The Impact of the Covid-19 Pandemic on Students Studying in High Education Institutions

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Abstract
Nowadays in Ukraine, people must plan their future according to the specifics of new relations - the new specifics of communications, labor organization etc. Each industry has both common problems and its own specifics. This paper examines the specifics of the education field by researching issues of higher education at Lviv Polytechnic, Lviv National Agrarian University, Ukrainian Academy of Printing in the field of information technology. In particular, the impact of time on graduates and the effectiveness of knowledge they`ve received at the university. The study is based on a survey of graduates of ICTA, Lviv National Agrarian University, Ukrainian Academy of Printing, which contains questions grouped into three subgroups: subjective perception of the studying process, subjective feeling for choosing a profession, subjective feeling of the need for changes in the education system. The survey was conducted in the target group of graduates. The answers in the training group shows the level of satisfaction with the baggage of knowledge and convictions in the quality of education among graduates. Indicate the level of how the market sees the prospects for computer science. Answers in the cyber security group is the attitude of young people (computer science students) to the provision of cyber communication at the state level. No research has been conducted on the provision of the internet at the university level. The results of the work are visualized and presented both in graphs and in absolute and relative values. The study can assess the level of resilience of computer science specialties to the problems caused by the pandemic, including distance studying and distance work in IT companies. To enhance the results, the dynamics of recruitment of entrants over several years was analyzed. In the report for 2021 we see that the number of freshmen has increased in Lviv universities. Of the 100% of surveyed students, who worked during the pandemic in the private IT companies, worked remotely and received a full salary, which also shows the resilience of the specialty to the challenges of the pandemic (this mode reduces risks and their distribution).

Keywords
Pandemic, communications, students survey.

1. Introduction

The Covid-19 pandemic [1, 2] and learning affect different countries in different ways: high/low degree of mobility, saturation with information and cybernetic technologies [1–4] and teaching different subjects with different content.

The study conducted a survey containing tables of questions grouped into subgroups. The survey was conducted in the target group—graduates with 10 work experience and students.

The aim of the study is to obtain a model of the effectiveness of the use of knowledge acquired at the university in time and how the pandemic affected the application of this knowledge. The sample was obtained from a group of graduates and students. The results will allow us to respond quickly to the challenges posed by a pandemic. In particular, to assess the need for qualitative/quantitative indicators of changes in the ways of presenting knowledge, changes in the retraining of teachers, changes in the content of courses, changes in the needs of the labor market.

The study conducted a survey containing 14 questions, grouped into three subgroups: the subjective feeling of the learning process, the subjective feeling of choosing a profession, and the subjective feeling of internet security. The survey was conducted in the target group of the most active part of society.

The aim of the study is to obtain a model of the effectiveness of the use of knowledge acquired at the university in time and how the pandemic affected the application of this knowledge. The sample was obtained from a group of graduates 15–20 years after graduation. The results will allow you to respond quickly to the challenges posed by a pandemic. In particular, to assess the need for qualitative / quantitative indicators of changes in the ways of presenting knowledge, changes in the retraining of teachers, changes in the content of courses, changes in the needs of the labor market.

2. Characteristics of Graduates of the National University Lviv Polytechnic

For indirect verification of the survey results, this section reflects the reporting of NU "LP" and ICTA. In particular, the trend of increasing the number of first-year students is considered.

In 2020 [5] 24,834 students studied at Lviv Polytechnic, of which 20,612 were full-time students and part-time students, see Fig. 1. In 2020, 24,834 students studied at Lviv Polytechnic, of which 20,612 were full-time students and 4,222 part-time students.
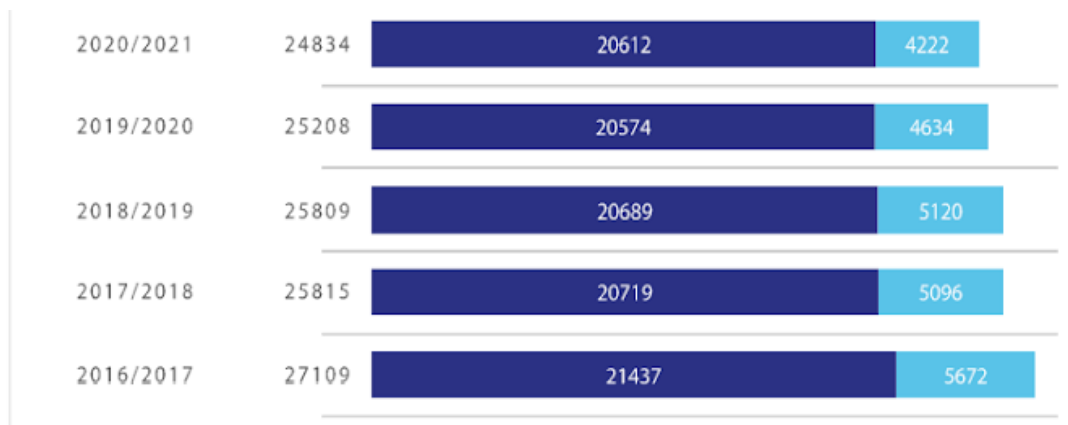
Figure 1: The total number of students at the university and its colleges

The contingent of full-time and part-time students at educational and research institutes in Fig.2 [5]. Thus, in 2020/2021, 24,834 students studied at Lviv Polytechnic, of which 20,612 full-time and 4,222 part-time, in 2019/2020 25,208 students studied at Lviv Polytechnic, of which 20,574 were full-time and 4634 students by correspondence, in 2018/2019 25815 students studied at Lviv Polytechnic, of which 20719 full-time and 5096 by correspondence, in 2018/2019 25815 students studied at Lviv Polytechnic, of which full-time 20719, and 5096 students by correspondence, in 2017/2018 25815 students studied at Lviv Polytechnic, of which 20719 full-time and 5096 by correspondence, in 2016/2017 27109 students studied at Lviv Polytechnic, with of which 21,437 full-time students and 5,672 part-time students.
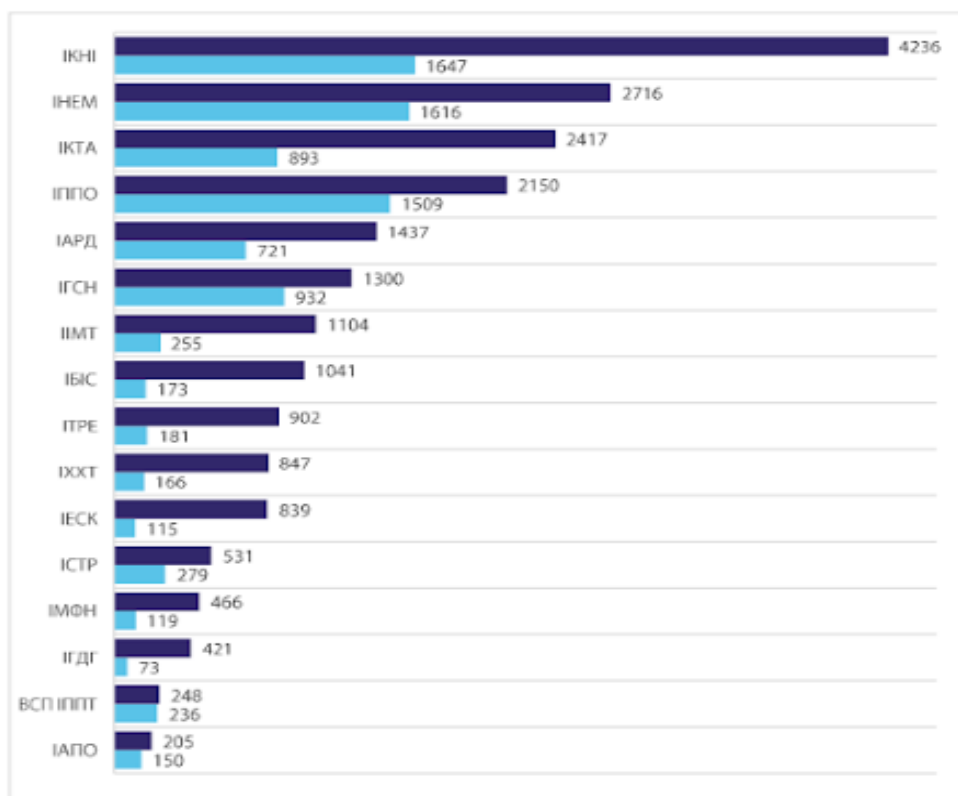
Figure 2: Contingent of full-time and part-time students at educational and scientific institutes

Thus, in 2019, the University enrolled in educational programs for bachelors, regardless of forms of education and sources of funding, a total of 5421 people (in 2018—5673 people, in 2017—5422 people, in 2016—5523 people) [5].

In total, 10,950 people were enrolled in Lviv Polytechnic and the colleges that are part of its structure in 2019 (11,574 in 2018, 11,701 in 2017), of which 5,287 were enrolled at the expense of the state budget persons [6].

That is, we are seeing a steady increase in the number of computer science students, and the pandemic has only underscored the industry's adaptability to the challenges of globalization.

3. Characteristics of graduates who studied at the Ukrainian Academy of Printing

The Ukrainian Academy of Printing includes: three faculties with 19 departments and Lviv Polygraphic Professional College [7].

UAP is constantly improving its material and technical base. In 2020, the academy launched Media Coworking Space and Art Space, which employs student television and online publications, organizes meetings with stakeholders, representatives of culture and art, and introduces elements of non-formal education. Since the beginning of 2020, the academy has created and successfully operates a modern laboratory of digital and additive technologies, where students of relevant specialties undergo practical and laboratory classes.

A total of 2,662 entrants applied for admission to the UAP for a bachelor's degree in 2020, including 2,391 full-time applications. In 2020, 403 applications were submitted for a master's degree, of which 305 were full-time and 98 were part-time.

The largest number of applications for full-time bachelor's degree applications is submitted in the specialty "Journalism"—409, "Computer Science"—327.

Today the contingent of students of the Ukrainian Academy of Printing is 2560 people. In total, in 2020, a total of 608 people were enrolled in the UAP for all levels of higher education, of which 331— by state order, 277—on a contract basis.

4. Survey and Analysis of the Results of Respondents-Graduates in the Field of "Computer Security"

The list of questions and answers of respondents-graduates in the field of "Computer Security" aged 35–40 years is given in Table 1.

Table 1
Questions and answers of respondents-graduates in the field of "Computer Security" aged 35–40 years (sample of 50 respondents)

	Question	Yes	No	Unknown/None
1	Did / how did the pandemic affect your opinion about your choice of specialty (profession)?	7%	3%	90%
2	Has distance learning had a positive effect on your learning?	0%	75%	25%
3	Do you think that in the future part of classes at the university should be remote?	0%	80%	20%
4	Did you plan to master the IT profession when you entered the 1st year?	IT—100% did not matter—0% technical—0%		
5	What is the first job you would like to get after graduation?	IT—100%		
6	Do you already work in IT?	no—60% yes—40%		
7	Is your work remote?	no—40% I do not work—20% yes—40%		
8	Is 4G bandwidth on your mobile device enough for you today (in the pandemic era)?	yes—100%		
9	Is 100 mb /s bandwidth enough for you today (in the pandemic era)?	yes—100%		
10	Do you use wi-fi at home?	yes—100%		
11	In your opinion, was there a cyber attack on you that could have been avoided in the absence of a pandemic?	no—99% yes—1%		
12	In your opinion, was a cyberattack carried out on your relatives, which could have been avoided in the absence of a pandemic?	no—99% yes—1%		
13	In your opinion, was there a cyber attack on your acquaintances, which could have been avoided in the absence of a pandemic?	no—99% yes—1%		
14	The main place of residence to study in Lviv?	yes—100%		

This study (Anonymous survey) showed that ICTA graduates (35-40 years old) clearly indicate their priority on IT. These answers show that a) the active part of society (sample of 35-40 years) already consciously sees the prospect of employment in the field of IT; b) clearly considers certain tools to achieve the goal; c) see the main purpose of training quality employment.

Surveys of students of the Ukrainian Academy of Printing were conducted with students studying in the Educational and Professional Programs Computer Science, Information Systems and Technologies, Automation and Computer-Integrated Technologies, for bachelor's and master's degrees.

Questions and answers of respondents-students of the Ukrainian Academy of Printing in the field of "Computer Science" aged 19-20 years (sample of 122 respondents) is given in Table 2.

Table 2

Questions and answers of respondents-students of the Ukrainian Academy of Printing in the field of "Computer Science" aged 19–20 years (sample of 122 respondents)

|	Question	Yes	No	Unknown/ None
1	Did / how did the pandemic affect your opinion about your choice of specialty (profession)?	0	3	119
2	Has distance learning had a positive effect on your learning?	83	7	32
3	Do you think that in the future part of classes at the university should be remote?	24	6	5
4	Did you plan to master the IT profession when you entered the 1st year?	122	0	0
5	What is the first job you would like to get after graduation?	122	0	0
6	Do you already work in IT?	24	90	8
7	Is your work remote?	91	0	31
8	Is 4G bandwidth on your mobile device enough for you today (in the pandemic era)?	116	6	0
9	Is 100 mB/s bandwidth enough for you today (in the pandemic era)?	91	17	4
10	Do you use Wi-Fi at home?	122	0	0
11	In your opinion, was there a cyber attack on you that could have been avoided in the absence of a pandemic?	5	117	0
12	In your opinion, was a cyberattack carried out on your relatives, which could have been avoided in the absence of a pandemic?	0	116	6
13	In your opinion, was there a cyber attack on your acquaintances, which could have been avoided in the absence of a pandemic?	0	112	10
14	The main place of residence to study in Lviv?	81	41	—

Table 3

Questions and answers of LNAU student respondents majoring in "Computer Science," "Information Systems and Technologies," and "Automation and Computer-Integrated Technologies" (19–20 years)

		Question	Yes	No	Unknown/None
1		Did / how did the pandemic affect your opinion about your choice of specialty (profession)?	2	18	8
2		Has distance learning had a positive effect on your learning?	22	3	3
3		Do you think that in the future part of classes at the university should be remote?	18	5	5
4		Did you plan to master the IT profession when you entered the 1st year?	27	0	1
5		What is the first job you would like to get after graduation?	28	0	0
6		Do you already work in IT?	2	24	2
7		Is your work remote?	15	13	0
8		Is 4G bandwidth on your mobile device enough for you today (in the pandemic era)?	26	1	1
9		Is 100 mb /s bandwidth enough for you today (in the pandemic era)?	26	1	1
10		Do you use wi-fi at home?	28	0	0
11		In your opinion, was there a cyber attack on you that could have been avoided in the absence of a pandemic?	1	27	—
12		In your opinion, was a cyberattack carried out on your relatives, which could have been avoided in the absence of a pandemic?	1	27	—
13		In your opinion, was there a cyber attack on your acquaintances, which could have been avoided in the absence of a pandemic?	1	27	—
14		The main place of residence to study in Lviv?	10	18	—
15		Did the LNAU Virtual Learning Environment have a positive effect on your learning process?	27	0	1

The answers to the questions related to the group of Internet / mobile communications indicate a) the use of the full range of services; b) satisfaction with this volume of services (Fig. 3). Which, given the total use of laptops in the classroom, indicates a lack of compliance with the university's provision of computer technology laboratories [8–11].

Answers to a group of questions about the impact of cyber attacks [12–14] show that the impact of negative Internet factors is perceived as either insignificant (the government copes with the task of protecting cyberspace), or there is a problem of misunderstanding the concept of cyber attack, and therefore additional research is needed will provide a more detailed list of threats).
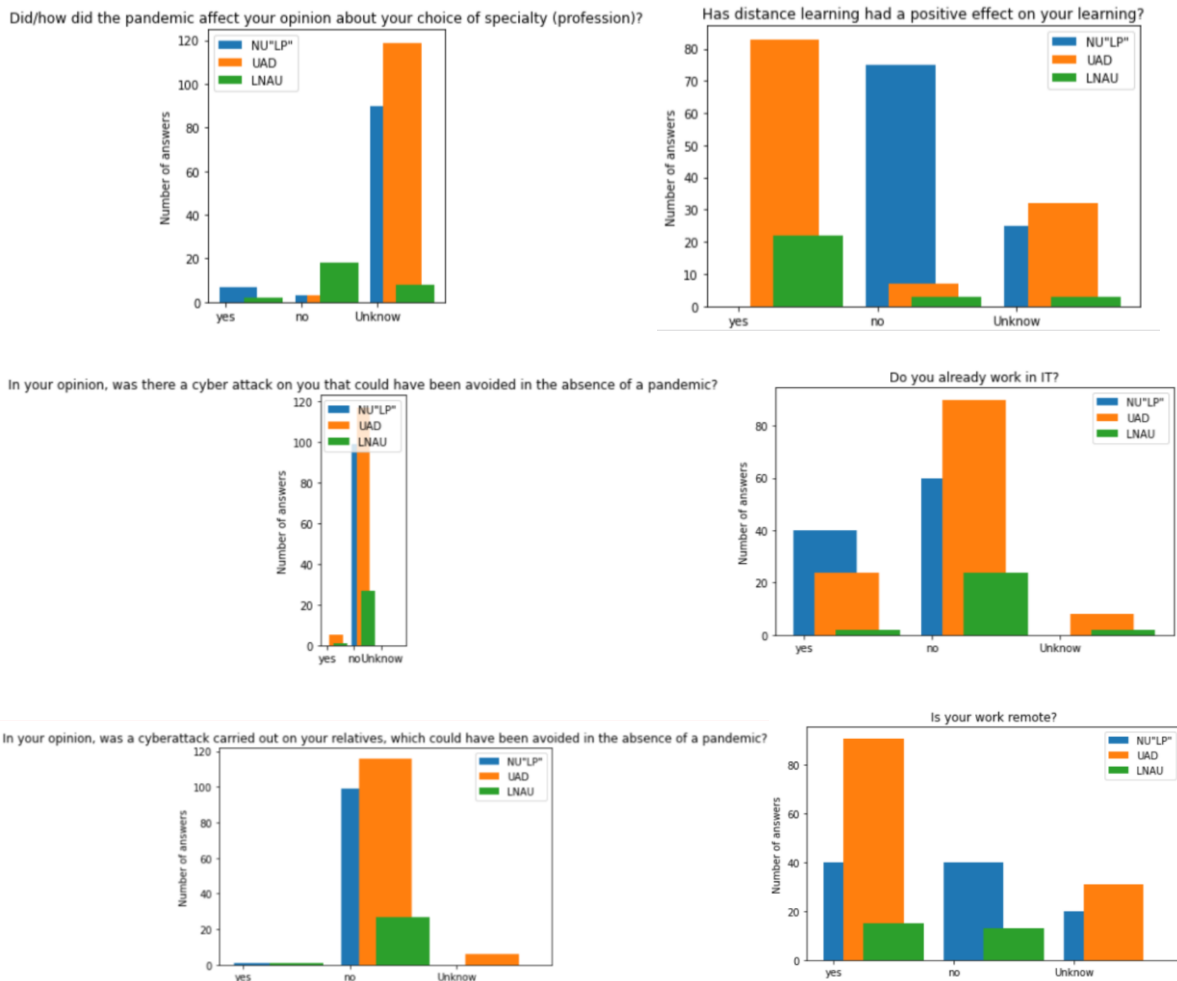
Figure 3: Visualization of survey results

The survey was conducted taking into account the methods described in [15]. Questions for respondents were selected according to [16]. Visualization of the results was performed on Python in real time according to the method discussed in [17–19]. In the future, it is planned to create a mobile survey installation, the approaches to which are described in [20–23, 27–30].

The paper shows the experiment as an element of pre-processing or for subjective evaluation [24,25]. In addition, this study shows the possibility of applying these methods in other areas [26]. The effectiveness of the considered methods in new / other areas is planned to be investigated in further works. The paper mentions the procedure of objective evaluation of efficiency and shows the way to the implementation of automatic survey.

5. Research Results

1. The answers in the study group show the dissatisfaction of graduates with the learning process and the belief in the insufficient quality of education. Especially the failure of programming and computer networks. Although the ICTA is not exactly a computer science. However, as we can see from anonymous surveys, technical specialties are clearly associated with either computer networks or programming.

For respondents of the Ukrainian Academy of Printing, it is advisable to create a single information environment for higher education institutions using cloud services Google Suite for Education (formerly Google Apps for Education).

On a positive note, the creation of the Virtual Learning Environment of Lviv National Agrarian University helps to improve the quality of the learning process during distance learning.

2. Answers in the group: employment indicates that the market sees the prospects of studying for the specialty of computer science.

3. The answers in the cybersecurity group shows the need for changes in universities understanding of the concept of computer security: in an era of mass "fake Internet news," "hired protesters with media coverage," "commissioned publications on social networks," etc. Graduates (including computer security) do not perceive this as a planned attack on them.

4. Thus, the study displays that both the survey schedules and student enrollment shows the resilience of computer science specialties to the problems caused by the pandemic, including distance learning and distance work in IT firms.

100% of the surveyed students, who worked during the pandemic in the private IT sector of information technology, worked remotely and received a full salary, which also shows the resilience of the specialty to the challenges of the pandemic (this mode reduces the risks).

Conclusions

The survey was passed by all willing, who graduated from the ICTA at the National University "Lviv Polytechnic" aged 35–40 years, students of Ukrainian Academy of Printing and Lviv National Agrarian University. The survey was voluntary and completely anonymous: personal and contact data were not collected.

This study is allowed to collect data for analysis, forecasting and development of next steps towards solving educational problems, including the problem of pandemic.

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