplace digitalization, frequency of contact with IT specialists, and informal online education in modern technologies.

Most respondents accept the digitalization of their work environment and perceive it as an inevitable element of contemporary professional practice (question Q1). They demonstrate a high awareness of the need to develop digital competences, reflected in the perceived necessity of upgrading qualifications in modern technologies. At the same time, digitalization is evaluated both as a source of benefits and as a source of challenges, mainly related to the requirement for continuous education. Respondents perceive numerous benefits of digitalization, such as the automation of routine tasks,

improved work organization, and increased data security. The main threat identified by respondents is the risk of job loss as a result of the automation of accounting processes.

Most respondents positively assess their preparation for working in a digitalized environment (question Q2), although the sources of this preparation are diverse. A high proportion of respondents declaring satisfaction with formal education indicates that it meets their subjective expectations; however, the lack of statistical significance of this factor suggests its limited impact on the actual development of digital competences. At the same time, 82.2% of respondents considered themselves well prepared to work in a computerized environment, which may be linked to lifelong learning activities and the use of various knowledge sources, including online resources. This confirms the importance of informal online education, which was included in the statistical modeling as a latent construct representing the intensity of using online knowledge sources.

The nearly even distribution of responses regarding the presence of technological topics in formal education offerings (48.5% affirmative responses) points to the diversity of educational programs and a competence gap largely filled through informal online education.

Selected demographic and enterprise-related organizational factors significantly differentiate the probability of declaring readiness to work in a digitalized environment (Hypothesis H1). Respondents' gender, enterprise size, and foreign capital participation were statistically significant, with the highest level of declared readiness observed among men employed in other (including large) enterprises with foreign capital participation. These results indicate that an organizational environment conducive to the use of advanced information technologies and access to modern digital solutions strengthens the sense of competence and readiness to work under conditions of ongoing digitalization.

The results confirm that the intensity of using informal online education in modern information technologies is positively associated with perceived readiness to work in a digitalized environment, while accounting for gender and work environment factors supporting the digitalization process, such as the degree of workplace digitalization and the frequency of contact with IT specialists (Hypothesis H2).

More frequent use of online knowledge sources is associated with higher self-assessed readiness to work in a digitalized environment, while the partial attenuation of the gender effect suggests that men and women differ in the extent to which they use informal online education. This finding confirms that digital competences develop not only within formal educational pathways but largely through self-directed, flexible, and continuous learning, which is consistent with the assumptions of the Mulder competence model emphasizing lifelong learning and the adaptive nature of competences.

The study results also confirm that respondents' perceived readiness to work in a digitalized environment is significantly shaped by both gender and work environment factors supporting the digitalization process (hypothesis H3). A higher degree of workplace digitalization and more frequent contact with IT specialists foster a higher self-assessment of readiness to function in a digital environment. These results indicate that, in addition to individual characteristics, organizational and technical working conditions play a key role, as they may either strengthen or constrain employees' ability to adapt during the digitalization process.

In summary, the conducted study addresses the research gap identified in the introduction and confirms that respondents' perceived readiness to work in a digitalized environment is shaped by both individual characteristics – particularly gender – and by enterprise-related organizational factors, work environment conditions, and informal online education. The findings align with the stream of research emphasizing the contextual nature of competences, which develop through interactions with technology, organization, and learning opportunities, in accordance with the assumptions of the Mulder model.

The theoretical implications of the study concern confirming the contextual character of digital competences, which develop through interactions among technology, organization, and educational processes. An important contribution is also the empirical demonstration of the role of informal online education in the relationships between gender, the work environment, and perceived readiness to work in a digitalized environment.

From a managerial practice perspective, the results suggest that practical implications include supporting the readiness of accounting department employees to work in a digitalized environment and creating a work environment conducive to the development of digital competencies. In particular, the following are recommended: strengthening the digitalized work environment; ensuring ongoing IT support; promoting informal online education (supporting e-learning, webinars, and online training, co-financing access to educational platforms, and recognizing the outcomes of informal education in employee evaluation systems); integrating informal education with everyday work (enabling learning during work, for example through access to online educational materials); revising the formula of internal training programs (the lack

of a significant effect of internal training on perceived readiness suggests the need for better alignment with employees' actual needs); and managing employees' concerns related to digitalization (e.g., fears of job loss indicate the need for communication and educational initiatives emphasizing technology as a tool that supports work).

The study is subject to certain limitations. The results apply only to the surveyed group of respondents and cannot be generalized to the entire population of accounting department employees in Poland. The study is based on declarative self-assessments of readiness to work in a digitalized environment, which may involve the risk of subjectivity.

Future research should include longitudinal studies enabling the analysis of the development of digital competences and changes in perceived readiness over time. It would also be valuable to incorporate objective measures of digital competences and in-depth qualitative analyses to better understand learning strategies and barriers to technological adaptation in the accounting profession.

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Appendix A. Additional tables

Table A1. Characteristics of the analyzed sample – respondents' profile (Part A of the questionnaire)

Respondents' particulars	**Categories (options)**	**All respondents (N = 332; 100%)**	
		n	%
A1. Gender	☐ female	254	77
	☐ male	78	23
A2. Age (generational ranges)	☐ up to 1964	33	10
	☐ 1965-1980	116	35
	☐ 1981-1994	136	41
	☐ after 1995	47	14

Respondents' particulars	Categories (options)	All respondents (N = 332; 100%)	
		n	%
A3. Education	☐ vocational education	0	0
	☐ secondary education	23	7
	☐ higher education – bachelor/engineer	41	12
	☐ higher education – master	250	75
	☐ phd or higher	18	6
A4. Education profile	☐ economics	256	77
	☐ law	16	5
	☐ technical	28	8
	☐ other	32	10
A5. Work position	☐ manager	63	19
	☐ accountant	204	62
	☐ financial analyst	21	6
	☐ other	44	13
A6. Workplace (if accountant)	☐ employee in an enterprise	146	44
	☐ employee in an accounting office	89	27
	☐ employee of an outsourcing corporation	50	15
	☐ employee of a public sector institution	47	14
A7. Professional experience in years	☐ up to 10	133	40
	☐ from 11 to 20	96	29
	☐ from 21 to 30	72	21
	☐ from 31 to 40	25	8
	☐ 41 and more	6	2
A8. Work system	☐ on-site work	137	41
	☐ remote work	26	8
	☐ hybrid (on-site and remote work)	169	51
A9. Size of the enterprise in which the respondent works	☐ micro	69	21
	☐ small	71	21
	☐ other	114	34
	☐ capital group	78	24
A10. Foreign capital participation in the enterprise	☐ yes	111	33
	☐ no	221	67

Table A2. Codebook of variables used in the analysis

Variable	Questionnaire item	Coding	Type	Role in analysis
C2	Are you well prepared to work in a digitalized environment?	1 = Yes 2 = No	Binary	Dependent variable (GLM, SEM)
A1	Gender	1 = Female; 2 = Male	Categorical	Predictor
A9	Size of the enterprise	1 = Micro enterprise 2 = Small enterprise 3 = Other enterprises 4 = Capital group	Categorical	Predictor (GLM)
A10	Presence of foreign capital in the enterprise	1 = Yes; 2 = No	Binary	Predictor (GLM)
C1	Is your workplace digitalized?	1 = Yes 2 = No	Binary	Predictor (SEM)
C5	Has the development of the digital economy increased the frequency of contacts with IT specialists in your workplace?	1 = Yes 2 = No	Binary	Predictor (SEM)
B7_2–B7_10	Frequency of using specific online sources of knowledge in the field of modern information technologies	1 = Never 2 = Rarely 3 = Often 4 = Very often	Ordinal (Likert)	Indicators of latent variable
B7K	Intensity of using informal online knowledge sources	Latent construct estimated from indicators B7_2–B7_10	Latent variable	Predictor (SEM)

Note: The table presents the variables used in the empirical analysis together with their questionnaire items, coding schemes, data types, and roles in the statistical models (GLM and SEM).

Appendix B. Survey questionnaire

SURVEY QUESTIONNAIRE

on the sustainable development of the accounting profession in the areas of:
knowledge – digitalization – ethics

Dear Sir or Madam,

We kindly ask you to complete this survey questionnaire. The purpose of the study is to diagnose the sustainable development of the accounting profession across three areas: knowledge, digitalization, and ethics. Researchers from the Cracow University of Economics, the University of Economics in Katowice, and the Wroclaw University of Economics and Business conduct the study. The survey is anonymous and the collected data will be used solely for statistical analysis.

PART A. RESPONDENT CHARACTERISTICS

1	Gender	☐ Female ☐ Male
2	Age (generational ranges)	☐ Up to 1964 ☐ 1965–1980 ☐ 1981–1994 ☐ From 1995
3	Education	☐ Vocational education ☐ Secondary education ☐ Higher education – Bachelor/Engineer ☐ Higher education – Master ☐ PhD or higher
4	Education profile	☐ Economics ☐ Law ☐ Technical ☐ Other: …….
5	Work position	☐ Manager ☐ Accountant ☐ Financial analyst ☐ Other: …….
6	Workplace (if accountant)	☐ Employee in enterprise ☐ Employee in accounting office ☐ Employee in outsourcing corporation ☐ Employee in public sector institution
7	Professional experience in years	Years of work: ……..
8	Work system	☐ On-site work ☐ Remote work ☐ Hybrid (on-site and remote work)
9	Size of enterprise	☐ Micro ☐ Small ☐ Other ☐ Capital group
10	Foreign capital participation in the enterprise	☐ Yes ☐ No

PART B. KNOWLEDGE OF THE ACCOUNTANT/MANAGER

1. Which educational forms do you use? (multiple answers possible)
   ☐ Courses and training at the Accountants Association in Poland
   ☐ Courses organized by commercial entities
   ☐ Postgraduate studies in accounting

☐ MBA (Master of Business Administration)
☐ CIMA (Chartered Institute of Management Accountants)
☐ ACCA (Association of Chartered Certified Accountants)
☐ IMA (Institute of Management Accountants)
☐ Other: _____

2. What motivated you to undertake education? (multiple answers possible)
☐ Expansion of theoretical and practical knowledge
☐ Learning modern methods and software
☐ Career advancement
☐ Prestige and recognition
☐ Increase of competences (intellectual capital)
☐ Mandatory training
☐ Other: _____

3. Did the undertaken education meet your expectations satisfactorily?
☐ Yes
☐ No

4. Does the educational offer include modern IT technologies?
☐ Yes
☐ No

5. Which thematic area is particularly important? (multiple answers possible)
☐ Accounting in a digital environment
☐ Management in a digital environment
☐ Corporate finance
☐ Strategic management
☐ Human capital management
☐ Business management
☐ Taxes (PIT, CIT, VAT) / tax strategies
☐ Small business accounting
☐ Management accounting
☐ Cost accounting
☐ Controlling
☐ Reporting and analysis
☐ Ethics and social responsibility
☐ Other: _____

6. Should improving qualifications in modern technologies be obligatory?
☐ Yes
☐ No

7. To obtain up-to-date knowledge, how often do you use the following?

Specification	Very often	Often	Rarely	Never
Social media	☐	☐	☐	☐
Online publications	☐	☐	☐	☐
Webinars	☐	☐	☐	☐
E-learning	☐	☐	☐	☐
Online training	☐	☐	☐	☐

Specification	Very often	Often	Rarely	Never
Mass media	☐	☐	☐	☐
Emails and chats	☐	☐	☐	☐
Audio/video communication tools	☐	☐	☐	☐
File-sharing platforms	☐	☐	☐	☐
Virtual whiteboard	☐	☐	☐	☐

PART C. DIGITALIZATION OF THE ACCOUNTING/MANAGERIAL PROFESSION

1. Is your work environment computerized?
   ☐ Yes
   ☐ No

2. Are you well prepared to work in a computerized environment?
   ☐ Yes
   ☐ No

3. Does your enterprise organize internal IT training?
   ☐ Yes
   ☐ No

4. Does your enterprise provide ongoing IT support?
   ☐ Yes
   ☐ No

5. Has digital economy development increased contact with IT specialists?
   ☐ Yes
   ☐ No

6. How often do you use the following tools?

Specification	Very often	Often	Rarely	Never
Financial and accounting software	☐	☐	☐	☐
Cloud computing	☐	☐	☐	☐
Online accounting	☐	☐	☐	☐
Advanced Excel	☐	☐	☐	☐
Blockchain	☐	☐	☐	☐
Big Data	☐	☐	☐	☐
Data Science	☐	☐	☐	☐
Python	☐	☐	☐	☐
Databases (SQL Server, Oracle)	☐	☐	☐	☐
Microsoft Power BI	☐	☐	☐	☐
Artificial Intelligence	☐	☐	☐	☐

7. Are blockchain technologies an important factor in accounting development?
   ☐ Yes
   ☐ No

8. Do digital solutions significantly impact the accounting profession?
   ☐ Yes
   ☐ No

9. Do you use structured invoices?
- ☐ Yes
- ☐ No
- ☐ The company plans to implement them

10. Does your F-K system allow data export based on user-defined criteria?
- ☐ Yes
- ☐ No

11. Available export formats:
- ☐ XLSX
- ☐ XML
- ☐ CSV
- ☐ TXT
- ☐ PDF
- ☐ DBF
- ☐ XTML
- ☐ Other: _____

12. Application server used in F-K system:
- ☐ No application server
- ☐ Oracle WebLogic Server
- ☐ Microsoft IIS
- ☐ JBoss Application Server
- ☐ IBM Application Server
- ☐ Other: _____

13. Will artificial intelligence replace accountants?
- ☐ Yes
- ☐ No

14. If yes, in what time horizon?
- ☐ Within 10 years
- ☐ Within 20 years
- ☐ More than 20 years

15. Does the use of modern technologies support enterprise development?
- ☐ Yes
- ☐ No

16. What makes it difficult to use new technologies?

Specification	Strongly YES				Strongly NO
	5	4	3	2	1
Cost of software licenses	☐	☐	☐	☐	☐
Continuous software changes	☐	☐	☐	☐	☐
Lack of access to training	☐	☐	☐	☐	☐
Cost of training	☐	☐	☐	☐	☐
Lack of time for training	☐	☐	☐	☐	☐

17. What opportunities and threats result from digital economy development?

Specification	Strongly YES				Strongly NO
	5	4	3	2	1
Positive impact on work	☐	☐	☐	☐	☐
Redesign of accounting procedures	☐	☐	☐	☐	☐
Improved organization and information flow	☐	☐	☐	☐	☐
Reduction of errors	☐	☐	☐	☐	☐
Elimination of routine activities	☐	☐	☐	☐	☐
Greater focus on soft skills	☐	☐	☐	☐	☐
Improved efficiency	☐	☐	☐	☐	☐
Greater creativity	☐	☐	☐	☐	☐
Greater influence on financial information	☐	☐	☐	☐	☐
Continuous IT education	☐	☐	☐	☐	☐
Greater data security concern	☐	☐	☐	☐	☐
Lower maintenance costs	☐	☐	☐	☐	☐
Risk of job loss	☐	☐	☐	☐	☐

18. Will digitalization depreciate the accounting profession?
☐ Yes
☐ No

19. Does digitalization influence remuneration?
☐ Yes
☐ No

20. Will accounting change radically due to digitalization?
☐ Yes
☐ No

PART D. ETHICS OF THE ACCOUNTING/MANAGERIAL PROFESSION

1. Should the accountants' social and economic role be reflected in their responsibility?
☐ Yes
☐ No

2. Do you know and comply with business ethics principles?
☐ Yes
☐ No

3. Does ratification of ethical principles increase professional status?
☐ Yes
☐ No

4. Does digitalization influence ethical behavior?
☐ Yes
☐ No

5. Does advanced digitalization require changes in ethical principles?
☐ Yes
☐ No

6. Which factors may influence unethical behavior?

Specification	Strongly YES				Strongly NO
	5	4	3	2	1
Pursuit of promotion and higher remuneration	☐	☐	☐	☐	☐
Fear of financial/criminal sanctions	☐	☐	☐	☐	☐
Improved work organization	☐	☐	☐	☐	☐
Concealing lack of knowledge	☐	☐	☐	☐	☐
Pressure from superiors	☐	☐	☐	☐	☐
Personality traits	☐	☐	☐	☐	☐
Emotions and over-optimism	☐	☐	☐	☐	☐
Opportunity without control	☐	☐	☐	☐	☐
Financial benefits	☐	☐	☐	☐	☐
Non-financial benefits	☐	☐	☐	☐	☐
Work stress	☐	☐	☐	☐	☐
Professional burnout	☐	☐	☐	☐	☐

Thank you for your time devoted to completing the questionnaire.

Biographical notes

Melania Bąk, PhD, DSc, Associate Professor at the Wroclaw University of Economics and Business, Department of Finance and Accounting. She is the author and co-author of numerous scientific articles, monographs, and educational publications in the fields of financial accounting and financial and non-financial reporting. She has supervised numerous master's and bachelor's theses and reviewed doctoral dissertations. She has also served as a lecturer and examiner for postgraduate accounting programs. She has reviewed monographs and scientific articles. Her research interests include accounting policy, behavioral and creative aspects of accounting, social responsibility in accounting, narratives in reporting, non-financial reporting, issues of intangible assets disclosed and undisclosed (invisible) in accounting, invisible property of an enterprise from an accounting perspective, and digitalization of the accounting profession. She is a member of the Accountants Association in Poland and the Finance and Accounting Association for Sustainable Development.

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Author contribution statement

Melania Bąk: Conceptualization; Data Curation; Writing – Original Draft Preparation; Writing – Review & Editing. **Andrzej Bąk**: Data Curation; Formal Analysis; Software; Validation; Visualization; Writing – Original Draft Preparation. **Marzena Strojek-Filus**: Conceptualization; Data Curation; Writing – Original Draft Preparation; Writing – Review & Editing. **Katarzyna Świetla**: Conceptualization; Data Curation. **Monika Turek-Radwan**: Conceptualization; Data Curation.

Conflicts of interest

The authors declare no conflicts of interest.

Citation (APA Style)

Bąk, M., Bąk, A., Strojek-Filus, M., Świetla, K., & Turek-Radwan, M. (2026). Determinants of the perceived readiness of accounting department employees to work in a digitalized environment. *Journal of Entrepreneurship, Management and Innovation, 22*(3), 13-46. https://doi.org/10.7341/20262232