Category: original scientific paper

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Digital Literacy of the Generation Z Students and Their Attitudes and Beliefs Towards ICT Knowlegde and Skills

Abstract:

Technology is rapidly developing and new generations easily adopt technological innovations. The education system is beginning to realize the increasing importance of adapting its education style to suit the specific characteristics of the new generations. Generation Z represents students who are born and raised in the highly progressed digital environment. Therefore, using the survey method, an analysis within the current Generation Z was made, focused on their digital literacy as well as perception and attitudes towards ICT learning, knowledge and skills.

Keywords:

generation Z; students; digital literacy; ICT knowledge and skills

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UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Introduction

Over the last couple of decades, there has been an increase of interest in information and communication technology (ICT) in both private and business areas of life. It is mainly due to the constant development of new ICT technology and the need to tailor it according to both personal and business preferences of its consumers. The ICT development in turn shaped values, characteristics and mindsets of each new generation of people [1]. Every new generation grows up in a different socioeconomic, cultural and technological context than the previous generation, and as a result each generation has its own way of thinking, communicating and reacting to everyday situations [2]. In the context of education, new generations represent a certain challenge for educational institutions [3]. Since Generation Z, which is the observed generation for the purpose of this paper, has been influenced by rapid technological development and ever faster progress of digital technology, its ICT knowledge and skills are one of the key drivers in transforming the existing learning approaches [3], [4], [5]. According to Pejić Bach, Bosilj Vukšić and Ćurko [6], computer literacy is one of the crucial foundations of successful education and business.

Having in mind all of the above, the aim of this paper is to explore the digital literacy and attitudes of students belonging to Generation Z regarding the ICT knowledge and skills. For that purpose, following research questions have been formed: (RQ1) Are there any statistically significant differences in perceived digital literacy of Generation Z students before and after the Business Informatics course?, (RQ2) What are the attitudes of Generation Z students towards ICT learning?, and (RQ3) What is the Generation Z students' perceived usefulness of ICT knowledge and skills?

In order to meet the aim of the paper and to answer these research questions, this paper is organized as follows. The second part of this paper sums up the classification of different generations, gives a brief overview of Generation Z students' characteristics and shows the teaching methods for Generation Z students in the time of highly advanced digital technology. Research methodology is explained in the third part of the paper, while the results of the conducted surveys are presented and discussed in the fourth part. Finally, concluding remarks as well as limitations and recommendations for future research are given in the fifth part of the paper.

Theoretical background

Classification of generations

Generational differences were first introduced by Strauss and Howe [7]. According to Berkup [1] and Bennett [8] every new generation has its own characteristics depending on the cultural, socioeconomic and political context that surrounds it. There is no definitive classification of generations in the existing literature, but some general conclusions can be drawn. We use the classification given by Berkup [1] in Table 1 as an example of one possible classification of generations for the purpose of illustrating an approximate historical period to which each generation belongs, but it should be noted that the classifications of generations in the existing literature often slightly vary from each other.

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Time period	Name of the generation
1900 - 1945	Builders
1946 - 1964	Boomers
1965 - 1979	Generation X
1980 - 1994	Generation Y
1995 - Present	Generation Z

Table 1 Classification of Generations; Source: [1]

Builders also known as the "Silent Generation" [9] were defined by several serious and important events that happened in that period [9], [1]. They were affected by the events and the aftermath of World War I (1914-1918) and World War II (1939-1945), as well as The Great Depression, which lasted from 1929 to 1939 [1]. It is important to note that some authors, such as Carlson [10] and Strauss and Howe [7], split the Builders into two generations. The Good Warrior generation that was born in the early 1900s and the Silent Generation that was born in the late 1920s. The Good Warrior generation fought in World War II and experienced the Great Depression, while the members of the Silent Generation did not yet reach adulthood [10]. When the Silent Generation reached adulthood, they reaped the benefits of an economic recovery in the 1950s and the 1960s resulting in early marriages and a high birth rate or baby boom [10]. Hence the name Boomers of the next generation that was born between 1946 and 1964 [1] Because there were so many of them, they had to learn to work together and were the first generation whose ability to cooperate and share with others was actually graded positively in educational institutions [11].

Next was Generation X that included people born between 1965 and 1979 who were heavily influenced by sudden technological advancement, including the appearance of personal computers [1]. This was the first generation that used various features of accessible technology to simplify its work tasks [1].

The next generation was Generation Y whose members were born between 1980 and 1994 [1]. Because they were influenced by the further technological development, the members of this generation are also known as Generation Next [12], Digital Generation [13], Nexters [11], Echo Boomers [12], [14], trophy Kids [1], [15], Generation www [1], [15], Net Generation [14], NetGen [16] or Gen N [1], [15]. Mobile phones, the Internet, and social networks were an essential part of their everyday lives [4]. The technological shrewdness of the Generation Y gave rise to new trends in learning such as the increase in popularity of informal types of learning, as well as using new technologies as tools to help with the learning process [4].

Generation Z

Some authors do not differentiate between the Generation Y and the Generation Z, calling all born between 1978 and 2000 the "Millennial Generation" [4]. However, the Generation Z was born after 1996, they grew up using social networks and are even more digitally oriented than the Generation Y, thus requiring a different analytical approach [4]. This Generation also has many other names, such as: Gen Tech [4], [17], Children of Internet [1], [18], Post-Millenials [16], [19], Generation I [1], [18], Digital Natives [1], [18], [20], Gen Wii [4], [17], Media Generation [1], [18], .com Generation [1], [18], iGen [1], [18].

Since the members of this generation frequently use digital technologies and social networks for social interactions, they rely heavily on the online world [20], [21]. Students that are members of this generation are not accustomed to thinking critically about the information they read online and the sources of those information [3], [5], [14], [22] The large amount of available information that is being received and processed on a daily basis resulted in students having shorter attention spans and taking longer to complete a single task [1], [3], [14]. Because the members of the Generation Z spend a lot of time by themselves, reading about the current events and communicating with others via digital devices, their process of learning is often intrapersonal [5]. At the beginning of their learning process, the students belonging to this generation want to independently acquire new knowledge via various types of digital technology [5], [20]. Later in the learning process, when they are already familiar with the learning matter, they relax enough to work in groups [5]. The students of Generation Z are not able to memorize as much information as the previous generations and they find it more important to know how to find specific information in the vast sea of data available on the Internet [14]. Consequently, they are skilled in filtering and sorting the information they need, which makes them a new generation of learners [14].

Learning process of Generation Z in the digital era

To be born and to live in an environment that is heavily influenced by technology is shaping the members of Generation Z in an entirely different way and it is affecting the way in which they behave in social interactions and adopt new knowledge [19]. Therefore, most educational institutions have to seriously consider reorganizing their learning strategies and their way of teaching to be more effective for the future generations [19]. According to Arkhipova et al. [3], among the new generations of students, there is no need for physical libraries, since all the information is immediately available on the Internet [23].

That is why the Generation Z students are active learners prone to multitasking that often have shorter and insufficient attention spans [1], [3], [14]. According to Persada [20], regardless of whether its formal or informal learning, Generation Z students will often turn to digital devices and sources to help them with the learning process. Therefore, educational institutions have to better understand the learning needs of the future generations and adjust their programs and teaching methods to meet and satisfy these new requirements to achieve sufficient quality for both students and teachers [3], [24]. The Generation Y was focused on e-learning or m-learning, but for Generation Z, those two learning methods are combined under the commonly used term "Digital learning" [20], [25]. Digital learning is based on using different digital tools and mobile devices to motivate students to utilize various academic documents, sources, books, journals, video clips, etc. that will help them in acquiring new knowledge [20]. Because of Generation Z, traditional universities now have to prioritize the needs of their students when defining and designing curriculums [5], [26].

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Research methodology

Research description

For the purpose of meeting the aim of this paper and answering the research questions stated in the Introduction, a survey has been conducted in two stages on a sample of first year students enrolled into the integrated undergraduate and graduate university study programme of business economics and economics at the Faculty of Economics & Business, University of Zagreb, Croatia. First stage of the research has been conducted in September 2018 in the first week of Business Informatics course, while the second stage has been conducted in January 2019, in the last week of Business Informatics course.

The survey for the first stage contained, among others, questions regarding the level of digital literacy, as well as the questions regarding the attitudes towards ICT learning. The second part of the survey is based on the work of Ng [27] who also examined the students' attitudes towards ICT learning. The survey for the second stage also contained questions regarding the level of digital literacy and the questions regarding the students' interest and perceived usefulness of the ICT knowledge and skills which they could learn during the Business Informatics class. In both surveys, a 5 point Likert scale has been used in all questions.

Collected answers have been analysed using methods of descriptive statistics as well as t-test statistics for investigating the existence of statistically significant differences in answers before and after the course. The results of the analysis have been further discussed in the following section.

Sample characteristics

Total of 192 students participated in the first stage of the research, answering the questions in the first week of Business Informatics course. However, since this study focuses only on the students belonging to Generation Z, the obtained data has been cleansed in order to exclude students born before 1995 as a threshold year for Generation Z. For that purpose, total of six responses have been excluded from the further analysis. Therefore, 186 responses have been further analysed. Next, total of 155 students participated in the study after the Business Informatics course. Again, for the purpose of analysing only the answers from Generation Z students, total of eight responses have been excluded from the further analysis, leaving 147 responses in the final sample for the analysis. Table 2 presents the sample characteristics.

Characteristic		Before course (n=186)		After course (n=147)	
		N	%	N	%
Gender	Male	57	30,65%	41	27,89%
	Female	129	69,35%	106	72,11%
Student status	Full-time	94	50,54%	113	76,87%
	Part-time	92	49,46%	34	23,13%

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Characteristic		Before course (n=186)		After course (n=147)	
		N	%	N	%
First enrollment in academic year 2018/2019	Yes	174	93,55%	110	74,83%
	No	12	6,45%	37	25,17%
Employment	Employed	13	6,99%	7	4,76%
	Employed as a student	30	16,13%	31	21,09%
	Not employed	143	76,88%	109	74,15%

Table 2. Sample characteristics

Results and discussion

Perceived level of digital literacy

The first research question referred to the existence of statistically significant differences between the Generation Z students' perceived level of digital literacy before and after the Business Informatics course. The results of the survey according to the digital literacy levels are presented in the Table 3. Half of the surveyed students (50%) perceived their level of digital literacy to be average before taking the Business Informatics course, while minority of them (only 1.08%) perceived their digital literacy level as very good. On the other hand, in the survey which took place after the Business Informatics course, majority of the surveyed students perceived their level of digital literacy as good (43.54%), followed by those who perceived their digital literacy level as very good (38.10%), while there were no students which perceived their digital literacy to be very weak.

Digital literacy level	Before course (n=186)	After course (n=147)
Very weak	4,30%	0,00%
Weak	20,43%	1,36%
Average	50,00%	17,01%
Good	24,19%	43,54%
Very good	1,08%	38,10%
Average digital literacy grade (mean)	2,973	4,184
Standard deviation	0,815	0,759
T-test	13,874	
p-value	<0,0001	

Table 3. Perceived level of digital literacy before and after the Business Informatics course

The results of the surveys revealed that the average digital literacy grade of students before taking the Business Informatics course was 2.973 with the standard deviation of 0.815, while it was 4.184 with the standard deviation of 0.759 after the course.

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The results of the t-test revealed that the difference between average digital literacy grades before and after the course is statistically significant at 1% level (t=13.874, p<0.0001).

There are some interesting findings in the presented results. Although Generation Z is born and raised surrounded by computers and digital technologies and its members are considered as "digital natives", they did not self-evaluate their digital literacy as very good before they took the Business Informatics course. However, their self-evaluation level of digital literacy increased significantly after taking the course which means that it still makes sense to teach digital natives about digital technologies. In other words, it is not enough to be surrounded by digital technologies from very young age in order to achieve higher levels of digital literacy; one can achieve it by engaging in the sort of education that will provide valuable ICT knowledge and skills.

Attitudes towards ICT learning

The second research question referred to the Generation Z students' attitudes towards ICT learning. Following work of Ng [27], seven statements using 5-point Liker scale were provided in the survey in order to investigate students' attitudes towards ICT learning. Those statements are: (i) I like using ICT for learning, (ii) I learn better with ICT, (iii) ICT makes learning more interesting, (iv) I am more motivated to learn with ICT, (v) ICT enables me to be a self-directed and independent learner, (vi) There is a lot of potential in the use of mobile technologies (e.g. mobile phones, PDAs, iPods, smartphones, etc.) for learning, and (vii) Teachers/lecturers should use more ICT in their teaching of my classes [27]. Named statements are the part of the before Business Informatics course survey. The results of the survey are given by the Table 4. For most of the statements, majority of the surveyed students neither agree nor disagree with the statement. However, the exceptions are the last two statements. Majority of the students (37.10%) strongly agrees that there is a lot of potential in using mobile technologies in educational process. Also, majority of the surveyed students strongly agrees (31.18%) and agrees (31.18%) that the teachers and lecturers should use more ICT in the educational process.

Attitude statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I like using ICT for learning	7,53%	10,75%	31,18%	25,81%	24,73%
I learn better with ICT	9,68%	14,52%	41,40%	18,82%	15,59%
ICT makes learning more interesting	9,14%	14,52%	34,95%	24,73%	16,67%
I am more motivated to learn with ICT	12,90%	15,59%	40,86%	17,20%	13,44%
ICT enables me to be a self-directed and independent learner	8,06%	17,74%	40,86%	18,28%	15,05%

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Attitude statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There is a lot of potential in the use of mobile technologies (e.g. mobile phones, PDAs, iPods, smartphones, etc.) for learning	1,08%	5,38%	27,42%	29,03%	37,10%
Teachers/lecturers should use more ICT in their teaching of my classes	3,76%	4,84%	29,03%	31,18%	31,18%

Table 4. Attitudes towards ICT learning

The presented results indicate that, although surveyed students are digital natives, their attitudes towards using ICT in educational process are not as strong. Nevertheless, if summarized scores for agreement and strong agreement are taken into account, it is visible that majority of the students have positive attitude towards ICT usage for learning purposes. On the other hand, although Generation Z students perceive that ICT can make learning process more interesting, majority of them do not believe that ICT can increase their learning skills or make them independent learners nor are motivated to learn with ICT. Moreover, students believe that more ICT should be used in educational process. However, one should keep in mind that the majority of the students have been answering this questions before taking any of the university level classes (there were 93.55% of the students in the sample who were first-time students in the observed academic year), so the results of the final statement could, in fact, be considered as guidelines for high school teachers to introduce more ICT in their teaching methods.

Usefulness of ICT knowledge and skills

The third research question referred to the Generation Z students' perception of usefulness of ICT knowledge and skills which they obtained during the Business Informatics course. The questions regarding this topic have been a part of the second survey which took place after the Business Informatics course. This part of the research has been divided into two parts: (i) perceived usefulness of the topics belonging to the theoretical part of the course and (ii) perceived usefulness of the topics belonging to the practical part of the course. All of the questions have been based on a 5-point Likert scale with 1 representing very low usefulness, and 5 represented very high usefulness.

The perceived usefulness of the topics belonging to the theoretical part of the course consists out of ten topics, being: (i) hardware, (ii) software, (iii) data, (iv) computer networks and IT, (v) designing Web sites, (vi) information systems in business, (vii) business decision-making systems, (viii) electronic business, (ix) risks and IT implementation in business, and (x) organization and management of IT as a business function. The results of the survey reveal that, among named theoretical topics, students of the Generation Z perceive Electronic business to be the most useful topic, while Data is the least useful topic according

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to their opinions, as presented by the Figure 1. However, all of the calculated average grades (means) range from 3.54 (with standard deviation of 1.16) for Data to 3.80 (with standard deviation of 1.18) for Electronic business, which cannot be considered as a wide range so it can be concluded that the average overall perceived usefulness of the theoretical topics taught in the Business Informatics course is middle to high, with an overall average score of 3.64 (with standard deviation of 0.11).

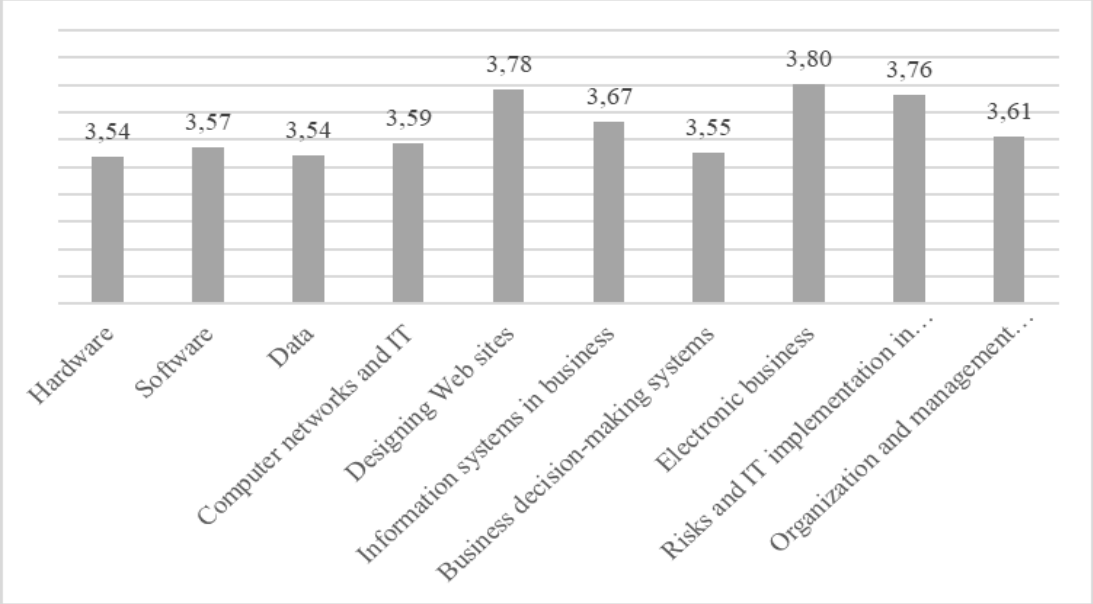

Figure 1. Perceived usefulness of the theoretical Business Informatics course topics

The perceived usefulness of the topics belonging to the practical part of the course consists out of nine topics, being: (i) computer fundamentals, (ii) databases, (iii) Internet services in business, (iv) Web sites design, (v) text processing, (vi) desktop publications, (vii) public presentations, (viii) spreadsheets, and (ix) electronic business. The results, as presented by the Figure 2, indicate that Spreadsheets is the most useful topic among practical topics of the Business Informatics course with an average grade of 4.65 and standard deviation of 0.72, while the least useful topic is perceived to be Desktop publications with an average usefulness grade of 4.39 and related standard deviation of 0.95. Again, as in the case of theoretical topics, the range of the average grades of the individual topics is not wide. The overall usefulness of the practical part of the Business Informatics course can be considered high, with an overall average value of 4.58 (with the standard deviation of 0.09).

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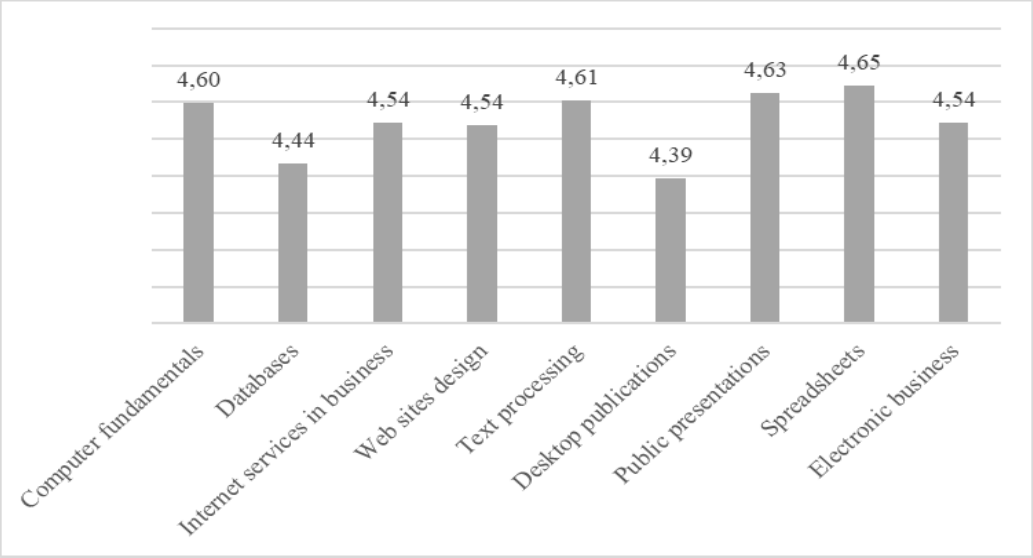

Figure 2. Perceived usefulness of the practical Business Informatics course topics

If one compares the results obtained for the theoretical topics and practical topics, it is clear that students of the Generation Z prefer to learn practical topics and perceive them as more useful than theoretical ones. This finding can be explained with the previously stated theory indicating that Generation Z students have attention disorder [1], [3], [14]. Since most of the theoretical topics are being taught in an old fashion ex cathedra way, students of the Generation Z can easily be distracted by available personal technology during that kind of lecture since they are, in most cases, not actively involved into the class. On the other hand, in case of practical topics, students are actively involved in solving business problems using ICT and therefore, perceive those topics more useful. Hence, it could be concluded that it is important to actively involve students of the Generation Z into the learning process and to put more emphasize on the practical part of the Business Informatics course than on the theoretical one.

Conclusion

This paper presented the research results of a survey conducted among the students of the first year of Business economics and Economics university study programme at the Faculty of Economics & Business, University of Zagreb, Croatia. Named students are considered to be members of the Generation Z, characterized by the rapid technology development and advanced digital technology surroundings from a very young age. The research results revealed that there are statistically significant differences between perceived level of digital literacy of the surveyed students, indicating that, although they have been constantly surrounded by digital technologies, education on the ICT topics is still needed in order to achieve higher levels of digital literacy. Also, the research revealed that students think that ICT can increase interestingness of teaching, see the potential of ICT usage for learning and would like more ICT to be used by their teachers in the educational process, but do not perceive that ICT

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can motivate them to learn or increase their learning skills. Finally, this study also revealed that students of the Generation Z prefer to learn practical ICT topics by being actively involved into the lectures in terms of problem solving than to listen and learn theoretical ICT topics.

The limitation of this study lies in unequal sample sizes for two different stages of survey research. In other words, one cannot be sure if the same students have been answering both surveys since there has not been any kind of tracking information involved in the first survey. In that sense, further research should ensure that the sample for both before and after the course surveys is the same, i.e. that same students answer the survey at the beginning of the course and later at the end of it. Therefore, the researchers should assign codes for each participant in the first survey which they should enter again in the second one. That way the research would be strengthen. Another limitation of the study is the fact that the attitudes towards ICT learning are being examined only before the course and not afterwards so it is not possible to investigate if there is a connection between students' attitudes towards ICT learning and the actual outcome after taking the course. This limitation could also be overcome in the further research by the inclusion of the named questions into the survey after the course. The generalisation of the findings could also be limited since the research is conducted only in one country. Therefore, in order to strengthen the generalisation of the findings, future research should include respondents from multiple countries. Moreover, further research should include comparison to previous researches on the topic including other generations, as well as conducting a survey on a larger sample of mixed generations so that the results regarding the attitudes towards ICT knowledge could be compared through generations.

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