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Do the young employees perceive themselves as digitally competent and does it matter?

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Abstract

Purpose – The study aims to examine the digital competence of young employees (under 30 years of age) who graduated from the technical university. Self-assessment of selected digital competencies was examined along with the determination of a self-efficacy level in the area of using digital competencies.
Design/methodology/approach – Quantitative research was conducted using the computer-assisted web interview method on a sample of 4532 respondents.
Findings – Young employees' self-assessment of digital competencies and self-efficacy in the area of using them is high, and it can be assumed that they perceive themselves as digitally competent. Both digital self-efficacy and assessed digital competencies have a positive impact on satisfaction with the university.
Research limitations/implications – The research sample consisted only of employees who graduated from the technical university, but the results may provide feedback on the demand for digital competencies sought in the labor market and constitute valuable information useful in university curriculum development and in vocational education and training.
Originality/value – This is the first study that focuses on the Kozanoglu and Abedin approach to the concept of digital literacy in the context of research on self-assessment and self-efficacy in using digital competencies among technical university graduates, adapting the creative self-efficacy scale by Tierney and Farmer, for measuring digital self-efficacy.
Highlights/value

(1) Young employees' digital competencies self-assessment is high.
(2) Young employees' self-efficacy of using digital competencies is high.
(3) Graduating from a DT-focused department has a positive impact on satisfaction.
(4) Digital self-efficacy has a positive impact on satisfaction with the university.
(5) Assessed digital competencies have a positive impact on satisfaction.

Keywords Digital literacy, Digital competencies, Digital self-efficacy, Technical university graduates
Paper type Research paper

Introduction

The characteristic features of contemporary labor markets are dynamic changes that require continuous monitoring of available labor resources (Gawrycka, Kujawska, & Tomczak, 2020). One of the most significant changes that we are facing nowadays is the progressive process of society and the economy digitalization (Dima & D'Ascenzo, 2021; Pieriegud, 2016),

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and technology is one of the key drivers of digital transformation (Karekla, Pollalis, & Angelopoulos, 2021). Verhoef *et al.* (2021) identified three stages of digital transformation, such as digitization, digitalization and after all – digital transformation. They define digitization as the encoding of analog information into a digital format. Moreover, they claim that digitalization pertains to how IT or digital technologies can be used to alter existing business processes. Finally, they find digital transformation to be the most pervasive phase of a company-wide change that leads to the development of new business models.

In the last decade, information and communication technologies (ICTs) have expanded at unprecedented rates in both developed and developing economies (Dammert, Galdo, & Galdo, 2013). The technologies and processes that are a manifestation of digitalization, and which are of particular importance for the economy, primarily include the so-called big data, cloud computing, distributed ledger technology (DLT), artificial intelligence (AI), cyber-physical systems (CPS), Internet of Things (IoT), augmented reality, blockchain, FinTech, InsurTech, RegTech, cryptocurrencies and the so-called cashless economy (Marszałek & Ratajczak-Mrozek, 2022; Spöttl & Windelband, 2021).

Data are the component of the change that currently strengthens the digital economy (Lăzăroiu *et al.*, 2018). We can observe a large increase in data available in a more or less structured form resulting from the rapid development of the Internet, social media and mobile devices (Olszak, Zurada, & Kozanoglu, 2020). Information resources became one of the key determinants of an organization's success, influencing its competitive position (Olszak & Zurada, 2020; Drucker, 2014; Chen, Chiang, & Storey, 2012). Digital technology is gaining importance in achieving business goals. Companies need to handle digital innovation (Nylén & Holmström, 2015) by creating and putting into action novel products and services (Hinings, Gegenhuber, & Greenwood, 2018), in the process of digital transformation (McPhillips & Licznerska, 2021; von Leipzig *et al.*, 2017; Bauer, Hämmerle, Schlund, & Vocke, 2015). To achieve these goals as part of innovative and sustainable development, organizations need to utilize available datasets in various ways, e.g. by increasing sales, enhancing products or services and improving operations (Olszak *et al.*, 2020) and production processes (Margherita & Braccini, 2021; Savastano, Amendola, Bellini, & D'Ascenzo, 2019).

The resource necessary to implement this assumption is competent and highly qualified employees. Today, companies are in high demand for digital skills of the staff (Cardenas-Navia & Fitzgerald, 2019; Beblavý, Fabo, & Lenaerts, 2016; Plawgo & Ertman, 2021) and digital literacy has become one of the foundational literacies and skills in the twenty-first century (Chen, 2021; Wild & Schulze Heuling, 2020). Noteworthy, digital literacy is also connected to sustainable development goals (see Kaplan, 2021). Irreversible processes of informatization, digitalization and computerization of procedures and jobs have made the learning and use of digital competencies necessary to face constant change and take advantage of it (Buonocore, Agrifoglio, & de Gennaro, 2021). Consequently, research on digital literacy concepts has grown in popularity in recent years (Sefton-Green, Nixon, & Erstad, 2009). Kozanoglu and Abedin (2020) expanded the affordance theory (Anderson & Robey, 2017; Vyas, Chisalita, & Dix, 2017; Orlikowski, 2000) by emphasizing the actualization of affordances as they drew attention to how technologies affect practices and vice versa in an organizational context. They defined "digital literacy" as an organizational affordance that consists in employees' ability to utilize digital technologies in work-related practices (Kozanoglu & Abedin, 2020). We followed this concept as a theoretical foundation for our research and bore in mind that it includes both individual and organizational levels. However, in this particular study, we did not focus on the assessment of digital literacy as an organizational affordance but on the examination of digital competency on the individual level. Similar to Kozanoglu and Abedin (2020), Vuorikari, Punie, Gomez, and Van Den Brande (2016) and Carretero, Vourikari, and Punie (2017), we assumed that digital competence covers elements such as information and data literacy, communication and collaboration, digital content creation, safety and problem-solving.

The competence level of each employee results from individuals' personal resources, including their involvement in learning, skills and individual talents (Hartog, 2001). Dynamic changes within work content and the interaction and communication between humans and technology entail many consequences for users and providers throughout the entire vocational training system (Spöttl & Windelband, 2021). The link between higher education and employment is indisputable (Souto-Otero & Białowolski, 2021; Brown, Hammer, Perera, & McIlveen, 2021). Universities play a key role in shaping employees' competence profile (Gawrycka, Kujawska, & Tomczak, 2021; Karaboga, Gurol, Binici, & Pınar, 2021; Tomczak, 2018; Bykowski, Szeluga-Romańska, Tomczak, & Ziemiański, 2012), including digital competence (Fernandez-Villavicencio, 2010) and integrating technology into the learning process (Mroczek-Dąbrowska & Kania, 2020; Sousa & Rocha, 2019). Therefore, we decided to examine a group of technical university graduates.

Our study aimed to examine the digital competence of young employees (under 30 years of age) who graduated from the Gdańsk University of Technology (GdańskTech), which is one of the largest technical universities in Poland. We focused on young employees, whom Prensky (2001) describes as "digital natives." They have all grown up in digital reality and can navigate the digitized world effectively using digital technologies (Prensky, 2001). We intended to recognize their proficiency in this field, focusing specifically on the area of professional work. First, we examined their self-assessment of a selected set of digital competencies. Second, we determined a self-efficacy level in the area of using digital competencies in day-to-day work. To the best of our knowledge, this is the first study of this kind involving such a large research sample and focused on graduates of a technical university.

In the following empirical part of the article, we will present the methods, hypotheses and used measures. Next, we will present the study results and their discussion that will include contributions and implications, both practical and theoretical. We will indicate the study limitations and future research directions, and the article will finish with conclusions.

Methods

We conducted a quantitative study using the computer-assisted web interview method. We created the research sample based on the non-random procedure, i.e. deliberate selection. We sent messages with a request to participate in the study and a link to the electronic questionnaire to all respondents who were in the database of the Career Office of the GdańskTech and who had previously agreed to participate in the study. We conducted three editions of the study successively in 2018, 2019, and 2020. Each time, the research sample included respondents who obtained a graduate status (bachelor's or master's degree) two years before participating in the study, respectively, in 2016, 2017, and 2018. In total, we asked almost 13,000 respondents to participate in the research. The response rate was 37.4%, and as a result, the research sample initially consisted of 4856 respondents. Ultimately, after we eliminated from the sample 324 non-working individuals (6.7% of all respondents), the final research sample consisted of 4532 young employees, including 2260 women and 2472 men. We may consider Poland in general and Polish graduates of technical studies in particular to be an important data basis for studying digital competencies. Based on Poland's development in recent decades, it may join the group of wealthy economies and become one of the world's "economic powerhouses" (Sharma, 2017). Undoubtedly, to further develop, the Polish economy needs to keep pace with the speed and demands of digital transformation (Wrobel, 2020). According to the World Bank (2022), Poland needs to successfully conduct a transition in three areas: green economy shift, digital technologies adoption, and the aging population. All these transitions will involve a demand for digitally and technically competent labor market participants and current university graduates will be at the forefront of managing these processes. To ensure a positive scenario for the Polish economy, which

requires a high level of digital competencies, it is crucial to thoroughly examine their levels and correlates, both theoretically and practically.

Hypotheses

Before starting the research procedure, we asked the following research questions:

RQ1. What is young employees' self-assessment of a selected set of digital competencies?

RQ2. What is the level of young employees' self-efficacy in the area of using digital competencies in day-to-day work?

RQ3. Are digital competencies and digital self-efficacy a significant predictor of satisfaction with the university?

To answer the above-mentioned questions, we set the following research hypotheses:

Main hypotheses:

H1. The level of young employees' self-assessment in the area of using digital competencies is high.

H2. The level of young employees ' self-efficacy in the area of using digital competencies in day-to-day work is high.

Supplementary hypotheses:

H3. Graduating from a university faculty focused on digital technologies positively impacts satisfaction with the university.

H4. Digital self-efficacy positively impacts satisfaction with the university over and beyond salary and evaluation of the studies program.

H5. Assessed digital competencies positively impact satisfaction with the university over and beyond salary and evaluation of the studies program.

We conducted the entire statistical analysis using a dedicated SPSS 27 software.

Measures

Satisfaction with the university

We measured satisfaction with the university was measured with three items pertaining to satisfaction derived from completion of the university, the faculty, and the particular field of study. We used a four-point Likert scale. Principal component analysis indicated that all statements were loaded on a single factor. The factor explained 72.12% of the variance and its Cronbach's alpha level reached 0.80. We computed a single score indicating the satisfaction level with the university for each participant by averaging the answers to three items.

Faculty type

When we conducted the survey, there were nine faculties at GdańskTech. For the purpose of the study, we divided them into two categories. The first comprised two faculties directly focused on digital technologies (the Faculty of Electronics, Telecommunications, and Informatics and the Faculty of Electrical and Control Engineering). The second category included all other faculties (Faculty of Architecture, Faculty of Applied Physics and Mathematics, Faculty of Chemistry, Faculty of Environmental Engineering, Faculty of Mechanical Engineering, Faculty of Ocean Engineering and Ship Technology, Faculty of Management and Economics). Although in all faculties at least selected courses include the

use of digital technologies, the two faculties comprising the first category are most strongly related to them. In total, 1138 participants (25.1%) graduated from these two faculties.

Studies program evaluation

We evaluated the studies program on a four-point Likert scale. We used two items. Participants indicated which program of their studies allowed them to gain the knowledge (the first item) and competencies (the second item) required in their professional careers. Both items were loaded on a single factor. The factor explained 81.81% of the variance and its Cronbach's alpha reached 0.78. We computed a single score indicating the evaluation of the studies program for each participant by averaging the answers to two items.

Salary

We measured salary using a single item. We asked participants to indicate their net salary using one of the ranges included in the questionnaire. Due to the sensitive nature of the salary information, participants did not have to answer this question. Although ranges are a less exact measure than a particular value, they increase the probability of obtaining responses. Overall, 396 participants (8.7%) decided not to provide an answer to the question about salary.

Answers regarding salaries were in Polish zlotys (PLN). We provided four ranges as possible answers. To ensure data clarity, it is worth indicating that the average net salary in Poland in December 2020 was app. 4300 PLN and the minimum wage was app. 1900 PLN. The ranges were as follows:

(1) up to 2500 PLN (521 participants; 12.6% of valid answers),

(2) between 2501 and 3500 PLN (1374 participants; 33.2% of valid answers),

(3) between 3501 and 5000 PLN (1230 participants; 29.8% of valid answers),

(4) over 5001 PLN (1011 participants; 24.4% of valid answers).

We created three dummy variables representing the salary level to include this aspect in the regression model. We used the lowest salary range as the baseline category.

Digital self-efficacy

We measured digital self-efficacy using the following three items based on the creative self-efficacy scale by Tierney and Farmer (2002):

(1) I am certain that I can be digitally competent.

(2) I trust in my ability to use the digital tools required in my organization.

(3) No matter what kind of digital technologies will be implemented at my workplace, I am sure that I will be able to master them.

We asked the participants to indicate how much they agreed with each of the statements using a five-point Likert scale. All three items were loaded on a single factor. The factor explained 79.99% of the variance, and its Cronbach's alpha was 0.87. We computed a single score indicating the level of assessed digital self-efficacy for each participant by averaging the answers to two items.

Digital competencies

There are multiple ways to measure digital competencies (van Deursen, Helspe, & Eynon, 2014). We could assess them with regard to their convenience and reliability. The most reliable

measurement tool is performance tests conducted in a controlled environment. However, the difficulties related to their organization and the fact that their administration is very time-consuming, significantly limit their applicability in testing large samples (as is the case in the present article). Thus, more often, scholars administer scales based on self-assessment (e.g. Correa, 2010; Hargittai & Hsieh, 2012). Noteworthy, we can increase their reliability by following certain principles. Firstly, it is of value to develop them with previously used and verified measurement scales as a basis. Furthermore, they should be specific in the sense that they allow to measure selected aspects of competencies in accordance with the particular research goals. Furthermore, the statistical properties of the scales used require careful analysis and verification in accordance with commonly accepted good practices. We followed all these three requirements in the present study in the manner described below.

We developed the questionnaire items based on the works of Vuorikari *et al.* (2016) and van Deursen *et al.* (2014). We measured participants' digital competencies with 12 items and a five-point Likert scale. We asked participants to indicate to what extent they possessed competencies related to various aspects of digital activity, e.g.

(1) Using advanced digital technologies to solve problems in everyday work.

(2) Keeping up with the changes taking place in the digital environment.

(3) Obtaining and analyzing information from the Internet.

The entire scale used in the study is available upon request.

We performed exploratory factor analysis to determine the scale's internal structure. We applied the principal component method. The Kaiser-Meyer-Olkin measure of sampling adequacy reached 0.94, and Bartlett's test of sphericity was significant χ^2 (66) = 35482.76, $p < 0.001$. We used the scree plot criterion to determine the number of factors. This revealed a one-factor solution. The factor explained 56.92% of the variance. Its reliability level reached 0.92 We computed the Cronbach's alpha coefficient and a single score indicating the level of participants' digital competencies was computed for each participant by averaging answers to twelve items.

Results

Table 1 presents descriptive statistics of the computed measures together with reliability levels (Cronbach's alpha internal consistency for multi-item indices).

Cronbach's Alpha reliabilities ranged from 0.78 to 0.92. Reliabilities were satisfactory for all variables; they were above – or approached – the recommended level of 0.7. Both H1 and H2 pertained to the levels of self-assessed digital competencies and digital self-efficacy. Their mean values obtained in the group of respondents were distinctly higher than the midpoint of the used scale (i.e. 3). To verify the hypotheses, we ran one-sample *t*-tests and compared the mean values obtained in our sample with a value of 3 (the scale's midpoint, which would indicate an average assessment of competencies and efficacy). In the case of both variables, the difference was significant at the level of $p < 0.001$. The value of the *t*-test reached 52.81 for digital competencies and 120.47 for digital self-efficacy. Thus, we confirmed H1 and H2.

Measure	Alpha	M	SD
1. Satisfaction with the university	0.80	3.22	0.60
2. Studies program evaluation	0.78	2.75	0.67
3. Digital self-efficacy	0.87	4.27	0.71
4. Digital competencies	0.92	3.64	0.82

Source(s): Own elaboration

Table 1.
Descriptive statistics: computed variables

We used hierarchical regression analysis to investigate the hypotheses H3, H4, and H5. We began with testing assumptions. We computed the correlations and variance inflation factors. Notably, there were significant positive correlations between the measures of elements of the tested model and the outcome variable – satisfaction with the university. Table 2 presents them. Variance inflation factor (VIF) scores indicated that the models used in this study were not multicollinearly distorted. All their values were below 10 (the highest VIF value reached 1.82).

Table 3 presents the results of the hierarchical regression. It includes information on three tested models.

We entered the faculty type together with gender (a control variable) to form the base model (Model 1 in Table 3). Altogether, we tested three models and in each of them, we added additional measures. We aimed to investigate whether these elements contribute to explaining the variance of the criterion variable (satisfaction with the university) over and beyond one another. We entered studies program evaluation in Model 2 together with dummy coded salary. The lowest salary served as the baseline category. We entered digital competencies and digital self-efficacy in the final model, i.e. Model 3. We noted a significant change in the variance explained for each consecutive model.

In the base model, only the type of faculty had a significant relationship with the criterion variable. We confirmed H3. Studies program evaluation and salary included in Model 2 significantly and positively related to the criterion variable. In Model 3, we found both entered variables-digital competencies and digital self-efficacy to be significant determinants of satisfaction with the university. We found the expected positive relationship. Thus, we confirmed H4 and H5. Moreover, we found the investigated variables to explain the variance in satisfaction over and beyond the predictors entered in Model 1 and Model 2.

Table 2.
Descriptive statistics: computed variables

Variable	1	2	3	4
1. Satisfaction with the university	–			
2. Studies program evaluation	0.56**	–		
3. Digital self-efficacy	0.22**	0.21**	–	
4. Digital competencies	0.21**	0.20**	0.51**	–

Note(s): $^{**}p < 0.01$
Source(s): Own elaboration

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Variables	Model 1	Model 2	Model 3
Type of department (digital = 1)	0.12***	0.06***	0.05***
Gender (female = 1)	0.00	−0.03*	−0.04**
Studies program evaluation		0.55***	0.53***
Salary – category 2 (dummy variable)		0.04*	0.03^{+}
Salary – category 3 (dummy variable)		0.07***	0.05***
Salary – category 4 (dummy variable)		0.07***	0.05***
Digital competencies			0.06***
Digital self-efficacy			0.07***
R^2	0.02	0.32	0.34
Adjusted R^2	0.02	0.32	0.33
ΔR^2	0.02	0.31	0.01
F value	33.96***	354.01***	279.26***
ΔF	33.96***	506.30**	37.50***

Note(s): Criterion variable is satisfaction with the university; standardized regression coefficients (β) are presented in the table. $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{+}p < 0.10$
Source(s): Own elaboration

Discussion

Regardless of the business' nature, employees are one of the company's key resources (Motyka, 2018). Employees' digital competencies impact the organization's functioning and build their competitive advantage in the market.

Most organizations operating in the world of digitization know that their key intangible assets are employees equipped with appropriate, often unique, qualifications. Nowadays, access to information resources seems to be unlimited, but their proper use and security guarantees are becoming a challenge for organizations. Thus, employees with high qualifications in the area of digital competencies become very important. It is also essential that universities prepare highly specialized staff following the trends set by the labor market. On the one hand, organizations must support employees with personal resource development (Hartog, 2001), and on the other hand, they must strive for their proper use in the organization to gain a market advantage (Kozanoglu & Abedin, 2020).

In the present study, we sought to verify the levels of the described variables related to being digitally savvy and their relationship with satisfaction with the university. Respondents were university alumni who graduated two years prior to taking part in the study. This period is sufficient to obtain first experiences in the labor market and gain perspective on the experience and results of university studies. We demonstrated that graduating from a digitally oriented university faculty, digital competencies, and digital self-efficacy were significant predictors of satisfaction with the university. They were not particularly strong predictors in terms of the explained variance of the criterion variable, but were significant beyond other factors, including salary and general assessment of studies' quality. This result seems to be particularly noteworthy as universities engage in increased competition to attract talents. Examining and identifying factors that may offer an advantage to specific institutions is a worthwhile endeavor. We believe that digital competencies and digital self-efficacy can play such a role, given their contemporary significance (Beblavý *et al.*, 2016; Kozanoglu & Abedin, 2020).

The results indicate that young university graduates assess their digital competencies and digital self-efficacy as high. Even though the study based on self-assessment, we cautiously propose that the investigated group has the potential to fulfill the employers' demand for digitally-skilled employees (Cardenas-Navia & Fitzgerald, 2019; Węglińska, 2018; Beblavý *et al.*, 2016). Respondents expressed a particularly strong sense of efficacy pertaining to using digital tools. As self-efficacy is a good predictor of performance and resilience (Tierney & Farmer, 2002), this result also fosters an optimistic view of the workplace performance prospects for recent technical university graduates. The level of self-assessed digital competencies was also clearly higher than the mid-point scale of our adopted scale. Nevertheless, it seemed that respondents displayed somewhat weaker confidence about the possessed skills than about their efficacy. Speculatively, while specific required digital competencies related to particular activities are bound to change, high self-efficacy can remain a stable foundation that allows mastering the necessary skills.

Contributions and implications

Among the contributions, we may indicate both theoretical and practical implications.

Practical implications

First, the results may provide practical implications, such as feedback on the demand for digital competencies sought in the labor market and constitute valuable information for university curriculum development, vocational education, and training of workers, to meet labor market demands, whose importance was confirmed by the previous study by Spöttl and

Windelband (2021). The contributions of our study go beyond the practical dimension of research on digital literacy and employee competencies.

Theoretical implications

To the best of our knowledge, this is the first study to focus on the Kozanoglu and Abedin (2020) approach to the concept of digital literacy in the context of self-assessment and self-efficacy research of digital competencies proficiency among technical university graduates. Moreover, we contributed to the methodology of self-efficacy measurement by adapting the creative self-efficacy scale by Tierney and Farmer (2002) for measuring digital self-efficacy.

Limitations

We are aware that despite the indisputable advantage of the large research sample, the study is not free from limitations. First, the research sample consisted only of employees who graduated from the technical university. Thus, we omitted individuals with non-technical education backgrounds. Second, to fully assess the digital competencies of young employees, we would have to conduct further comparative studies on employers' opinions. Only research that involves the employer's assessment of employees' digital competencies will allow us to verify their point of view on the respondent's self-assessment in our study.

Further research

Today, the dissemination of digital technologies is progressing, and their importance will only increase. Furthermore, the Covid-19 pandemic constituted an unprecedented crisis in a world already undergoing digital transformation (Bennett & McWhorter, 2021) and it only exacerbated new technology's impact on work and employment (Hodder, 2020). To effectively use technology within the digitized world, people need competence at an appropriate level. Thus, we need to continue research focused on digital competencies including such skills as the ability to master information resources and databases or using advanced digital technologies to solve problems in everyday work. Such research should be multi-faceted and cover both the individual dimension and the organizational perspective. It should also include comparative studies on the graduates' self-assessment of their competencies coupled with the employers' assessment. This seems to be the necessary condition to successfully face the digital transformation process and to effectively implement the constantly emerging digital innovations.

Conclusions

We confirmed all hypotheses. Young employees, often referred to as digital natives, who have unrestricted access to digital resources, are proficient in the realm of multimedia. They seem to be aware of their strengths in this field and perceive themselves as digitally competent. They evaluate highly their digital competencies and the self-efficacy level in the area of using these competencies in day-to-day work. Moreover, the study results indicated that closer contact with digital technologies and mastering them at a higher level by graduating from faculties focused on digital technologies had a positive impact on satisfaction with graduating from university. Finally, we also confirmed that both digital self-efficacy and assessed digital competencies positively impact satisfaction with the university over and beyond salary and evaluation of the studies program, which additionally emphasizes the importance of knowledge and skills in the above-mentioned areas.

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