

The Interaction of Information Technology Habits and Learning in Young Adulthood

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Abstract

This study examines the relationship between the habits of young adults in the use of information technologies and the cognitive processes involved in learning. It was found that information technologies have become an irreplaceable part of modern education, offering vast opportunities to access information and resources, thus promoting the learning of young adults. A large research phase was held to qualitatively analyze the impact of expert interviews on information technology usage habits on young adults' cognitive processes and to investigate the changes it can create in the learning process. Data was collected using semi-structured interviews with open-ended questions. At the end of the research stage, it was found that using information technology in the learning process has positive and negative consequences, as it has changed the way knowledge is acquired and has made information accessible; however, the use of technology creates an illusion that a person is able to multitask. Learning with the help of information technology reduces the visual perception field; moreover, under its influence, a different attitude towards time and the pace of life arises, creating a feeling of lacking time. Various cognitive, emotional, and social disorders intensify; directly affecting young adults' well-being. This study highlights the importance of the interaction of information technology usage habits and cognitive processes in the learning of young adults.

Keywords: IT, Technology, young adulthood, habits

Introduction

Information technologies (IT) have created a new cultural phenomenon a virtual cultural space where humanity's knowledge and skills are uploaded, stored, supplemented and reflected upon. It has become a place where people socialize, communicate, and create new content for this space.

The theories of cultural-historical psychology (Vigotskis, 2002) postulate that human psychological processes and behavior are developed by introducing artificial means created by culture. Culture creates artificial culture-specific stimuli that people learn and use to guide their behavior. Symbols and words are essential means of self-regulation of human psychological processes. As language develops as a cultural-historical product, it becomes the basis for generalizing and turning external reality into an internal reality. With the development of writing, humanity experiences a cognitive revolution that results in written language becoming an artificially created intellectual technology. The emergence of book printing technology and modern information technology continues this series of cognitive changes. However, there is no single answer to the question of how and to what extent these intellectual technologies impact the human psyche, but current research from various fields shows that they have different effects on higher psychological processes.

Some technologies are like extensions or accelerations of the human body – guns, cars or tractors – but other technologies, like calculators, maps, books, computers or the Internet, are intellectual. Smart technology does not act as an extension of the body but as a mediator between the human psyche and the environment. Smart technologies have a profound impact on our thoughts (Weizenbaum, Torous & Fulford, 2020).

Moreover, information technology in education is only logical; making various activities much simpler and less time-consuming. Furthermore, technologies enable access to information in new and faster ways than before, and they also enable the generation and transmission of information, teaching and learning without the limitations of space and time (which was proved during the COVID-19 pandemic). Thanks to technology, many manual tasks can be easily automated. Moreover, technology is becoming an important factor in learning and development in today's classroom. In the ever-changing world of technology, educators are working hard to incorporate technology into their daily work to help students and teachers connect their passion for modern technology to learning. Some of the new technologies in education affect teaching and learning behavior, create changes in the roles of teachers and students, increase the need to use various self-learning opportunities and expand the availability of information.

Therefore, along with the development and rapid progress of technology, it is also necessary to analyze in depth use of technology in education, from the perspective of developing new theoretical directions, understanding the possibilities of using technology and promoting its full use in the educational processes. It is necessary to ensure that technologies make the learning process more efficient from its organizational perspective and be used for knowledge improvement (Daniela, 2022).

For this reason, the Institute of Humanities of Riga Technical University, in cooperation with the Institute of Sociology and Philosophy of the University of Latvia, conducts research funded by the Latvian Science Council, "The impact of internet usage patterns on the development of youth's cognitive styles" (No. lzp-2021/1-0357): the research consists of several stages. This study aims to qualitatively analyze expert interviews on the impact of information technology on young adults' cognitive

processes and to find out what changes can result from the use of IT in the learning process.

Technology in the Learning Process

Technology in education refers to any form of teaching and learning that uses technology and technological solutions, be it face-to-face, distance learning, online learning, or blended learning. Initially, educational technology encompasses everything that could be used to automate certain activities (e.g., calculators and computers, among others) or to expand access to information, which in the past was primarily transmitted through radio and television. Currently, several lessons can be delivered using online networking opportunities (Daniela, 2022). Technology in the classroom today ranges from IFPDs (Interactive Flat Panel Displays) to laptops and smartphones, all connected via Bluetooth and Wi-Fi and supported by many cloud-based applications. On the other hand, students have become more independent due to technological support. Technology seems not to be an added advantage in the current education system but has become a basic requirement.

Today, educators are pressured to provide students with quality education that meets current standards and requirements. These demands provide students with the technological and information-seeking approach and the skills necessary to compete and thrive in an ever-changing, technology-driven world (Harris, 2016). Technologies influence students' communication, facilitate communication and information acquisition, and enable them to control their learning. Nevertheless, modern technologies only benefit education if they are used correctly. Many parents and teachers forbid children from using tablets and smartphones, but they have to accept that these gadgets are more attractive to students than ordinary tangible books. Smart technology better manages their learning time and makes content easier to learn: it also encourages collaboration in the learning process, where students can share their opinions and help their peers solve similar or related problems through online communication (Nethra, 2019).

IT expands access to education while increasing its personalization and quality, significantly influencing the educational process and promoting active learning. Moreover, IT facilitates the assessment of standardized knowledge and skills as well as the calculation and interpretation of achievement reports. As they are digital, they become easily accessible for reference. Compared to memorization-based learning, information technology improves reading comprehension because students can choose what they want to learn at their own pace and focus on real-life problems in relationships science or other issues (Wakil, Muhamad, Sardar, Jalal, 2017). Additionally, IT develop creative learning and support modification of existing data and creation of new knowledge in order to create a specific product or achieve a specific educational goal; this promotes holistic learning. Unlike traditional classroom learning (where the main focus is on one aspect of a learning or study subject), information technology promotes an integrative approach to learning; thereby mitigating the boundary between theory and practice.

Moreover, information technology is human-centered and provides meaningful feedback through various interactive features. Instead of haphazard learning, information technology helps pupils and students explore and learn in organized and innovative ways supported by postmodern learning theories (Ghory & Ghafory, 2021). Information technology develops collaborative learning, and facilitates engagement and

cooperation between students and teachers, regardless of their geographical location. By extension, it allows students to interact with individuals from many cultures and work in groups, which helps them develop their conversational skills and global awareness. Equally, using information technology allows for interactive contact between students and teachers, in and out of school (Alkahtani, 2017).

Ghory and Ghafory (2021) determines the educational impact of technology on the learning process. On the account of research findings, these researchers established that technology has beneficial and adverse effects on education. Teachers and students should embrace technology and work to reduce the barriers that prevent many students from succeeding. The researchers emphasize that it is time for all countries to implement a more technologically advanced education system. In addition, researchers' findings reveal that learning through technology is more beneficial for the education system and society as a whole, as it allows students and other individuals to increase their knowledge in many areas (Ghory & Ghafory, 2021).

Nevertheless, some studies found a decline in fine motor skills and, in particular, the impact of social media on writing. Teachers believe that social media is both helpful and harmful for writing. They encourage their students to write by hand whenever possible because they believe that students think, synthesize, and edit more actively when writing by hand than when writing on a computer or smartphone. Moreover, writing by hand discourages the temptation to copy the work of others. On the other hand, it is positive social media enables students to write collaboratively, share their work with more people, and be more creative when writing messages to others (Pursels et al. 2013; Carstens, Mallon, Bataineh & Al- Bataineh, 2021). One of the studies aimed to analyze the impact of technology on student learning revealed a need for teachers and students to have greater proficiency to implement technology better. Moreover, this study showed that students feel engaged in learning and are satisfied with technology. The study results concluded that the use of technology has many positive aspects, but there are also negative aspects to learning. Although teachers shared more positive than negative effects of technology when looking at the survey results, students' engagement and motivation to learn was (not) high when information technology was used.

Teachers indicated that in the future, they would appreciate a more personalized training on technology implementation in the classroom so that they would be well equipped to incorporate technology into the learning process. Additionally, educators believe that students should be provided with more technology to promote greater autonomy and independence in learning (Carstens, Mallon, Bataineh & Al- Bataineh, 2021). The results of a similar study showed a significant positive relationship between technological research skills and research self-efficacy. Technological research skills could improve students' research functions, which highlights the need for their acquisition (Seraji, Tavakkoli & Hosseini, 2017). Another study concluded that the balanced development of students' technological skills in higher education is crucial for their future personal, social, and professional spheres and improves their quality of life. The integration of digital technologies plays a vital role in the changes in the organization of academic work; in the relations between students, teaching staff, and institutions; as well as in new teaching and learning experiences (Rodrigues, Cerdeira, de Lourdes Machado Taylor & Alves, 2021).

In today's world, classrooms are increasingly equipped with technology because there is a growing need to incorporate technological equipment into student learning. While technology can benefit student learning, it can also be detrimental to the educational process.

The Positive Influence of Technology in the Learning Process

In the previous section, when analyzing the studies, it was noted that the use of technology in education can be both positive and negative, and sometimes it becomes difficult to separate these two aspects. However, to analyze the interaction between technology and cognitive processes, we want to emphasize and distinguish both aspects and consider the research on the impact of technology on young adults' mental health.

Moreover, with regard to technology's positive and negative effects on learning, Raja and Nagasubramani (2018) discuss that one of the key positive aspects includes **the technologically improved learning and teaching process**. This is due to the development of technology in the learning process, for example, digital cameras, projectors, various training software, computers, presentations, 3D visualization tools, and simulators among others. All these technologies have become great assistants for teachers to help students learn the content easily. In addition, visual representation makes learning interesting and enjoyable for students. Students can actively participate in their learning, and educators have the opportunity to make lessons more interactive and engaging.

The authors highlight **globalization as the another positive aspect** Students can get to know their peers through video conferencing when studying in different cities and countries (Raja & Nagasubramani, 2018). Some websites allow students to learn foreign languages online in pairs or groups with students and teachers from other countries. This advantage leads to the next – technology-based learning has no **geographical limitations**. With the introduction of online and distance learning and study programs, the need for in person attendance has drastically reduced, even though face-to-face learning does more than promote learning as it allows and encourages social interaction (Raja & Nagasubramani, 2018).

Another advantage is **the continuity of learning** during COVID 19, which allowed many students to learn without leaving home (Raja & Nagasubramani, 2018). Among other advantages, **inclusion should be mentioned**, which means that using technology in learning benefits people with intellectual, physical, visual, and hearing disabilities (Raja & Nagasubramani, 2018). Technology helps them to adapt learning to their needs and pace of learning so that they fit into mainstream programs, and this might increase their motivation and self-esteem.

The Negative Impact of Technology on the Learning Process

Conversly, in their study, Raja and Nagasubramani (2018) mention that one of the negative impacts of IT on education is **the decline in writing skills**. Today, people rely more on digital communication, which prevents them from thinking about improving their writing skills. Many young adults today know neither the spelling of different words nor the rules of grammar or literary writing styles.

The next negative impact worth noting is the decrease and neglect of academic honesty in teaching and studying and honesty in general, because technologies contribute to **the increase in cheating cases** (Raja & Nagasubramani, 2018). Graphing calculators, smart watches, mini cameras and similar devices have become great sources for cheating on exams and tests. Moreover, it is worth mentioning that the rapid development of artificial intelligence such as *chatGPT* may help students cheat.

On the other hand, **the lack of focus** and the changes in the quality of attention are reflected in the growing use of emoticons and abbreviations in text messages and

graphic communication; these non-verbal forms of communication have become a favorite way of spending time for many schoolchildren and students. Additionally, it is observed that students spend a lot of time on their mobile phones during the day and often at night, resulting in a constant connection to the online world, which leads to a lack of focus and concentration in academics and sometimes even in sports and extracurricular activities.

Another disadvantage is possibility of **addictive behavior appearing**, which could be detrimental to the personal and social development of young adults (Raja & Nagasubramani, 2018).

The Impact of Technology on Youth Mental Health and Disorders

Many studies have been conducted on the impact of IT on the mental health of young adults. One study was conducted on the relationship between excessive use of devices and mental health among 15–18-year-olds. The researchers used a three-section questionnaire to determine the correlation between technology dependency, general health and sociodemographic information in more than 1000 students. The results showed that excessive use of technology is associated with poorer mental health. They suggested that excessive use of technological devices can lead to alienation from other people and to anger, tension or depression when technology is not available (Mahmoodi et al., 2018).

For example, one study conducted during the COVID-19 pandemic found that pupils and students spent most of the day in front of screens, which had a negative impact on their mental health, as there was no balance between screen time and sports or other extracurricular activities. In another study of 1,500 mothers, the majority (60.2%) observed changes in their children's behavior, and the most frequently observed symptoms were restlessness (69.1%), aggression (33.3%) and anxiety (34.2%) (Scarpellini et al., 2021). In addition, a survey was conducted to determine the general health of the students and whether there was a correlation between their health and their sleep quality, their phone usage habits and their dependence on social media or the internet. The students with the poorer health scores were those with excessive phone use and internet and social media addiction (Kawyannejad et al., 2019).

It is still unclear how to determine the exact level of technology use that can be considered "healthy" or "harmful" for students; however, daily device use has been found to worsen overall health. Academic success has a direct correlation with overall health and well-being. Excessive use of technology is a "gateway habit" that opens the door for adolescents to make negative life choices (Faught et al., 2017).

All of these studies show how technology can be integrated into the learning process and highlight the need for in-depth research into how technology affects learning and teaching skills. Therefore, a study should be conducted to investigate the interaction of information technology and cognitive processes in young adult learning and to identify the opinions of experts on this topic.

Research Method

Participants

The respondents were seven experts between the ages of 35 and 65. The experts' main professions are teachers, lecturers and doctors. All interviewees work with young adults in their daily work and are well-informed about their use of information technology. The respondents' data was kept disclosed. For confidentiality

purposes, experts are numbered from 1 to 7 in this study. The respondents participated voluntarily after giving their prior verbal consent.

Design

The study employed a qualitative design and is part of the larger project "The impact of internet usage patterns on the development of youth's cognitive styles" (No. lzp-2021/1-0357). This research phase aims to qualitatively analyze expert interviews about the impact of information technology on the young adults' cognitive processes and to find out what changes in these processes can be caused by the use of information technology in the learning process.

The research questions were: What is the impact of IT on cognitive processes in young adults? What changes in well-being and cognitive processes can be observed by using technology in the learning process? Semi-structured interviews were conducted using open-ended questions to obtain the data required to answer the research questions.

The topic of the expert interviews was divided into four conditionally separated blocks. The questions in the first block was considered as introductory questions that helped the respondents to establish a connection to the topic. The wording of the questions varied for different respondents, but they were similar in content. Here are some examples of introductory block questions:

- "What do you think, does Internet usage affect young adults' cognitive practices and cognitive processes?"
- "How do information acquisition and perception habits change?"
- "How might this affect their cognitive development?"
- "Are there any differences, or peculiarities between the age groups of young adults 15 – 18 years and 19 – 25 years?"
- "For what purposes do young adults use computer technology, and which types have more dangerous consequences?"

The questions of the next block were related to possible problems: Do you agree that young adults encounter the following problems when they frequently use digital tools for cognitive (learning/studying) purposes?

- fragmentation of knowledge, understanding, and loss of cohesion;
- deterioration of advanced reading (reading with comprehension) skills;
- distractibility, problem with distracting attention, impaired ability to focus;
- the illusion that they can successfully perform cognitive tasks and other tasks at the same time or perform different learning tasks at the same time;
- the perception that knowledge is easily accessible (everything can be found on the internet), so there is no need to memorize and learn a lot by themselves.

The questions of the third block were devoted to the issues of mutual interaction between the Internet and cognitive styles, for example:

- "Have you noticed that young adults process information in different ways?"
- "Have you noticed any changes in cognitive styles in young adults?"
- "Does technology change the way young adults think and process information?"
- "Have you observed 'cognitive offloading' – facilitating intellectual activity, the fact that young adults are increasingly trying to facilitate their cognitive work?"
 - "Do young adults try not to facilitate their cognitive work?"
- "What are the observations regarding 'digital skins' and 'soft cyborgization'?"

- “Is it observed that young adults' thinking habits and style resemble algorithmic categorical thinking ('yes/no,' 'if yes, then') not allowing ambiguity?”
- “Have you noticed that the young adults of the digital generation have any changes in the relationship between memory and thinking? For example, is their memory less loaded with information and knowledge; thus, does thinking become simpler?”
 - “Does not thinking turn into memory (as it does at an early age)?”
- “Are there any peculiarities/changes in the development of conceptual thinking?”
- “Is there a tendency for thinking to become distinctly empirical (in a different way now) relying on digital tools instead of relying on sensory organs?”
- “How do young adults of the digital generation develop critical thinking?”
- “Does the ability to express oneself and to use language change?”
- “Do young adults use IT tools to communicate with others, or on the contrary - do their homework alone using technology?”

The questions of the fourth block included a question about the expert's opinion regarding the positive and negative aspects of using the internet for teaching/studying purposes and the possibility of supplementing the existing information if the respondent considered necessary.

The analytical strategy used for the qualitative data was thematic analysis (Braun & Clarke, 2006). Thematic analysis was carried out in six stages: 1) familiarization with the content of the interviews, 2) generation of initial codes, 3) search for themes, 4) revision of themes, 5) definition and naming of themes, and 6) preparation of the report.

Materials and Procedure

All interviews took place on the ZOOM platform were recorded then transcribed. All respondents provided their consent for conducting the interview. Research funding was allocated from the project "The impact of internet usage patterns on the development of youth's cognitive styles" (No. lzp-2021/1-0357). At the beginning of the interview, experts were informed about the project, its goals, expected results and ethical issues were discussed before the interview began. by extention, the expert could refuse and stop the interview at any time if it affected their safety or ethics in any way. At the beginning of the interview, a short introduction was shared with the respondents, and when they were ready the interview started: the interviews lasted about 45 minutes.

This process was done with every individual participant. The recorded interviews were then transcribed. A thematic analysis was performed to process the data; after transcription, the recordings were deleted following ethical guidelines and data protection regulations.

Interviewees were informed of their right to learn about the progress and results of the research including the fact that they could contact the interviewer during the research.

Results

The thematic analysis of the interviews revealed the topics that should be discussed in the next phase of the research in focus groups. Such included young adults' information technology usage habits, the relation of said usage to cognitive processes

and possible psychological disorders due to excessive internet use. Moreover, thematic analysis made it possible to analyze the interviews as a data set, dividing them into separate themes, and repeated; after, significant themes were obtained.

As explained, the analysis had six stages following the thematic analysis method. After interpreting the interviews and transcriptions, a table was compiled in which the quotes of each respondent-expert were added to the given topic. After this stage, initial codes were identified and grouped into thematic groups. All relevant concepts were highlighted, marked, and annotated. Seven main themes were identified: (1) memory, (2) attention, (3) perception, (4) thinking, (5) communication, (6) knowledge, and (7) disorders. This article shows some of the respondents' answers, which allowed us to draw conclusions regarding a specific topic and its interpretations (see Tables 1-7).

Topic: Memory

Table 1

Memory in Respondents' Answers.

Respondent	Quotes
P.1.	"Memory processes are also less trained" "Size of memory, absolutely not trained in any way" "Relying on the Internet and not memorizing"
P.2.	"Memory is very short-termed" "Young adults are generally less educated; they don't remember facts, history" "The effect is on certain skills, actions, habits change, facts, figures are not remembered by heart, fear of missing something" "No longer remembers facts and numbers by heart."
P.3.	"Memory is not trained these days. You don't have to learn anything by heart. Everything can be found on the Internet."
P.5.	"Long-term memory is not affected, the amount of short-term memory changes, a lot is transferred to gadgets, cyborgization or 'incarnation of gadgets' takes place." "The ability to remember unrelated facts changes to the ability to navigate the flow of facts and process this information."
P.6.	"Without repetition, knowledge does not settle in a person's biological memory, and the student only remembers that he said something, but does not remember what he said." "Saves meta-information that is not usable, and you get the feeling that if you need it, you will be able to quickly find slides or fast internet" "Transactive memory - has always existed in human society" "Nowadays, it's the world wide web where everything is stored..." "Students who have slides get the false feeling that they know the information."
P.7.	"Research in cognitive psychology shows that logical memory is based on mechanical memory. Therefore, in the first grades of primary school, it is very important to train them to learn by heart. But if they didn't train this mechanical in their childhood, then they have difficulties with the logical"

When interpreting the experts' answers regarding the topic "Memory," it was found that memory is less trained, and this affects its capacity. Experts point out that technology affects changes in short-term memory and define relying on technology as extended memory does not require individuals to store information in memory and recall it. Moreover, they suggested that over-reliance on technology can interfere with memory retention which affects long-term memory in an indirect way (not sleeping, not recalling). The Internet is defined as a form of transactive memory, and technologies used appropriately can relieve memory from memorizing redundant information.

Topic: Attention

Table 2

Attention of Young Adults According to Respondents' Answers

Respondent	Quote
P.3.	"Young adults cannot focus their attention for long; they are distracted by their gadgets. They cannot fully focus and complete tasks."
P.4.	"Perceptual imbalance, disharmony - if this type of perception does not correspond to the pace of the student [cognitive processes], then his attention will wander." "The phenomenon [divided attention] exists, it is related to the learning process — the speech [of the teaching staff] is not as fast as the students' thoughts, so the student "jumps" from the content of the lecture to the technology. The brain is in a more intense mode with constant switching."
P.5.	"Concentration of attention is associated with inhibition, regulation of movements, regulation of emotional impulses, the flow of information is large, inhibition weakens. The screen doesn't train attention, but we don't know, maybe in the future we won't need it at all. It just shows the contradiction between school requirements and environmental/developmental needs."
P.6.	"Experiments have been conducted that show that attentional abilities have not become weaker; this is evolutionarily impossible. Their attention switches every 20 seconds or so, from email to music, from music to <i>Word</i> , from <i>Word</i> to <i>Facebook</i> , and from the outside, it looks like they can't keep their attention, even though they could, it's just that the content is so varied that they just keep their content wandering around comfortably. In addition, each unit of content is viewed for less than 1 minute. It is an illusion that at the same time students can multitask, listen to the lecturer at the same time, and do something in parallel."
P.7.	"Focusing abilities seem to decrease. (Lack of) Intentional attention is the one that causes the greatest difficulty."

When interpreting the topic "Attention," it was found that IT did not change the biological prerequisites of attention but clarifies the issues related to attention switching, concentration, and division. The attractiveness of technology promotes the

development of intentional attention, but young adults have difficulty in focusing on tasks that require effort because of the technological environment which requires minimal effort. Technology serves as a stimuli; young adults find it interesting than the content of the curriculum, thereby diverting attention from the formal curriculum. Additionally, technologies create the illusion that a person is optimal enough to develop an ability to multitask.

Topic: Perception

Table 3

Perception of Young Adults in Respondents' Answers.

Respondents	Quotes
P.1.	"Inability to perceive audio information. Young adults perceive more superficial and simple information, that it will be more difficult to process large arrays or synthesize information. From the perspective of cognitive processes, the scope of perception could decrease."
P.3.	"Moving pictures are needed to keep attention and perception, unable to read long messages. Theory questions can no longer be included in the exams because the answers can be found on the Internet."
P.4.	"Perception and attention disbalance, disharmony – perceives everything, but does not select information on which to focus. Visual perception is very pronounced, [...] and this could also be interpreted as not going into depth."
P.5.	"Interaction with information – visual information dominates, also in social communication. Does not call but writes text messages – written non-verbal communication."
P.7.	"They perceive information in very large chunks, very large pieces. They perceive information diagonally, sometimes without even going into the essence. Young adults need visual perception tasks more. Involvement of young adults contributes to a better ability to absorb information. If young adults feel good, feel involved, they also perceive information more, they perceive information better, they have better analytical abilities, critical thinking."

When interpreting the data on perception, it was concluded that IT develops visual perception and reduces the need to use the auditory perception channel. In addition, it was mentioned that young adults perceive a large amount of information superficially and do not deeply immerse themselves in the subject. Moreover, technologies increase the field of human visual perception, and influence a belief that time is 'swelling'.

*Topic: Thinking***Table 4***Respondents' Opinion About Thinking in Young Adults.*

Respondents	Quotes
P.1.	"All psychological activity becomes more fragmented, more uniform, and no synthesis is formed. Young adults have an uncritical reliance on information. They trust it. The positive aspects are related to the development of strategic thinking, intuition, reflection, and learning foreign languages."
P.2.	"Thinking takes time, and we don't seem to have that time."
P.3.	"Young adults are unable to find regularities. They compile their works without knowing how to generalize. When writing theses, one relies on the Internet. There is no critical thinking."
P.4.	"I think young adults retain all the same judgment and sometimes, sometimes very good."
P.5.	"Thinking functions do not disappear - they change, their proportions change. Conceptual thinking, if we look at it very narrowly, is declining, but that is because the environment is changing – the impact of technology. The function itself does not disappear..."
P.7.	"The lack of abstraction is [...] even when reading, also when searching for research in databases, then you have to have a very specific task, not a very broad one. They make less effort, however – to understand, to delve deeper. Young adults can connect such things and at such lightning speed, but the older generation does not know how. And then we think that they know or know something worse than us, because we don't fully understand."

When interpreting the topic of thinking, it can be concluded that the use of thinking processes have changed under the influence of IT. For example, young adults have difficulty synthesizing, generalizing, and abstracting. Nevertheless, concrete thinking develops more, regardless of difficulties in critically evaluating a lot of available information. They can recognize false information on the internet better, so young adults are more difficult to deceive.

On the other hand, technologies are developing the ability to copy and paste information from the internet without processing it cognitively. Acquiring information contributes to learning a foreign language, which teaches young adults how to think in the constructs of another language. Additionally, technology offers detailed information, and young adults do not need to use thought operations to generate deeper meanings. Moreover, young adults have developed an understanding of technology and how to use it, and they are developing the ability to process information obtained through technology at a faster rate than the previous generations.

Topic: Knowledge

Table 5

Respondents' Opinion About Knowledge in Young Adults.

Respondents	Quotes
P.1.	"Knowledge is needed when you get into real practical action, and then you just have to act, then there is no time to look for information on the computer[.] The problem could be with spelling, correct sentence formation."
P.2.	"Young adults are generally less educated, less knowledgeable about what comes from schools. There are such unreasonable, unthought-out conclusions, gaps in knowledge, haste, simultaneity, and speed, that very essential aspect is removed from education and, therefore, also from a person."
P.3.	"Gets fragmentary knowledge. Fragmentary knowledge does not allow to see the overall picture and regularities. They rely on the Internet to always be able to find information quickly."
P.4.	"By the time the lecturer tells something in a slow pace, the young adult will have already understood, found, studied everything, because they have already understood these models, how those tools are made, how they work, and they get there very quickly - knowledge is learned differently. The availability of knowledge creates a high speed of its acquisition but also superficiality. Technologies develop the ability to explore different sides, to interpret differently [..] The ability to find the necessary information [..] information is not knowledge."
P.5.	"[.] in the course of development, useless skills are lost – for example, oral storytelling. Knowledge is acquired in a different way."
P.6.	"No need to worry, because the information will always be available, for example, some kind of Wikipedia page, databases, etc. when searching for such information, false beliefs or illusions of knowledge arise, that if I can quickly find everything, then with time I may have a false belief that it is my own knowledge. The knowledge is stored somewhere outside, but I get the false belief that it is my biological knowledge. As soon as a person acquires this knowledge, he does not know how to use it, or uses it very superficially, incorrectly, fragmentarily. [..] the knowledge I use must also be specific. It must be learned in-depth and thoroughly."
P.7.	"[.] there is a fragmentary understanding of practical matters."

Gathered experts' answers on acquiring knowledge for young adults and interpreting them on the topic of "knowledge," led to concluding that IT has changed how knowledge is acquired and has made information quickly and easily accessible. On the plus side, technology provides immediate information. However not all information is accurate. On the other hand, knowledge is superficial and sometimes erroneous. External media might not always be relied on for acquiring and using professional knowledge. Technologies create the illusion of a knowledge system; although in reality,

knowledge is fragmentary. There is also an imbalance between knowledge about the real and virtual environment. If the level of knowledge is high in the virtual environment, then it might be low in the real environment.

Topic: Communication

Table 6

Respondents' Opinion on Communication of Young Adults.

Respondents	Quotes
P.1.	"Mutual communication deteriorates. "
P.2.	"Technology is essentially encapsulated in the home environment. It's the free time we spend in technology. Statistically, we start to read books less, we go out less, having lost the ability to relax well as a result of digitization."
P.3.	"Computer specialists [IT students] spend a lot of time in front of the screen. Technology is their lifestyle and family members. Communicate with peers in Discord, not only for studies but use it for fun. "
P.4.	"Text message communication has quite seriously undermined the ability to express not only in writing, but also orally. There are a lot of people who spend their time on Facebook. There is a feeling that they are in a kind of communication starvation. Hide yourself in Zoom."
P.5.	"Does not call, but writes Text messages – written, not verbal communication. Speech as social communication diminishes when sitting in technology. Video is not a medium of speech e.g., TikTok."
P.6.	"I absolutely believe that there, on the Internet and in the technology environment. It is very interesting, there is both an opportunity to regulate the mood or to forget, and to gain new friends, skills, everything you need. In the daily life of an adult, I could probably be wrong, but most likely the TV will be on, two adults in front of the TV with phones in their hands, and somewhere in the background, a child with his console. As if all together but there are several screens. And there you have to look for an answer to the question why it is so."
P.7.	"[...] then they also develop so-called virtual communication skills. It has a positive effect on self-esteem, they can choose their own environment, they can switch off, they can turn off, connect, choose their friends. Various events in the virtual environment, they form teams there, participate in projects, in various games, play those levels, can sell those (laughs), can earn. As this multicultural experience develops, they also do not understand how far others have embellished their personalities and what can be expected from them."

By collecting the answers given by experts about communication for young adults, it can be concluded that ways of communicating and the need for face-to-face communication are changing under the influence of IT. The possibilities of using technologies have provided the option of choosing one's communication and cooperation partners.

Moreover, virtual communication replaces face-to-face communication, which has helped develop multicultural experiences. In turn, multicultural communication changes aspects of thinking such as decision-making and problem-solving. The social hierarchy, social roles, and relationships in the family are changing, and the form of communication is becoming shorter, more written, less verbal and pictograms are used a lot.

Topic: Disorders

Table 7

Respondents's Opinion on Psychological Disorders in Young Adults Derived from IT Use.

Respondents	Quotes
P.2.	"Young adults develop various disorders: narcissism, obsessive-compulsive disorder. For hyperactive children, using the Internet has a greater negative impact on their studies. Young people may have Internet addictions, read less books, spend more time at home, change the social hierarchy and social roles in the family."
P.4.	"Is an internet, [and] gaming addict. "
P.5.	"The artificially drawn boundaries between the norm and the non-norm. There will be an increase in the number of children who have/will have various types of functional impairment, learning disabilities, ASD, dysgraphia, etc., but these are 'neurophenotypes,' they are not diseases. This manifests itself in the complex features of the CNS, which are never dichotomous: there is intelligence/no intelligence. The problem arises from the contradiction between the neurophenotype of these children and society's expectations or artificially drawn boundaries[.]"
P.6.	"[...] it does both direct and indirect damage to health[.] Not using your brain so much to keep developing, stimulating yourself. Those who are less cognitively active in middle age are at risk of developing neurodegenerative diseases sooner. Similar to muscles. Changing habits: young adults are used to surfing [the Internet]. And everyone has their own habits of how they consume social and other digital content. It gives the impression that young adults switch quickly."
P.7.	"Dissociative thinking - from time to time living in such, I must say, fictional world. [Young adults] lose this sense of reality and they also do not understand how far others have embellished their personalities and what can be expected of them."

On the basis of expert's opinions about the psychological disorders of young adults derived from IT use, it can be suggested that there is a risk of internet addiction, and that technology affects health directly and indirectly. Frequent use of technology directly leads to inactivity and reduced mental exercise, thereby increasing the risk of neurodegenerative diseases. Indirectly, habit-forming mechanisms are disrupted. The influence of the technological environment is more likely to reveal a larger spectrum of different types of functioning disorders (dysgraphia, dyslexia, ADHD, learning disabilities, OCD, narcissism). According to experts, the use of information technology creates the possibility of dissociation, and it poses a threat to the development of the spectrum of dissociative disorders.

Discussion

The revolutionary communication technology, is now firmly rooted in daily activities, forming an integral part of life in many ways. Our research gathers expert's opinions about the impact of IT on various cognitive processes in young adults, which is of great importance in the learning process. This research echoed many studies conducted elsewhere in the world.

The results of our research show the experts' opinions about young adults' memory; their perception regarding memory and training in young adults, and how the internet is used to search for information. On the other hand, a study was carried out, investigating memory as a cognitive process, and it aimed to show the resulting changes - new relationships with time and space, forms of socialization, access to a large amount of information and interactivity through a case study and in-depth interviews with network users. The results of the study showed changes in these areas. For example, habits and behavior; communication; interaction and learning methods changed radically, creating an extremely dependent relationship with the media. Consequently, the internet increasingly remains in its users' memories and individual experiences. Thus it impacts social memory formation to a great extent.

Additionally, life is dynamic and communication also changes the way of thinking and worldviews, and this takes an important place in the formation, maintenance and development of symbolic life; this contributes to the formation of collective memory. The internet lives as a form of feedback loop with collective memory affects the memories of its participants: at the same time it imbues them with imaginary and social memory (Storm et al., 2017). Other studies also show the influence of the media and the internet on the development of cognitive processes (Fitton et al., 2013; Crone & Konijn, 2018).

Undeniably, the internet and technology have impacted how people learn, remember, and solve problems. Moreover, a study investigated how people become ready to use the internet for cognitive discharge. Three experiments show that using the internet to obtain information changes a person's tendency to use other ways of obtaining information (offloading). Specifically, participants who used Google to answer an initial set of difficult questions were more likely to choose Google when answering a new set of relatively simple questions than participants who answered the initial questions from memory. These results show that people are more likely to rely on the internet for information searches when they are used to it (Storm et al., 2017). Our research found similar results, where experts indicated that young adults do not rely on their cognitive

abilities and knowledge but look for information on the internet; which has become the easiest way of learning and obtaining information.

Additionally, it is not news that the media and the internet are closely related to entertainment and enable multitasking (Uncapher & Wagner, 2018). This changes the division of attention and perception processes in the process of learning, knowledge strengthening and resilience. For example, 15 independent studies examined the relationship between internet use disorder and attention deficit disorder. They found that individuals with internet use disorder were more than three times more likely to have attention deficit disorder than those with healthy controls (Wang et al., 2017). Also, the results of our study suggest the possible increase of attention deficit syndrome in young adults, owing to multitasking and constant attention switching observed by the experts. Other studies on young adults show similar results (Nikkelen, Valkenburg, Huizinga & Bushman, 2014).

On the other hand, it has been noticed that young adults choose an idealized profile and want others to see them that way; this shows their abilities, physical parameters and sociability on social networks. It is worth noting that younger teenagers are less aware of the risks of deception on the internet (De Fina & Gore, 2017; Handyside & Ringrose, 2007; Nisa, 2018). As a result, digital programs have dramatically changed how young adults interact with their peers, access information and engage in social relationships. This has significantly impacted their health, well-being (such as smartphone usage habits), sleep-wake cycles and cognitive development (such as their level of attention during a task). Given the importance of viewing the role of technology use in adolescent development, one of the main questions many scholars are now trying to answer is how adolescents' online presence shapes their offline lives (Benvenuti et al., 2023). The results of our study show how experts can see and warn young adults about the risks of a sedentary lifestyle, so it is important to understand if young adults could reduce the use of IT for tasks. This includes limited and necessary use of IT, or discovering possible new ways to implement the use of IT that strengthen memory and improve their knowledge acquisition and retention.

As formerly mentioned, many studies show that communication has changed over time, and young adults communicate more on social networks. Social media has become an integral part of everyday life, and it is estimated that there are 3 billion social media users worldwide. The most active users of social media are teenagers and young adults. Consequently, the number of studies on social media has rapidly increased and identified the potential relationship between social media use and mental health and well-being (Schønning et al., 2020). Young adults' social support, well-being, and ability to overcome loneliness are often cited as the main reasons for using social media and digital technologies (Gentina & Chen, 2019). Young adults rely heavily on the internet for social support (Brandtzaeg et al., 2021), which is very acceptable. However, social support can also be obtained face-to-face from family, close people and friends. In their study of loneliness, researchers analyzed the relationship between loneliness and social internet use. If, in one case, the internet is used to improve relationships and create new social connections, it is a useful tool for reducing loneliness. Then, in another case, social technologies are used to escape the social world and the "social pain" of interaction, increasing feelings of loneliness (Mohan & Ravindran, 2020).

Moreover, researchers believe loneliness is also a determining factor in how people interact with the digital world. Single people prefer the internet for social interaction and are more likely to use the internet in this way, crowding out time spent in offline social activities (Vesnic-Alujevic, 2013). This suggests that lonely people may need

social support for their in order to use internet in ways that enhance existing friendships and form new ones (Nowland et al., 2017). The internet also provides access to social support regardless of time and space (Ellison et al., 2007). For this reason, young adults are ready to communicate with a chatbot to overcome loneliness and experience different types of social support, such as appraisal, informational, emotional and instrumental support (Brandtzaeg et al., 2021). The results of our research also show that experts have perceived that young adults' engagement in face-to-face meetings is declining, meaning that loneliness could increase. However, multicultural experience is also increasing, allowing people to communicate with people worldwide and expand their contacts.

On the other hand, a study that analyzed the relationship between the time spent on the internet and mental health among adolescents was conducted in South Korea in 2018, in which 29,811 students aged 16-18 participated (Kwak et al., 2022). The results of the study showed that the internet use group that exceeds the average use time (193.4 ± 1.6 min/ day) differs from the mental health group, whose indicators are lower than the average use time, especially regarding subjective health status, stress level, sadness and suicidal thoughts (Kwak et al., 2022). Additionally, one study conducted in a large population survey covering 11 European countries looked at the prevalence of pathological internet use in a sample of 11,956 adolescents and found that 4.4% of adolescents had psychological addiction (Durkee et al., 2012). Nevertheless, the prevalence of problematic internet use, depression, anxiety and stress symptoms among adolescents was 16.32%, 30.16%, 35.97%, and 18.80%, respectively. Although the prevalence of problematic internet among boys (17.89%) was higher than among girls (14.86%), girls had the highest rates of depression, anxiety and stress. Moreover, the prevalence of problematic internet was highest in the 9th grade (17.29%) (Xue et al., 2023). This suggests that there are many disorders related to the use of IT, which can have long-term consequences and require the intervention of mental health professionals.

Our study focused on analyzing the expert views on cognitive processes in young adults; however, experts were asked questions about disorders related to IT use. As previously mentioned, experts acknowledged that young adults may have attention disorders and addictions. However, many other mental health disorders and internet addictions among young adults cannot be ruled out. This is supported by other studies also show that spending a long time online is detrimental for population mental health (Evren et al., 2019).

In order to ensure appropriate behavior towards the use of the internet, improve social-emotional learning and self-regulation strategies and prevent its misuse, it is argued that teenagers should be taught technological literacy (Schilhab, 2017).

Today's reality, in the context of every aspect, makes us think about sustainability. The first step towards adopting sustainable IT habits is being aware of the impact that our digital activities have on the environment. As "digital natives," young adults have grown up with technology and are often more adept at using it than the previous generations. However, this increased usage of technology also comes with an increased environmental footprint. Melville (2010) asserts that information systems greatly influence organizations' beliefs and affect their actions concerning environmental sustainability (Padhi, 2018). Therefore, it is essential for young adults to understand how their digital habits contribute to sustainability. The Sustainable Development Goal 4 in the 2030 Agenda for Sustainable Development emphasizes the importance of equipping young adults with digital skills, which are directly linked to ubiquitous

learning through devices such as smartphones (Vila et al., 2020). Within this context, it is crucial for educational institutions to promote sustainable use of information and communication technologies. In particular, one group of young adults that is important to study in this regard is university students. University students are likely to constitute a significant proportion of the socio-economic elite of the future, their habits and behaviors are most likely to become the norm, making them an interesting population to investigate (Telleria-Aramburu et al., 2019). When it comes to incorporating learning into sustainability efforts, educational institutions play a crucial role in shaping young adults' attitudes and behaviors. By integrating sustainability principles into the curriculum and promoting projects that encourage sustainable IT habits, universities could empower students to become innovators and leaders in the field of environmental sustainability.

Future research should conduct a broader and deeper analysis of the relationship between information technology and cognitive processes in learning for young adults, including different age groups and learning contexts. Moreover, future studies could rely on the experts' opinions gathered in this research to develop research that focuses on the impact of IT on young adults in Latvia and worldwide. It is important to evaluate the impact of technology on learning outcomes and youth development in general for future environmental sustainability.

Conclusions

Information technology has become an essential part of today's education system, providing wide access to information and resources that are important to the learning of young adults. Cognitive processes such as thinking, memory, attention and problem-solving are important in learning, and information technology can facilitate and support these cognitive processes. Available digital tools and software such as e-books, interactive learning materials, and simulators can help young adults acquire and consolidate knowledge; improve skills and promote critical thinking.

The study results show that the experts consulted think that IT might interfere with the retention of information in memory and affect long-term memory indirectly (not sleeping, not recalling) by interfering with the retention of information in long-term memory. Technologies create the illusion that a person multitask while maintaining the same quality as if they were focusing on one task. Moreover, IT might reduce the field of visual perception of a person, and under its influence, an attitude that time is swelling could be developed. Technology offers detailed information; young adults do not need to use thought operations to get deeper meanings.

Knowledge can be superficial and sometimes erroneous. Technologies create the illusion of a knowledge system, although knowledge is fragmentary. Moreover, there is also an imbalance between knowledge in the real and virtual environment; if the level of knowledge is high in the virtual environment, then it may be low in the real environment.

Virtual communication replaces face-to-face communication, which has helped develop multicultural experiences. On the other hand, multicultural communication changes aspects of thinking such as decision-making and problem-solving. Additionally, communication is becoming shorter, more written, less verbal, and pictograms are frequently used.

Habit-forming mechanisms are disrupted indirectly by IT use, while frequent use of technology leads to inactivity and reduced mental exercise, which might increase the

risk of neurodegenerative diseases. Therefore, it is important to balance the use of information technology and other types of learning such as face-to-face interaction, discussions and practices. Physical interaction with others and real objects is very important for the cognitive development of young adults.

Despite all the disadvantages, IT can be very useful in learning. With its help, communication skills can be developed; quick access to information and learning can be accessible to everyone, including people with various physical and mental disorders. However, teachers and educational institutions must be well-trained and prepared to use information technology in the learning process effectively and purposefully. Technical infrastructure and access to appropriate resources are also required.

In the future, by integrating sustainability principles and promoting projects that encourage sustainable IT habits, universities could empower young people to become innovators and leaders in environmental sustainability.

Further research is needed to gain a deeper understanding of the impact of information technology and how it can contribute to the academic achievement, well-being and development of young adults.

Limitations

The study has a qualitative design and is a part of the larger project "The impact of internet usage patterns on the development of youth's cognitive styles" (No. lzp-2021/1-0357). The study has 7 experts, it would be advisable to continue the study and organise focus groups of experts for the next phase of the study.

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