Self-Assessment of Digital Competenciees among Employees and Non-Working People of Generation Z in the Economy 4.0

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Abstract:

Purpose: *The objective of this article is to identify and analyse self-assessment of digital competencies among employees, soldiers and Generation Z people who are not in employment, as well as its correlations with gender, generation, personality, place of residence, professional status, interest in professional military service, motivation, feeling of satisfaction of their expectations concerning employment/military service, as well as capacity to work in Economy 4.0.*

Design/Methodology/Approach: *The sample was based on random selection of 23 out of 28 powiats and questionnaires handed out during the obligatory military entrance processing by Military Draft Offices. Non-parametric tests were used for data analysis. Correlations between the variables were tested by chi-square test for variables on nominal scale. For analysing correlations between the numerical and categorical variables, U-Mann-Whitney test (for two groups) or Kruskal-Wallis test (for more than two groups) were applied. In the case of two numerical variables, Spearman's linear correlation coefficient was applied. Furthermore, in the case of more than two groups, the author applied Jonckheere-Terpstra trend test and post hoc analysis with Dunn test with Bonferroni's correction for tied ranks.*

Findings: *Empirical research indicates that the level of the studied digital competencies is not high in respondents' self-assessment. Respondents of Generation Y declared the highest self-assessment of the competencies. The level of digital competencies varied depending on the place of residence and it was the lowest among respondents living in countryside. It turned out that soldiers have significantly higher digital competencies than civilians. No significant differences in digital competencies were found with respect to gender and position held. However, a series of significant correlations were found between digital competencies and other variables.*

Practical Implications: *Practical business implications concern mainly necessity of broader development of digital competencies in organisations, and in Economy 4.0.*

Originality/value: *The article describes a diagnosed competency gap in the area of digital competences in employees, soldiers and non-working representatives of generation Z. It has also been established that the increase in their digital competences increases their motivation to work, their willingness to operate their own business, leads to a higher sense of fulfilment of expectations concerning employment/military service, higher interest in professional military service and higher capacity to work in Economy 4.0.*

Keywords: *Digital competences, Economy 4.0, employees, students, soldiers.*
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1. Introduction

The digital transformation taking place as part of the fourth industrial revolution is a special organizational change, which brings penetration of digital technologies through all aspects of an organization's operation (Volini, Occean, Stephan, and Walsh, 2017). Communication Technologies (ICTs) have brought about a revolution in the entire social spectrum, especially in the way of communicating and obtaining information (Lores *et al.,* 2019). As a result, the demand for digital competences is growing. About 10 % of the EU labour force has no digital skills, mostly because they do not use the internet. 35 % does not have at least basic digital skills, which are now required in most jobs (DESI, 2019). Poland, next to Bulgaria, Romania and Greece have the lowest scores on the The Digital Economy and Society Index (DESI, 2019). Poland took 26th place out of 28 countries in the DESI 2019 digital economy and society ranking of the EU. In Poland, 43% of women (56% in the EU) and 46% of men (69% in the EU) have at least basic digital competences (European Commission, 2020).

These data indicate an existing gap in the level of digital competences. The above-mentioned statistics do not allow determination of the level of digital competences in the self-assessment of employees, soldiers or people from Generation Z who are not yet working. Although this self-assessment is subjective, it is important from the point of view of determining whether the level of their digital competences will enable them to work/serve in Organization 4.0. This issue is poorly researched in relation to employees and non-working people from Generation Z. However, there is a complete lack of studies concerning soldiers. There is also a knowledge gap regarding the relationship between digital competences and personality, professional status, interest in professional military service, motivation, the sense of satisfaction of expectations towards work / service, as well as the ability to work in Economy 4.0.

Therefore, the author decided to analyze this subject in detail. The objective of the article is to identify and analyze digital competences in the self-assessment of employees, soldiers and people from Generation Z, as well correlations of these competences with gender, generation, personality, place of residence, professional status, interest in professional military service, motivation, sense of satisfaction of expectations towards work/service, as well as the ability to work in Economy 4.0. The above objective was also associated with the practical goal of empirical research, consisting in formulating recommendations regarding the possibility of modifying and improving digital competences, which are crucial in Economy 4.0. In the course of the research and the literature review, the following research thesis was adopted:

T1: There are statistically significant relationships between the employees' (self-assessed) digital competences and: gender, age /generation, place of residence, personality, professional status, position held, interest in professional military

service, motivation, expectations towards work and the employer, and the ability to work in Economy 4.0.

2. Literature Review

Given the enormous and growing importance of technology in our everyday lives, digital competencies have become the key question for real digital citizenship. These new competencies have become necessary life-long learning competencies not only for students from all levels but for all citizens (Pérez-Escoda and Fernández-Villavicencio, 2016). The transformation of technology has accelerated in pace. Business models are evolving for the communication, media, and technology (CMT) industry, and companies are looking to take advantage of new opportunities and innovate to keep up with the changes ahead. Some analysts point to us living in the age of "VUCA" – volatility, uncertainty, complexity, and ambiguity – driven, in part, by CMT innovations. Now, business models are more dynamic and fluid than ever before; this new phase has been dubbed Economy 4.0, also known as the sharing or gig economy (Marsh, 2018).

The conducted research required terminological considerations for such concepts as competences and digital competences. Competence refers to complex know-how that encompasses a set of knowledge, skills and attitudes which complement each other and allow a responsible and efficient professional exercise when conveying expertise (knowledge), know-how (skills) and adequate behavior (attitudes) in each action (Armengol *et al.,* 2011). According to Ferrari, digital competence can be described in a broader sense as the confident, critical and creative use of ICT (information and communication technologies) in work, employment, learning, recreation, social inclusion and/or in the field of participation. Digital competence is a transversal key competence that, as such, enables us to acquire other key competencies (e.g., language, mathematics, learning, cultural awareness) (Ferrari, 2013).

As defined in the Recommendation of the European Parliament and of the Council of 18 December 2006 on Key Competences for Lifelong Learning (2006/962/EC) digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT, the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet. Digital competence requires a sound understanding and knowledge of the nature, role and opportunities of IST in everyday contexts: in personal and social life as well as at work. This includes main computer applications such as word processing, spreadsheets, databases, information storage and management, and an understanding of the opportunities and potential risks of the Internet and communication via electronic media (e-mail, network tools) for work, leisure, information sharing and collaborative networking, learning and research. These skills need to include the ability to search, collect and process information and use it

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in a critical and systematic way, assessing relevance and distinguishing the real from the virtual while recognising the links. Individuals should have skills to use tools to produce, present and understand complex information and the ability to access, search and use internet-based services (European Commission, 2018).

Digital competences have been the subject of discussions in the area of:

- What kinds of skills and knowledge people should have in a knowledge society, what to teach young people and how to do (Ilomäki, Paavola, Lakkala, Kantosalo, 2016);
- The level of digital competence of the employee and teaching Staff (Jarad and Abbas, 2020);
- Dimensions and Influencing Factors on Digital Competencies (Jarad and Abbas, 2020);
- Generational differences in digital competence (Fawad, 2019);
- Gender differences in digital competence (Ove Edvard Hatlevik and Knut-Andreas Christophersen, 2013; Laszlo, Beata, Marton, and Gergo 2018; Jarad and Abbas, 2020);
- Identifying factors explaining digital inclusion (Ove Edvard Hatlevik and Knut-Andreas Christophersen, 2013);
- Relations between cultural capital and digital competences (Ove Edvard Hatlevik and Knut-Andreas Christophersen, 2013).
- Agility and digitalization competency in Logistics 4.0 in military setting (Lee and Chen, 2015; Rahman, Rashid, and Hamid, 2020; Dutton, 2014).

However, there is a lack of research on the level of digital competences of polish employees, soldiers and non-working people from Generation Z and its correlations of gender, age/generation, interest in professional military service, place of residence, personality, motivation, sense of satisfaction of expectations towards work/service, willingness to run one's own business and ability to work in Economy 4.0.

3. Materials and Methods

The conducted empirical exploration was aimed at finding answers to the research problems posed, which took the form of the following questions:

Q1: What is the level of (self-assessed) digital competences of employees, soldiers and non-working people from Generation Z?
Q2: Are there significant relationships between (self-assessed) digital competences and gender, age/generation, interest in professional military service, place of residence, personality, motivation, sense of satisfaction of expectations towards work/service, willingness to run one's own business and ability to work in Economy 4.0?

In order to verify the hypotheses and answer the research questions, the following methods were used, the method of critical analysis of the literature, diagnostic survey and statistical methods. The grounded theory methodology was applied, consisting in building a theory based on the collected empirical data (Glaser and Strauss 1967, Glaser 1978). Quantitative and qualitative research was carried out at the turn of 2019/2020 on a sample of 4243 people. The respondents were employees of enterprises, soldiers and non-working people from Generation Z (pupils and students born after 1999). Using the nominal scale, the respondents were classified into groups:

- Baby Boomers generation, born in 1960-1969 (2.5%), Generation X, born in 1970-1979 (9.6%); Generation Y, born in 1980-1989 (20.3%), Generation Z, born in 1990-1999 (20.1%), born in 2000 (47.5%);
- management staff (7.5%), employees not holding managerial positions (41%), non-working people from Generation Z (pupil/student) (50.9%);
- civilians (candidates for professional military service) (76.3%), soldiers (23.7%);
- residents of large cities (over 200 thousand), of medium cities (20-100 thousand), of small towns (under 20 thousand), and of countryside;
- women (14.4%) and men (85.6%).

The described study applied mainly quantitative tools, based on deductive reasoning and relying on "hard" scientific evidence, making generalizations and using numbers to analyze and present the studied economic reality (Colander, 2000; Holt, Barkley, and Colander, 2010; Spencer, 2013). The research technique in the form of a questionnaire was used. Random selection was used (23 out of 28 poviats were randomly selected and, as part of the compulsory military qualification, questionnaires were distributed via the Military Supplementary Command). All persons participating in the research gave their consent to participate in the research. The assessment of digital competences can be made on the basis of their actual level using specific tools (García-Valcárcel *et al.,* 2020; Frailon *et al.,* 2013), as well as based on self-assessment, where the process of measuring self-assessment based on perception (Agudo *et al.,* 2020; Basantes-Andrade *et al.,* 2020).

The first method is easy to carry out in the youth community as part of their education. This is visible in the large number of studies on digital competences that have been carried out on learners and students (Casillas-Martín *et al.,* 2020; He *et al.,* 2020; Moreno Rodríguez *et al.,* 2018; Nowak, 2019; Pérez Rodríguez *et al.,* 2019; Terry *et al.,* 2019; Torres-Hernández *et al.,* 2019; Xu *et al.,* 2019). It is definitely more difficult to carry out such research on company employees or soldiers. The use of competency assessment based on self-assessment, although burdened with the subjective nature of respondents' answers (González Segura *et al.,* 2018), has its benefits. It allows you to recognize the level of your digital competences in relation to the requirements of the labor market and Economy 4.0, as well as the development of your professional career. In addition, man generally

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knows what competences he has. This view is also shared by Drucker (1999), emphasizing that *"in his professional activity, an employee is able and should recognize his strengths, including competences, and undertake those tasks in which his skills and predispositions can be best used"*.

The usefulness of self-assessment in digital competences is indicated by numerous authors (Bonnes *et al.,* 2020; Cabezas-González and Casillas-Martín, 2018; He *et al.,* 2020). Taking into account the above arguments, the level of digital competences of the respondents was determined through self-assessment using a seven-point Likert scale (Gamst, Meyers, and Guarino, 2008), defining 1 as very low, 2 low, 3 rather low, 4 neither low nor high, 5 rather high, 6 high, 7 very high. Similar tools, based of self-assessment, using a seven-point scale were applied to measure interest in professional military service, motivation, willingness to run one's own business, level of satisfaction of expectations towards work/service and the ability to work in Economy 4.0. It was undertaken to establish the relationship between the held digital competences and gender, age/generation, interest in professional military service, place of residence, motivation, a sense of satisfaction of expectations towards work/military service, willingness to run own business, ability to work in Economy 4.0 and personality according to The Big Five.

Personality testing involved one of the shortest validated instruments Ten-Item Personality Inventory (TIPI), a measure of five personality traits (extraversion, agreeableness, conscientiousness, emotional stability, and openness) (Costa and McCrae, 1992). It was developed by Gosling *et al.* (2003), and it takes about 1 min to be completed. There is evidence suggesting that TIPI is an appropriate measure of the Big-Five model. The original TIPI (Gosling *et al.,* 2003) showed low-to-moderate Cronbach's alphas (α = 0.40–0.68), a typical finding in short scales (Ziegler *et al.,* 2014), but it exhibited high temporal stability (rs = 0.62–0.77), strong correlations with longer personality trait measures, such as BFI (rs > 0.65), and patterns of correlations with other psychological variables similar to those obtained with longer measures. This has been replicated in validation studies across languages (Muck *et al.,* 2007; Renau *et al.,* 2013; Chiorri *et al.,* 2015).

The research attempted to determine with the use of statistical methods what is more and what is less likely. Non-parametric tests were used, as a statistically significant discrepancy between the observed distribution of variables and the normal distribution was observed on the basis of the Shapiro-Wilk test p <0.05. These are groups of statistical methods used to test hypotheses that do not require knowledge of the parameters of the distribution of the examined characteristics in the population. Non-parametric tests were used for data analysis. The relationships between the variables were examined using the chi-square test for variables measured on the nominal scale (both categorical variables). The Mann-Whitney U-test (for two groups) or the Kruskal-Wallis test (for more than two groups) were used to analyze the relationship between the numerical and categorical variable. Spearman's linear correlation coefficient was used for two numerical variables.

Additionally, for more than two groups, the Jonckheere-Terpstra trend test and post hoc analysis with Dunn's test (Dunn 1964) with Bonferroni's correction for associated ranks, were performed. The level of significance was defined at 0.05 (marked as * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). The calculations were made in the R statistical software ver. 3.6.0 and IBM SPSS Statistics version 21. The conducted research required terminological considerations for such concepts as Generation Baby Boomers, X, Y and Z. The Baby Boomers generation are people born in the years 1960-1969, Generation X are born in the years 1970-1979, Generation Y are born in the years 1980-1989, and Generation Z are people born in the years 1990-1999 (Lain-Kennedy, 2007; Hardey, 2009).

4. Empirical Results

The conducted empirical exploration shows that the level of digital competences of the respondents according to their self-assessment is not high (Table 1, 2, 3). The respondents from Generation X and Y assessed their competences at the highest level of competence (Table 1).

Table 1. *The self-assessed level of digital competences of the respondents, taking into account the age / generation criterion (scale of 1-7, with 1- very low, 7 - very high) (N = 4243).*

Date of birth	1960-1969 Baby Boomers generation	1970-1979 Generation X	1980-1989 Generation Y	1990-1999 Generation Z	after 2000
Average	4.7	5.2	5.1	5	4.5

Source: *Original research results.*

People from Generation X assessed their competences quite highly, which is puzzling. Many studies show that among different generations, the individuals of the so-called Net generation, also labelled as Digital natives, have obtained the highest level of digital competence and they were able to solve complex digital issues (Fawad, 2019). This may indicate that people from Generation X are not fully aware of their difference in digital competences with regard to younger generations or they are ignoring her. The level of digital competences of the respondents differed statistically significantly depending on the place of residence (Kruskal-Wallis test; p <0.001). People living in the countryside declared the lowest competences (Table 2).

Table 2. *The self-assessed level of digital competences of the respondents, taking into account the criterion of place of residence (scale of 1-7, where 1- very low, 7 - very high) (N = 4243).*

Place of residence	Countryside	Small town (<20 thousand residents)	Medium town (20-100 thousand)	Big city (above 200 thousand)
Average	4.6	4.9	4.8	5.1

Source: *Original research results.*

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Significant differences were found between the level of digital competences between soldiers (average 5.2; N = 1005) and civilians (average 4.7; N = 3215). No significant differences were identified in digital competences in the context of the gender criterion (average for women and men: 4.8), as well as the position held (Table 3).

Table 3. TheThe level of self-assessed digital competences of the respondents, taking into account the criterion of professional status (scale of 1-7, where 1- very low, 7 - very high) (N = 4243).

professional status	managers	non-managerial employee	Generation Z (pupil /student) non-working people	soldiers	civilians
Average	5,2	5,1	5,2	5,2	4,7

Source: Original research results.

Statistically significant relationships between the level of digital competences and the analysed variables were observed. It turned out that the higher the digital competences correlated with:

• higher interest in professional military service (p <0.001, r = 0.38);
• higher level of personality traits: "extraversion" (p<0.001, r=0.20), "conscientiousness" (p <0.001, r = 0.18) and "openness to experience" (p <0.001, r = 0, 17);
• lower level of the personality trait "neuroticism" (p <0.001, r = -0.21);
• higher sense of satisfaction of expectations towards work / military service (p <0.001, r = 0.10);
• higher motivation to work (p <0.001, r = 0.18);
• higher willingness to run one's own business (p <0.001, r = 0.31);
• higher level of sense of being "overwhelmed" by the technological progress (p <0.001, r = 0.20);
• higher ability to work in Economy 4.0 (p <0.001, r = 0.31).

5. Discussion and Conclusions

The conducted research shows that the level of digital competences in the respondents (according to self-assessment) is not the highest, therefore efforts should be intensified to increase them. The respondents are aware of this, noticing a competency gap in this respect. The results of the conducted research confirm other studies indicating that the level of digital competences is not high (DESI, 2019; European Commission, 2020; Jarad and Abbas, 2020). Analysis of research results allowed to verify the presented Thesis 1. It was partially confirmed. It turned out that the higher the digital competences, the higher the motivation to work, the willingness to run one's own business, the higher the sense of meeting expectations towards work/military service, the higher the interest in the professional military service and the higher the ability to work in Economy 4.0. These dependencies are

not strong, but they cannot be underestimated, especially in the context of the fourth industrial revolution.

A significant relationship was also found between digital competences (according to self-assessment) and professional status. It turned out that soldiers rated their competences significantly higher than civilians. The self-assessment of digital competences of the respondents differed significantly depending on the place of residence. It was the lowest among people living in the countryside. The presented Thesis 1 was not confirmed in relation to the relationship between digital competences (according to self-assessment) and gender and position. Women and men assessed their digital competences in a similar way.

This may indicate that there are no gender differences in digital competences. This result comes in line with several studies that have been done in the same field (Ove Edvard Hatlevik and Knut-Andreas Christophersen, 2013; Jarad and Abbas, 2020). Differences in digital competences (according to self-assessment) between employees/soldiers from different generations were diagnosed. Generations X, Y and Z give the highest ratings, and Baby Boomers the lowest. This could indicate that age could be one of the influencing factors that have affect in the level of peoples' digital competence. Some authors formulated similar conclusions in their research (Fawad, 2019; Jarad and Abbas, 2020). Another conclusion that results from the conducted analysis is that due to the established dependencies, the importance of digital competences in modern organizations is growing. This situation significantly increases the requirements for managers and human resources in organizations responsible for increasing the level of digital competences.

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