

Digital Literacy of Digital Natives



Dalia Suša Vugec and Ana-Marija Stjepić

Abstract Digital transformation is quickly progressing in all spheres of human life and new generations have to adjust to changes that the digital age caused in the economy and society. Consequently, digital literacy is becoming one of the crucial skills of today's students. Therefore, the education system needs to understand the growing significance of adjusting and modifying its educational methods to support the needs and specific characteristics of generations living in the digital era. Students born and raised in the strongly developed digital environment are presented as digital natives. This chapter provides a theoretical overview of the context of digital natives as well as the methodology and results of an empirical research conducted among two generations of digital natives, one in 2015 and one in 2020. The main aim of the named research is to assess the attitudes of students towards learning information technology, frequency of their usage of modern tools such as Google tools, e-mail, and Microsoft Office tools as well as the levels of their digital literacy.

Keywords Digital literacy · Digital natives · Learning IT · Students

1 Digital Age

The dramatically rapid development of technology has led to great changes in the world. From the appearance of the abacus, through the first mechanical computer to the emergence of social networks such as Facebook, Instagram, etc., and then the increasingly popular Internet of Things, the world has adapted and developed in accordance with the development of technological innovations.

The world as we know it today has shaped itself in line with the industrial revolutions that have taken place over time (Fig. 1). Thus, in the first industrial revolution (Industry 1.0), that took place in the eighteenth century, the emergence of the steam engine that allowed the introduction of mechanically assisted production happened (Croatian Chamber of Commerce, 2021). Two centuries later, during the twentieth

D. Suša Vugec (✉) · A.-M. Stjepić
Faculty of Economics & Business, University of Zagreb, Zagreb, Croatia
e-mail: dsusa@efzg.hr

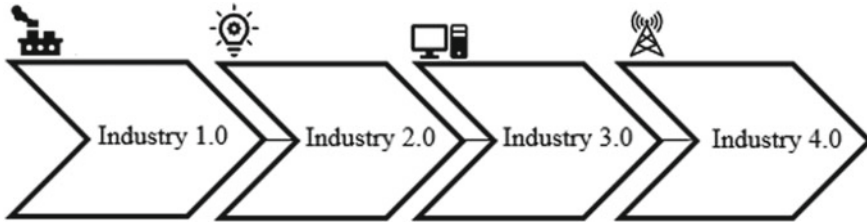


Fig. 1 Industrial revolutions through the time (*Source* Authors' work, 2021)

century, an era of the second industrial revolution (Industry 2.0) began. In this industrial revolution, mass production occurs as a consequence of the application of electrical energy (Croatian Chamber of Commerce, 2021). Information technology (IT), along with computer technology, has been emerging in the next industrial revolution (Croatian Chamber of Commerce, 2021). The third industrial revolution (Industry 3.0) was characterized by the application of various information and computer technologies that contributed to the development of automation in production processes (Croatian Chamber of Commerce, 2021). Today's era, the era of development and application of digital technologies, and the consequent digital transformation of the business of all kinds (e.g., medicine, tourism, manufacturing, etc.) are also called the fourth industrial revolution (Industry 4.0). The fourth industrial revolution began in the twenty-first century and is actually based on the digitization and application of the Internet of Things (IoT) concept that enables the networked operation of production facilities (Croatian Chamber of Commerce, 2021). The fourth industrial revolution, also called the "digital transformation," arose from the Internet and the increased networking of people and machines into one global business network. In the industry of the fourth revolution, with the help of so-called smart technologies, smart products are created and implemented through smart processes. With the help of the cooperation of digital and physical processes in the organization, organizational and geographical boundaries become insignificant (Schmidt et al., 2015), and business activities are now mostly carried out globally.

In today's digital age, it is almost impossible to imagine an organization without computers in its business, internal and external business networking, access to social networks for advertising, storage, processing, and analysis of business data supported by IT, etc. Due to the rapid development of diverse technological advances through time that generates more and more data, today's business organizations depend on quality analysis and interpretation of data that have become crucial elements of business success and competitive advantage maintenance in the market. Organizations that want to be competitive and sustainable in an increasingly demanding and turbulent market must keep pace with the changes posed by IT (Aleksić, 2009; Belak & Ušljebrka, 2014). According to the European Commission (2020), large, and small and medium-sized enterprises within the countries of the European Union at most adopt technologies as Electronic Information Sharing systems (ERP systems), Customer relationship systems (CRM systems), and social media (Fig. 2).

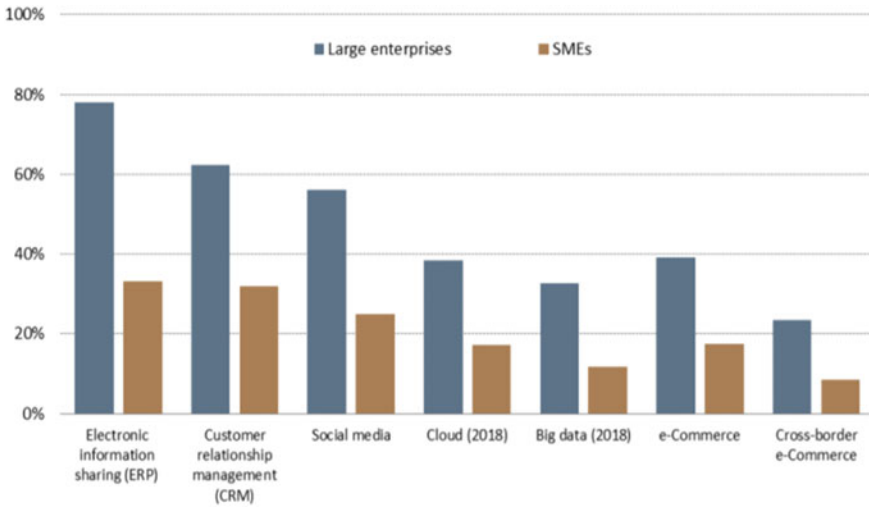


Fig. 2 Technology adoption within large and small and medium-sized enterprises within the countries of the European Union (Source European Commission, 2020)

Digital technologies development and consequent changes that are imposed on organizations by their wide implementation worldwide, bring various benefits for organizations but also challenges and risks that organizations must promptly respond to successfully overcome them. According to Ali et al. (2018), technological development and the digital age have radically changed the ways organizations conduct their business. Such changes, driven by digital transformation, are equally taking place in organizations across developed and underdeveloped countries in different fields of activity (Maiti & Kayal, 2017).

Additionally, concepts like digital transformation, digitization, and digitalization can be often found in the literature. These terms differ in their meanings, so it is advisable to define them correctly and use them correctly. The term digitization denotes the process of changing and improving business models, business values, etc., using digital technologies, while the term digitalization denotes the transition from analog to the digital state of affairs (Gartner, 2018). Viewed from the broadest point of view, the notion of digital transformation can represent any changes in human life, which are encouraged by the introduction and application of some, for him, new innovative technologies (Cocca et al., 2018; Stolterman & Fors, 2004). It is important to note that digital transformation can occur not only at the level of the individual but also at the level of the organization or the entire industry in which the organization operates (Lankshear & Knobel, 2008).

According to the results of the Digital Economy and Society Index (DESI), measured by the European Commission (2020), that observe connectivity, human capital, use of the internet, integration of digital technologies and digital public services, Finland, Sweden, Denmark, and the Netherlands are the leaders in the

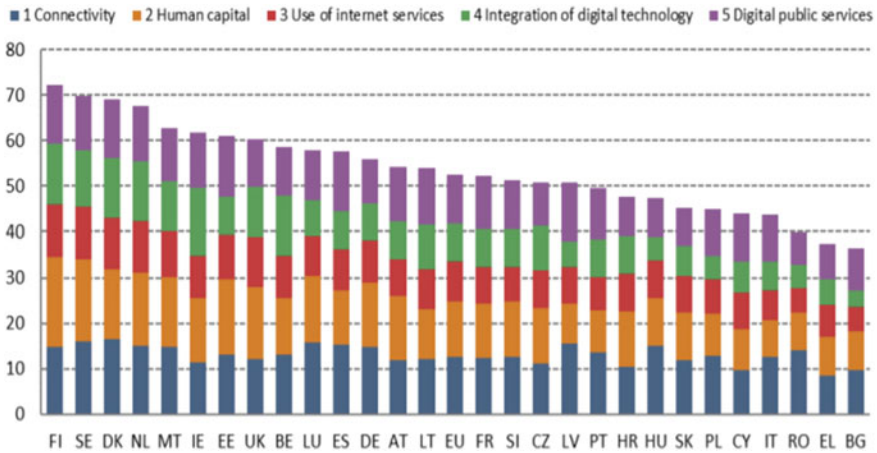


Fig. 3 Digital and society index 2020 within the member countries of the European Union (Source European Commission, 2020)

digital age (Fig. 3). On the other hand, countries like Bulgaria, Greece, Romania, and Italy did not show significant effort in “becoming digital” (Fig. 3).

2 Digital Skills Versus Digital Literacy

The development of technology and the application of digitalization in all spheres of human life have imposed the need for skills and knowledge that users should possess in the digital age. Already back in 2014, the authors, Brynjolfsson and McAfee (2014), emphasized that new technological achievements in the future will impose new knowledge and skills that will be required of workers.

At the outset, it is very important to distinguish between the concepts of digital literacy and digital skills. According to authors Richardson and Bissell (2019), digital skills involve the application of IT skills to solve a particular problem. On the other hand, digital literacy defines the ability to find and use the information received from a variety of digital sources (Bawden, 2008).

For many economies around the world, the key to successful digital transformation lies precisely in the digital skills of its citizens (Maji & Laha, 2021). Thereby, digital skills can be observed as a backbone of today’s digital economies (European Commission, 2020). According to Saputra et al. (2020), digital skill encompasses general and specific skills related to information and communication technology (ICT) usage. Today, digital skills have become commonplace and something that falls under the normal skills of every human being, such as reading (Maji & Laha, 2021). Digital skills are considered imperative for the normal functioning of everything around us in today’s modern world (Maji & Laha, 2021). Even those people

who used to have a kind of resistance to the emergence of new technologies, today use certain digital technologies that enable them to function normally in life. Those technologies were a “must-have,” especially during the COVID-19 pandemic (Maji & Laha, 2021). According to the European Commission (2020), there was an increase in the number of Internet users during the COVID-19 pandemic, however at the same time, that was not an indicator for the risen number of people possessing a higher level of digital skills. Therefore, it is important to perceive how the higher percentage of new digital technologies utilization is not directly correlated with digitally skilled users growth (European Commission, 2020).

Figure 4 present the digital skills level of European Union Member States citizens from 2015 till 2019. According to the European Commission (2020), European Union Member States as the Netherlands and Finland have the highest number of people with sufficient levels of digital skills, while Bulgaria and Romania still got enough space to increase an adequate level of digital skills of their citizens.

On the other hand, digital literacy should be viewed as a specific ability of users to cope with digital technologies as opposed to generally defined digital skills. It is important to have sufficient digital skills in handling digital technologies such as keyboard, mouse, printer, smartphones, etc., but the question is whether users know how to use them properly and for the right purposes. An even more important question in the context of digital literacy is whether users know how to handle the information provided by modern digital technologies (Martin, 2008). Digital literacy is actually the ability of users to successfully find the information they need with the help of digital technologies, distinguish relevant from irrelevant information, use it ethically while protecting their own and others’ privacy and security in the digital environment (Buckingham, 2006). According to Tohara et al. (2021) self-reliant learners, living in the era of digital transformation, and rapid development of digital technologies, can only be established by having a sufficient level of digital literacy. Therefore, digital

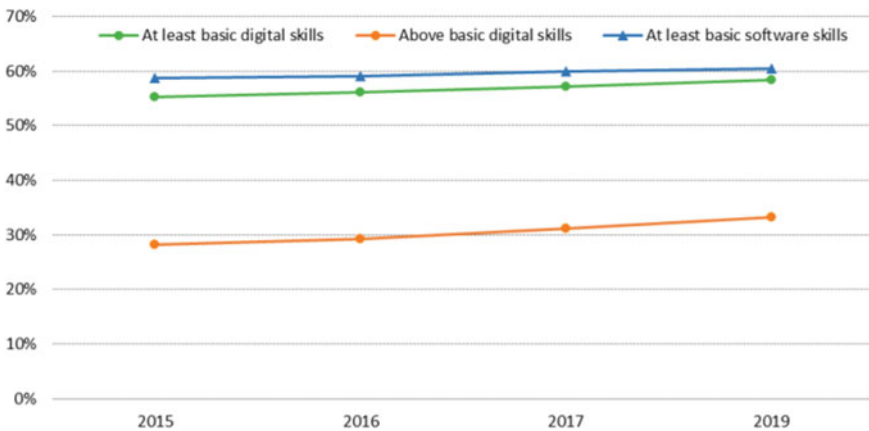


Fig. 4 Digital skills from 2015 to 2019 (Source Eurostat, community survey on ICT usage in households and by individuals in European Commission, 2020)

literacy can be observed as the ability of users to independently and critically analyze information and transform them into needed knowledge and wisdom (Buckingham, 2006). Furthermore, digital literacy can encompass comprehending the importance of digital technology progress and the ability to assess its positive and negative effects on the economy and society worldwide (Buckingham, 2006).

The term digital literacy is used inconsistently in the literature, according to Eshet-Alkalai (2004), because it is defined differently by different authors. Some authors define it as cognitive and socio-emotional aspects of working in a computing world, while others define it as technological aspects of living in a digital environment. Several academics have described various sorts of IT literacy types in this context (e.g., Buckingham, 2006; Martin, 2006; Koltay, 2011; Ng, 2012). For example, one should be aware of the distinction between computer literacy, which refers to a small collection of skills that enable a person to work successfully with software applications or perform simple information retrieval tasks (Buckingham, 2006), and information literacy, which refers to the ability to think critically and to browse, find, and evaluate Web-based knowledge efficiently (Ng, 2012). In addition, Koltay (2011) defines information literacy as the one which enables people to recognize when certain information is needed. Digital literacy, on the other hand, covers a variety of abilities connected to the capacity to utilize basic IT such as spreadsheets and word processors, as well as to use search engines and databases in a more complex fashion, all while keeping online safety in mind (Buckingham, 2006).

While Martin (2006, p. 155) defines digital literacy as “the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process,” Ng (2012, p. 1066) defines it shortly as “the multiplicity of literacies associated with the use of digital technologies.” Following that definition, it is explained that digital literacy comprises, besides, information literacy, many other types of literacies as well, for example, being (Eshet-Alkalai, 2004; Eshet-Alkalai & Chajut, 2009; Ng, 2012; Jůvová, 2017; Rea-Guaman et al., 2017):

- critical literacy – referring to the capacity to study textual, visual, spoken, multi-media, and performance materials in order to examine and challenge underlying attitudes, values, and beliefs;
- reproduction literacy – referring to the capacity to generate real, meaningful written and visual works using the reproduction and manipulation of previous digital text, images, and audio elements;
- branching literacy – referring to the capacity to generate knowledge through nonlinear navigation through domains of knowledge, such as the Internet and other hypermedia environments;
- operational literacy – referring to the capacity of an individual to be flexible, proactive, and sensitive to a variety of life situations;

- photo-visual literacy – referring to the capacity to communicate successfully in graphical contexts, such as user interfaces, that are based on digital technologies such as graphics;
- online etiquette literacy – referring to the capacity to understand and apply the good manners and other parts of etiquette in the online world;
- cyber safety literacy – referring to the capacity to protect the information assets, involving the elimination of risks that jeopardize the data processed, stored, and conveyed by linked information systems;
- social networking functional literacy – referring to the capacity to collaboratively and communicatively function through social networking platforms, and
- social-emotional literacy – referring to the capacity for successful communication using online communication platforms such as discussion groups and chatrooms.

2.1 Digital Literacy Framework

Having in mind the previously named types of literacies that comprise digital literacy, Ng (2012) proposes a framework for digital literacy, consisting of the following three dimensions:

- technical dimension,
- cognitive dimension, and
- social-emotional dimension.

As described by Ng (2012), technical dimension essentially refers to possessing the technical and operational abilities necessary to use IT for educational purposes and daily activities, which includes the ability to connect and utilize input and peripheral devices such as earphones/headsets, external speakers, and smartboards but also presupposes knowledge of working components, the capacity to safeguard data, and the ability to troubleshoot using manuals, help tools, and other web-based resources, such as YouTube. In that sense, technical dimension comprises operational literacy, critical literacy, reproduction literacy, branching literacy, and social networking functional literacy (Ng, 2012).

Cognitive dimension of digital literacy comprises information literacy, critical literacy, multiliteracies including photo-visual, audio, spatial, linguistics and gestural ones, reproduction literacy, branching literacy, online etiquette literacy, and cyber safety literacy (Ng, 2012). This dimension is connected with the capacity to think critically throughout the cycle of searching, evaluating, and creating digital information, and it not only entails the ability to analyze and select relevant software packages for use in learning or performing a certain activity but also necessitates an understanding of the ethical, moral, and legal implications of online commerce and content replication that make use of digitally based resources (e.g., plagiarism and copyrights) (Ng, 2012).

Social-emotional dimension, as described by Ng (2012), entail the ability to use the Internet responsibly for communication, socializing, and learning by adhering to

‘netiquette’ by following similar rules to those used in face-to-face communication, such as respect and the use of appropriate language and words to avoid misinterpretation and misunderstanding, ensuring individual safety and privacy by keeping personal information as private as possible and releasing no more than is required; and recognizing when one is endangered and understanding how to respond, for example, whether to ignore, report, or respond to the threat. This dimension, therefore, comprises social-emotional literacy, critical literacy, online etiquette literacy, and cyber safety literacy as well as the social networking functional literacy (Ng, 2012).

The described model of digital literacy implies that digital literacy is in the intersection of previously named three dimensions (Ng, 2012). The digital literacy framework used for the empirical research in this chapter is the one proposed by Ng (2012), and presented as previously described by the Fig. 5.

Taking into consideration all of the above, it is especially crucial for the educational system worldwide to strategically adapt its teaching and learning methods for new generations that will be the future workforce in the digital-shaped world. Consequently, the next chapter will provide a description of generations over time. After that, in further elaboration, the subchapters will give the general characteristics of the generations that make up the representatives of the digital era.

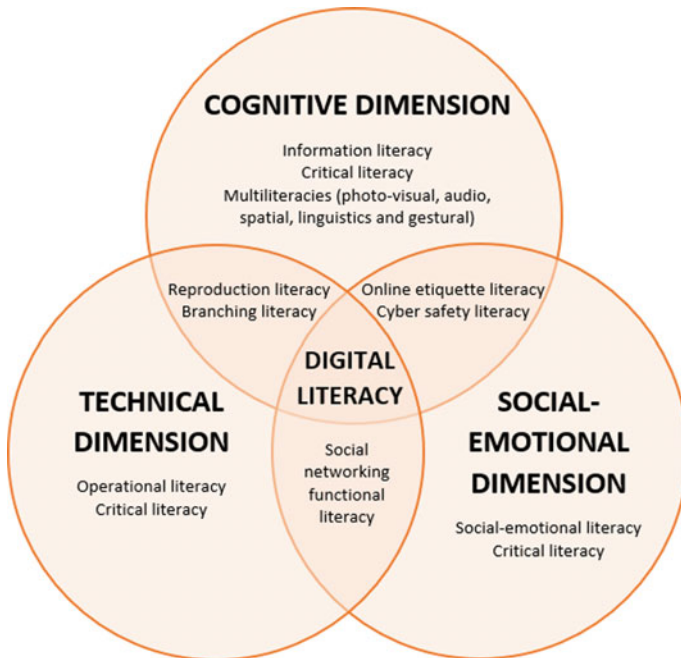


Fig. 5 Digital literacy framework (Authors’ work, 2021 based on Ng, 2012)

3 Generations

Author Karl Mannheim was the first one who introduced generational cohorts at 1952 (Mannheim, 1952). During the time, this established theory about generational cohorts was further improved by many other authors in their scientific and practical works. For example, authors Strauss and Howe (1992) described differences among generations that appeared during the time in their book “*Generations: The History of America’s Future.*” Generational cohorts can be defined as a group of people, born and raised in the same period of time in which they experienced similar or same events, creating their common values and thoughts about life at that moment which consequently shaped their characteristics in each point of time (Koksal, 2019). According to numerous authors, e.g., Berkup (2014), Dimock (2019), etc., generations through time can be classified into five different generational cohorts: Silent, Boomers, Generation X, Millennials, and Generation Z. Such classification of the named five generations is presented by the Table 1.

On the other hand, there are many authors that recognize and distinguish yet another generation, the newest one, being Generation Alpha (e.g., Tootell et al., 2014; Carter, 2016; Cirilli et al., 2019, etc.). According to Cirilli et al. (2019), Generation Alpha comprises children born after 2010, while Carter (2016) estimates that the Generation Alpha is going to end with those born until the year 2025.

However, as it is clear from the literature and previously stated classifications, there is no unified definition of generational cohorts classification since many authors defined different time periods and names for each generational cohort (Dreyer, 2020). In that sense, and for the purpose of this chapter, Fig. 6 presents all six classes of generations that emerged through the time, according to Carter (2016) and Cirilli et al. (2019).

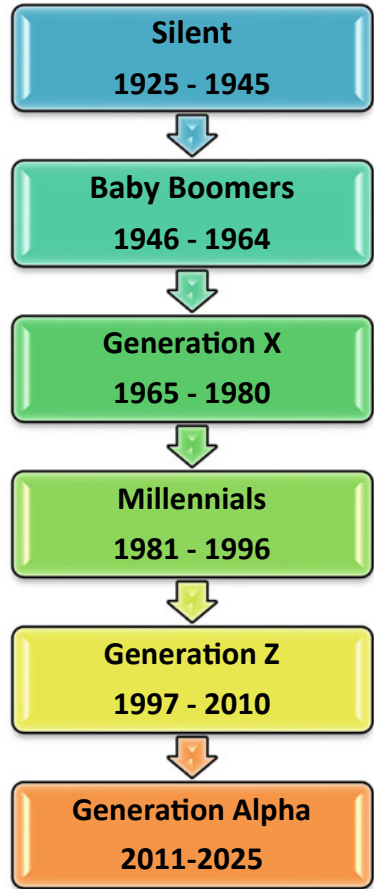
3.1 Silent Generation

The first generation called Silent represents people born and raised between 1925 and 1945, according to Cirilli et al. (2019). In the literature, this generation is also called “Builders” (Berkup, 2014) or “Lost Generation” (Enam, 2018; Dreyer, 2020), while

Table 1 Classification of five generations (*Source* Authors’ work, 2021 according to Dimock, 2019)

Time period	Name of the generation	Current age in 2021
Born 1928–1945	Silent	76–93
Born 1946–1964	Boomers	57–77
Born 1965–1980	Generation X	41–56
Born 1981–1996	Millennials	25–40
Born 1997–2012	Generation Z	9–24

Fig. 6 Six generations through the time (Authors' work, 2021 based on Carter, 2016 and Cirilli et al., 2019)



Cirilli et al. (2019) also call them “Traditionals.” They are the people who were born during the Great Depression and the World War II (Cirilli et al., 2019). Representatives of Silent generations are people characterized as disciplined, ethically oriented in work, grateful, and which strongly holding to their values (Dreyer, 2020). They want to fell needed and they strive for financial security, while also being patriotic, conservative, simple, and patient with high inter/intrapersonal skills (Cirilli et al., 2019). They also value traditional families, are very loyal to their employers while expecting the same amount of loyalty from them back, and also have understanding of the nobility of sacrifice for the purpose of common good (Cirilli et al., 2019).

3.2 *Baby Boomers*

Next were the Baby Boomers or just Boomers, generation of people named by the baby boom event caused by early marriages and high birth rate of Silent Generation members (Carlson, 2008). This generation is characterized by people born between 1946 and 1964, according to Cirilli et al. (2019). Cruz and Díaz (2016) describe them as people born in the post-World War II world, which was financially stable and increasingly optimistic, which made them witness several important changes in society, such as Women's Movement, Civil Rights Movement, and similar. Members of the Boomers generation can be described as creative, ready to take a risk at work, competitive, goal-oriented etc. (Dreyer, 2020). Cruz and Díaz (2016) also characterize them as idealistic, while Cirilli et al. (2019) add assertiveness, casualness, ambition, promotion of social causes, and optimism but without trust to the government to their characteristics list. They also have respect towards religion and family, and strong orientation towards work and career, as well as towards political and civil commitment (Cirilli et al., 2019). This transformation from individual and independent workaholic from Silent generation into people with characteristics which are focused on teamwork and collaboration happened because there were many members of Boomers and they needed to learn how to cooperate and work together (Zemke, 2003).

3.3 *Generation X*

Generation X is the next generation that presents people born and raised between 1965 and 1980. In the literature, this generation is also called "Gen X" (Stewart, 2017; Dreyer, 2020), "Latchkey Kids" (Cruz & Díaz, 2016), "Busters" (Cirilli et al., 2019), and "Generation Golf" (Enam, 2018; Dreyer, 2020). They were born during the period in history that is represented by the Watergate affair, Nixon's resignation, fall of the Berlin wall, emergence of computers and services such as MTV, etc. (Cirilli et al., 2019). Such events led to strong trends of divorces and economic uncertainty, but at the same time, the emergence of disco and hip-hop culture, video games, and cable TV (Cruz & Díaz, 2016). The representatives of Generation X are considered as depressed, focused, and mainly oriented towards balancing their personal and work time (Dreyer, 2020). They are described by Cirilli et al. (2019) as self-sufficient, ambitious, open to dialogue, multi-tasking and organized, tolerant towards differences, flexible, realistic, and rejecting the rules, while pursuing their personal development. Also, they seek stability and distrust in institutions since they believe in people and not in family, but, at the same time, they have a spirit of adaptation and responsibility (Cirilli et al., 2019). Cruz and Díaz (2016) also point out that they are skeptical of authorities and known for being individuals. Generation X members prefer informal and friendly workplaces where they can always learn and have the freedom and flexibility, as well as possibility to communicate regardless of

the title or the position (Cirilli et al., 2019). Since the first personal computer, also known as PCs, appeared during the 1970s, members of this generation were the first ones who witnessed the IT emergence and growth and who utilized IT in operating their work (Berkup, 2014).

3.4 Millennials

The next generation is called Millennials. This generation also has several names like Generation Y (Stewart, 2017; Dreyer, 2020), Gen Y (Dimock, 2019; Dreyer, 2020), Digital Generation (Tapscott, 1998), Net Generation (Tapscott, 2009), NetGen (Oblinger & Oblinger, 2015), etc. Members of Millennials are born and raised in the time period from 1981 till 1996, in the era of technological development such as instant communication via e-mails and text messaging (SMS), but also terrorism and swine flu (Cruz & Díaz, 2016; Cirilli et al., 2019). The Millennials can be observed as flexible workers and also the ones who take care of establishing the balance within the personal and business time in life. Since this generation is characterized by the further progress of IT as well as the appearance of the Internet (Postolov et al., 2017), members of the Millennials Generation show a higher level of curiosity, social awareness, and orientation to globalization (Dreyer, 2020). Cirilli et al. (2019) point out this generation to be the one that leaves their parent's home late in life, but are concentrated on the present, being hyper-connected, receptive, multitasking and having deep knowledge of technology. Similar, Cruz and Díaz (2016) point out that Millennials are very brand loyal and tech-comfortable. In addition, they accept diversity and tend to achieve goals in a short time and with people helping them, however, they have short attention and immediate gratification, while being entrepreneurial, ambitious, optimistic, impatient, informal, and individualistic. As employees, they tend to make a difference and want to be remembered for it, which is, for them, more important at their workplaces than their salary (Cirilli et al., 2019). They are curious and open to new things and perceive their jobs as opportunities to learn, and, in addition, as emphasized in (Cirilli et al., 2019, p. 5138), they “work to live, rather than live to work.”

3.5 Generation Z

The following generation is the Generation Z that encompasses people born and raised in the time period between 1997 and 2010, characterized by the even greater emergence of terrorism, the Great recession, emergence of the World Wide Web and technologies such as iPods and social networks such as Facebook (Cirilli et al., 2019). Members of this Generation Z are also called GenZ (Bejtkovsky, 2016; Dreyer, 2020), Gen Tech (Postolov et al., 2017; Singh & Dagmei, 2016), PostMillennials (Enam, 2018; Dreyer, 2020; Oblinger & Oblinger, 2015; Bullen et al., 2011), Gen Wii

(Postolov et al., 2017; Singh & Dagmei, 2016), Children of Internet (Berkup, 2014; Levickaite, 2010) and also Digital Natives (Berkup, 2014; Levickaite, 2010; Persada et al., 2019), etc. Members of Generation Z are characterized as people familiar with digital technologies, as they were born in the digital environment (Dreyer, 2020). Cruz and Díaz (2016) emphasize that they witnessed widespread use of electronic gadgets and digital technologies such as Internet and social networking sites and media. Therefore, usage of media, various digital technologies, social networks for them is not something strange and undiscovered (Postolov et al., 2017; Dreyer, 2020). They are also more family-oriented than generations before (Dreyer, 2020). Cruz and Díaz (2016) point out that Generation Z members are tech-savvy, flexible, smart, and tolerant for diverse cultures and globally connected in the virtual world. Generation Z members are independent, very self-critical, highly connected to communicate, make innovative choices, are used to receive immediate information, suffer from the fear of being excluded and have little concern for privacy, except when it comes to the money (Cirilli et al., 2019). Furthermore, in their personal or business progression, they are looking for safety and estimation of values (Dreyer, 2020). At their workplaces, Generation Z members are used to education and trainings through the usage of social media who love to turn their passions into work, but are not team workers (Cirilli et al., 2019).

3.6 Generation Alpha

Generation Alpha is called the “Google kids” by Cruz and Díaz (2016), and includes people born after 2010 and, most likely, until 2025 (Carter, 2016). They are born into a world that is newly emerging from widespread economic slowdown, and are expected to be even more tech-savvy than the Generation Z, well educated and more materialistically oriented in comparison to previous generations (Cruz & Díaz, 2016). According to Carter (2016), Generation Alpha members favor visual and voice-controlled communication over typing and texting, are more open to augmented reality and thrive to be social media influencers. Cirilli et al. (2019) point out that Generation Alpha members are the most experienced in technology and that they know perfectly how to use technology practically since the day they are born. However, one of the characteristics of this generation is possible dependence on the screen, moreover since their screen time and time spent on devices is greater than their social time (Cirilli et al., 2019). They are used to having virtual friendships and socialize through virtual worlds and virtual realities, which can make them, despite the hyper-connection, feel lonely (Cirilli et al., 2019).

4 New Kids on the Block: Digital Natives

As mentioned earlier, generational differences stem mostly from the political, social, and cultural events that marked their period of time in which they were born and raised. The period of time in which adult members of Generation Z and Generation Millennials have been marked by the extremely strong and rapid development of information and communication technologies, Internet technologies, and digital technologies. This environment of rapid advances in technology has shaped members of Generation Z and Generation Millennials in terms of their adaptations to new ways and approaches to learning and the establishment and maintenance of social relationships (Bullen et al., 2011). These two generations fell under the same name “Digital natives.”

The concept of “digital natives” was firstly introduced by the author Prensky (2001a, b). Prensky (2001a, b) encompassed both generations, Millennials and Generation Z, under the same generation of people who were so-called “tech-savvy” (Judd, 2018). Prensky (2001a, b) also make a clear difference between digital natives and “digital immigrants.” According to Nikou et al. (2019) members of digital immigrants are people born before 1980s and those people will, in a contrast to digital natives, always rather choose reading from a paper than reading from the display of the computer, mobile phone or tablet (Prensky, 2001a, b). Because of these differences in digital technology usage, the sufficient competencies of digital immigrants in teaching digital natives are often discussed. In scientific and practical circles, the digital skills that members of digital natives possess that digital immigrants have yet to acquire is also often debated theme (Nikou et al., 2019). According to Evans and Robertson (2020), digital immigrants can often be highly skilled in using digital technologies since they have a strong and long focus as well as developed ability to learn new skills by actively utilizing the information they get in the learning process.

Digital natives are described as learners in the continuously and aggressively progressive digital environment (Prensky, 2001a, b; Smith et al., 2020). According to Sarkar et al. (2017) digital natives comprises young members (learners) from Generation Z and Millennials that developed specific characteristics and personalities by playing various online games, watching videos on the Internet, using different mobile applications, etc. Moreover, the authors Nikou et al. (2019) describe how members of digital natives use the Internet, various online media, mobile phones, instant messaging for conversations, and other digital services on a daily basis since all of these technologies are already integrated into their everyday lives. Those newly developed characteristics of digital native members also shaped their needs and demands in the learning process by strongly changing and modifying current established learning methods (Sarkar et al., 2017). Digital natives are considered to be the crucial trigger for the educational system changes and further reform in the digital way (Evans & Robertson, 2020; Prensky, 2001a).

According to Sarkar et al. (2017) there are several common characteristics of members of digital natives that contribute to the new ways of shaping teaching

Fig. 7 Characteristics of Digital natives in learning process (Source Authors work, 2021 based on Sarkar et al., 2017)



and learning methods in schools and universities. Those characteristics are categorized into seven categories, as shown in Fig. 7. The following categories of learning characteristics of digital natives are:

1. Environment that comprises digital technologies.
2. Schedules that are not strictly defined.
3. Relatively short retention of attention/focus.
4. Strong need for quick feedback.
5. Expressed desire and need for team learning and collaboration with other colleagues.
6. Prefer learning through a particular activity rather than through standard reading and writing.
7. Usage of various portable devices (Sarkar et al., 2017).

As it has been mentioned earlier, digital natives grew up in the age of digital technology development. They, therefore, deal well with digital technologies and require a learning environment that will enable them to apply them. According to Nikou et al. (2019) digital natives “spend less than 5,000 h of their lives reading, they spend over 10,000 h playing video games and almost 20,000 h watching TV” (Prensky, 2001a). This is the main reason why most modern primary schools, secondary schools, and universities are looking for a new way of organizing their teaching methods and learning techniques (Bullen et al., 2011). The main reason for such transformation is to provide a supportive and more effective learning environment for digital natives (Bullen et al., 2011).

The digital environment in which digital natives grew up is responsible for shaping the way of thinking and performing everyday tasks for digital natives (Nikou et al., 2019). In addition to shaping their characteristics, the application of digital technology has given them a kind of freedom and independence (Sarkar et al., 2017).

Therefore, digital natives are often seen as students who rely on themselves and want to plan their activities independently, i.e., not follow a schedule that someone else has strictly planned for them (Sarkar et al., 2017).

The Internet has also had a major impact on shaping behavior and thinking. Digital natives spend a lot of time online browsing websites, reading posts on various social networks, etc. The information displayed on the Internet is often “scattered.” Namely, news and posts that appear on the Internet are mostly related to hyperlinks whose selections often lose the sequence of originally selected information for reading. This may be one of the reasons why digital natives do not have enough focus or enough concentration to keep their focus on just one piece of information for a long time and read it to the end (Berkup, 2014; Arkhipova et al., 2019; Tapscott, 2009). Digital natives are also able to do more than one thing at a time (Nikou et al., 2019; Judd, 2018) which also reduces their ability to stay focused on just one activity for longer (Berkup, 2014; Arkhipova et al., 2019; Tapscott, 2009). This can be greatly facilitated, for example, by the simultaneous reading of news on a computer and correspondence via a particular social network.

The next characteristic of digital natives that demands changes in educational systems is digital natives’ requirements for quick responses or feedback. The reason for such requests can be in the daily use of the Internet, various social networks, digital tools, etc., which allows them to access any information at any time (Sarkar et al., 2017). According to Jarrahi and Eshraghi (2019), members of digital natives are devoted users of social media and various applications for instant messaging such as Facebook Messenger, WhatsApp or Viber applications, which can be additional motivation why they have needs for getting feedbacks as soon as it is possible (Jarrahi & Eshraghi, 2019). By comparison, digital immigrants will decide to send an e-mail that has a slightly longer response time by the recipient of the message than with various instant messaging applications (Jarrahi & Eshraghi, 2019).

According to Jarrahi and Eshraghi (2019), digital natives do not have problems with sharing information with others on social media (Jarrahi & Eshraghi, 2019). Also, digital natives often ask for their colleagues’ opinion or advice (Jarrahi & Eshraghi, 2019). Likewise, they like to interact with each other (Nikou et al., 2019) and to share their knowledge with their colleagues on the personal networks (Jarrahi & Eshraghi, 2019). Consequently, the education system should adapt learning techniques by encouraging team development and the introduction of various collaborative tools and applications that will encourage mutual communication such as forum discussions, Google Hangouts, other social networks, etc., to suit Digital natives’ needs.

According to Nikou et al. (2019), digital natives are defined as students who prefer “learning by doing” and “learning by experiencing.” Digital natives will prefer the learning process by participating in student associations or committees (Evans & Robertson, 2020) rather than through conventional writing and reading and participation in class (Sarkar et al., 2017). In the literature, digital natives can also be observed as producers, not only consumers of the digital content, which can explain their need to actively participate in the learning process to gain new knowledge rather than only passively absorbing it (Smith et al., 2020).

Since almost all information is available on the Internet, as well as various e-editions of books, students who fall under the digital natives no longer show a desire and interest in visiting physical libraries and reading physical books (Arkhipova et al., 2019). Therefore, they rather prefer using portable devices like mobile phones or tablet to engage in learning process (Persada et al., 2019). According to the obtained results of the research made by Koumachi (2019), digital natives prefer remote lectures and reading digital learning materials on different digital devices rather than reading the same material on the paper. Thereby, schools and universities should include mobile devices and other digital devices that could support digital native students in gaining new knowledge through searching digital documents like electronical books, electronical articles, etc. (Persada et al., 2019).

5 Methodology of the Empirical Research of Digital Literacy of Digital Natives

This part of the chapter provides an overview of the part of the longitudinal empirical research that is being conducted each year since 2013 at the Faculty of Economics & Business, University of Zagreb, Croatia for the students of the first year of both Business and Economics study programs. The surveyed students can be, by their birth year, age, and characteristics, considered to be digital natives as they are both Millennials and Generation Z (Judd, 2018). However, some authors, like Cruz and Díaz (2016), argue that only Generation Z (born from 1997 till 2010) can be considered to be true digital natives. Therefore, for the purpose of this study, two different generations of digital natives are going to be taken into consideration, those surveyed in 2015, since they can be considered to be the first generation of Generation Z participating in the research, and those surveyed in 2020, as the last one participating since there are yet no results from the new 2021 academic year in the moment of writing this chapter.

The main aim of the named research is to assess the attitudes of students towards learning IT, their usage of modern tools such as Google tools and Microsoft Office tools as well as the levels of their digital literacy. This research is being conducted each year at the beginning of the academic year, when students are asked to voluntarily complete an anonymous survey within the first 2 weeks of their studies.

In the continuation of this part of the chapter, first, the data collecting procedure is going to be presented, followed by the detailed description of the research instrument used to conduct the empirical research provided in this part of the chapter. Furthermore, the samples have been provided and discussed, as have the methods of data analysis that have been used to deliver and evaluate the study's conclusions.

5.1 *Data Collection Process*

As already mentioned, a study of both Business and Economics study programs students' digital literacy levels and their attitudes toward learning IT, as well as the level of their usage of modern technological tools was conducted at the start of the academic year, during the first 2 weeks of the winter semester. The questionnaire was provided to the whole generation of the first-year students by their Business Informatics teachers via Google Classrooms, but, as previously mentioned, their participation in this research was entirely voluntary.

This chapter shows the findings of two surveys that are identical by their questions. The first, which surveyed the first generation of Generation Z students, was conducted at the start of the academic year 2015/2016, while the second was conducted at the start of the academic year 2020/2021. Having in mind the current situation in the world regarding the COVID-19 pandemic, it is significant to emphasize that first generation of Generation Z students spent their whole education in physical classrooms, whereas surveyed Generation Z in 2020 enrolled in their first year at the university following a semester of online learning during their senior high school year.

5.2 *Research Instrument*

For the purpose of this research, a methodology developed by Ng (2012) has been utilized to investigate the levels of digital literacy among the population under investigation, i.e., digital natives. Besides the already set framework for assessing the attitudes towards learning IT and determining the levels of digital literacy, the work of Ng (2012) also served as an inspiration for developing another set of questions regarding the usage of modern tools such as Microsoft Office and Google tools.

The previously named framework, as developed by Ng (2012), is comprised of seven questions that are used to examine respondents' attitudes towards studying IT. A 5-point Likert scale was used to determine how much agreement respondents had with each of the statements. The lowest number, i.e., grade 1 reflected the most degree of disagreement, while the highest number, i.e., grade 5 signified the greatest degree of agreement. Table 2 presents the research instrument that has been used to evaluate the attitudes of the surveyed students towards learning IT.

Next, as previously described, the Ng (2012) digital literacy framework also includes statements that address the three dimensions of digital literacy that have been described earlier, being technical dimension, cognitive dimension and social-emotional dimension. There was a total of ten statements in the research instrument regarding digital literacy as presented in the Table 3. Each statement was graded on a 5-point Likert scale, with 1 representing total disagreement and 5 representing total agreement (Table 3).

Table 2 Attitudes towards IT learning research instrument (*Source* Authors’ work, 2021 following Ng, 2012)

Dimension	Statement ID	Statement
Attitudes towards IT learning	ATT1	I like to use IT in the learning process
	ATT2	I learn better with the help of IT
	ATT3	IT makes learning more fun
	ATT4	I have more motivation to learn with IT
	ATT5	IT allows me to learn on my own initiative and independently
	ATT6	The use of mobile technologies for educational purposes has a lot of potential
	ATT7	Teachers should make more use of IT in the educational process

Table 3 Digital literacy research instrument (*Source* Ng, 2012)

Dimension	Statement ID	Statement
Technical dimension	TD1	I know how to solve my technical problems on my own
	TD2	I easily learn to use new technologies
	TD3	I follow the development of new technologies
	TD4	I have knowledge of a wide range of technologies
	TD5	I possess technical skills in using IT to present my knowledge
	TD6	I have good IT skills
Cognitive dimension	CD1	I am confident in my Internet search skills in terms of getting quality information
	CD2	I am familiar with problems related to the use of the Internet (e.g., security issues, plagiarism, piracy)
Social- emotional dimension	SED1	IT allows me to better collaborate with colleagues on various projects and other educational activities
	SED2	I often ask my colleagues for help with teaching assignments online

The next part of the research included questions regarding the usage of Microsoft Office, and Google tools, as well as the question regarding the frequency of usage of an e-mail. There was a total of seven questions regarding the Microsoft Office tools and ten questions regarding the Google tools, as presented by the Table 4, which also presents the answers that were offered to the respondents to select. Finally, there was on question regarding the frequency of usage of an e-mail.

Table 4 The usage of Microsoft Excel, Google tools, and e-mail research instrument (*Source* Authors' work, 2021 inspired by Ng, 2012)

Question	Statement ID	Tool	Possible answers
Have you used the following Microsoft Office tool so far and to what extent?	MSO1	Word	<ul style="list-style-type: none"> – Never – I have heard of this tool – I have used it several times – I am using it often
	MSO2	Excel	
	MSO3	Access	
	MSO4	PowerPoint	
	MSO5	Publisher	
	MSO6	InfoPath	
	MSO7	Outlook	
Have you used the following Google tool so far, and to what extent?	GT1	Google Chrome	<ul style="list-style-type: none"> – Never – I have heard of this tool – I have used it several times – I am using it often
	GT2	Google Drive	
	GT3	Gmail	
	GT4	Google Sites	
	GT5	Google Keep	
	GT6	Google Calendar	
	GT7	YouTube	
	GT8	Google Translate	
	GT9	Google Scholar	
	GT10	Google Books	
How often do you use e-mail?	EM1	E-mail	<ul style="list-style-type: none"> – On a daily basis – Several times a week – Several times a month – Less than once a month – I don't have an email address

Additionally, the questionnaire contained demographic questions that were asked of the participants in the study, regarding their age and sex, as well as if the academic year when the survey took place was the year of their first university enrolment.

5.3 Sample

There were 384 surveyed first-year Business and Economics students in 2015, and 271 of them in 2020. In 2015, majority of the respondents were female students (75.77%) aged between 18 and 21 (93.49% of them), while 12.76% of them did not enrol the University for the first time in the academic year 2015/2016. In 2020, the majority of the respondents were also female students (74.10%) aged between 18 and 21 (97.05% of them), while 6.27% of them did not enrol the University for the first

Fig. 8 Final sample sex characteristics, N(2015) = 326, N(2020) = 251 (Source Authors work, 2021)

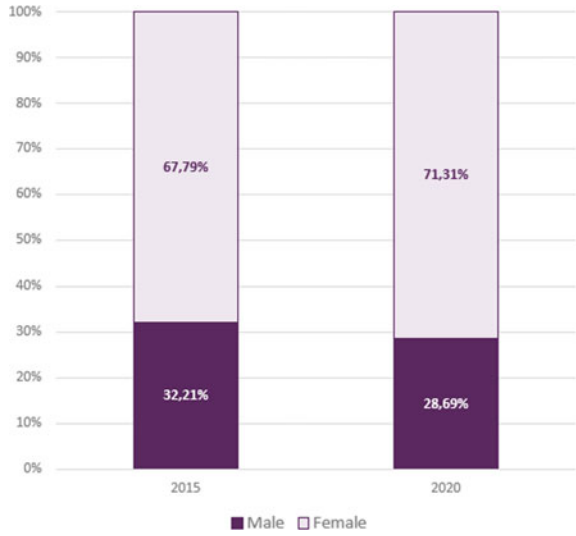


Table 5 Sample Characteristics: sex, age, and first enrolment (Source Authors’ work)

Sample characteristic		2015 N = 384		2020 N = 271	
		N	%	N	%
Sex	Male	137	42.02	85	33.86
	Female	247	75.77	186	74.10
Age	18–21	359	93.49	263	97.05
	22–25	17	4.43	8	2.95
	26–30	4	1.04	0	0.00
	31–40	2	0.52	0	0.00
	41–55	1	0.26	0	0.00
	above 55	1	0.26	0	0.00
First enrolment	Yes	335	87.24	254	93.73
	No	49	12.76	17	6.27

time in the academic year 2020/2021. The first sample characteristics are presented by the Table 5.

Since the purpose of this study was to identify the first generation of the Generation Z students, with the assumption that their first enrolment at the University should be at the age of 18, all answers that have been received by those that did not belong to the first age group (18–21) and by those who did not enrol the university for the first time in the surveyed academic year have been omitted from the further analysis. In that sense, there was a total of 326 responses left for the analysis collected in 2015, and 251 responses collected in 2020.

Figure 8 presents the sample characteristics regarding respondents' sex in the remaining sample, i.e., the one that has been further analyzed. In that, final sample, among 2015 survey respondents there were approximately 68% of female students and 32% of male ones, while in 2020, there were approximately 71% of female students and 29% of male ones.

5.4 Data Analysis

IBM SPSS statistic software and Microsoft Excel 2019 were used to analyze the data obtained by the previously described research using the final sample. The means, standard deviations, modes (in certain cases), and frequencies were computed for statements using the Likert scale.

Frequencies of distributions have also been computed for the third part of the questionnaire, referring to the frequency of usage of Microsoft Office tools, Google tools, and e-mail.

5.5 Results and Discussion

Table 6 presents the results of the descriptive statistics for both 2015 and 2020 surveys regarding the frequencies of answers on the questions related to the students' attitude towards learning IT. It is visible from the results that the first generation of Generation Z students, surveyed in 2015 have given highest grades to the item ATT7 (29%) which refers to the idea that teachers should make more use of IT in the educational process. On the other hand, this item received only 18% of the highest grade in 2020 survey, which comes as no surprise if one takes into consideration the previously mentioned fact that the 2020 students have been involved in distance learning using IT for

Table 6 Frequency of distributions for attitudes towards learning IT part of the research (*Source* Authors' work)

ID	% 2015					% 2020				
	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
ATT1	9	11	36	23	21	8	14	35	25	20
ATT2	8	17	39	20	17	10	16	37	21	15
ATT3	9	12	39	23	18	10	16	36	20	17
ATT4	9	19	40	17	14	14	26	32	18	10
ATT5	9	16	41	19	14	8	18	34	25	16
ATT6	3	6	33	29	28	1	8	27	31	33
ATT7	4	9	33	26	29	6	13	38	25	18

Table 7 Frequency of distributions for digital literacy part of the research (*Source* Authors’ work)

ID	% 2015					% 2020				
	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
TD1	4	16	41	28	11	6	16	39	24	15
TD2	2	7	30	29	32	3	5	31	33	27
TD3	5	12	38	25	20	6	14	32	31	17
TD4	6	21	42	21	10	11	25	40	18	7
TD5	6	17	38	27	12	6	17	37	26	14
TD6	5	12	42	29	11	8	17	39	25	11
CD1	3	7	29	33	27	3	6	25	36	30
CD2	1	7	28	31	33	1	10	24	26	39
SED1	2	7	31	32	29	2	7	29	29	33
SED2	2	10	28	34	25	4	11	27	32	26

quite a while due to the COVID-19 pandemic and they probably strive for an “old-normal” when they had the opportunity to learn side to side to their colleagues in the physical classrooms. The results of the 2020 survey frequency distribution reveal that most of the highest grades have been awarded to item ATT6 (33%), which refers to the potential of using mobile technologies for educational purposes. Such findings corroborate prior Eurostat research, which indicated that about 75% of adults in the European Union used a mobile device to access the Internet in 2019, while 93% of young adults aged 16–29 did the same (Eurostat, 2020). The same study discovered that mobile phones were used to connect to the Internet at a far greater rate than computers (Eurostat, 2020).

Next, Table 7 presents the results of the descriptive statistics for both 2015 and 2020 surveys regarding the frequencies of answers on the questions related to the students’ digital literacy. Within the technical dimension, it is visible from the results that the first generation of Generation Z students, surveyed in 2015, as well as the students surveyed in 2020, have given highest grades to the item TD2 (32% in 2015 and 27% in 2020), which refers to the ease of learning new technologies. Such results are, again, no surprise, and are in line with the characteristics of the digital natives and Generation Z, as discussed in previous subchapters.

In the cognitive dimension, higher grades have been given to the CD2 item, referring to the familiarity of the problems related to the use of the Internet (e.g., security issues, plagiarism, piracy). In that sense, both surveyed generations have given the higher grades to CD2 item, 31% of them in 2015 and 39% of them in 2020, which shows an increase in that sub-dimension of the digital natives’ digital literacy. That awareness of the security issues that can occur while using Internet is, of course, a good trend, since there has been an increase in the amount of such events. As indicated by Sobers (2021), recent trends, the consequences of a worldwide COVID-19 pandemic, and cybersecurity statistics all point to a dramatic increase in hacked and

leaked data from more prevalent workplace sources, such as smartphones and IoT devices, where 95% of cybersecurity breaches have been caused by human error.

In the social-emotional dimension, both observed years reveal higher grades for the SED1 item, referring to belief that IT allows students to better collaborate with colleagues on various projects and other educational activities. Such results are in line with Kahootz (2019) statements on how the usage of IT can improve collaboration and encourage teamwork.

Figure 9 presents the mean values of items ATT1–ATT7 which comprise the construct attitudes towards learning IT. It is visible that the highest mean grades have been awarded for both surveyed years to ATT6 item, referring to the potential of using mobile technologies for educational purposes, as explained earlier. On the other hand, lowest grades have been awarded to the ATT4 item, which refers to the increase in motivation when IT is involved in learning. Again, very likely due to the COVID-19 pandemic situation which has shifted practically the whole world online, and ongoing distance learning for 2020 surveyed students, the average grade on the ATT4 item is lower in the 2020 survey results (2.83) compared to the 2015 survey results, where the average grade was 3.09.

Figure 10 presents the mean values of items referring to the digital literacy and its three dimensions. It is visible that the highest mean grades within technical dimension have been awarded for both surveyed years to TD2 item, referring to the ease of learning how to use new technologies, as explained earlier. On the other hand, lowest grades have been awarded to the TD4 item, which refers to the knowledge of a wide range of technologies. Such results can be explained by the increasing and rapid development of new technologies every day, so digital natives are, according to these results, well aware of the fact that their knowledge of a wide range of technologies is scarce and limited in comparison to the actual range of available technologies nowadays.

As presented by the Fig. 10, in the cognitive dimension, higher average grade in both observed years have been appointed to CD2 item, referring to familiarity with problems related to the use of the Internet (e.g., security issues, plagiarism,

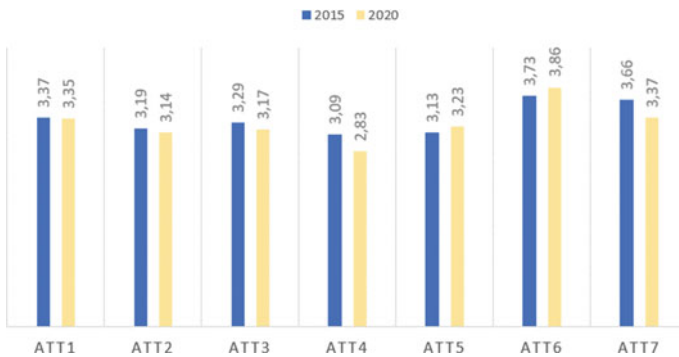


Fig. 9 Mean values of attitudes towards learning IT items (Source Authors work, 2021)

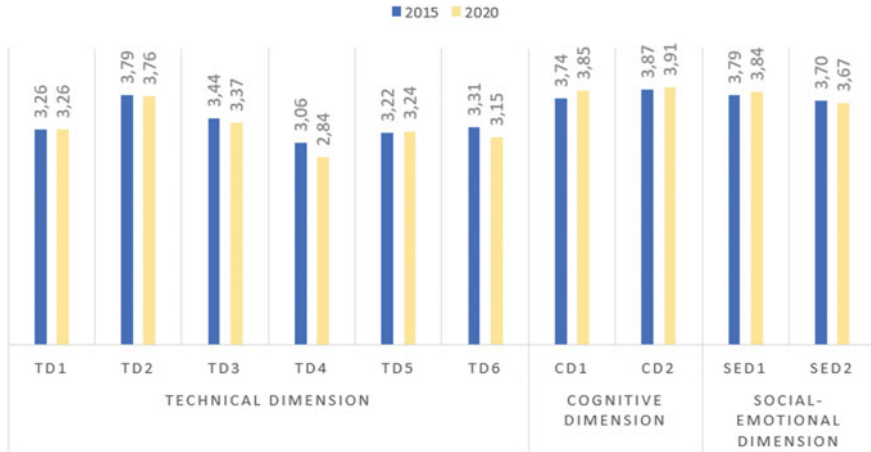


Fig. 10 Mean values of digital literacy items (Source Authors work, 2021)

piracy), while lower grades have been appointed to the other item, CD1, referring to the confidence in the Internet search skills in terms of getting quality information. However, for both items, the average grades are slightly higher in 2020 than in 2015 research results.

When it comes to the social-emotional dimension, higher average grade in both 2015 and 2020 research is given to the SED1 item, referring to belief that IT allows students to better collaborate with colleagues on various projects and other educational activities, while lower ones have been given to other item, SED2, referring to seeking colleagues for help with teaching assignments online. While the higher average grade for the SED1 item has been given by the 2020 students in comparison to 2015 ones, there is a reverse situation when it comes to the SED2 item, where 2020 students have given slightly lower average grade to it than 2015 students. One of the possible causes could, again, be found in COVID-19 pandemic, since the 2020 students have not met in person after their university enrolment, so it is probably harder for them to reach out to colleagues than if they know each other in person, and not just virtually.

Having in mind previously showed results regarding attitudes towards learning IT and digital literacy of different two generations of digital natives, it can be concluded that their attitudes are changing over the years, but the level of their digital literacy remains fairly on the similar path.

The next part of the research has been focused on the frequency of usage of Microsoft Office tools and Google tools among digital natives. The results are presented in the Table 8, where 1 represents “Never,” 2 represents “I have heard of this tool,” 3 represents “I have used it several times,” and 4 represents “I am using it often.” As it is visible from the results, most often used Microsoft Office tool is Word (item MSO1) with 85% of 2015 students, and 84% of 2020 students using it often. The next most frequently used one is PowerPoint (item MSO4), which is been

used often by 75% of the digital natives surveyed in 2015, and 82% of them surveyed in 2020. The least used Microsoft Office tool is Microsoft InfoPath (item MSO6), which has never been used by 50% of the digital natives surveyed in 2015, and 67% of them surveyed in 2020. The next least used Microsoft Office tool is Publisher (item MSO5), which has never been used by 29% of the digital natives surveyed in 2015, and 43% of them surveyed in 2020.

When it comes to Google tools, the most frequently used Google tool for digital natives surveyed in 2015 has been YouTube (item GT7), with 96% of them using it often, followed by Google Chrome (item GT1), which has been used by 92% of 2015 surveyed students. In 2020, most of the digital natives, 97% of them voted YouTube to still be the most used one, while the second most frequently used Google tool is Gmail (item GT3), with 95% of 2020 digital natives using it often. On the other hand, the least used Google tool for digital natives in 2015 has been Google Keep (item GT5), with 40% of them have never use it. In 2020 research, the least used Google tool among digital natives has been Google Scholar (item GT9), as 49% of students have never used it (Table 8).

Finally, regarding the frequency of the usage of an e-mail, the results are presented by the Fig. 11. As it is visible from the results, there has been an increase in the frequency of usage of e-mails if one compares the results of the survey that have

Table 8 Frequency of distributions for the frequency of usage of Microsoft Office tools and Google tools (Source Authors' work)

Statement ID	% 2015				% 2020			
	1 (%)	2 (%)	3 (%)	4 (%)	1 (%)	2 (%)	3 (%)	4 (%)
MSO1	0	1	14	85	0	0	14	86
MSO2	2	8	64	27	0	11	69	19
MSO3	13	41	43	3	17	47	35	1
MSO4	0	1	24	75	0	1	16	82
MSO5	29	52	17	3	43	45	10	2
MSO6	50	45	4	1	67	30	2	1
MSO7	13	40	30	16	24	49	23	4
GT1	0	1	7	92	0	0	6	93
GT2	14	32	33	20	3	17	42	38
GT3	1	2	9	88	0	1	4	95
GT4	21	38	21	20	22	39	22	18
GT5	40	40	16	5	41	47	10	2
GT6	22	44	23	11	19	38	30	14
GT7	0	1	3	96	0	0	3	97
GT8	1	2	17	79	0	1	21	78
GT9	36	44	16	4	49	32	12	7
GT10	30	50	16	5	41	41	14	4

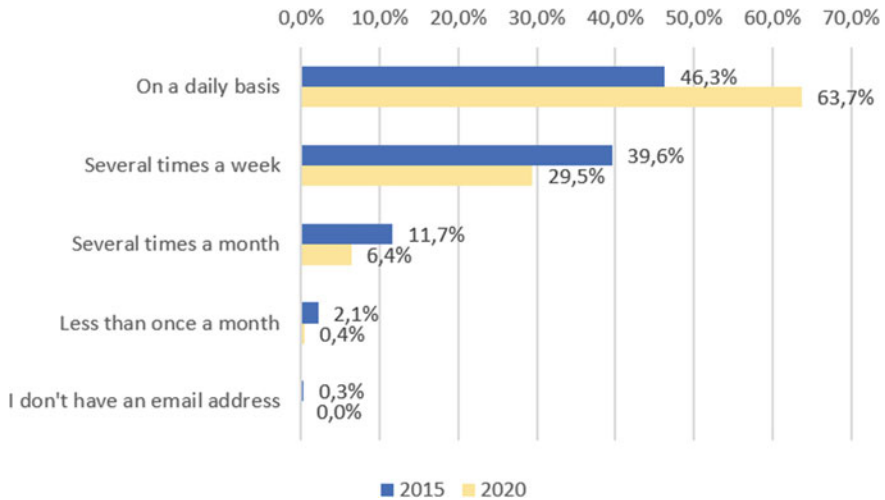


Fig. 11 Frequency of an e-mail usage among digital natives (Source Authors work, 2021)

been obtained in 2015 and those that have been obtained in 2020. In 2015, 46% of digital natives have been using e-mail on a daily basis, while approximately 40% of them have been using it several times a week. Also, 0.3% of digital natives in 2015 voted that they do not have an e-mail address, where in 2020 there are no students who have selected that option. In 2020 survey, there has been an increase, and now approximately 64% of digital natives use e-mail on a daily basis, while approximately 30% of them use it several times a week. Only 6.8% of students surveyed in 2020 use e-mail several times a month or less than once a month.

6 Conclusion

This chapter discussed the theoretical framework of digital natives and the methods and findings of an empirical study that has been carried out among two generations of digital natives, where one generation has been surveyed in 2015 as the first generation of Generation Z and one has been surveyed in 2020. The primary objective of this empirical research was to ascertain the degree of digital literacy of students who can be considered to be digital natives, as well as their attitudes about learning IT, and the frequency of their use of current tools such as Google tools, e-mail, and Microsoft Office tools. The results have shown similar trends in the levels of digital literacy of surveyed digital natives, but there is a shift in their attitudes towards learning IT. Also, when it comes to the usage of Microsoft Office and Google tools, similar trends have been noted, while, when it comes to the frequency of usage of an e-mail services, an increase has been found in 2020 in comparison to 2015.

Although the empirical research presented in this chapter contributes to the corpus of knowledge, it does have certain limitations that must be acknowledged. For example, all of the digital natives that have been surveyed are first-year students of Business and Economics study programs, which means that the findings may vary for different majors. Also, this research has been conducted in Croatia, which limits the possibilities for generalization. Additionally, one should be mindful that utilizing a different framework and research instrument may result in very different findings and insights.

For further research, authors propose that this kind of survey is conducted on a sample of students of other majors, as well as outside of Croatia in order to increase the generalization of the findings and allow their comparison. In addition, as this chapter provided an overview of the research results, further statistical tests need to be performed in order to see if the noted differences between the digital natives of the first generation of Generation Z surveyed in 2015 and those surveyed in 2020 are statistically significant.

References

- Aleksić, A. (2009). The role of organisation's change management in building a company's sustainable competitive competence. *Proceedings of the Faculty of Economics in Zagreb*, 7, 37–37.
- Ali, Z., Gongbing, B., & Mehreen, A. (2018). Does supply chain finance improve SMEs performance? The moderating role of trade digitization. *Business Process Management Journal*.
- Arkipova, M. V., Belova, E. E., Gavrikova, Y. A., Pleskanyuk, T. N., & Arkipov, A. N. (2019). Reaching generation Z. Attitude toward technology among the newest generation of school students. In E. Popkova, & V. Ostrovskaya (Eds.), *Perspectives on the use of new information and communication technology (ICT) in the modern economy. ISC 2017. Advances in Intelligent Systems and Computing* (Vol. 726, pp. 1026–1032). Springer.
- Bawden, D. (2008). Origins and concepts of digital literacy. In *Digital literacies: Concepts, policies and practices* (Vol. 321). Peter Lang Inc
- Belak, S., & Ušljebrka, I. (2014). Organizational culture as a factor in the successful implementation of organizational changes. *Oeconomica Jadertina*, 4, 80–98.
- Berkup, B. S. (2014). Working with generations X and Y in generation Z period: Management of different generations in business life. *Mediterranean Journal of Social Sciences*, 5, 218–229.
- Bejtkovsky, J. (2016). The Employees of Baby Boomers Generation X Generation Y and Generation Z in Selected Czech Corporations as Concoivers of Development and Competitiveness in their Corporation. *Journal of Competitiveness* 8(4) 105–123. 10.7441/joc.2016.04.07
- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. WW Norton & Company.
- Buckingham, D. (2006). Defining digital literacy. *Medienbildung in neuen Kulturräumen. VS Verlag Für Sozialwissenschaften*, 1, 59–71.
- Bullen, M., Morgan, T., & Qayyum, A. (2011). Digital learners in higher education: Generation is not the issue. *Canadian Journal of Learning and Technology*, 37
- Carlson, E. (2008). *The lucky few: Between the greatest generation and the baby boom*. Springer.
- Carter, C. M. (2016). The complete guide to generation alpha, the children of millennials. *Forbes*. Retrieved September 20 2021, from <https://www.forbes.com/sites/christinecarter/2016/12/21/the-complete-guide-to-generation-alpha-the-children-of-millennials/?sh=5128724e3623>

- Cirilli, E., Nicolini, P., & Mandolini, L. (2019). Digital skills from silent to alpha generation: An overview. In L. G. Chova, A. L. Martinez, I. C. Torres (Eds.), *Edulearn19: 11th international conference on education and new learning technologies* (pp. 5134–5143).
- Cocca, P., Marciano, F., Rossi, D., & Alberti, M. (2018). Business software offer for Industry 4.0: The SAP case. *IFAC-PapersOnLine*, 51, 1200–1205.
- Croatian Chamber of Commerce. (2021). Industrija 4.0. Retrieved September 16, 2021, from <https://www.hgk.hr/documents/hgk-industrija-4058d8c59722f1e.pdf>
- Cruz, F. J. F., & Díaz, M. J. F. (2016). Generation z's teachers and their digital skills. *Comunicar. Media Education Research Journal*, 24(1).
- Dimock, M. (2019). *Where millennials end and generation Z begins*. <https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/>
- Dreyer, C. (2020). Characteristics of generation X, Y, and Z (literature review), In *PEFnet 2020—24th European Scientific Conference of Doctoral Students* (pp. 39–40). Mendel University in Brno
- Enam, A. (2018). Time allocation behavior of twentieth-century American generations: GI generation, silent generation, baby boomers, generation X, and millennials. *Transportation Research Record*, 2672, 69–80.
- Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93–106.
- Eshet-Alkalai, Y., & Chajut, E. (2009). Changes over time in digital literacy. *CyberPsychology & Behavior*, 12(6), 713–715.
- European Commission. (2020). Retrieved September 26, 2021, from <https://digital-strategy.ec.europa.eu/en/policies/desi>
- Eurostat. (2020). *Being young in Europe today—Digital world*. Retrieved September 26, 2021, from [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Being_young_in_Europe_today_-_digital_age_divide](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Being_young_in_Europe_today_-_digital_world#A_digital_age_divide)
- Evans, C., & Robertson, W. (2020). The four phases of the digital natives debate. *Human Behavior and Emerging Technologies*, 2(3), 269–277.
- Gartner (2018) Gartner IT glossary: Digitalization. Retrieved September 19, 2021, from, <http://www.gartner.com/it-glossary/digitalization>
- Jarrahi, M. H., & Eshraghi, A. (2019). Digital natives vs digital immigrants: A multidimensional view on interaction with social technologies in organizations. *Journal of Enterprise Information Management*.
- Judd, T. (2018). The rise and fall (?) of the digital natives. *Australasian Journal of Educational Technology*, 34, 100–119.
- Jůvová, A. (2017). The Guerrilla literacy learners' project: Development of literacies through informal learning. *Acta Technologica Dubnicae*, 7(1), 83–92.
- Kahootz. (2019). *How technology can encourage teamwork and collaboration*. Retrieved October 8, 2021, from <https://www.kahootz.com/teamwork-and-collaboration/>
- Koksal, M. H. (2019). Differences among baby boomers, Generation X, millennials, and Generation Z wine consumers in Lebanon: Some perspectives. *International Journal of Wine Business Research*, 31, 456–472. <https://doi.org/10.1108/IJWBR-09-2018-0047>
- Koltay, T. (2011). The media and the literacies: Media literacy, information literacy, digital literacy. *Media, Culture & Society*, 33(2), 211–221.
- Koumachi, B. (2019). The digital turn in higher education: “Digital natives” mythbusted. *International Journal of Technology in Education and Science (IJTES)*, 3, 56–62.
- Lankhshear, C., & Knobel, M. (2008). *Digital literacies: Concepts, policies and practices*. Peter Land Publishing Inc.
- Levickaite, R. (2010). Generations X, Y, Z: How social networks form the concept of the world without borders (the case of Lithuania). *LIMES: Cultural Regionalistics*, 3, 170–183.
- Maiti, M., & Kayal, P. (2017). Digitization: It's impact on economic development & trade with special reference to services and MSME sector of India. *Asian Economic and Financial Review*, 7, 541–549.

- Maji, S. K., & Laha, A. (2021). The role of digital skill in mitigating digital divide: evidences from Asia-Pacific region. *Rajagiri Management Journal*.
- Mannheim, K. (1952). The problem of generations. In K. Mannheim (Ed.), *Essays on the sociology of knowledge*. RKP.
- Martin, A. (2006). A European framework for digital literacy. *Nordic Journal of Digital Literacy*, 1(02), 151–161.
- Martin, A. (2008). Digital literacy and the “digital society.” *Digital Literacies: Concepts, Policies and Practices*, 30, 151–176.
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065–1078.
- Nikou, S., Brännback, M., & Widén, G. (2019). The impact of digitalization on literacy: Digital immigrants vs. digital natives. In *ECIS. Research Papers*. 39. https://aisel.aisnet.org/ecis2019_rp/39
- Oblinger, D. G., & Oblinger J. L. (2005). *Educating the Net generation*. EDUCASE.
- Persada S. F., Miraja B. A., & Nadlifatin R. (2019). Understanding the generation Z behavior on D-learning: A unified theory of acceptance and use of technology (UTAUT) approach. *I-JET*, 14
- Prenkys, M. (2001a). Digital natives, digital immigrants: Part 1. *On the Horizon*, 9, 1–6. <https://doi.org/10.1108/10748120110424816>.
- Prenkys, M. (2001b). Digital natives, digital immigrants: Part 2. Do they really think differently? *On the Horizon*, 9, 1–6. <https://doi.org/10.1108/10748120110424843>
- Postolov, K., Magdinceva Sopova, M., & Janeska Iliev, A. (2017). E-learning in the hands of generation Y and Z. *Poslovna izvrsnost*, 11(2), 107–119.
- Rea-Guaman, A. M., San Feliu, T., Calvo-Manzano, J. A., & Sanchez-Garcia, I. D. (2017). Comparative study of cybersecurity capability maturity models. In *International conference on software process improvement and capability determination* (pp. 100–113). Springer.
- Richardson, L., & Bissell, D. (2019). Geographies of digital skill. *Geoforum*, 99, 278–286.
- Saputra, N., Ardiyansyah, F., Palupiningtyas, D., Bahri, T. N. (2020). Tracing the predictors of WFH productivity: A structural equation modelling. In *8th international seminar and conference on learning organization, proceeding conference* (pp. 252–261).
- Sarkar, N., Ford, W., & Manzo, C. (2017). Engaging digital natives through social learning. *Systemics, Cybernetics and Informatics*, 15, 1–4.
- Schmidt, R., Möhring, M., Härting, R.C., Reichstein, C., Neumaier, P., & Jozinović, P. (2015). Industry 4.0-potentials for creating smart products: empirical research results. In *International Conference on Business Information Systems* (pp. 16–27). Springer, Cham.
- Singh A. P., & Dangmei J. (2016). Understanding the generation z: The future workforce. *South-Asian Journal of Multidisciplinary Studies*, 3
- Smith, E. E., Kahlke, R., & Judd, T. (2020). Not just digital natives: Integrating technologies in professional education contexts. *Australasian Journal of Educational Technology*, 36, 1–14.
- Sobers, R. (2021). *134 Cybersecurity statistics and trends for 2021*. Varonis. Retrieved October 8, 2021, from <https://www.varonis.com/blog/cybersecurity-statistics/>
- Stewart, J. S. (2017). Managing millennials: Embracing generational differences. *Business Horizons*, 60, 45–54.
- Stolterman, E., & Fors, A. C. (2004). Information technology and the good life. In B. Kaplan, D. P. Truex, D. Wastell, A. T. Wood-Harper, J. I. DeGross (Eds.), *Information systems research*. IFIP International Federation for Information Processing (Vol. 143, pp. 687–692). Springer.
- Strauss, W., & Howe, N. (1992). *Generations: The history of America's future, 1584 to 2069*. William Morrow & Company.
- Tapscott, D. (1998). *Growing up digital: the rise of the net generation*. McGraw-Hill.
- Tapscott, D. (2009). *Grown up digital how the net generation is changing your world*. McGraw-Hill.
- Tootell, H., Freeman, M., & Freeman, A. (2014). Generation alpha at the intersection of technology, play and motivation. In *2014 47th Hawaii international conference on system sciences* (pp. 82–90). IEEE.

- Tohara, A. J. T., Shuhidan, S. M., Saiful Bahry, F. D. & Nordin, M. N. (2021). Exploring Digital Literacy Strategies for Students with Special Educational Needs in the Digital Age. *Turkish Journal of Computer and Mathematics Education*, 12(9), 3345–3358.
- Zemke, R., Raines, C., & Filipczak, B. (2003). Generations at work: Managing the clash of veterans, boomers, xers, and nexters in your workplace. AMACOM.