

“Universities in times of war: Challenges and solutions for ensuring the educational process”

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SPECIAL ISSUE: ACADEMIC MANAGEMENT IN THE CONDITIONS OF WAR

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UNIVERSITIES IN TIMES OF WAR: CHALLENGES AND SOLUTIONS FOR ENSURING THE EDUCATIONAL PROCESS

Abstract

Educational activities of higher education institutions located in the war zone are undergoing significant changes, particularly in Ukraine. This study aims to generalize the experience of the National University "Zaporizhzhia Polytechnic," Ukraine, in ensuring the continuity of the digital services of the educational process and generate recommendations for countering threats arising under the influence of active hostilities.

49% of students are residents of Zaporizhzhia, and 40% live in the occupied territories. Most students were forced to move to safer locations or even abroad. Still, some of them remained in the occupation (due to the strict regime by the occupiers, they could not move to the territory controlled by Ukraine). About 5% of students temporarily or entirely stopped their studies. The city of Zaporizhzhia is under constant fire from the occupying forces, so academic staff is dynamically relocating to safer regions. The university constantly responds to the situation at the front and implements measures to continue educational activities in these conditions, relying on digital services. To minimize the impact of war threats and ensure the continuity of digital services, the university administration guarantees protection against power outages of all elements of the digital infrastructure, providing backup Internet communication channels and creating a distributed information base. National University "Zaporizhzhia Polytechnic" continues to further expand its information services library, improving the quality of the educational process in war conditions.

Keywords

war, digital services, education process, digital infrastructure, Ukraine

JEL Classification

J11, J21, H56, O15

INTRODUCTION

Higher educational institutions located in particularly dangerous areas of Ukraine found themselves in the most challenging circumstances with the beginning of the aggression by the Russian Federation against Ukraine. There was a need to support the students in the occupied territories and those who lost their homes and were forced to move to different regions or abroad. The working conditions of teachers also changed; some of them were also forced to change their housing. Moreover, educational institutions in the occupied territories that relocated to the territory controlled by Ukraine need special attention.

Implementing educational activities by universities in a war zone or under the threat of possible hostilities also requires changes in management methods. Consequently, there is a need to use fundamentally new mechanisms for securing the educational process in these conditions. All this determines the relevance of studying the peculiarities of providing educational activities with the help of digital services.

es. Therefore, this study aims to generalize the experience of the National University “Zaporizhzhia Polytechnic” regarding the continuity of the functioning of digital services in the educational process and develop recommendations for countering threats arising under the influence of active hostilities.

1. RESULTS

1.1. Background information about the university

National University “Zaporizhzhia Polytechnic” is territorially located at a distance of 30 km from the front line. According to the orders of the Ministry for Reintegration of the Temporarily Occupied Territories of Ukraine, the territory of the Zaporizhzhia district was an active hostile area from March 12, 2022 to December 31, 2022. As of January 1, 2023, it is an area of possible hostilities. About 80% of the territory of the Zaporizhzhia region is occupied. Some students reside in the occupied territories, and some have become internally displaced persons, relocated, and are now far from the war zone. Some students have found temporary shelter in other countries. About 20% of scientific and pedagogical staff also became internally displaced persons or found temporary refuge abroad.

As of February 24, 2022, the National University “Zaporizhzhia Polytechnic” comprises 13 faculties, 60 departments, 9 educational and laboratory facilities, more than 160 educational programs, 6 student dormitories for 2,300 places, and a scientific library with a book fund of more than a million copies. In addition, about 10,000 students study at the university full-time and part-time. The university has a military training department, which has been operating since 1997 and is located territorially separately from the university.

1.2. University management during the war

Management approaches are undergoing significant changes starting from February 24, 2022. First of all, the university leadership changed. According to the results of the legitimate elections of the rector, a new rector was appointed, with whom the contract was signed on February 23, 2022, a day before the beginning of the Russian invasion.

Taking into account the rapid advance of the Russian invaders toward Zaporizhzhia, the capture of Melitopol, Berdyansk, and other cities of the Zaporizhzhia region, an operational headquarters was created at the university from the first days of the war. The university launched round-the-clock working groups of vice-rectors and deans and started preparing bomb shelters. The advance of the Russian invaders was stopped 30 km from Zaporizhzhia. Zaporizhzhia district was recognized as a war zone. Now about 80% of the Zaporizhzhia region is occupied. In the occupied territory, there remained a part of higher education students with the most limited opportunities to use information services to continue their education. Moreover, separate structural subdivisions remained occupied: Tokmak technical school and Berdyansk college were forced to relocate to the National University “Zaporizhzhia Polytechnic”. In addition, the university buildings were damaged due to explosions and shelling of the city in the spring of 2022.

In the first days and months of the war, the city of Zaporizhzhia practically became a temporary shelter for those who left Mariupol, Berdyansk, Melitopol, Vasilyevka, Enerгодар, and other cities and towns in the South of Ukraine. Volunteer assistance centers were organized in the dormitories to support them. If necessary, parents of students from the occupied territories were provided shelter in hostels. Students and academic staff engaged in many volunteer activities. Some senior students joined the ranks of the territorial defense and the Armed Forces of Ukraine.

From the first days of the war, the military training department initiated express training of officers and mobilized personnel in artillery and fire training. In addition, they developed a course on drone control in cooperation with the academic staff of university technical specialties. Furthermore, department personnel repairs and restores military equipment damaged in battles with the support of the military administrations of the region and the city.

The educational process was resumed according to the schedule despite the immediate proximity to the front. A number of the educational provisions and regulations were revised, taking into account the new war conditions. The university management created a new procedure for defending the theses (online via Zoom). The theses were signed using electronic digital signatures. The classes were organized according to the schedule online using various telecommunication tools: Zoom, Google Meet, Skype, Viber, and Telegram. The university also adopted the Moodle system for learning in asynchronous mode. Special attention was paid to students from the occupied territories who needed constant communication. The university teachers offered courses for students of Berdyansk to ensure the implementation of educational plans for individual disciplines. The examination session was also conducted online. Teachers forced to leave the city signed their academic records using electronic digital signatures. All this required the introduction of a complex of software packages for conducting classes in online and asynchronous modes. In addition, it was vital to guarantee the reliability of digital services.

Since internationalization is one of the priority directions of the university's development strategy, the university continued actively developing partnerships with universities and scientific institutions in European countries, particularly the European network SDSN Europe and SDSN Black Sea, in implementing solutions and achieving sustainable development goals. The directions of cooperation are:

- financing academic exchanges and scientific projects;
- publishing research results in leading journals;
- restoring the damaged infrastructure of Ukrainian universities;
- introducing European standards of higher education;
- involving the university in the European institutions of the SDSN Europe and SDSN Black Sea networks and the European Association of Universities.

1.3. Financial condition of the university

The university's financial condition at the end of 2022 has mostly remained unchanged. Compared with 2021, the income to the university's general fund is UAH 211,585.14 thousand, which is UAH 11720.4 thousand less than in 2021, and the income to the special fund is UAH 111,501,883 thousand, which is UAH 37178.1 thousand more than in 2021. In addition, the provision of a scholarship fund in 2022 of UAH 41,458.7 thousand allowed the university to pay out scholarships for 40-45% of students according to the rating following the resolution of the Cabinet of Ministers of Ukraine (The Verkhovna Rada of Ukraine, 2020).

In 2022, according to the resolution of the Cabinet of Ministers of Ukraine (The Verkhovna Rada of Ukraine, 2022), students were allowed to switch from the fee-based form to state-funded education, notably those who applied in 2021 and earlier and are registered in territorial communities belonging to the occupied territories or the territories of active hostilities. As a result, more than 400 students among students from the occupied territories and territories of hostilities were transferred to state-funded education mode in December 2022. But the increase in the number of students of the state-funded form of education and the reduction of the scholarship fund in 2023 led to the need to reduce the number of students receiving scholarships to 35% of the total number of students studying under this form.

The revenues to the special fund from tuition fees have dropped from the beginning of 2023. The budget funding fell at the same time too. All this worsened the financial condition of the university. The operation of the business school was resumed, and the university administration is looking for other funding sources to improve the university's financial situation.

The lecture halls are being refitted (with grants and other sources helps) by installing an interactive whiteboard, which is combined with a multimedia projector, a camera, and a laptop for simultaneously holding classes offline and online.

1.4. A contingent of students in wartime conditions

The conditions for the admission of applicants to study at the university changed significantly during the war. Therefore, the new procedure for admission to higher education in 2022 was approved by order of the Ministry of Education and Science of Ukraine (2022).

The main factors complicating the admission campaign in 2022 were:

- Low work speed and sometimes the lack of access to the services of the Unified State Electronic Database on Education and the Enrollee's Electronic Office, especially at peak loads during the start of the admission of a particular category of entrants.
- Delays in the introduction of changes into the Unified State Electronic Database on Education Issues related to updates in regulatory documents regulating admission (namely, the new category was added – category 109 – persons whose place of residence is registered (declared) in a particularly dangerous territory, streamlining the possibility of paper submission of documents by applicants of category 109, entering the second higher education).
- The emergence of “legal vacuum” situations when certain territories of Ukraine were excluded from the list of particularly dangerous territories during the acceptance of documents or enrollment of applicants.
- Significant time delays in obtaining the results of the additional and special sessions of the National Multidisciplinary Test/External Independent Testing and Master's Test of Educational Competence from the Ukrainian Center for Evaluation of the Quality of Education database to the electronic offices of applicants.
- Prolonged response of the technical support of the entrant's electronic cabinet to applicants' appeals regarding correcting errors and inconsistencies in documents.

Several steps contributed to an increase in the number of applicants to study at the National University “Zaporizhzhia Polytechnic” (Table 1). First, the testing procedure for entrants of previous years was simplified; applicants were allowed to apply for a master's degree in certain specialties by submitting only a motivation letter; the duration of the admissions campaign was increased; practical cessation of higher education institutions in the occupied territories of Zaporizhzhia, Kherson region and the city of Mariupol was ensured. Admission and training took place through electronic offices, online, and by the admissions committee directly at the university. Military personnel was also enrolled in training under the

Table 1. Dynamics of increase in the number of applicants

Year	Admission results			Deviation percentage
	State-funded	Fee-based	Total	
2020	1520	1500	3020	–
2021	1098	1529	2627	–14.96%
2022	2189	2719	4908	+46.47%

Table 2. Dynamics of increase in the number of students

Year	Contingent of students			Deviation percentage
	State-funded	Fee-based	Total	
as of January 1, 2017	4702	5488	10190	-
as of January 1, 2018	4596	5334	9930	–2.62%
as of January 1, 2019	4797	5465	10262	+3.24%
as of January 1, 2020	4760	5274	10034	–2.27%
as of January 1, 2021	4555	4840	9395	–6.80%
as of January 1, 2022	3882	4503	8385	–12.05%
as of January 1, 2023	5081	5865	10946	+23.40%

simplified system. In addition, employees of many enterprises in Zaporizhzhia applied for master's degrees. Optimized digital services of the admission committee made it possible to reduce the negative impact of complications in war conditions and significantly increase the number of enrolled students.

In 2021, there was a decrease in the number of enrolled students by 14.96%; in 2022, the number of enrolled students increased by 46.47%. The dynamics of changes in the total number of students are shown in Table 2.

If, in the previous years, there were negative dynamics of changes, then as of January 1, 2023, the total number of students increased by 23.4%.

1.5. Digital services for the educational process in times of war

The growth of digital services at the National University "Zaporizhzhia Polytechnic" began during the pandemic due to the need to support online education. During this time, the functioning of the distance learning system, its own video conference service, e-mail service, and the "Dekanat" system was implemented and adjusted; the central institution and separate structural units were connected by a single private network. Even then, the BigBlueButton video conferencing system was initially hosted on rented foreign server facilities. This provided experience for the possibility of scaling this mechanism in the future to other services.

The dependence on ensuring information services' continuous operation is increasing along with the expansion of the new threats to the uninterrupted operation of the services that appeared with the beginning of the armed invasion of the Russian Federation. The main threats are the termination of the electrical energy supply, disconnection of the Internet routing network, and damage to communications and even the servers where the information base is located.

Any of these threats can lead to a complete or partial stoppage of digital services and even to the impossibility of the educational institution func-

tioning, provided that the digital infrastructure is placed on its own equipment. Therefore, the university sought ways to eliminate or reduce the consequences of such threats by adopting fundamental changes in information services to ensure their continuity. The National University "Zaporizhzhia Polytechnic" decided to change the information infrastructure to ensure the continuous operation of information services and to eliminate the influence of several threats.

Critical components of the digital infrastructure were transferred to providers in EU countries. The information base was also transferred to servers in the countries of the European Union. These have ensured the preservation of information and access to it, provided the user can access the Internet. The university also created its own virtual system of organizing the educational process.

Autonomous generators and power systems ensured uninterrupted power supply to critical network equipment and routing systems. The administration decided to transfer the Moodle distance learning system to the data center of the Ukrainian Scientific and Educational Telecommunication Network URAN, which was created following the decision of the Ministry of Education of Ukraine and the National Academy of Sciences of Ukraine with the support of universities (Kyiv), taking into account the experience of hosting information services on leased foreign server capacities, during martial law. However, considering the damage to the data center due to the shelling of Kyiv in October 2022, there were lengthy interruptions in the work of the distance learning system of the National University "Zaporizhzhia Polytechnic" which necessitated its further transfer to the cloud services (such critical services as the website of the admission committee and the catalog of educational programs were moved). The university is now working on transferring data and software related to the functioning of the official site, the library resource, the electronic institutional repository, and the website of periodicals.

Thanks to the Ministry of Education and Science of Ukraine's support and assistance, university students and teachers got access to Google Workspace for Education, Zoom for Education, and digital content of Coursera, edX, and Udemy

platforms. Furthermore, as part of international cooperation, students had the opportunity to join the online learning platform of Yamanashi University (Japan).

The alternative power supply of the university's data centers was enforced by:

- powerful sources of uninterrupted power supply (equipment with battery systems);
- diesel generators that provide backup power supply;
- backup electrical inputs from various substations.

These measures require high financial costs for purchase, installation, and maintenance.

For continuous access to data, the alternative methods of high-speed Internet access were implemented, which are directly connected to the main European hubs bypassing the territory

of Russia and Belarus, in particular, the use of Starlink stations (backup communication channel in case of damage to optical and wired networks and the absence of wireless Internet providers mobile communication). Currently, the reservation of external communication channels at the National University "Zaporizhzhia Polytechnic" is carried out by the following providers: URAN network, Ukrtelecom joint-stock company, Radiocom Zaporizhzhia, and Starlink.

Preserving the results and achievements of the educational process, which are stored in internal data processing systems, requires special attention. For this, the use of so-called "cold" copies of data is organized, making it possible to quickly restore services in an emergency.

The continuity of the digital services of educational institutions protected the participants of the educational process from external threats while providing high-quality educational services within the framework of the distance educational process.

CONCLUSION

The study aims to generalize the experience of the National University "Zaporizhzhia Polytechnic" in securing the functioning of digital services of the educational process and develop recommendations for countering threats arising under the influence of active hostilities. The results can be disseminated to other universities located in the territory of hostilities or possible hostilities.

According to the university's experience, uninterrupted access to digital services is secured through uninterruptible power sources equipped with powerful battery systems. Diesel generators are used for backup power supply. The connection of backup electrical inputs from various substations has also been implemented. Such a system provides uninterrupted power supply to data centers but requires additional financial costs.

The university also offers alternative methods of high-speed Internet access through the use of connections to various providers of both conventional wired and optical networks, as well as wireless Internet and mobile communication providers. A separate backup channel is satellite communication using Starlink stations.

Changes in the configurations of digital services require changes in organizational support and provide for the adjustment of the university regulatory framework and instructional and methodical materials. Moreover, university management should constantly update administrative documents considering the specifics of martial law. In addition, there are peculiarities of introducing new software services that require assimilation by all participants of the educational process. In some cases, this demands separate training.

The unique needs of online education determine the use of new application packages. The university should adopt innovative communication programs for video conferencing and provide the possibility of learning asynchronously, introducing a cloud and service model of data use and improving the information security system. Students and teachers of the National University “Zaporizhzhia Polytechnic” got access to digital tools thanks to the support and assistance of the Ministry of Education and Science of Ukraine.

The unique experience of the National University “Zaporizhzhia Polytechnic” allowed for defining the optimal set of programs that ensures the resistance of the educational process and the ability to control the educational process’s quality.

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