

## THE CHANGING ROLE OF ACCOUNTANTS THROUGH THE LENS OF UNIVERSITY STUDENTS' PERSPECTIVE

Beata KOTOWSKA<sup>1</sup>, Marta SIKORSKA<sup>2\*</sup>

<sup>1</sup> University of Gdańsk, Faculty of Management, Department of Accounting; beata.kotowska@ug.edu.pl,  
ORCID: 0000-0002-0709-9934

<sup>2</sup> University of Gdańsk, Faculty of Management, Department of Accounting; marta.sikorska@ug.edu.pl,  
ORCID: 0000-0001-8598-4077

\* Correspondence author

**Purpose:** The article aims to explore final-year undergraduate accounting students' knowledge and awareness of the changing role of accountants in the wake of digitalization.

**Design/methodology/approach:** A survey was conducted among students attending the last semester of specialized undergraduate studies in Poland regarding their state of knowledge and awareness of digitalization-driven change in the role of accountants. The results obtained were further compared with a pilot study conducted among students of master's degree programs.

**Findings:** The survey showed unequivocally that students are aware of the change in the role of accountants in consequence of digitalization, with no distinction between undergraduate and graduate students, full-time or part-time mode. The respondents indicate the need to possess and refine digital competencies. The students are familiar with digitalization tools, although to a very varying degree. They recognize the benefits of and barriers to implementing digitalization. They likewise identify new roles for accountants arising from digitalization.

**Research limitations/implications:** The survey employed the method of selection by convenience, which renders the results obtained non-generalizable to the entire population.

**Practical implications:** The article indicates students' awareness of the changing role of accountants and the need for digital competence in the profession.

**Originality/value:** The article allows to partially fill the research gap in empirical studies on the changing role of accountants as a result of digitalization. It also sets the stage for further empirical research on the challenges in academic accounting education, with a focus on digital transformation.

**Keywords:** digitalization, accounting profession, education, accounting students.

**Category of the paper:** Research paper.

## 1. Introduction

The introduction of the provisions set by Directive 2012/17/EU of the European Parliament and of the Council (Directive 2012/17/EU) impacted the implementation of accounting digitalization processes and the fulfillment of the guidelines imposed on EU member states. As a result, changes in legal regulations, including tax and accounting regulations, ensued, which in turn initiated the mandatory adoption of a number of multiple digitalization tools across business entities, inclusive of those operating in Poland.

As of July 1, 2016, new provisions of the Tax Ordinance Act (Tax Code) came into force, which mandated the reporting of the information derived from accounting books and accounting evidence to tax authorities in the Standard Audit File for Taxes (SAF-T) electronic form (Marcinkowska, 2021). All tax declarations are submitted to tax authorities in electronic form. Effective October 1, 2018, amendments to the Accounting Act introduced mandatory filing of financial statements in electronic form, in a format corresponding to the XML logical structure. Beginning January 1, 2023, electronic (online) cash registers have been required for businesses making sales to non-business buyers. From February 1, 2026, in turn, regulations are to come into effect requiring structured invoices to be issued and made available via the National e-Invoice System (KSeF)<sup>1</sup>. In summary, tools such as e-invoices, e-declarations, e-transfers, e-reporting or electronic signatures - qualified signatures or ePUAP trusted profile - have become a reality and are obligatorily utilized by business entities.

With the implementation of new technologies and information systems, company accounting systems are therefore undergoing constant change and transformation. Digitalization and digitization have become integral to accounting under the impact of several factors: the widespread access to the Internet and the development of technology, as well as the aforementioned legal regulations.

These changes continue to progress and are also beginning to affect the regulation of the accounting profession, as exemplified by the pre-consultation conducted in January 2024 in connection with the consideration of the possibility of including the profession in the catalog of regulated professions and regulating the reserved activities (Pre-consultations, 2024). The pre-consultation report presents possible avenues for the accounting profession and how the responsibilities accountants are expected to face will change. In the future, the work of an accountant will not only involve event documentation, but also analysis, advisory and suggestion of directions for company optimization (Lewandowski, 2021), while accountants will become business advisors (Digitalization, 2022). Digitalization, however, also brings risks to the profession, as it has been ranked as one of the professions most threatened by the development of artificial intelligence and robotization (Jarco, 2023).

---

<sup>1</sup> KSeF stands for Krajowy System e-Faktur (National e-Invoice System).

The changing regulations, as well as the ongoing digitalization and digital transformation, have provided a rationale for research into the changing role of the accountant and the changes in the education of future students of accounting.

The main purpose of the article is to study the state of knowledge and awareness, among final-year undergraduate (bachelor's) accounting students, of the changing role the accounting profession has faced as a result of digitalization, as well as to compare the results with those of a pilot study involving master's students as the respondents. The following research questions were posed:

- Are students aware of the changing role of the accounting profession?
- Do students possess digital skills and are they aware of the need for these skills in accounting?
- Is there a difference in the perception of digitalization in accounting among bachelor's vs. master's students?
- Is there a difference in the perception of digitalization in accounting among full-time vs. part-time students?

A literature review was conducted using the Scopus and Web of Science databases, in search for positions describing the impact of digitalization on accounting systems and the accounting profession, as well as addressing the issues of academic education in this area. The results of a survey conducted among last-semester students of specialized bachelor's studies at the Faculty of Management, University of Gdańsk, on the state of their knowledge and awareness of the changing role of accountants in the wake of digitalization have been presented as well. The results obtained were compared with a pilot study conducted among master's students at the same university.

## 2. Literature review

A literature review was conducted using the Scopus and Web of Science databases. The search involved two groups of keywords, applied simultaneously:

- digitalization, RPA, cloud computing, UiPath;
- accounting profession.

This approach enabled identification of literature positions describing issues related to the topic of the impact of digitalization and its tools on the accounting systems used and the accounting profession itself. This topic falls within the areas of interest of numerous researchers around the world, resulting in a significant number of publications in this area. The conclusions drawn by the authors after analyzing the positions identified are presented below. First, focus was placed on modern tools affecting accounting systems. The following have been noted:

1. Cloud computing provides great convenience and flexibility (Dimitriu, Matei, 2014; Knihova, 2019; Mangiuc, 2016; Weng et al., 2014), as well as delivers relevant information to all stakeholders (Dimitriu, Matei, 2014).
2. RPA technology is used to automate repetitive processes (Bakulina et al., 2020; Cooper et al., 2022; Harrast, 2020; Kokina, Blanchette, 2019; Sharma et al., 2022) and yields many benefits in the process of accounting firm transformation (Januszewski et al., 2021; Kokina et al., 2021; Tiron-Tudor et al., 2022). The obstacles it brings should not be overlooked, however, thus the factors affecting the success of RPA implementation in a company should be taken into account (Cooper et al., 2022; Hsiung, Wang, 2022; Razak, Ismail, 2022), keeping in mind the disadvantages and risks of RPA as well as the leveraging of best practices (Gotthardt et al., 2020; Januszewski, Kujawski, 2021; Plattfaut, Borghoff, 2022).
3. Digitalization exerts a huge impact on accounting systems and the evolution of the accounting profession (Andreassen, 2020; Carter, 2015; Dong, 2022; Frolova et al., 2021; Fulop et al., 2022; Meiryani et al., 2022; Onyshchenko et al., 2022; Stoica, Ionescu-Feleaga, 2021b; Sytnik et al., 2022).
4. Three aspects such as accounting education, professional regulations and accounting information systems contribute to changes in the accounting profession (Stoica, Ionescu-Feleaga, 2021a).
5. AI technology is changing the accounting profession (Knihova, 2019; Mihai, Dutescu, 2022; Onyshchenko et al., 2022; Stancu, Dutescu, 2021).
6. Professional accountants who understand digital transformation will play an important role in the development of these systems and processes (Ciurea, Man, 2020).
7. The emotional intelligence, ethical and moral values characteristic of experienced accountants are qualities that cannot be replaced by digitalization (Boutellis-Taft, 2019).
8. Cloud computing, AI and digitalization of accounting processes are forcing the need for retraining and upskilling of accountants, due to the rapidly changing business processes (Knihova, 2019; Onyshchenko et al., 2022; Rindasu, 2017).

Modern technologies and digitalization tools have affected the role of the accounting profession, which has increasingly evolved from the classic role of accountants into a role of identifiers, explainers, trainers, supporters, analyzers, qualified strategic business consultant, decision-makers, and financial supervisors (Kokina et al., 2021; Frolova et al., 2021; Knihova, 2019; Andreassen, 2020). Moreover, in 2019, the International Federation of Accountants (IFAC) identified seven new functions of the accounting profession, i.e.: a co-pilot, a navigator, a brand protector, a storyteller, a digital and technology enabler, a process and control expert, a trusted professional (IFAC, 2019), which means that these new requirements faced by accountants affect the competencies and skills future accounting students should possess. To cope with this challenge, they should be adequately prepared for the emerging challenges posed by the economic environment. Accordingly, the literature review also included a search for positions focusing on the digitalization of the accounting profession within the context of

academic education and training of students on the use of modern digital transformation technologies. The conclusions that emerged after this part of the search are as follows:

1. The need to introduce in academic education courses demonstrating the use of such digital technology tools Big Data, cloud computing (Stanciu, Rindasu, 2017), blockchain technology (Moore, Felo, 2022), data analytics involving RPA and AI (Iordan et al., 2022; Ng, 2023; Keys, Zhang, 2020; Xuxin, 2022; Vincent et al., 2020; SzeKee et al., 2023) has been indicated, as these areas are severely lacking in current study programs (Guşe, Mangiuc, 2022).
2. The accounting profession needs to keep pace with the changes associated with digitalization, thus it is extremely important to provide accounting students, during their education, with exposure to the latest digital technology tools involved in accounting (Berikol, Killi, 2021). It is therefore vital to further develop and improve the accounting curriculum (Suartha et al., 2023).
3. Changes are needed in academic education, addressing the alignment of accounting students' competencies with the business environment needs resulting from the digitalization of the accounting profession (Stanciu, Rindasu, 2017; Moore, Felo, 2022; Guşe, Mangiuc, 2022), as well as the needs reported by such business organizations as NASBA, AICPA, AACSB (Moore, Felo, 2022).
4. Modern forms of teaching such as online and hybrid courses (Iordan et al., 2022, Bastos et al., 2022), video lectures or e-learning courses (Volokhin et al., 2022), as well as case studies on digitalization processes (Guşe, Mangiuc, 2022) and the use of other digital technologies will improve the effectiveness of accounting teaching (Thomas, 2021), especially if the changes introduced will meet the challenges of Industrial Revolution 4.0 (Bastos et al., 2022).
5. Following an analysis of accounting-related college syllabuses and curricula (Stanciu, Rindasu, 2017; Moore, Felo, 2022; Guşe, Mangiuc, 2022), necessary changes in programs have been suggested, incorporating digitalization tools to effectively train accounting professionals. Universities' potential for education in this area has also been highlighted.
6. The need for technological competence in the accounting profession has been indicated, which should include proficient use of spreadsheet and accounting software, inclusive of cloud accounting (Suartha et al., 2023). ICT competence (Berikol, Killi, 2021) and technical skills are a requisite as well (Stanciu, Rindasu, 2017; Moore, Felo, 2022; Guşe, Mangiuc, 2022; Ng, 2023).

The literature review analysis carried out reveals a significant research gap in the empirical studies conducted on digitalization in academic accounting education. The only studies addressing digitalization in the accounting profession from an academic perspective were conducted by Awang et al., 2023 and Taib et al., 2023. Digital competencies and the impact thereof on the digitalization of the accounting profession were examined in two groups: 136 and 440 postgraduate accounting students at the University of Malaysia. The results showed

a strong positive correlation between information literacy, ICT literacy, digital literacy and digitalization (Taib et al., 2023). What is lacking, however, is research on undergraduate and graduate accounting students' knowledge and awareness of the changing role of accountants in response to digitalization. The authors aim to partially fill this gap with their research and the present publication.

### 3. Empirical research methodology

The literature review conducted and the analysis of the legal acts applicable in Poland led the authors of the article to plan the research within areas divided into three stages and a total of ten phases (Table 1).

**Table 1.**  
*Planned empirical studies*

Research stage/ studies	Task	Study sample	Method
<b>STAGE 1</b>			
1) Preliminary study	Presentation of voluntary digitalization tools and the related benefits and barriers	Case study	Semi-structured interview
2) Literature review - preliminary	Scopus, Web of Science	-	Literature analysis
3) Law regulation	Digitalization obligation under the law	-	Law analysis in Poland
<b>STAGE 2</b>			
4) Questionnaire 1	Change in the accountant's role due to digitalization	Accounting firm owners	Questionnaire - MsForms
5) Questionnaire 2	Change in the accountant's role due to digitalization	Accounting firm employees	Questionnaire - MsForms
6) Result analysis	Study summary and conclusions	-	Synthesis, deduction
<b>STAGE 3</b>			
7) Literature review	Scopus, Web of Science	Literature review has been supplemented with positions published in 2023	Literature analysis
8) Questionnaire 3	Survey of last-year Master of Accounting students' knowledge and awareness of the changing role of accountants in connection with digitalization	Students – Poland, Romania – pilot study	Questionnaire MsForms
9) Questionnaire 4	<b>Survey of last-year Master of Accounting and Bachelor of Accounting students' knowledge and awareness of the changing role of accountants in connection with digitalization</b>	<b>Students – Poland – main study</b>	<b>Questionnaire - MsForms</b>
10) Result analysis	Study summary and conclusions	-	Synthesis, deduction

Source: own elaboration.

The first, second and part of phase three research has already been carried out, and the results are presented in B. Kotowska & M. Sikorska (2023a, 2023b, 2024).

The present article reports on the findings of the ninth-phase survey of final-year bachelor's students of specialized studies. The participants of the survey were students of the Faculty of Management at the University of Gdańsk.

In the summer semester of the 2023/2024 academic year, a survey was conducted among last-semester full-time and part-time bachelor's accounting students of the Faculty of Management at the University of Gdańsk. A total of 84 students participated in the survey, who were divided into two research groups:

- Full-time bachelor's students (30 respondents),
- Part-time bachelor's students (54 respondents).

The research sample covered a total of 93 students: 32 full-time and 61 part-time students attending the University of Gdańsk. The questionnaire return rates for each group were: 93.75% and 88.52% respectively.

The research was further cross-referenced to the pilot study conducted earlier (Kotowska, Sikorska, 2024), drawing on the following research groups:

- Full-time master's students (24 respondents),
- Part-time master's students (28 respondents).

For the purpose of the article, the following abbreviations were assigned to the respondents:

- full-time bachelor's students (FB),
- part-time bachelor's students (PB),
- full-time master's students (FM),
- part-time master's students (PM).

The survey was aimed at investigating the state of knowledge and awareness of final-year undergraduate accounting students about the changing role of accountants under the impact of digitalization. The survey was divided into two parts. The purpose was to find answers to the following questions:

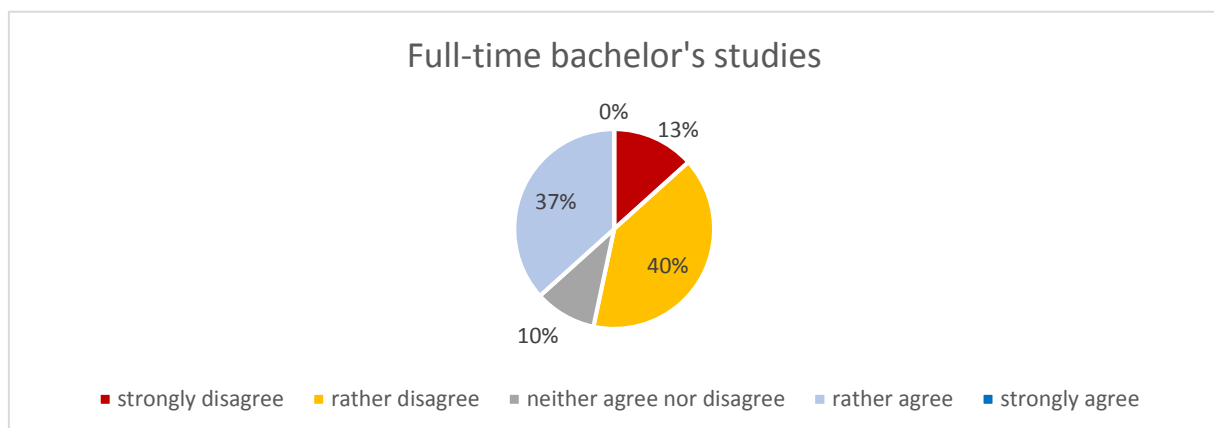
- Are students aware of the changing role of accountants?
- Do students possess digital skills and are they aware of the need for these skills in the accounting field?
- Is there a difference in the perception of digitalization in accounting among undergraduate (bachelor's) vs. graduate (master's) students?
- Is there a difference in perception of digitalization in accounting among full-time vs. part-time students?

#### 4. Results of the empirical research

The survey opened with four questions probing the students' opinions. Answers to the first of the questions - is digitalization changing the role of accountants - were fairly unequivocal. As many as 26 (87%) full-time bachelor's students (FB) and 52 (96%) part-time students (PB) rather agreed or strongly agreed with the statement. The master's students participating in the pilot study (Kotowska, Sikorska, 2024) showed a similar pattern, with 18 (75%) full-time students (FM) and 24 (86%) part-time students (PM) rather agreeing or strongly agreeing with the statement.

The next question inquired about the students' opinions regarding the transformation of the accounting profession in consequence of digitalization. The results leave no doubt – as many as 29 (97%) FB and 53 (98%) PB rather agree or strongly agree that the profession is undergoing a transformation as a result of digitalization. Master's students took a similar view on the issue, with 22 (92%) FM and 26 (93%) PM expressing such an opinion.

More varied answers emerged with the question regarding whether it is likely that a person employed as an accountant in the future will hold no specialized education. The results are illustrated in Figures 1 and 2.

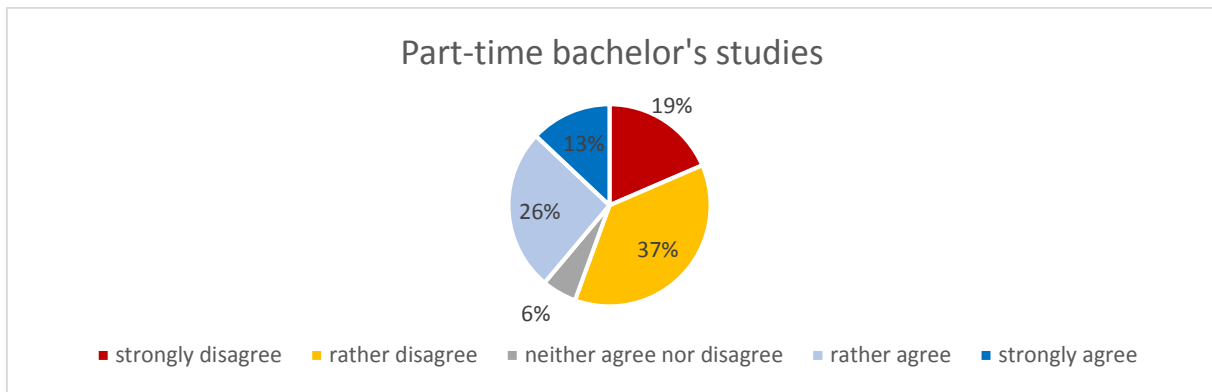


**Figure 1.** Do you consider it possible that digitalization may lead in the future to a situation in which people employed as accountants will not be required to hold specialist degrees?

Source: own elaboration.

The results indicate that students' opinions vary. Among the FB group, 40% rather disagree and 13% strongly disagree that digitalization will lead to conditions under which a person employed as an accountant will not be required to hold a degree in the field. A large percentage of the respondents (37%), however, rather agree with the statement.



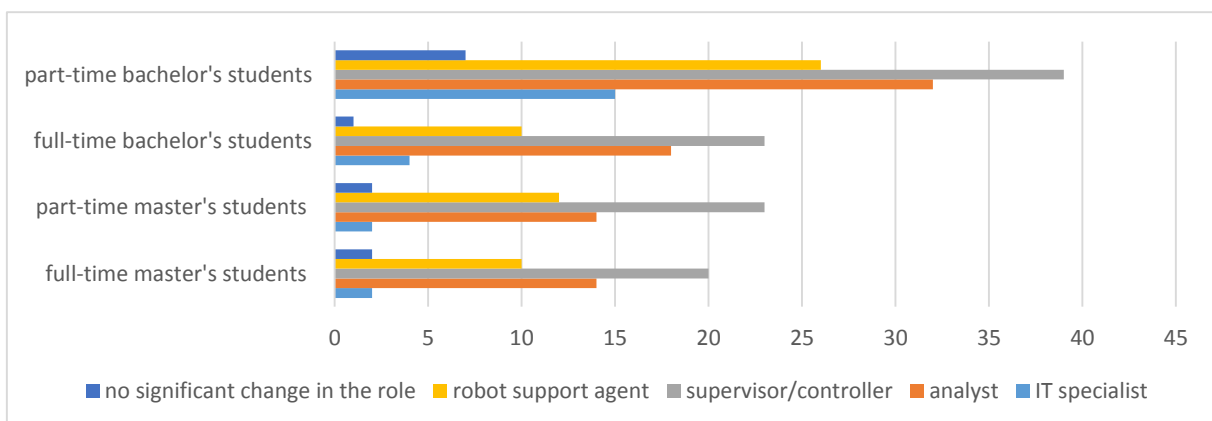


**Figure 2.** Do you consider it possible that digitalization will lead in the future to a scenario in which individuals employed as accountants will not be required to hold specialist degrees?

Source: own elaboration

In the case of the PB group, the results were also divergent. Out of the total of the surveyed, 37% rather disagree and 19% strongly disagree that digitalization will lead in the future to a situation in which those employed as accountants will not need to hold specialized education. Noteworthy, however, is the fact that as many as 39% of the PB group agree (including 13% who strongly agree) with the statement. Similar results were obtained in the pilot study conducted among full-time master's students (FM) - 38% strongly or rather agree with the statement.

With respect to the question “Can RPA or AI technology replace the professional judgment of an accountant, in your opinion?” more than 55% of the respondents in all surveyed groups strongly or rather disagree with this statement (67% in the FB group, 56% in the PB group, 71% in the FM group, and as high as 86% in the PM group), which indicates that a new role of accountants – supervisors, controllers - has been emerging as a result of digitalization. This new role has been indicated by the largest number of respondents in all the groups surveyed. The results are illustrated in Figure 3.

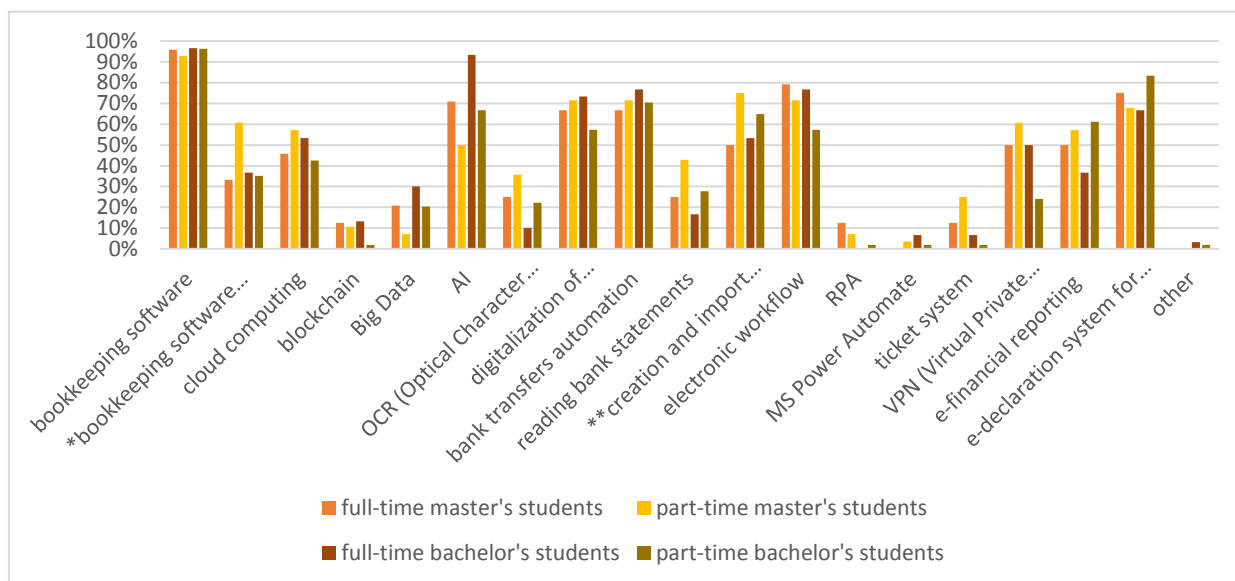


**Figure 3.** Digitalization-effectuated role of accountants.

Source: own elaboration.

The students were, in this question, free to choose more than one answer. In addition to the role of a supervisor/controller, an analyst and a robot support agent likewise received high numbers of indications in all groups. The respondents were also free to provide their own suggestions for the new role of accountants. The examples listed included a person implementing accounting information systems, a tax or business advisor, or a person verifying the data generated by artificial intelligence.

Another issue addressed in the questionnaire was the knowledge of the tools involved in accounting digitalization. The results are illustrated in Figure 4.



\* online/in-cloud bookkeeping software.

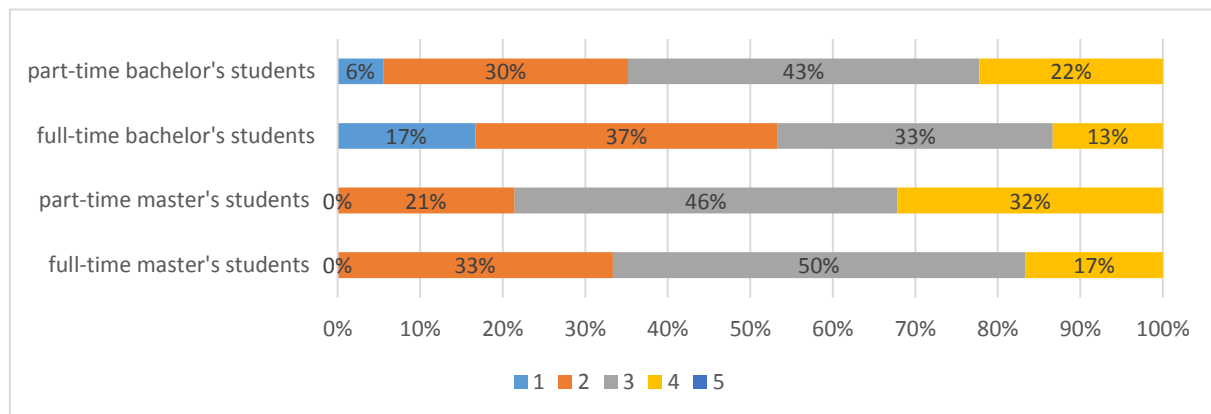
\*\* compilation and import of electronic forms corresponding to the logical structure of the Standard Audit File for Taxes (SAF-T).

**Figure 4.** The operation of which of these tools are you familiar with?

Source: own elaboration.

Across all the groups surveyed, students are most familiar with bookkeeping software. Worth noting, however, is the fact that familiarity with online/in-cloud bookkeeping software was indicated by 61% of the PM group, which represents the highest result, with less than 40% in the other groups. Students are also familiar with the operation of wire transfer automation, document digitalization, VPN or electronic workflow. They are also knowledgeable about the e-declaration system, e-reporting and the compilation of JPK files. Noteworthy is also the fact that as many as 93% of the full-time bachelor's degree (FB) students are familiar with the functioning of artificial intelligence - AI. The remaining groups indicated such familiarity at 71% (FM), 67% (PB) and 50% (PM). The students indicated minor familiarity with RPA and MS Power Automate, and slightly greater with Big Data, blockchain or ticket systems. Bank statement loading as an MT940 file is a feature known to 43% of the PM group. Fewer than 30% in the remaining groups indicated such familiarity.

The respondents were also asked to assess their own digitalization competence. The results are illustrated in Figure 5.

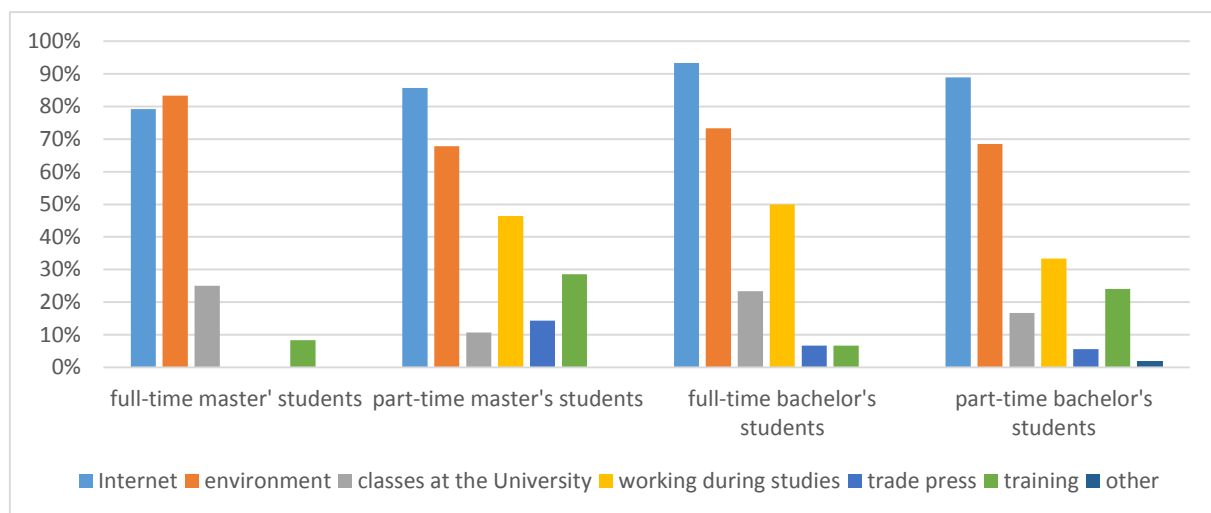


**Figure 5.** How would you rate your knowledge of technological innovations in accounting digitalization?

Source: own elaboration

The data show that none of the students surveyed, both in the pilot survey and the main study, rated their skills at the highest level. Among the PB group, most students assessed the level at “3.” Similar was the trend among the FM and the PM groups. The FB group rated their skills relatively lowest, i.e., 37% of the respondents rated the level at “2,” and as many as 17% rated the level at “1” - the lowest possible level.

The respondents were also inquired about the source of their knowledge of technological innovations. The results are illustrated in Figure 6.



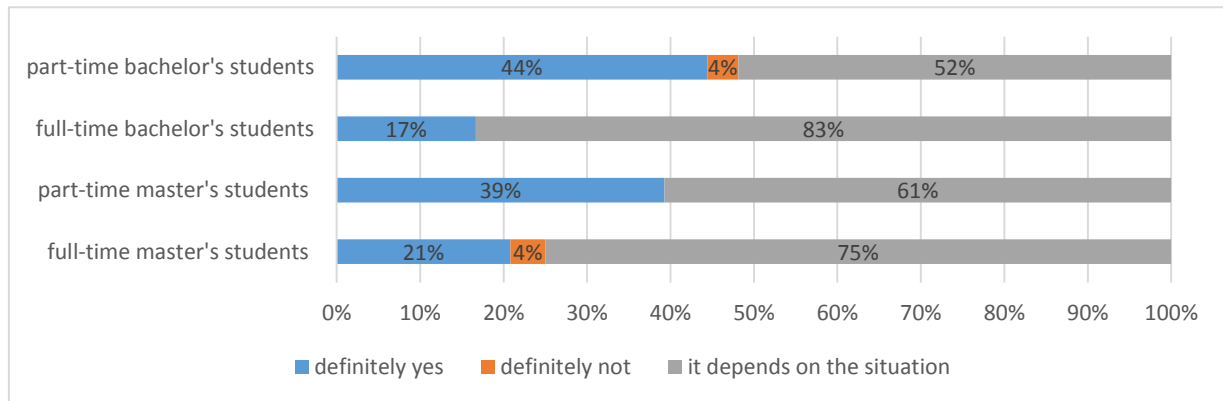
**Figure 6.** Where do you derive your knowledge of technological tools/innovations from?

Source: own elaboration.

The most popular source of information on technological innovations, indicated by the respondents, is the Internet and the environment. The third source of information, in terms of the number of indications, is work during studies. Worth noting is the fact that part-time students, of both master's and bachelor's degree programs, have frequently indicated training as

a source of knowledge on technological innovations. More than 20% of full-time students of both graduate and undergraduate degrees, in turn, have indicated coursework during their studies.

The next survey question addressed the students' preference for digitalization solutions over traditional ones. The results are illustrated in Figure 7.

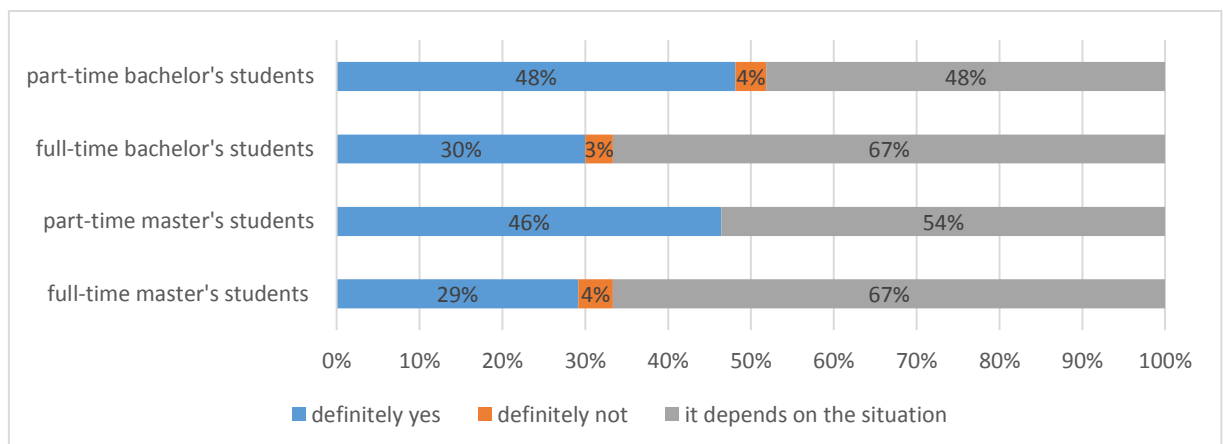


**Figure 7.** Do you prefer digital over traditional/manual solutions?

Source: own elaboration.

The vast majority of students in all groups answered that their preference depends on the situation. Worth noting, however, is that a large percentage of both undergraduate and graduate part-time students - 44% of the PB group and 39% of the PM group - strongly prefer digitalization solutions.

Students were also asked whether they are keen on using technological innovations. The results are illustrated in Figure 8.



**Figure 8.** Are you keen on using technological innovations?

Source: own elaboration.

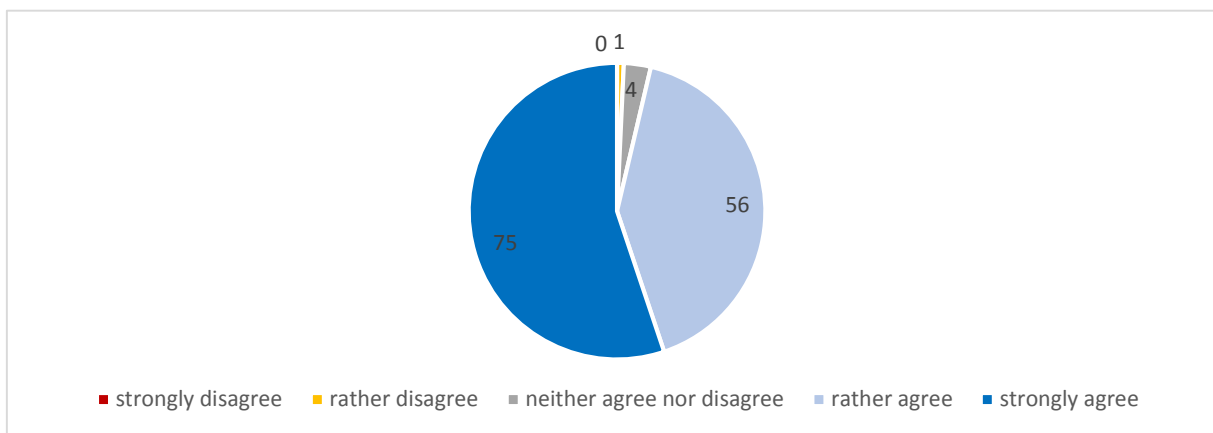
Within the PB group, the results showed a nearly 50-50 split, with 48% of the respondents opting for the answer “it depends on the situation,” another 48% indicating that they are definitely keen to use such facilitations, and 4% expressing the opposite. Across the remaining surveyed groups, more than half responded that their preference depended on the situation,

although as many as 46% in the PM group were definitely eager to use technological innovations.

Another issue raised was the need for knowledge of digitalization among accountants. Two questions were asked in this regard:

- 1) Do you discern the need for digital skills/knowledge of digitalization tools in the accounting profession?
- 2) Are accountants in need of acquiring new technological competencies due to digitalization, in your opinion?

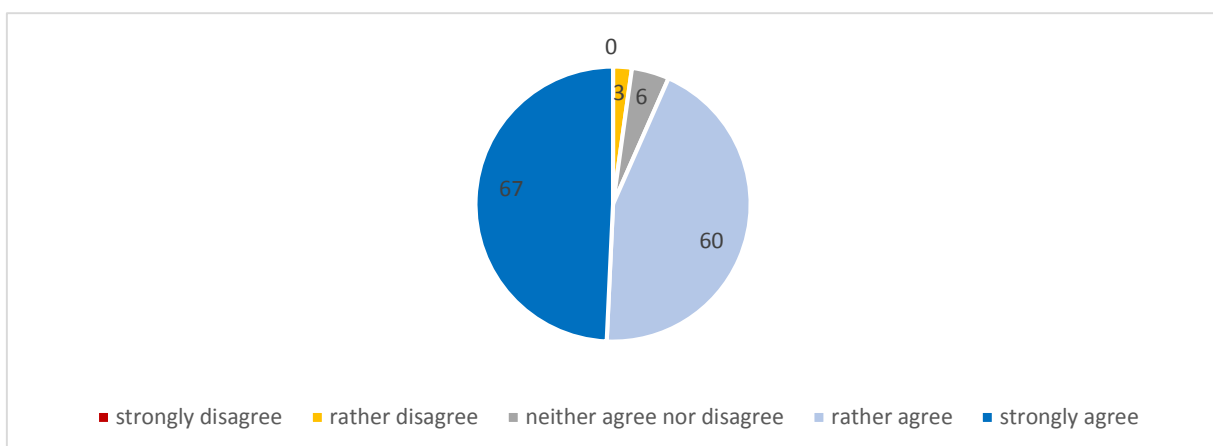
Aggregated results for all four groups are illustrated in Figures 9 and 10.



**Figure 9.** Do you discern the need for digital skills/knowledge of digitalization tools in the accounting profession?

Source: own elaboration.

The results leave no illusion - the majority of the surveyed rather (56 respondents) or strongly (75 respondents), agree that knowledge of digitalization tools is essential in the accounting profession. Only four respondents have no opinion in this regard, and one (PB) rather disagrees with the statement.

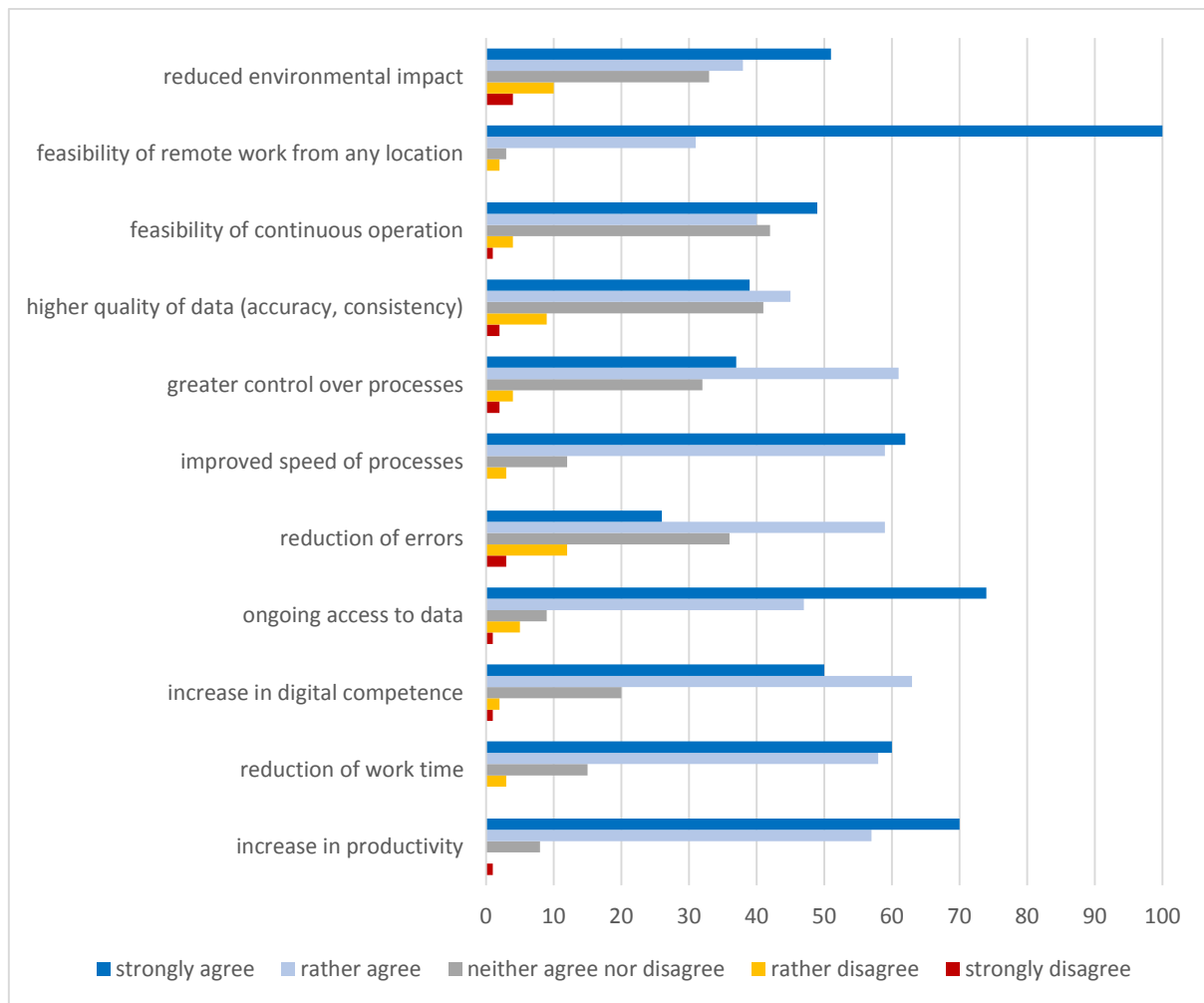


**Figure 10.** Are accountants in need of acquiring new technological competencies due to digitalization, in your opinion?

Source: own elaboration.

When asked whether accountants should acquire new digital competencies in technology as a result of digitalization, the students surveyed provided a similarly unequivocal response - the majority of the surveyees rather (60 respondents) or strongly (67 respondents) agree with the statement. Six respondents have no opinion on the matter, and three (FM) rather disagree with the statement.

The respondents were also asked to rate the identified benefits of digitalization. Aggregated results are illustrated in Figure 11.

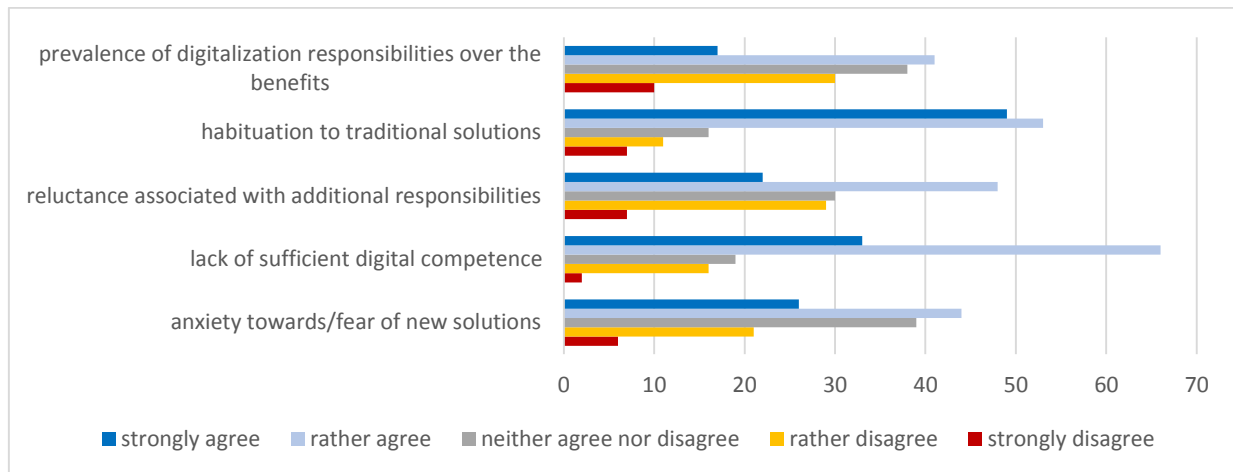


**Figure 11.** Benefits of digitalization.

Source: own elaboration.

One benefit of digitalization most of the respondents strongly agreed with was the ability to work from any location. Continuous access to data, acceleration of processes and increased productivity were likewise ranked highly. The benefits identified by the least number of respondents were reduced errors and higher quality of data.

Awareness of the barriers that may arise during the process is, nevertheless, advisable when implementing digitalization. The respondents were asked to rate the barriers identified, which is illustrated in Figure 12.



**Figure 12.** Barriers to digitalization.

Source: own elaboration.

The biggest barriers to implementing digitalization identified were habitual use of traditional solutions and lack of sufficient technological competence. The prevalence of obligations over benefits, in turn, received the most “disagree” or “strongly disagree” responses, which renders it the barrier identified least by the students.

## 5. Discussion and findings

The literature review conducted reveals a significant research gap in the empirical studies on digitalization in academic accounting education at the undergraduate and graduate levels. The only research addressing digitalization in the accounting profession from an academic perspective were the studies carried out by Taib et al., 2023 and Awang et al., 2023, who surveyed digital competencies and their impact on the digitalization of the accounting profession among postgraduate students at the University of Malaysia. The results showed a strong positive correlation between information literacy, ICT literacy, digital literacy and digitalization. There are no studies on the state of undergraduate and graduate accounting students' knowledge and awareness of the changing role of accountants due to digitalization, however, which renders the results obtained incomparable. A partial bridging of this gap has become the main objective of the present article.

The survey carried out allows some of the following conclusions to be drawn:

1. The answers to the questions regarding whether digitalization has been changing the role of accountants and the profession were unequivocal across all groups, indicating that indeed the role and the profession have been changing as a result of digitalization.
2. A large percentage of the surveyed undergraduate students, i.e., 37% of FB and 39% PB rather or strongly agree with the stance that digitalization will lead to a scenario in which persons working as accountants will not be required to hold a degree in the field.

Such a result, reflecting the students' opinion, may raise concerns with regard to the prospect of teaching the accounting profession. The pilot study (Kotowska, Sikorska, 2024) reinforces the concern expressed in the answers to this question, with 38% of the FM group strongly or rather agreeing with the statement.

3. Optimism, however, is instilled by the answers provided to the question: "Can RPA or AI technology replace the professional judgment of an accountant, in your opinion?" More than 55% of the respondents in all groups strongly or rather disagree with the statement (as much as 86% in the case of the part-time PM group). This highlights the importance of the accounting profession, albeit with new roles - that of supervisors, controllers, robot support agents.
4. One digitalization tool most widely known across all surveyed groups is bookkeeping software. Noteworthy, however, is the fact that knowledge of online/in-cloud bookkeeping software was indicated by 61% of the PM-group respondents, representing the highest result, with less than 40% in the remaining groups. Students are also no strangers to transfer automation, document digitalization, VPNs or electronic document workflow. They are also familiar with the e-declaration/e-reporting system and well versed in JPK files. Most familiar with the functioning of artificial intelligence are the full-time bachelor's degree students (FB) - as many as 93% of the group indicated this very answer.
5. None of the students surveyed rated their technological competence at the highest level, while the FB-group students rated it relatively lowest - 37% of the respondents assessed the level at "2", and as many as 17% at "1" - the lowest possible level. These results, in conjunction with the confirmation that the surveyees are aware of the changes the accounting profession has been undergoing, set the necessary development path for students.
6. The most common sources of information on technological innovations were the Internet and the environment. Work during studies came in third place, and while this answer would seem to be more prevalent among part-time students, the opposite proved to be true. Both in the undergraduate and graduate student groups, work during studies as a source of knowledge on technological innovations was indicated by proportionally more full-time students, compared to part-time students. This highlights the fact that full-time students of both bachelor's and master's degree programs opt for and engage in field-specific work during their studies. Worth noting is that part-time students - both master's (PM) and bachelor's (PB) degree students often also rely on training courses as a source of knowledge of technological innovations. The indication of classes at the University as a source of knowledge, among full-time students in greater proportion than part-time students, only confirms that the scope of expertise after completing full-time studies is, for obvious reasons, more extensive, compared to that of part-time students.



7. Although the majority of surveyees answered that their preference for digitalization solutions over traditional ones varied depending on the situation, the high percentage of part-time students - 44% of the PB group and 39% of the PM group - who strongly prefer digitalization solutions should be underlined. The answer to the question of whether they are keen on using technological innovations presents a similar pattern.
8. Nearly all the respondents recognize the need for digital skills in the accounting profession and imperative of acquiring new digital competencies in technology in the wake of digitalization.
9. The benefits of digitalization which the largest number of surveyees rather or strongly agree with are the ability to work from any location, continuous access to data, acceleration of processes and increased productivity. The least identified benefits, in turn, were reduced errors and higher quality of data.
10. Habitual use of traditional solutions and insufficient technological competence were identified as barriers to the implementation of digitalization by the largest number of the respondents. A large proportion of the students, in contrast, fail to identify a barrier in the form of obligations outweighing benefits.

The above findings provide affirmative answers to the first two research questions. The students are indeed aware of the changing role of accountants. They are aware the major role digital skills, which they possess in a greater or lesser extent, play in accounting.

Answering the third and fourth research questions, it should be concluded that the results obtained are very similar across all groups. Worth noting, however, is the high level of familiarity with AI among full-time bachelor's degree students (FB), compared to other groups (93% are familiar with its functioning), which does not correspond to their self-assessment – they rated their state of knowledge the lowest of all groups in the assessment of competence. It should also be highlighted that knowledge of online/in-cloud bookkeeping software was indicated by 61% of the PM group, which was the highest score, compared to less than 40% in the other groups. Similar results emerged for MT940 statement loading - again, the PM group showed the highest knowledge of the format.

Comparing full-time and part-time students, by contrast, a divergence in the sources of information on technological innovations can be observed - while the main sources: Internet and the environment were indicated by the largest number of students in all groups, full-time students more often than part-time students of a given degree indicated work during their studies. Part-time students, in turn, more commonly indicated training as a source of knowledge, compared to full-time students. The high percentage of part-time students - 44% of the PB group and 39% of the PM group - who strongly prefer digitization solutions over traditional methods should also be highlighted - respectively, 17% in the FB group and 21% in the FM group of full-time students.

## 6. Summary

The changing legal and economic environment, Industrial Revolution 4.0 and the advancement of digital accounting technologies have been affecting the accounting profession. The need for changes in accounting education is therefore imperative. Integration of technology into accounting education is crucial, in order to thereby equip future accountants with the essential skills and competencies. Future accounting professionals will indeed be in need of digital skills. They also need to be ready for continuous professional development, in order to function effectively in digital environments. The potential for the development of digitalization, in terms of accounting and reporting information output, opens up new opportunities for the accounting profession, posing, at the same time, challenges in the areas of new knowledge, the skills and abilities required of accounting professionals. AI and blockchain, are technologies that will evolve over the years and reshape the business landscape, impacting the accounting profession.

The literature review indicated that there are no studies on the state of undergraduate and graduate accounting students' knowledge and awareness of the changing role of accountants due to digitalization. A partial bridging of this gap has become the main objective of the present article.

The survey revealed that both full-time and part-time students of bachelor's and master's degree programs are aware of the changes in the functioning of the accounting profession and the changing role of accountants. A proportion of the respondents (over 30%) indicate that specialized education is likely not to be required for accounting positions, in their opinion, which raises a certain concern within the perspective of teaching in this field. The respondents also indicate that the profession will not be limited to the recording of business operations, but accountants will assume new roles of supervisors, controllers and robot support agents. Most of the surveyees are familiar with such tools as accounting software, document digitalization, transfer automation and electronic financial statements. The lowest, by contrast, was their level of familiarity with RPA, MS Power Automate, blockchain, Big Data or ticket systems. Full-time undergraduate students most commonly rate the level of their technological competence at "2," on a five-point scale, while graduate and part-time undergraduate students rate it at "3". All, nevertheless, do agree that a need for digital skills in the accounting profession exists. The results of the empirical research carried out, therefore, provided answers to the research questions posed.

In his comments on the survey, one respondent shared his thoughts on the changes affecting the role of accountants. He indicated that the use of new technologies, mainly artificial intelligence, is inevitable in the current world. "The machine", as he put it, is no longer going to stop, and will actually intensify the dynamics of its development, which in turn will also affect the accounting profession. The surveyee stresses at the same time that the accounting

profession will not, in his opinion, be fully supplanted by AI, yet the role of accountants will change considerably, which presents as a positive factor diversifying the work, owing to the automation of tedious, monotonous and repetitive tasks. One negative effect, however, could be job cuts and a shortage of employment for less digitally competent specialists.

Learning and acquisition of new competencies associated with modern technologies in the accounting profession is gaining significance and will continue to grow in importance in the future (ACCA, 2020). Not only accountants and accounting office owners are aware of these requirements (Kotowska, Sikorska 2023b), but students who are gearing up for the profession are aware of those imperatives as well, which has been confirmed by survey research conducted.

Noteworthy is the fact that the results obtained and conclusions drawn apply to a selected population at only one university in Poland, which poses as a limitation and does not allow for generalization to the entire population. The conclusions of the pilot study (Kotowska, Sikorska, 2024) in turn, apply to master's degree students at two selected universities in Poland and Romania, which also prevents generalization of the results. Nevertheless, the study carried out provides a basis for further research in the field of academic accounting education. The Authors are considering inviting other economic universities from Poland and Romania to participate in a future study, which would facilitate a cross-country comparison of accounting students' knowledge and awareness of the undeniably changing role of accountants in the modern economy. Worth investigating, moreover, would be whether the current curricula of accounting majors address the needs of the market in the era of digital transformation, which is something other researchers are beginning to focus on as well.

## References

1. ACCA (2020). *The digital accountant: Digital skills in a transformed world*.
2. Andreassen, R.-I. (2020). Digital technology and changing roles: a management accountant's dream or nightmare? *Journal of Management Control*, Vol. 31, Iss. 3, pp. 209-238, doi: 10.1007/s00187-020-00303-2.
3. Awang, Y., Taib, A., Shuhidan, M.S., Zakaria, Z.N.Z., Ifada, L.M., Sulistyowati, S. (2023). Mapping between Digital Competencies and Digitalization of the Accounting Profession among Postgraduate Accounting Students. *Asian Journal Of University Education*, Vol. 19, Iss. 1, pp. 83-94. doi:10.24191/ajue.v19i1.21226.
4. Bakulina, G., Kalinina, G., Luchkova, I., Pikushina, M., Gracheva, A. (2020). Transformation of the accountancy profession during digitalization of agriculture. *International Scientific and Practical Conference on Agriculture and Food Security - Technology, Innovation, Markets, Human Resources (FIES)*, Vol. 17, Iss. 00188, pp. 1-5, doi: 10.1051/bioconf/20201700188.

5. Bastos, S.M., Girardi, S., Schvirck, E. (2022). Technology 4.0 in Accounting: What Future for Education? In: A. Mesquita, A. Abreu, J.V. Carvalho (Eds.), *Perspectives and Trends in Education and Technology. Smart Innovation, Systems and Technologies, Vol. 256*. Singapore: Springer. doi:0.1007/978-981-16-5063-5\_23.
6. Berikol, B., Killi, M. (2021). *The Effects of Digital Transformation Process on Accounting Profession and Accounting Education*, pp. 219-231, doi: 10.1007/978-981-15-1928-4\_13.
7. Boutellis-Taft, O. (2019). New relevance of accounting and reporting: SMEs, ethics and sustainability. *New models of financing and financial reporting for european SMEs: A practitioner's view*, pp. 95-105, doi: 10.1007/978-3-030-02831-2\_8.
8. Carter, C., Spence, C., Muzio, D. (2015) Scoping an agenda for future research into the professions. *Accounting and Auditing & Accountability Journal, Vol. 28 , Iss. 8*, pp. 1198-1216, doi: 10.1108/AAAJ-09-2015-2235.
9. Ciurea, M., Man, M. (2020). *The Accounting Profession from Romania in the Digitized Economy*. Proceedings of 2nd International Scientific and Practical Conference on Modern Management Trends and the Digital Economy - from Regional Development to Global Economic Growth (MTDE 2020), pp. 307-312, doi: 10.2991/aebmr.k.200502.050.
10. Cooper, L.A., Holderness, D.K. Jr., Sorensen, T.L., Wood, D.A. (2022). Perceptions of robotic process automation in big 4 public accounting firms: Do firm leaders and lower-level employees agree? *Journal of Emerging Technologies in Accounting, Vol. 19, Iss. 1*, pp. 33-51, doi: 10.2139/ssrn.3445005.
11. *Digitalization - Cyfryzacja wchodzi do księgowości. Pracownicy albo się dostosują, albo wypadną z rynku pracy*. Retrieved from: <https://www.bankier.pl/wiadomosc/Cyfryzacja-wchodzi-do-ksiegowosci-Pracownicy-albo-sie-dostosuja-albo-wypadna-z-ryнку-pracy-8373607.html>, 5.04.2023.
12. Dimitriu, O., Matei, M. (2014). Cloud accounting: a new business model in a challenging context. *Emerging Markets Queries in Finance and Business (EMQFB 2014) - International Conference on Emerging Markets Queries in Finance and Business (EMQFB), Vol. 32*, pp. 665-671, doi: 10.1016/S2212-5671(15)01447-1.
13. Directive 2012/17/EU of the European Parliament and of the Council of 13 June 2012 amending Council Directive 89/666/EEC and Directives 2005/56/EC and 2009/101/EC of the European Parliament and of the Council as regards the interconnection of central, commercial and companies registers. *Official Journal of the European Union, 16.6.2012, L 156*, 1-9.
14. Dong, Y. (2022). Influence of RPA Financial Robot on Financial Accounting and its Countermeasures. *Lecture Notes on Data Engineering and Communications Technologies. Vol. 97*, pp. 33-40, doi: 0.1007/978-3-030-89508-2\_5.
15. Frolova, O.A., Milgunova, I.V., Sidorova, N.P., Kulkova, N.S., Kitaeva, E.N. (2021). Development of accounting in digital economy era. *Lecture Notes in Networks and Systems, Vol. 136*, pp. 53-59, doi: 10.1007/978-3-030-49264-9\_5.

16. Fulop, M.T., Topor, D.I., Ionescu, C.A., Capusneanu, S., Breaz, T.O., Stanescu, S.G. (2022). Fintech accounting and Industry 4.0: future-proofing or threats to the accounting profession? *Journal of Business Economics and Management*, Vol. 23, Iss. 5, pp. 997-1015, doi: 10.3846/jbem.2022.17695.
17. Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C., Martikainen, M., Lehner, O. (2020). Current State and Challenges in the Implementation of Smart Robotic Process Automation in Accounting and Auditing. *ACRN Journal of Finance and Risk Perspectives*, Vol. 9, Iss. 1, pp. 90-102, doi: 10.35944/jofrp.2020.9.1.007.
18. Gușe, G.R., Mangiuc, M.D. (2022). Digital Transformation in Romanian Accounting Practice and Education: Impact and Perspectives. *Amfiteatru Economic*, Vol. 24, Iss. 59, pp. 252-267, doi: 10.24818/EA/2022/59/252.
19. Harrast, S.A. (2020). Robotic Process Automation in Accounting Systems. *Journal of Corporate Accounting and Finance*, Vol. 31, Iss. 4, pp. 209-213, doi: 10.1002/jcaf.22457.
20. Hsiung, H.-H., Wang, J.-L. (2022). Research on the Introduction of a Robotic Process Automation (RPA) System in Small Accounting Firms in Taiwan. *Economies*, Vol. 10, Iss. 8, pp. 1-18, doi: 10.3390/economies10080200.
21. IFAC - International Federation of Accountants (2019). *Future-Fit Accountants: Roles for the Next Decade, Guidance & Support Tools*. Retrieved from: <https://www.ifac.org/>
22. Iordan, M., Burca, V., David, D., Nicoara, S.A. (2022). Perception of students and master students from the western part of Romania over the digitalization process in the accounting education. *Studies in Business and Economics*, Vol. 17, Iss. 1, pp. 52-72, doi: 10.2478/sbe-2022-0004.
23. Januszewski, A. Kujawski, J. (2021). *Best Practices in Robotic Process Automation in Global Business Services*. 27th Annual Americas Conference on Information Systems, AMCIS 2021.
24. Januszewski, A., Kujawski, J., Buchalska-Sugajska, N. (2021). Benefits of and Obstacles to RPA Implementation in Accounting Firms. *25th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems*, Vol. 192, pp. 4672-4680, doi: 10.1016/j.procs.2021.09.245.
25. Jarco, M. (2023). *Zawody zagrożone przez robotyzację i rozwój AI*. Retrieved from: <https://serwisy.gazetaprawna.pl/praca-i-kariera/artykuly/8697887,zawody-robotyzacja-sztuczna-inteligencja-rozwoj-zagrozenie.html>, 5.04.2023.
26. Keys, B., Zhang, J. (2020). Introducing RPA in an Undergraduate AIS Course: Three RPA Exercises on Process Automations in Accounting. *Journal of Emerging Technologies in Accounting*, Vol. 17, Iss. 2, pp. 25-30, doi: 10.2308/JETA-2020-033.
27. Knihova, L. (2019). Virtual reality in financial reporting: are accountants an endangered species? *7th International Scientific Conference on IFRS - Global Rules and Local Use - Beyond the Numbers*, pp. 137-147. Retrieved from: <https://www.webofscience.com/wos/woscc/full-record/WOS:000649685400011>, 29.11.2022; [knowledge-gateway/](#)

- preparing-future-ready-professionals/publications/future-fit-accountants-roles-next-decade, 30.12.2023.
28. Kokina, J., Blanchette, S. (2019). Early Evidence of Digital Labor in Accounting: Innovation with Robotic Process Automation. *International Journal of Accounting Information Systems*, Vol. 35, doi: 10.1016/j.accinf.2019.100431.
  29. Kokina, J., Gilleran, R., Blanchette, S., Stoddard, D. (2021). Accountant as digital innovator: Roles and competencies in the age of automation. *Accounting Horizons*, Vol. 3, Iss. 1, pp. 153-184, doi: 10.2139/ssrn.3449720.
  30. Kotowska, B., Sikorska, M. (2023a). Digital transformation of a Polish accounting firm: tools, impediments, business performance benefits and implications – case study. *27th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems (KES 2023), Procedia Computer Science*, Vol. 225, pp. 327-336, doi: 10.1016/j.procs.2023.10.017.
  31. Kotowska, B., Sikorska, M. (2023b). Accounting profession transformation in the wake of digitalization – survey results in Poland. *Scientific Papers of Silesian University of Technology – Organization and Management Series*, Iss. 182, pp. 147-165, doi: 10.29119/1641-3466.2023.182.9.
  32. Kotowska, B., Sikorska, M. (2024). Accounting profession transformation as perceived by students – results of a pilot study. *Scientific Papers of Silesian University of Technology – Organization and Management Series*, Iss. 198, pp. 231-251, doi: 10.29119/1641-3466.2024.198.13.
  33. Lewandowski, A. (2021), *Cyfryzacja księgowości – czego powinien oczekiwać przedsiębiorca od nowoczesnego biura rachunkowego?* Retrieved from: <https://dmsales.com/blog/cyfryzacja-ksiegowosci-czego-powinien-oczekiwac-przedsiębiorca-od-nowoczesnego-biura-rachunkowego/>, 5.04.2023.
  34. Mangiuc, D.M. (2016). *Cloud computing for accountants – how to take part*. Proceedings of the 11<sup>th</sup> International Conference Accounting and Management Information Systems (AMIS 2016), pp. 77-89, Retrieved from: <https://www.webofscience.com/wos/woscc/full-record/WOS:000416982800005>, 29.11.2022.
  35. Marcinkowska, E. (2021) Proces przygotowania i składania e-sprawozdań finansowych – dotychczasowe doświadczenia. In: S. Kopera (Ed.), *E-management, t. 1, Digitalizacja procesów biznesowych* (pp. 29-41). Retrieved from: [https://ruj.uj.edu.pl/xmlui/bitstream/handle/item/278590/kopera\\_e-management\\_t-1\\_2021.pdf](https://ruj.uj.edu.pl/xmlui/bitstream/handle/item/278590/kopera_e-management_t-1_2021.pdf), 5.04.2023.
  36. Meiryani, M., Aprilia, K.R., Warganegara, D.L., Yanti, Y. (2022). *Challenges of the accounting profession in the era of the industrial revolution 4.0*. ICEMC '22: Proceedings of the 2022 International Conference on E-business and Mobile Commerce, pp. 39-46, doi: 10.1145/3543106.3543113.
  37. Mihai, M.S., Dutescu, A. (2022). *How cloud accounting and integrated services based on AI can impact accounting companies?* Proceedings of the 16th International Conference on

- Business Excellence (ICBE) - New Challenges of the Century - Digital Economy and the Green Revolution, pp. 849-858, doi: 10.2478/picbe-2022-0079.
38. Moore, W.B., Felo, A. (2022). The evolution of accounting technology education: Analytics to STEM. *Journal of Education for Business*, Vol. 97, Iss. 2, pp. 105-111, doi: 10.1080/08832323.2021.1895045.
39. Ng, C. (2023). Teaching Advanced Data Analytics, Robotic Process Automation, and Artificial Intelligence in a Graduate Accounting Program. *Journal of Emerging Technologies in Accounting*, Vol. 20, Iss. 1, pp. 223-243, doi: 10.2308/JETA-2022-025.
40. Onyshchenko, O., Shevchuk, K., Shara, Y., Koval, N., Demchuk, O. (2022). Industry 4.0 and accounting: directions, challenges, opportunities. *Independent Journal of Management & Production*, Vol. 13, Iss. 3, pp. 161-195, doi: 10.14807/ijmp.v13i3.1993.
41. Plattfaut, R., Borghoff, V. (2022). Robotic Process Automation: A Literature-Based Research Agenda. *Journal of Information Systems*, Vol. 36, Iss. 2, pp. 173-191, doi: 10.2308/ISYS-2020-033.
42. *Pre-consultations - Podsumowujemy prekonsultacje dotyczące kierunków rozwoju zawodu księgowego*, Retrieved from: <https://www.gov.pl/web/finanse/podsumowujemy-prekonsultacje-dotyczace-kierunkow-rozwoju-zawodu-ksiegowego>, 22.01.2024.
43. Razak, N.A., Ismail, K. (2022). Factors Influencing the Adoption of Robotic Process Automation among Accounting Personnel in Malaysia. *Management and Accounting Review*, Vol. 21, Iss. 3, pp. 181-207, doi: 10.24191/MAR.V21i03-08.
44. Rindasu, S.M. (2017). *Emerging information technologies in accounting and related security risks*. Proceedings of the 12<sup>th</sup> International Conference Accounting and Management Information Systems (AMIS 2017), pp. 151-171.
45. Sharma, S., Kataria, A., Sandhu, J.K. (2022). *Applications, Tools and Technologies of Robotic Process Automation in various Industries*. International Conference on Decision Aid Sciences and Applications, DASA 2022, pp. 1067-1072.
46. Stanciu, V., Rindasu, S.M. (2017). Emerging Information Technologies In Accounting - Are The Aspiring Professional Accountants Prepared To Face The Challenges? A Case Study Of Romanian Universities. *Sustainable Economic Growth, Education Excellence, and Innovation Management Through Vision 2020*, Vol. I-VII, pp. 2455-2467.
47. Stancu, M.S., Dutescu, A. (2021). The impact of the Artificial Intelligence on the accounting profession, a literature's assessment. Proceedings of the 15th International Conference on Business Excellence (ICBE). *Digital Economy and New Value Creation*, Vol. 15, Iss. 1, pp. 749-758, doi: 10.2478/picbe-2021-0070.
48. Stoica, O.C., Ionescu-Feleaga, L. (2021a). *Digitalization in Accounting: A Structured Literature Review. Resilience and economic intelligence through digitalization and Big Data analytics - 4th International Conference on Economics and Social Sciences*, pp. 453-464, doi: 10.2478/9788366675704-045.
49. Stoica, O.C., Ionescu-Feleaga, L. (2021b). The accounting practitioner as a driver of digitalization pace. Proceedings of the 15th International Conference on Business

- Excellence (ICBE). *Digital Economy and New Value Creation*, Vol. 15, Iss. 1, pp. 768-782, doi: 10.2478/picbe-2021-0072.
50. Suarta, I.M., Suwintana, I.K., Sudiadnyani, I.G.A.O., Sintadevi, N.P.R. (2023). Employability and digital technology: what skills employers want from accounting workers? *Accounting Education*, 10.1080/09639284.2023.2196665.
51. Sytnik, O.E., Kulish, N.V., Tunin, S.A., Frolov, A.V., Germanova, V.S. (2022). Digitalization as an element of transformation of the accounting and information environment to ensure sustainable development of an economic entity. In: A.V. Bogoviz, E.G. Popkova (Eds.), *Digital Technologies and Institutions for Sustainable Development. Advances in Science, Technology & Innovation* (pp. 335-340). Cham: Springer, doi: 10.1007/978-3-031-04289-8\_57.
52. Taib, A., Awang, Y., Shuhidan, S.M., Zakaria, Z.N.Z., Sulistyowati, S., Ifada, L.M. (2023). Digitalization of the Accounting Profession: An Assessment of Digital Competencies in a Malaysian Comprehensive University. *Asian Journal Of University Education*, Vol. 19, Iss. 2, pp. 365-380. doi:10.24191/ajue.v19i2.22229.
53. Tax Code of 29 August 1997 with subsequent amendments, Dz.U. 1997, Nr 137, poz. 926.
54. The Act in Accounting of 29 September 1994, as amended, Journal of Laws 1994, No. 121, item 591.
55. Thomas, M. (2021). *On dual technology integration for effective teaching of digital accounting in a technology-rich, online learning context*. 8th International Conference on Educational Technologies 2021, ICEduTech 2021 and 17th International Conference on Mobile Learning 2021, ML 2021, pp. 250-254.
56. Tiron-Tudor, A., Donțu, A.N., Bresfelean, V.P. (2022). Emerging technologies' contribution to the digital transformation in accountancy firms. *Electronics (Switzerland)* Vol. 11, Iss. 22, doi: 10.3390/electronics11223818.
57. Vincent, N.E., Igou, A., Burns, M.B. (2020). Preparing for the Robots: A Proposed Course in Robotic Process Automation. *Journal of Emerging Technologies in Accounting*, Vol. 17, Iss. 2, pp. 75-91, doi: 10.2308/JETA-2020-020.
58. Volokhin, Y., Mukhametzyanova, F., Khairutdinov, R. (2022). *Lifelong Learning of an Accountants (Digital Information Processing Masters) in the Context of Digital Economy*. IV International Scientific and Practical Conference (DEFIN-2021). Association for Computing Machinery, pp. 1-7. <https://doi.org/10.1145/3487757.3490923>.
59. Weng, D.D., Wang, X.F., Lv, S. (2014). The business model of cloud computing application in the recovery of accounting. *Advanced Materials Research*, Vol. 962-965, pp. 2770-2773, doi: 10.4028/www.scientific.net/AMR.962-965.2770.
60. Xuxin, Y. (2022). *The Path of Cultivating Applied Accounting Talents Based on DES Model under Big Data, Intelligentization, Mobile Internet and Cloud Computing*. Proceedings of the 5th International Conference on Big Data and Education (ICBDE '22). Association for Computing Machinery, pp. 183-188. doi: 10.1145/3524383.3524399.