

# *Digital Culture of University Students: Analysis of Future Economists and Managers*

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**Abstract**—The article presents the results of the study carried out at Peter the Great St. Petersburg Polytechnic University with the purpose of exploring the digital culture of students enrolled in Economics and Management courses. The following problems have been solved to achieve this goal. We have proposed a definition for the term “digital culture” with respect to an individual as the subject and carrier of this culture. We have developed a questionnaire allowing to identify the level of digital culture in the target group and surveyed a representative sample of 176 people. We have analyzed the results in terms of learning levels, formulating conclusions and making recommendations based on the analysis performed. Our findings indicate that a significant proportion of students have a low level of digital culture and are conservative towards modern information and communication technologies. We have drawn conclusions on the dynamics of using information and digital technologies for training bachelor’s and master’s students, generating recommendations on the possible methods for solving the problem we have discovered and on increasing the level of digital culture of students.

**Keywords**—*personal digital culture; university; educational platforms; digital skills*

## I. INTRODUCTION

The term “digital culture” is most often used in modern scientific literature to describe the degree of digitalization of certain processes in enterprises and organizations, i.e., the level of development of the digital environment in which individual employees operate as individuals. However, the concept of digital culture is discussed far less frequently with respect to an individual as the subject and carrier of this culture. In our view, the digital culture of a person comprises a system of knowledge, skills and proficiencies, as well as ideas and preferences, even personal values in what regards applying digital technologies in the person’s professional (for employees), educational (for students) and private activities.

Aside from the digital culture of an individual, we can consider digital cultures of various communities, categorized by certain demographic (for example, gender, age, and other similar aspects), geographical (i.e., digital cultures of cities, regions, countries) and other characteristics. The level of development of digital culture depends on the degree to which the representatives of a given community of modern information technologies have mastered the skill to operate in the digital environment.

It should be borne in mind regarding the evolving digital economy that university graduates who are currently students will increasingly make up the bulk of human resources in the near future. In this context, managing the development of digital culture of students, that is, prospective employees of enterprises and organizations of the digital economy, is an important task. However, a starting point for the process to be successfully managed is gaining an understanding of the current situation in this field.

Thus, the goal of our study has been to explore the level of development of digital culture of university students with the example of the students enrolled in the Economics and Management courses.

To achieve this goal, we have completed the following tasks:

- analyze the concept of “digital culture” of an individual with respect to students in the context of their participation in the educational process;
- develop a questionnaire for assessing the level of digital culture of representatives of a target group (students of the Institute of Industrial Management, Economics and Trade of Peter the Great St. Petersburg Polytechnic University);
- carry out a survey of the representative sample;

- analyze the most interesting and informative aspects of the results obtained;
- formulate conclusions and offer recommendations based on the analysis performed.

## II. LITERATURE REVIEW

The concept of digital culture was first introduced by Gere [1] and Deuze [2] and was developed primarily in sociology and cultural studies. While different aspects of the effect that digitalization has on a person have been considered, economic and socio-economic processes and consequences, including social and labor relations, have been studied to a much lesser extent, compared with social phenomena. Therefore, analysis of digital culture of an individual as an employee of an organization poses an important challenge.

Digital competence is an integral part of an employee's digital culture. Digital competence has traditionally been understood as a person's ability to effectively and safely use infocommunication technologies both in the process of learning and in professional activities. The skill to participate in the life of the society using the new opportunities offered by digital economy improves social integration. However, according to the data in [3], a significant part of the population is still excluded from this process. For this reason, it seems particularly interesting to analyze the behavior of students as a social group that is the most mobile, motivated and receptive to new information.

The analysis of the literature that we have carried out has revealed that Russian studies primarily concentrate on confirming the effectiveness of using new educational technologies. Most of these studies are descriptive and based on qualitative assessments. For example, [4,5,6] considered the possibilities of using online services for solving methodological problems, the potential of using digital video materials, etc., but the result of forming the actual digital competences was not discussed.

A notable study [7] reported on the results of students' interaction with digital technologies in an institutional school environment. It was established that new opportunities are more attractive to students who are internally motivated to learn new information and acquire new skills. On the other hand, students focused on getting the right answer and seeking external approval from teachers are more likely to resist new technologies. This result is interesting from the standpoint of assessment and formation of personal human capital.

A noteworthy foreign study [8] was aimed at analyzing the actual state of digital culture, with an emphasis on the informational behavior of a group of students in the social sciences taking into account their competence in distributing information via modern technologies. An attempt to determine the factors influencing the information literacy of university students was made in [9].

A study based on the data obtained via an online survey of students from three different types of universities in Spain [10]

found a number of determinants indicating who uses Internet tools in the learning process the most often. This includes the more motivated students (regardless of the degree of academic encouragement), the youngest students, as well as women (but only in the older group). The authors proposed to improve the digital skills of students to a certain level, keeping in mind the different starting positions of different groups, before actively promoting Internet technologies.

Different levels of benefiting from the opportunities provided by modern digital technologies in the learning process [11] are due to divides of the first (access to digital technologies) and the second (differences in usage skills) levels. It was established in [12] that a digital divide depending on the level of education of the population exists both between individual countries and within them. Problems caused by digital divides exist even in countries that are successful in terms of digital development, such as Finland. It was demonstrated in [13] that what can be called a third-level digital divide has now appeared (judging from considerably different results of using the Internet). It was confirmed that the digital divide of the third level is currently poorly studied. Since digital divides lead to substantial stratification of employees and the corresponding segmentation of the workforce, it seems interesting and worthwhile to explore the state and dynamics of these divides.

Other aspects of study of digital competence include study of the influence of various demographic (most often gender-related) characteristics on digital competences. For example, [14, 15] focused on the gender aspects of digital competences of university students. Another study on the implementation of infocommunication technologies by universities in Saudi Arabia and its impact on student performance [16] also considered gender aspects.

A somewhat different view was presented in [17], analyzing, instead of the existing digital skills of students, the curricula and programs from the standpoint of official requirements for using information technologies, digital tools and platforms in the educational process. The authors of [18] state that modern professions require highly qualified technical and engineering specialists with advanced intellectual skills and suggest improving students' transdisciplinary skills.

A distinct group of studies was dedicated to assessments of the quality of education made by students [19]. The authors note that, despite significant efforts of higher education institutions, conflicting or ill-defined concepts and requirements still pose a major problem for implementing the approach treating the educational process as a unified automated information system [20]. For example, Ref. [21] analyzed the students' loyalty to learning using Internet resources, finding that the need for cognition was an important factor in forming the students' loyalty to this type of education. The authors proposed to form different strategies in accordance with the levels of motivation to improve integration of informal resources into formal education. An

interesting study [22] described the students' actual use and approaches to digital tools; however, this study was limited to analysis of the advantages of using an interactive textbook (iBook).

Thus, review of the scientific literature revealed the following problem areas:

1. Digital culture and real digital skills of students of technical universities are rather poorly understood, in particular, from the standpoint of future use of these skills in professional activities.

2. Only some of the factors hindering students from using new digital technologies have been determined.

3. The preferable proportions for combining traditional and digital technologies in the education process have not been established.

4. Neither the mechanisms for identifying students' preferences with respect to individual platforms, nor their priorities in choosing modern learning tools have been studied.

5. The degree to which students are ready to use the obtained skills in their future professional activities has not been studied.

Therefore, the study we have carried out can lay the foundations for more detailed research into these problems. The preferable first step should be describing the current state of the students' digital culture and of their digital skills.

### III. RESULTS OF THE STUDY

The study considered a sample of students of the Institute of Industrial Management, Economics and Trade of Peter the Great St. Petersburg Polytechnic University, the Russian Federation. The university education system is organized so that undergraduate students take only general subjects for the first two years, while specialized courses begin only in years 3 and 4. Master's students take only specialized subjects. The logic of sampling students for the survey was based on these considerations (Table I). We assumed that the degree of motivation in learning and the level of digital culture of students increase as students pass to the next level of study. At the same time, the number of senior undergraduate students decreases because some students stop their studies due to lack of motivation or for other reasons.

TABLE I. SAMPLE STRUCTURE

No	Groups	Number	%
1	1 <sup>st</sup> and 2 <sup>nd</sup> year bachelor's students	69	39%
2	3 <sup>rd</sup> and 4 <sup>th</sup> year bachelor's students	37	21%
3	1 <sup>st</sup> and 2 <sup>nd</sup> year master's students	70	40%
Total		176	100%

The analysis performed (Table II) revealed that self-study became more attractive as the studies progressed, the number of users increased (from 7.9% to 41.2%), as well as the number of students re-evaluating their initially negative experience (rows 2 and 4). At the same time, the proportion of

initially conservative-minded students who regarded using independent sources for learning as inconvenient remained virtually unchanged (row 3). Furthermore, at least 11% of students did not use digital technologies for educational purposes even at the end of their studies and had no future plans of doing so.

TABLE II. ATTRACTIVENESS OF SELF-STUDY, %

No	Answers	Group 1	Group 2	Group 3
1	I do self-study often, it is very convenient	7.9%	31.6%	41.2%
2	I do self-study if there are no other options	34.9%	26.3%	5.9%
3	I do self-study rarely, it is not very convenient	22.2%	18.4%	26.5%
4	I had a negative experience, I do not do self-study anymore	7.9%	2.6%	1.5%
5	I have not yet done self-study but I plan to	7.9%	7.9%	13.2%
6	I did not do self-study and do not plan to	19.0%	13.2%	11.8%

The respondents were asked to assess whether different types of educational materials were attractive and convenient to use in self-study (on a scale from 1 (inconvenient) to 5 (the most convenient)). The answers are given in Table III; video courses turned out to be attractive only for 1<sup>st</sup> and 2<sup>nd</sup> year undergraduates. As students gain experience in university studies and skills for self-studies, they tend to prefer traditional textbooks or their electronic versions.

TABLE III. ASSESSMENT OF TYPES OF EDUCATIONAL MATERIALS BY ATTRACTIVENESS AND CONVENIENCE FOR SELF-STUDY

No	Sources	Group 1	Group 2	Group 3
1	Paper textbook (study guide)	1.2	3.95	3.84
2	E-textbook (electronic study guide)	3.3	3.54	3.66
3	Video course	3.4	3.31	3.53

The analysis performed (Table IV) showed that 1<sup>st</sup> and 2<sup>nd</sup> year undergraduates actively use Russian platforms such as Open Education, Lectorium and Universarium, recommended by teachers in the course of studies. The proportion of students who do not use educational platforms is less than 10%. Foreign educational platforms are almost never used. The following trends emerge as students gain experience with educational platforms and develop their own "digital culture":

- the proportion of students who stop using any educational platforms at all increases (about 50% of students),

- searching for more convenient services, students start using new digital platforms, including foreign ones (more than 20%).

Between 8% and 17% of students use several educational platforms.

**TABLE IV USE OF EDUCATIONAL PLATFORMS, %**

No	Platform	Group 1	Group 2	Group 3
1	Coursera	1%	8%	9%
2	EdX	-	-	1%
3	LendWings	-	-	0%
4	Uniweb	-	-	1%
5	Zillion	-	-	1%
6	Web.University	1%	3%	11%
7	Lectorium	10%	11%	4%
8	Open Education	83%	5%	23%
9	Universarium	3%	3%	6%
10	Other	7%	19%	11%
11	Not using any platforms	9%	59%	49%
12	Total % of the number of students	114%	108%	117%

The analysis of the databases used for studying (Table V) revealed interest in using Google Scholar and Google Books and growing interest in the Russian E-Library database (from 10% to 34%). Even though the Polytechnic University provides free access to foreign databases such as WoS, Scopus, Springer and others (rows 3-7) from any university computer, use of these resources is only slightly increased among master's students (from 10% to 31% in total).

**TABLE V. USE OF DATABASES, %**

No	Database	Group 1	Group 2	Group 3
1	Google Books	11.6%	56.8%	51.4%
2	Google Scholar	39.1%	10.8%	18.6%
3	EBSCO:Academic Search Ultimate	5.8%	2.7%	5.7%
4	Passport (Euromonitor)	0.0%	0.0%	5.7%
5	ProQuest Dissertations &Thesis Global	1.4%	0.0%	2.9%
6	Scopus	0.0%	8.1%	2.9%
7	Springer	1.4%	0.0%	5.7%
8	Web of Science	1.4%	10.8%	8.6%
9	E-Library	10.1%	24.3%	34.3%
10	Codex	21.7%	16.2%	11.4%
11	Consultant Plus	15.9%	54.1%	27.1%
12	Other	21.7%	10.8%	18.6%

Notably, the willingness to purchase electronic textbooks, the results of scientific studies, or scientific articles needed for learning or for research increases to 24% for master's students (row 1). This might be both because these students may earn their own money (which is indirectly confirmed by row 4) and are aware that not all materials can be found in open access (row 3). At the same time, more students in this group believe that the university should be responsible for providing all the necessary materials for research (54% compared to 23% in Group 1). This indicates a divide forming in the digital culture of students.

**TABLE VI. STUDENTS' WILLINGNESS TO USE THEIR OWN FUNDS TO PAY FOR THE MATERIALS NEEDED FOR STUDY AND RESEARCH**

No	Answers	Group 1	Group 2	Group 3
1	Yes, I am willing to pay myself	0	16.2%	24.3%
2	No, the university should provide access to the materials	23.2%	37.8%	54.3%
3	No, I can always find open-access materials	40.6%	16.2%	17.1%
4	No, this is too expensive	176	31.9%	5.4%

Even though students state that they are willing to pay for access to the materials necessary for education, they are not ready to bear such expenses in practice (Table VI).

**TABLE VII. USE OF PAID MONTHLY SUBSCRIPTIONS TO EDUCATIONAL RESOURCES**

No	Answers	Group 1	Group 2	Group 3
1	Yes, I use paid subscriptions	4.3%	5.1%	8.6%
2	No, I do not use paid subscriptions	95.7%	92.3%	88.6%

Some students did not answer whether they paid for the subscriptions, and in fact no more than 4.3% – 8.6% of students said they actually paid for access to subscriptions to scientific resources, without specifying how much they paid (Table VII). Only two students said they were willing to pay no more than 500 rubles per month, and only one student was willing to pay up to 3 thousand rubles per month. This is to say that students recognize that digital resources are useful for learning, but estimate the usefulness as very low (i.e., they are not ready to pay). Thus, according to the Chaddock scale [13], the correlation of attractiveness of self-study, willingness to use educational platforms, experience of using mobile applications, willingness to pay for electronic resources, to use paid subscriptions is estimated as weak. Pearson's coefficient for these positions is from 0, 0.0516 to 0.2192.

#### IV. CONCLUSIONS

To summarize, an important finding of the study is that a substantial proportion of students (about 30% of respondents) is conservative and skeptical towards digitalization of the educational process and modern digital technologies in education. Notably, the level of the students' digital literacy increases during university studies; this is especially true of master's students (Group 3). However, digital culture has not yet become an integral part of the students' mentality and understanding of modern methods of obtaining and processing information; in the future, when these students enter the labor market, this may be problematic, creating barriers to development of digital economy. A number of measures should be implemented to solve this problem, in particular, additional training of university teachers in the field of IT, as well as developing user-friendly mobile applications for practical use by students in the educational process.

We should note that our conclusions are based on analysis of a limited sample of the students enrolled in the Economics and Management courses at the Polytechnic University. As a direction for further research, we plan to increase the representativeness of the sample and conduct a survey among students of other institutes of the Polytechnic University, as well as other universities, which should provide more generalized and comparable results and confirm the reliability of the findings.

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