MYKOLAS ROMERIS UNIVERSITY

FACULTY OF PUBLIC GOVERNANCE AND BUSINESS

ELECTRONIC BUSINESS MANAGEMENT

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ANALYSIS OF THE EFFECT OF COVID-19 PANDEMIC ON EDUCATION TECHNOLOGY IN KAZAKHSTAN

A Master's thesis

Supervisor

Dr. Tomas Mendelsonas

VILNIUS, 2021

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ABBREVIATIONS

EdTech – Educational Technologies

IT – Information Technology

CBI – Computer-Based Instruction

CBT - Computer-Based Training

WBT - Web-Based Training

CSCL - Computer-Supported Collaborative Learning

CAL – Computer Aided/Assisted Learning

E-learning – Electronic/ Online Learning

VR - Virtual Reality

AR – Augmented Reality

MIT - Massachusetts Institute of Technology

CMI – Computer-managed Instruction

PLE – Personal Learning Environment

VLE – Virtual Learning Environment

PLATO - Programmable Logic for Automatic Teaching Operations

ICT – Information and Communication Technologies

TEL - Technology-Enhanced Learning

CAI - Computer-Assisted Instruction or Computer-Aided Instruction

IBT - Internet-Based Training

VLE - Virtual Learning Environments

CMS – Course Management System

LMS – Learning Management System

CD-ROM - Compact Disc Read-Only Memory

UNESCO – United Nations Educational, Scientific and Cultural Organization

COVID – 19 – Coronavirus disease 2019

Blackboard Collaborate, Adobe Connect, WebEx, Skype, Zoom, BigBlueButton – Live Interactive Online Conference/ Online Virtual Space) is a real-time video conferencing tool that lets you add files, share applications, and use a virtual whiteboard.

Blackboard, WebCT, Moodle, Sakai – CMS/ LMS/ VLE (is educational software platform designed to support learning, research and collaboration).

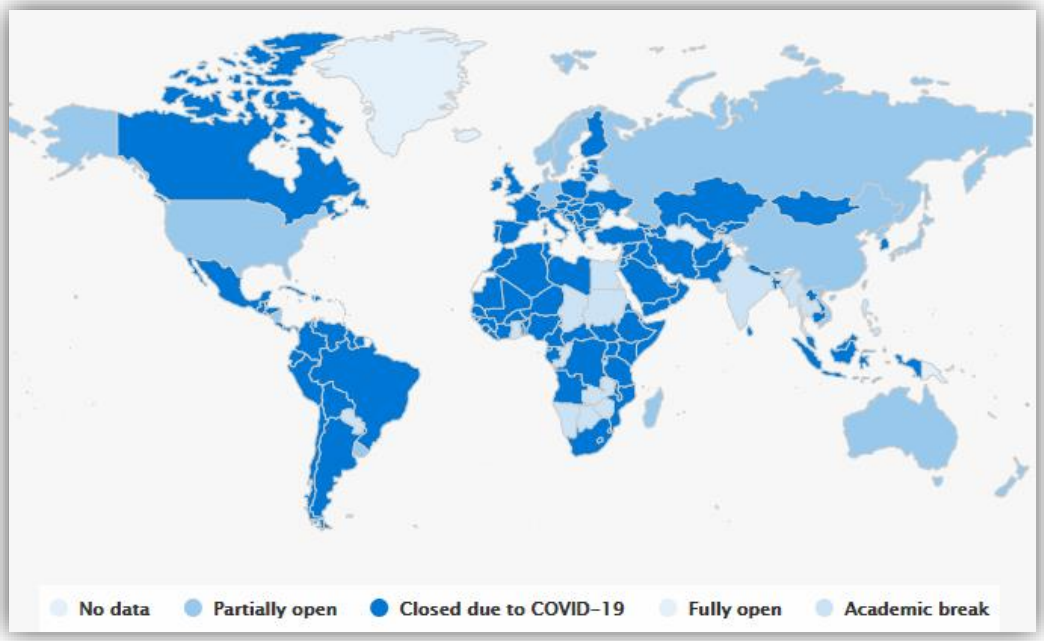
Web 2.0 – The second generation of the World Wide Web.

Math chat – is an online messaging service compatible to mathematical equations, functions, and vocabulary.

INTRODUCTION

Relevance of the topic – The global coronavirus epidemic has exposed many holes in the functioning of educational markets, both technologically advanced and developing. Despite the long history of these markets, for most schools and universities, the transition to distance learning has caused stress at all levels. Someone had already used online tools by that time, some had practically nothing. In such situations, IT specialists were forced to urgently implement remote communication tools with students within a few days.

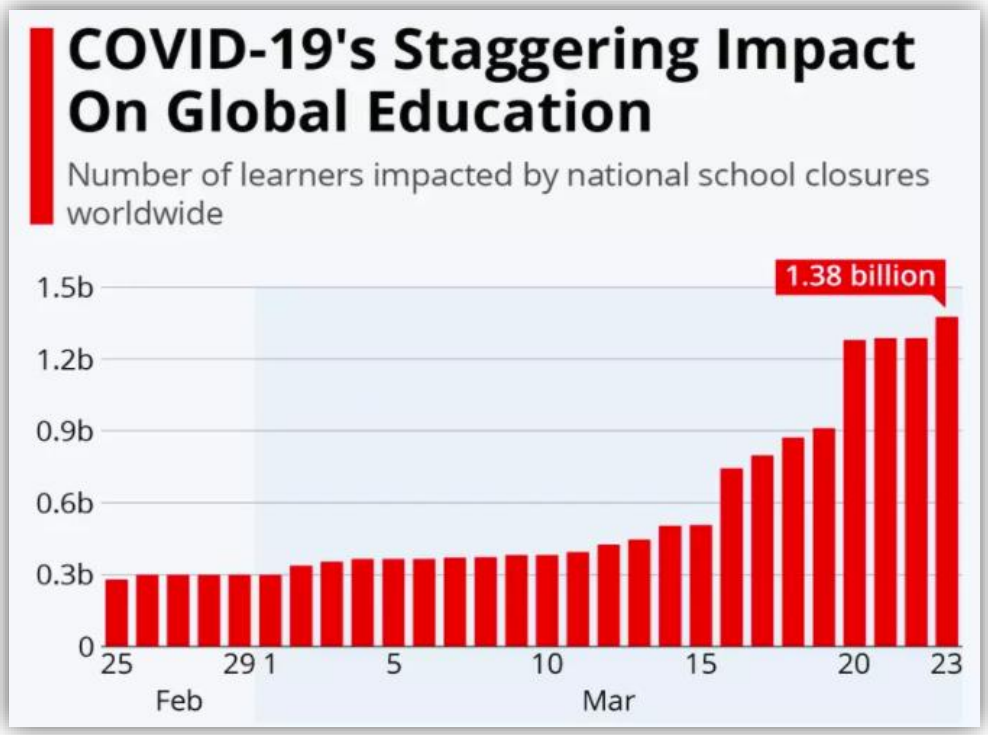
The COVID-19 pandemic posed a major challenge to education worldwide and led to the largest disruption to the education system, affecting nearly 1.5 billion students in over 165 countries and all continents, according to UNESCO. The pandemic has forced the global academic community to adopt new teaching methods, including distance and online learning. This proved to be difficult for both students and teachers. This is the first-time humanity has faced such a global problem.



Source: Based on UNESCO Institute for Statistics Data, 2020.

Fig.1. Global monitoring of school closures by Covid-19

The crisis has begun to exacerbate pre-existing inequalities in education, preventing the most vulnerable children, youth, and adults, who live in poor or rural areas and do not have access to the Internet, to continue their studies. Moreover, the disruption of the educational process has and will have a serious consequence outside the educational system.



Source: Based on UNESCO Institute for Statistics Data, 2020.

Fig.2. Figures refer to learners enrolled at the pre-primary, primary, lower-secondary, and upper-secondary levels of education, as well as at tertiary education levels.

School closures affect the ability of many parents to do their jobs and increase the risk of violence against women and girls.

At the same time, it should be noted that the crisis served as a stimulus for innovations that society puts before the education system to prepare the younger generation for independent life and professional activity as citizens with a high degree of digital literacy. To ensure the continuity of education and training, various types of distance learning are used: broadcasting lessons on TV channels, posting video lessons on special sites, audio broadcasting lessons by radio, e-mail, etc.

Statement of the scientific problem

For Kazakh schools, the current situation was also completely new and unexpected. However, the changes that have taken place make it clear that the promising learning prospects and the accelerated transformation of the delivery of quality education cannot be seen in isolation from the critical challenge that concerns children and young people who lack the necessary resources or an enabling environment to access education.

The study described in this document was designed to analyze the impact of the Covid-19 pandemic on the education system and determine the effectiveness of distance learning methods during

this crisis. This discovery will help to understand, rethink, draw conclusions, develop new strategies, and implement them in the educational process.

Problem of the research - how has the Covid-19 Pandemic impact on EdTech in Kazakhstan?

Object of the research – the impact of the Covid-19 Pandemic on EdTech in Kazakhstan.

Research hypothesis – According to sources, the impact of the pandemic on EdTech is both a crash and a challenge, but it also opens up huge opportunities for us to fundamentally rethink the education system.

Aim of the research – after the identification of how the Covid-19 Pandemic has affected EdTech to formulate the solutions for the effective functioning of the education system.

Objectives of the research:

1. To review the literature of the effect of Covid-19 Pandemic on EdTech
2. To consider the theoretical aspects of EdTech.
3. To analyse the applying of EdTech to identify positive practices, both domestic and foreign countries.
4. To evaluate the impact of Covid-19 Pandemic on the education system and students through the most appropriate method of research and select more suitable solutions and recommendations to implement them in the educational process.
5. To determine the effect of Covid-19 Pandemic on Education system based on the survey result.

Research questions

This research seeks to answer the question of "**How has the Covid-19 Pandemic impacted on EdTech in Kazakhstan?**" In connection with this question, answers are sought for the following sub-problems:

1. How did the Covid-19 process, and the distance education method applied in this process affect the students of the Republic of Kazakhstan?

2. What are students' opinions on distance education courses given to them during the coronavirus (Covid-19) process, the presentation ways of these courses, materials used in courses and how can courses be made with higher quality?

3. What recommendations can they give to improve the education system?

Limitations of the scientific research

In my case, personal data collection may not be safe for members or workers if COVID-19 transmission is high in areas where you live, study or work. As such, it may not be appropriate to conduct personal data collection to minimize transmission of COVID-19.

It would be possible to collect data remotely using various available methods, but at the same time there are many limitations such as:

- Target population, their needs, and preferences regarding data collection. Taking into account the languages spoken by these groups, their literacy rate, mobile coverage in the area, and access and use of mobile phones or PCs in the community.
- It is important to have a good understanding of the local context, including cultural customs and norms. When choosing a data collection method, we should always check whether it is appropriate for the local context and acceptable to the community, especially when you collect data remotely.
- Data quality and response rates - some methods are more likely to have a low response rate. This should be taken into account when calculating the sample size. Some methods can also be prone to error responses, especially if there are school and university students in the aggregate.

Master thesis is organized as the following

The work is divided into several parts, consisting of an introduction, theoretical foundations, research methodology, data analysis results, as well as conclusions, recommendations, and a list of references.

The first part of the study, which is an introduction, provides a brief overview of the impact of the pandemic on the educational system. It also lays out a basic work plan that includes, among other things, the purpose of the dissertation and the research questions that the research is trying to answer.

The second part will present the historical and theoretical background with an overview of the research literature. The next part includes the methodology for researching, collecting, and presenting data. The last part presents the results and conclusions on the impact of Covid-19 on the educational system and technologies in Kazakhstan are analysed.

The work ends with a conclusion, recommendation, annotation, and a list of used literature.

1. THE THEORETICAL ASPECTS OF EDUCATIONAL TECHNOLOGIES

1.1. Concept of educational technologies

Today, educational technology is the concept of applying and assimilating knowledge, taking into account technological tools and human resources in teaching. This includes various tools such as media, machines, and networking equipment, as well as considers the theoretical perspectives of their effective use. Simply put, educational technology is any concept or tool that facilitates learning with technological resources. This is a very broad definition, but it really defines what EdTech is. Ancient abacus with retractable beads for counting and math work is the same form of EdTech as the modern classroom computer today. This is the basic definition of the term today, if it uses any technology for teaching, it is a type of EdTech.

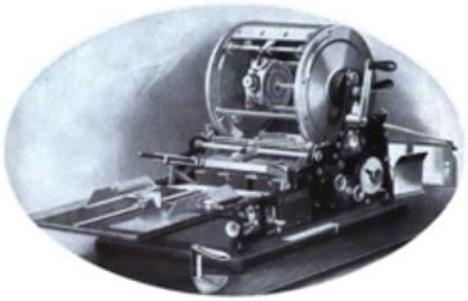
Definitions of Educational Technology

"*Educational technology is the systematic application of scientific knowledge about teaching-learning conditions of learning to improve the efficiency of teaching and training*". (G.O.M. Leith, 1967)

"*Educational technology is concerned with the application of modern skills and techniques to requirements of education and training. This includes the facilitation of learning by manipulation of media and methods, and the control of environment in so far as this reflects on learning*". (D. Unwin, 1969)

"*Educational technology may be defined as the application of the laws as well as recent discoveries of science and technology to the process of education*". (S.S. Kulkarni, 1969)

The use of different teaching tools to facilitate and diversify learning can be seen as far back as early instrumentals, such as wall paintings in caves or the use of different types of accounts for calculating. Various types of writing boards have been in use for at least a millennium. Since their inception, books and brochures have played an important role in education, and so now. Since the beginning of the twentieth century, copy machines such as the Gestetner mimeograph and stencil were commonly used to make small copies for use in the classroom or at home.



Source: Based on History of printing

Fig.3. Illustration of a Mimeograph machine (1918)

The use of the media for educational purposes usually begins in the first decade of the 20th century with the introduction of Sydney Press educational films and mechanical learning machines.

Slide projectors were widely used in educational institutions in the 1950s.

Source: Based on History of printing

Fig.4. Illustration of a Slide projector (1960)

Online education began at the University of Illinois, although the Internet was not available for another nine years, students had access to classroom information through connected computer terminals. The first online course was suggested by the Electronic Universities Network in 1986, and computer learning finally became the first online course to offer real-time interaction. In 2002, MIT started offering free online classes and as of 2009, around 5.5 million students have completed at least one online course.

The concept of distance learning was invented centuries ago in the history of online education and as a basis for understanding what needs it meets. The importance of online learning lies not in its ability to create a distance learning method, but in its ability to make this type of learning process more effective by creating an environment in which the teacher and his or her students can interact with them in real time. The topic of online education emerged mainly in the late twentieth century, when institutions and businesses began to produce products to help students learn. These groups wanted to further develop educational services around the world, especially for developing countries. In 1960, the University of Illinois created a system of connected computer terminals called the Intranet, so that students could access recorded lectures and course materials that they could view or use in their spare time. This type of concept, called PLATO (Programmable Logic for Automatic Learning Operations), was quickly adopted around the world. Many organizations have used a similar method during the development of the Internet.

By the mid-1980s, access to course content had become possible in many college libraries.

In 1994, the first online school was established. Advanced Internet functionality has allowed new communication schemes with multimedia or webcams. The National Center for Education Statistics estimates that the number of high school students enrolled in online distance learning programs increased 65 percent from 2002 to 2005 due to greater flexibility, ease of communication between teacher and student, and quick feedback on lectures and assignments.

Students growing up in this digital age are widely familiar with a variety of media. Large high-tech companies are funding schools to enable them to educate their students with technology.

Educational technologies are not limited to high technologies, but today e-learning technologies have become an important part of society. Modern Educational Technologies include e-learning, learning technologies, information and communication technologies (*ICT*) in education, computer-mediated communication, cyber-learning and milti-modal instruction, virtual education, personal learning environments (*PLE*), networked learning, virtual learning environments (*VLE*), also called learning platforms, mobile learning, and digital education, learning technologies, multimedia learning, technology improvement (*TEL*), computer-managed instruction (*CMI*), computer-based training (CBT), computer-assisted instruction or computer-aided instruction (CAI), computer learning (CBI), internet-based training (*IBT*), flexible Learning, web-based training (*WBT*), online education, digital Educational collaboration and distributed learning. These labels have been used and understood in different ways and relate to the wider field of Educational technology and e-learning. Using technology to align with evidence-based learning is at the heart of technology education, not just on an individual basis.

Today, some of the most influential and easily recognizable forms of EdTech can be seen in the vast and ever-growing worlds of e-learning and mobile learning. E-learning or virtual learning is the use of computers and the Internet for Educational purposes. Mobile learning is the use of mobile technologies such as mobile phones and tablets for learning. Distance learning or online learning at geographic distances uses both mobile and e-learning. All of these alternative descriptive terms are more restrictive than "Educational technology" because they individually emphasize a particular digitization approach, component, or delivery method. For example, mobile learning emphasizes mobility, but otherwise it is basically indistinguishable from Educational technology.

The application of theories of human behaviour to educational technologies comes from learning theory, educational psychology, and technologies of human behaviour. Educational technologies encompass many types of media delivering text, audio, images, animation, and streaming video, and include technology applications and processes such as audio or videotapes, satellite television, CD-ROM, and machine learning, and local learning.

Information and communication systems, whether autonomous or based on local networks or the Internet for Internet-based learning, are at the heart of many e-learning processes and can take place both in the classroom and beyond. This can be self-paced training, asynchronous training, or synchronous instructor-led training. It is suitable for distance learning and in combination with face-to-face training, which is called blended learning. Educational technologies are used by students and teachers at home, in schools for 12, and in higher education, in businesses and elsewhere.

In 2020, many schools around the world had to close due to the COVID-19 pandemic, which resulted in more and more elementary school students participating in distance learning and college students enrolling for online courses to ensure compliance with these organizations distance learning.

Higher education has not improved as some expected today, and today many predict that schoolchildren and students will return to traditional learning formats once vaccination becomes ubiquitous. This puts startups in a quandary: If 2020 means the inclusion of video-based learning, what will happen in 2021-2022?

1.2. Types and necessity of Educational technologies

1.2.1. Synchronous

The workforce today is expected to be well educated and to constantly improve and acquire new skills through lifelong learning. Here, e-learning, defined as online and web-based learning, is one of the strongest answers to the growing need for knowledge. Some researchers have raised concerns about learning outcomes in e-learning, but a review of comparative studies shows that there is no significant difference in learning outcomes, as measured by grades or exam results, between traditional and e-learning. For e-learning initiatives to be successful, organizations and educational institutions need to understand the advantages and limitations of various e-learning methods and techniques. Research can help practitioners by examining the impact of various factors on e-learning effectiveness. Two main types of e-learning are compared: asynchronous and synchronous. Until recently, e-learning initiatives relied heavily on asynchronous teaching and learning tools. However, recent advances in technology and increased bandwidth have increased the popularity of synchronous e-learning.

Synchronous learning is a learning environment in which all people participate at the same time. Lectures are an example of synchronous, face-to-face teaching where students and teachers are in the same place at the same time. Until technology made it possible to create a synchronous learning environment, much of online learning was done using asynchronous learning methods.Starting with synchronous tools that can be used during training

Being available, many people are turning to online education as a way to help reduce transactional distance problems.

Some examples of synchronous learning environments are: students watching a live broadcast of a course in conversation, students and teachers participating in a lesson using web conferencing tools such as BlackboardCollaborate, Adobe Connect, WebEx, Skype, Zoom, BigBlueButton and more. designed to develop and strengthen the teacher-student relationship that can be challenging in distance learning programs.

Although many online Educational programs began with the advent of web conferencing tools, people can read in different places at the same time. For example, the use of instant messaging or live chat, webinars and video conferencing allows students and teachers to collaborate and learn in real time.

1.2.2. Asynchronous

The current discussions are about the usefulness of asynchronous and synchronous e-learning. Media such as e-textbooks, e-mail and forums are often supported, and members maintain a working relationship between students and teachers, even if they are not online at the same time. It is therefore an essential part of corporate e-learning. In fact, many people take online courses because of their asynchronous nature, which combines learning with work, family, and other commitments. Asynchronous eLearning allows students to log into eLearning at any time and upload documents or send messages to teachers or colleagues. Students can spend more time perfecting their material, which is generally considered more thoughtful than synchronized communication.

This approach combines self-learning with asynchronous interaction to facilitate learning and can be used to facilitate learning through traditional campus learning, distance learning, and continuing education. This interconnected network of students and the electronic network with which they communicate is known as an asynchronous learning network.

Online learning resources used to support asynchronous learning include email, mailing lists, multi-threaded conference systems, online forums, wikis, and blogs. Course management systems such as Blackboard, WebCT, Moodle and Sakai are designed to support an interactive experience by allowing users to discuss, post and respond to messages, download and access multimedia content. Asynchronous forms of communication are sometimes complemented by synchronous components, such as text and voice conversations, telephone conversations, video conferencing, and even virtual space meetings, where groups of students can discuss.

1.2.3. Linear learning

Computer-based training (*CBT*) is a self-paced learning activity sent to a computer or portable device such as a tablet or smartphone. CBT content is provided via a local CD-ROM and is usually linear content like reading a book or tutorial on the internet. For this reason, CBT is widely used to teach static processes like using software or running math equations. Computer-based training is similar to Web Based Teaching (WBT), which is provided over the Internet using a web browser. Frequent assessment of CBT training using computerized assessments such as multiple choice questions, drag and drop, radio buttons, simulations, or other interactive tools. Ratings are easily assessed and recorded using interactive

software, which provides immediate end user feedback and readiness status. Users can often print completed records in the form of a certificate. CBT encourages reading outside of traditional teaching methods in textbooks, manuals, or in the classroom. CBT can be a good alternative to printed materials that can include multimedia materials, including videos or animations, to improve the learning process. However, CBT presents some learning challenges. Building an effective CBT usually requires significant resources. A lack of human interaction can limit both the type of content suggested and the type of evaluation and must be complemented by interactive discussions or other interactive elements.

1.2.4. Collaborative learning

Computer supported collaborative learning (*CSCL*) uses teaching methods that aim to motivate learners or get them to solve learning tasks. The concept of CSCL is similar to the terms eLearning 2.0 and Learning Network.

Collaborative learning is different from traditional teaching methods, where teachers are the main source of knowledge and skills. For example, with the advent of Web 2.0 technology, information exchange between multiple people on the Internet has become easier and consumption has increased.

Using Web 2.0 social tools in the classroom enables students and teachers to collaborate, discuss ideas, and share information. After an initial introduction to the use of the tools, the students reported improved knowledge and user-friendliness of Web 2.0. Collaboration tools enable students to develop the technology skills required by today's workforce.

Another type of tool is a collaboration program that allows students and teachers to interact while teaching. One of the examples is MathChat, which you can use to work together to solve problems and respond to reviews. Some apps may allow you to browse new topics or learn on your own by simulating in class. Another example is the Khan Academy, which offers materials in math, biology, chemistry, economics, art history, and more. It has the benefit of combining learning styles as the app has more imagery for visual and face-to-face learners, as well as training and assignments for kinaesthetics. Other post-game apps offer an interesting way to check this out. When it's fun, students become more active. The game is usually accompanied by a sense of development which helps students stay motivated and constantly strive for improvement.

Collaborative learning is a group learning approach in which learners interact to achieve a learning goal or to solve learning problems. The latest advances in smartphone technology allow you to develop and use applications faster with the computing power and storage capacity of a modern cell phone. Many app developers and education professionals view smartphone and tablet apps as collaborative learning environments.

A supportive learning environment can support and encourage people to acknowledge their attendance and participation. Ancestry students learn most thoroughly and effectively, and the material is presented in a logical and orderly manner. The ability to work together by encouraging students to reach out to each other to solve problems and share knowledge not only promotes teamwork, but also leads to learning and better understanding.

1.2.5. Virtual reality (VR)

Virtual Reality, or *VR*, gives the user to interact with a 3D model or virtual environment created by a computer. This environment can be real in the sense that it is known to us on a visible scale, it can be real in the sense that it depicts the physical world known to science but normally invisible, or it can be used to describe a completely fictional one visualize the world. Thus, virtual reality is used in many areas of education including science, archaeology, history, and architecture. The benefit of VR over traditional description methods is that it gives students the opportunity to familiarize themselves with a topic that would be difficult, if not impossible, to illustrate or describe using conventional methods.

Modern education often requires the student to understand complex or abstract concepts or to understand situations that no longer exist. To this end, the usual mechanisms for conveying abstract concepts, especially in the natural sciences, are the use of metaphors and analogies. By analogy, we describe an event or an abstract concept in relation to a generally observed reality. That is, we relate concepts to experience. Experience provides material for building a mental model of the concept, which in turn leads to the basis of knowledge. People learn from their own experience, interact with their environment and use their senses to get information from the world.

Virtual Reality is a technology that replaces touch input from the real world with touch input generated through computer simulations. It provides interactivity by responding to people's movements and natural behaviour in the real world. In this regard, virtual reality can prove to be a powerful resource that can aid learning by providing an environment that allows the learner to experience scenarios and situations instead of imagining them. The empirical nature of virtual reality systems arises from three sources: immersion, interactivity and multi-sensory feedback. The benefit of immersion is that it gives a sense of presence or the feeling that the person is really in the world being depicted.

The goal of VR is therefore to replace the real world with a virtual one and to enable the user to behave like in the real world.

1.2.6. Augmented reality (AR)

Augmented Realities (*AR*) and Virtual Realities (*VR*) use similar hardware technologies and have several factors in common, such as computer-generated virtual scenes, 3D objects and interactivity. The main difference between the two is that virtual reality seeks to replace the real world, while augmented reality complements it. The main augmented reality devices are displays, computers, input and monitoring devices.

The new "Augmented Reality" environment currently offers us unique opportunities to merge the physical and virtual worlds. This is a new way of manipulating how we interact with this world. Without replacing the real world, you find yourself in this technology that expands virtual information to the forefront of the real world, with continuous and implicit monitoring of the user from a point of view and interactive.

Augmented reality technology is not a new problem. It has been used in fields such as military; medicine; engineer design; robot; telerobot; applications for production, service and repair; consumer design; psychological procedures, etc. The display of information using virtual things that the user cannot directly perceive with his or her own senses can enable a person to interact with the real world in ways previously impossible. We can change the position, shape and/or other graphical properties of virtual objects using interaction methods supported by augmented reality. With our fingers or movements of a handheld device such as shaking and tilting, we can manipulate both virtual objects and physical objects in the real world. Augmented Reality can be used for learning, entertainment, or learning to improve the user experience and improve interaction with the real world. The user can move around the virtual 3D image and view it from any point like a real object. The information transmitted by virtual objects helps users to perform real tasks.

It is very important to coordinate a specialists for the possible resolution of augmented reality problems in educational matters. Educators need to work with researchers to develop augmented reality interfaces. Software and hardware technologies play an important and central role in the creation of augmented reality applications. There are engineers who can design different augmented reality environments. For learning in educational technology, however, there is a great need for learning material manufacturers who can design learning materials for augmented reality.

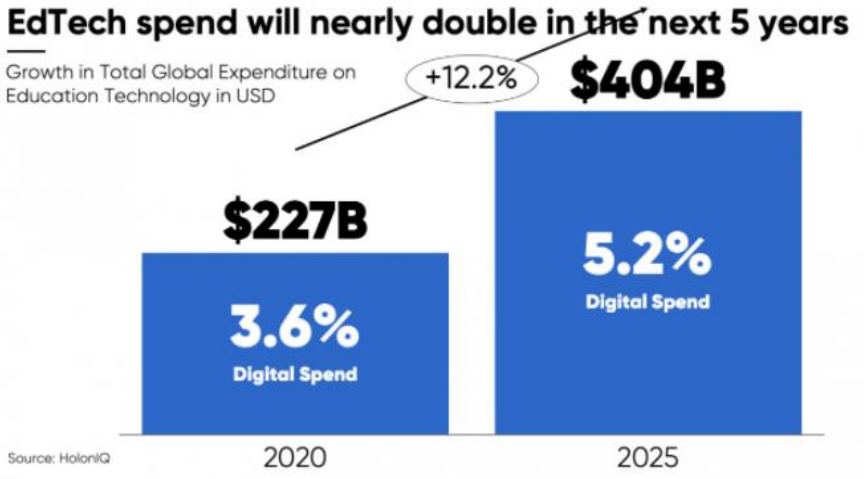
1.3. Identification of the growth factors for the Education Technology market globally

1.3.1. World practice of application and use of Education technologies

Modernity is the age of science and technology. Today's world is very dynamic, and we are witnessing a number of technological innovations in our daily life. There have been tremendous changes in the way people live, which can be explained by the contribution of science and technology. Its influence is reflected in all production endeavors. The contribution of science and technology is felt in almost all areas of human life, including education.

In general, EdTech refers to the digitalization of Education processes. However, the introduction of new technologies cannot be limited only to new solutions in consumption, but also requires the improvement of existing business models, as well as the development of new ones. Taking into account the innovation process itself, from product development to the start of sales and subsequent growth, each of the typical stages involves the search and implementation of a new one. For example, a more convenient way from the student's point of view of delivery of material means online training.

Today's students actively use modern information technologies (personal computers, Internet services, electronic textbooks, etc.), they are brought up on audio-visual products and other elements of computer culture. According to the existing requirements of the modern labor market, a graduate of a professional Education organization must be a competitive, comprehensively developed and educated specialist, possess professional skills, a high level of information competence, which is one of the key aspects of a modern graduate. His knowledge, skills and abilities, personal qualities are decisive in order to be in demand in certain areas of activity.



Source: Based on HolonIQ

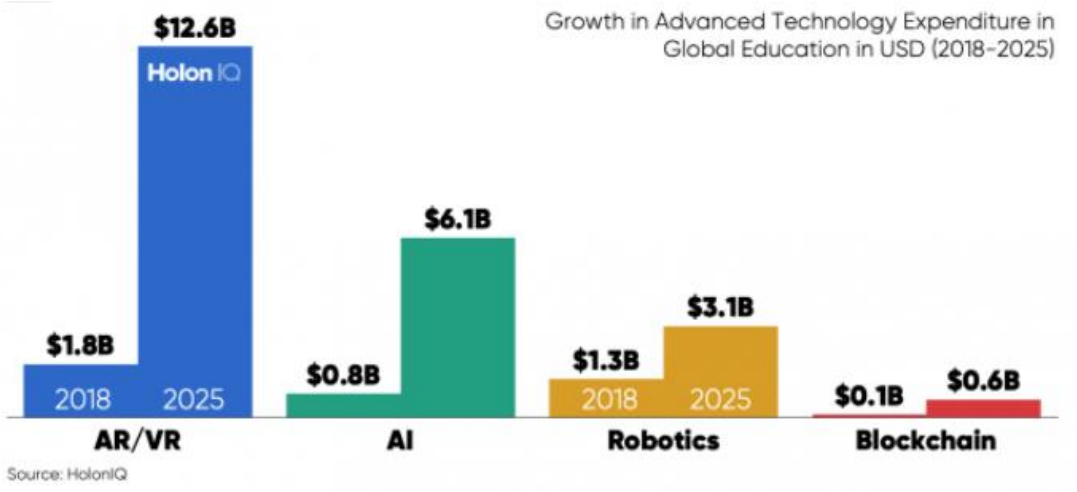
Fig.5. Growth in Total Expenditure on EdTech

Even before COVID-19, Education technology was already experiencing high growth and spread, with global investment in Education technology reaching $ 18.66 billion in 2019. Whether it's language

apps, virtual learning, video conferencing tools, or online learning software. significant increase in use after COVID-19.

While many industries have struggled to stay afloat during the COVID-19 pandemic, the Education technology market has seen explosive growth. According to HolonIQ education spent $ 227 billion on digital in 2020 but they project that digital spending is changing rapidly and is projected to grow to $ 404 billion by 2025.

While the long-term impact of COVID-19 on Education models remains to be seen, over the next few years we expect to see an increase in spending on digital infrastructure in education and an increase in spending in the long term on new digital models.

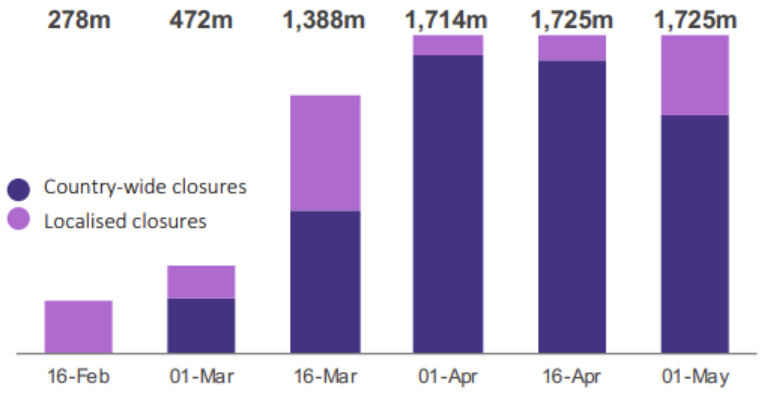


Source: Based on HolonIQ

Fig.6. Advanced Technology Growth in Education

By 2025, the application of advanced technologies in education and training will become successful, as augmented, and virtual reality and artificial intelligence will increasingly be integrated into mainstream education and learning processes. While virtual and imitation learning is already becoming a mainstream of adult learning and development, we are also seeing increased use of these technologies in formal education settings.

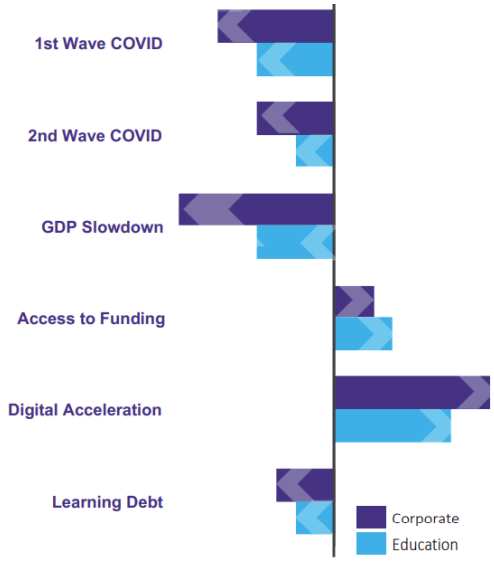
The United States is one of the leaders in the global online education market through the introduction of e-learning courses and distance learning programs. China is another major market in this field. The Indian online education market has seen significant growth over the past couple of years and this growth is expected to continue over the forecast period. India's online market is expected to grow thanks to cost-effective education, accessibility of quality education, government digital initiatives, smartphone user base and internet penetration.



Source: UNESCO, IMF

Fig.7. Leaners impacted by COVID-19 lockdowns

As COVID-19 swept across the world, governments around the world were required to take social distancing measures to slow the spread of the virus and protect vital health infrastructure. The impact of the new coronavirus and related containment measures on education and training is enormous. In the meantime, employers have struggled to introduce teleworking as a global recession looms. Modelling economic recovery from the COVID-19 recession is highly dependent on the success of measures to contain the spread of the virus. Against the backdrop of this bleak prospect, Education Technology (EdTech) offers a lifeline for students, institutions and employers trying to pursue education and learning. Acceptance has skyrocketed as many EdTech companies make their products free during the crisis. The result is a global EdTech experiment on an unprecedented scale. Products will be tested, and only those products that benefit students, teachers, Education institutions and employers will remain sustainable after the crisis. Overall, online education is seen as a long-term trend, with an expanding paid user base and lower customer acquisition costs.



Source: UNESCO, IMF

Fig.8. COVID-19 generates significant distortions to the education and learning environment

1st Wave COVID

- The first wave of COVID-19 triggered an immediate dislocation in supply chains and consumer demand with a variety of online learning opportunities.
- Education has suffered less than corporations because learning can be transferred online. Corporations were less prepared and faced a wider range of problems.

2nd Wave COVID

- The second wave was also painful for corporations. State support was extended.
- In education, a large-scale distance learning experiment was conducted, and it became the second wave with deeper use of EdTech platforms.

GDP Slowdown

- The prolonged global economic downturn has resulted in reduced business spending on education and training, which has had a greater impact than the original COVID-19 pandemic.
- Education has been affected but partially isolated by the state. The recession has led to an increase in demand for retraining and an increase in the duration of training.

Access to Funding

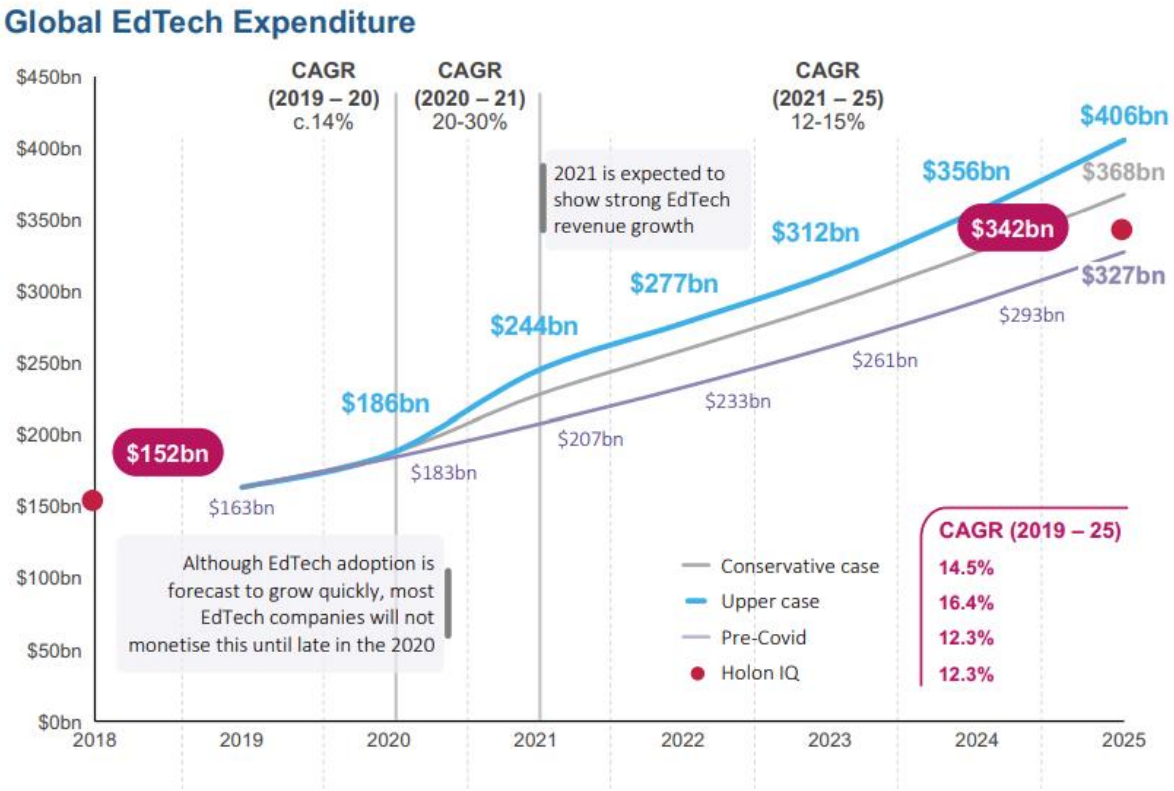
- Private equity has moved to education and training companies with digital delivery capabilities.
- The government's tax base has been reduced but has sought to protect funding for education and training through direct funding and indirect incentives.

Digital Acceleration

- COVID-19 has required massive digital adoption, and for much of the economy, virtual operations will remain and will be improved to improve efficiency in the face of an economic downturn.
- Education is undergoing a similar online transformation. However, unless online is used to improve teacher productivity, financial constraints will slow growth.

Learning Debt

- A significant historical lack of investment in digital learning resources and skills has left both the corporate and education sectors with training debt that impedes development opportunities.
- To ensure that the necessary skills of staff are developed after COVID-19, there is a need to focus on the next generation of training tools.



Source: Holon IQ

Fig.9. Global EdTech spend

Key Trends

- Since the beginning of 2020, the global EdTech market has been valued at $ 186 billion.
- Taking into account the impact of COVID-19, the market is expected to grow from 14.5% to 16.4% per year to a total value of $ 368 billion to $ 406 billion in 2025.
- The COVID-19 crisis is driving an increase in the use of technology to replace, complement and improve teaching and learning in the context of social distancing.
- During 2020, EdTech companies were focused on increasing market share and therefore often gave away their products for free.
- Spin-up revenue became significant in 2021 as many of the tools tested in 2020 were converted to paid subscriptions.
- This led to a dramatic change in costs for EdTech between 2020 and 2021.
- By 2025, we expect this phased change in usage to result in additional annual revenue of $ 40 billion to $ 90 billion at EdTech.
- Thus, EdTech's share of education and training spending is expected to grow from 3.1% in 2019 to 5-6% in 2025.

Table 1. Global EdTech Expenditure

	EdTech Expenditure (% of Total)	2019-2025 CAGR	Covid-19 Impact on EdTech	Long-term, Trends on EdTech
Early Years	***$5.6bn*** *(3%)*	***c.4%***	• Decreased demand for nursery management and parent communication software in the short term • Growing adoption of B2C learning applications.	• Positive main long-term drivers • Most EdTech supports / management tools. Digital assets - a small but growing segment • The emergence of large differentiated groups that consume technology more actively.
K-12	***$77.2bn*** *(47%)*	***11-12%***	• Widespread use of online learning methods • Expected to further positively impact the use of K-12 EdTech even after blocking • Reallocation of costs from infrastructure to resources	• Growth in private service provision drives EdTech adoption • Next generation digital learning resources are expected to grow, including adaptive learning and VR / AR. • The growth of blended learning with traditional face-to-face learning in parallel with online learning.

Table 1. is continued on the next page

Continuation of Table 1.

HE	***$14.3bn****(9%)*	***16-17%***	• Surge in Demand for Online Courses - Online Program Managers and MOOCs Benefit • Step-by-step change of teachers in the development of digital tools. • Reallocation of costs from infrastructure to resources	• Steady growth of online courses • Convergence of OPM and MOOC reduces profitability and improves quality. • Growth of resources for adaptive learning and analytics.
B2C	***$12.1bn*** *(7%)*	***25-32%***	• Strong short-term growth in adoption of digital resources and virtual learning by parents	• The ongoing shift in tutoring towards online delivery
Training	***$54.0bn*** *(33%)*	***16-18%***	• Move on to online training so you don't miss out on the cost and flexibility benefits.	• Strong main drivers of growth • Technology facilitates VO mergers through partnerships with employers and the development of microcredit. • Confirmation of required credentials • Combining training with human capital services

Source: Global education spend model, UNESCO Institute for statistics

1.3.2. Analytical review of the use of Education technologies under the "Digital Kazakhstan" program

Objectives of the «*Digital Kazakhstan*» state programme are: to accelerate the development of the economy of the Republic of Kazakhstan and improve the quality of life of the population through the use of digital technologies in the medium term, as well as create conditions for the transition of the economy of Kazakhstan to a fundamentally new trajectory of development.

Achieving this goal implies movement in two vectors of development:

Digitalization of the existing economy - for a pragmatic start, consisting of specific projects in the real sector, the launch of digitalization projects and technological re-equipment of existing sectors of the economy, government agencies, and the development of digital infrastructure.

Building the digital industry of the future - ensuring long-term sustainability, launching the digital transformation of the country by increasing the level of human capital development, creating institutions for innovative development and, in general, the progressive development of the digital ecosystem. The program, which will be implemented over the period 2018-2022, will give additional impetus to the technological re-equipment of the country's flagship industries and create conditions for broad and long-term productivity growth.

The program consists of five main areas:

1. "***Digitalization of economic sectors***" - the direction of transformation of traditional sectors of the economy of the Republic of Kazakhstan using breakthrough technologies and opportunities that will increase labor productivity and lead to an increase in capitalization.

2. "***Transition to a digital state***" - the direction of transforming the functions of the state as an infrastructure for providing services to the population and business, anticipating its needs.

3. "***Realization of the digital Silk Road***" - the direction of development of high-speed and secure infrastructure for transmission, storage and processing of data.

4. "***Development of human capital***" - the direction of transformation, covering the creation of the so-called creative society to ensure the transition to new realities - the knowledge economy.

5. "***Creation of an innovation ecosystem***" - the direction of creating conditions for the development of technological entrepreneurship and innovation with stable horizontal links between business, the scientific sphere and the state. The state will act as a catalyst for the ecosystem, capable of generating, adapting and introducing innovations into production.

Digitalization efforts are creating a new society where human capital is being actively developed knowledge and skills of the future are being nurtured from the earliest years, increasing the efficiency and speed of business through automation and other new technologies, and the dialogue of citizens with their states is becoming simple and open. The digital revolution is taking place right in front of us. These

changes are due to many technological innovations that have been introduced in different industries in recent years. The way in which the production and acquisition of value added has changed dramatically, new requirements for the education and labour skills of people are emerging. Commercial Internet of things is 7 shaping the future of production industries by using flexible and intelligent production capabilities, and it provides a revolutionary growth in productivity. Artificial intelligence is being introduced, including in conservative industries such as financial services and medicine. 3D printing technology is already contributing to the transformation of industries such as education, aviation, logistics, biomedicine and automotive industry.

Even before the Covid-19, the process of digitization affected virtually any country in the world. At the same time, the priorities of digital development are determined by each country. More than 15 countries in the world are currently implementing national digitalization programmes. Advanced countries in the digitalization of national economies are China, Singapore, New Zealand, South Korea and Denmark. China in its "*Internet Plus*" programme integrates digital industries with traditional ones, Canada is creating an ICT hub in Toronto, Singapore is building a "*Smart economy*", which is the driver of ICT, South Korea is focusing on the development of human capital, entrepreneurship and the diffusion of ICT achievements in its "*Creative economy*" programme , and Denmark focuses on public sector digitalization.

One of the steps towards creating the conditions for transition to an information society was «*Information Kazakhstan 2020*» State Programme, approved in 2013. As a basis for digital transformation of a country's economy, the Programme has contributed to the development of the following factors: the transition to the information society, improvement of public administration, establishment of "open and mobile government" institutions, increasing accessibility of the information infrastructure not only to corporate structures but also to the citizens of the country. According to the results of three years of the State Program "Information Kazakhstan 2020", the measures of activities have been fulfilled by 70%, the target indicators have been exceeded by more than 40%.

However, the rapid development of IT on a global scale dictates its rules and requires an adequate and timely response, especially during the Covid-19 Pandemic. The next step for Kazakhstan, therefore, is to initiate the process of transforming the key sectors of the national economy, education, health, and the state's interaction with society and the business. Head of State, in a message to people of Kazakhstan on 31 January 2017, has announced the Third modernization, in which the digitalization is a mainstay, has noted the need to cultivate new digital industries and that "it is important to promote communication, universal access to fibre-optic infrastructure. The digital industry is developing all other areas. The criteria for achieving the objectives of the Third Modernization - Kazakhstan shall join the 30 developed countries of the world by 2050. To this end, the average annual economy growth rate should be 4.5-5%. Key drivers in the new growth model should be the economy sectors that can provide 70% of GDP

growth, increase employment, exports and investment attraction. Accordingly, priority areas in the vanguard of the third modernization have been approved. The remaining 30% of growth is to be provided by the social sectors (healthcare, education) and ICT in short-term. In the fifth priority of the Third Modernization, President of the country has identified the need to combat cybercrime, religious extremism and terrorism. In the message of the Head of State, a separate request has been made to the Government and National Security Committee to develop "*Cybershield of Kazakhstan*" concept aimed at ensuring the information and communication security of society and the state in the field of information and communications, as well as protecting privacy of citizens in using information and communication technologies.

The digital economy requires digital skills of the population to benefit from it. At present, the level of computer (digital) literacy is 85.1 % and needs to grow in the coming years (see table.2,3). To date, the Ministry of Education and Science is already introducing a number of initiatives:

1) In 3-4 grades, the subject of "*Information and communication technology*" has been introduced, generating common basic knowledge of modern information technology for effective use in learning and daily life;

2) There are 372 robotics clubs that are teaching the common basics of robotics programming.

However, taking into account the new requirements for younger generation, there is a need to review the content of secondary education through the development of creative thinking and technical skills. In technical and professional, higher, postgraduate education, according to data from the Ministry of Education and Science of the Republic of Kazakhstan:

1) On the basis of 3 (three) specialties, the subject of "*Information and communication technology*" has been introduced to ensure that students have a basic knowledge of the use of ICTs in practice within chosen profession;

2) Professional standards are developed which will become the main basis for technical and vocational education programmes, higher education and postgraduate studies. Also to date, 14.5 thousand Education grants have been allocated for the training of ICT specialists over the period 2014-2016, while the output for the same period was 94 thousand people. At the present time, there is a shortage specialists in ICT specialties with professional knowledge and skills in the chosen profession. Digitalization is far ahead of the existing production requirements system for occupations in the labour market. Lack of an operational link between labour market and education system can lead to preparation of untapped staff and release of personnel in "dying" occupations. Content of all levels of education needs to be fully reviewed through the development of digital skills of all professionals.

Table 2. Digital Kazakhstan Program implementation outcomes

Target Indicator	Responsible executor	Source of information	Units of measurement	2016/ 2017	including by years				
					2018	2019	2020	2021	2022
1	2	3	4	5	6	7	8	9	10
Level of population digital literacy	EEA, MDDIAI, interested state bodies	MNESC statistical data	%	-	77	78.5	80	81.5	83
Share of Internet users	MDDIAI, communication providers «QazTech Ventures»	Statistical data	%	77	78	79	80	81	82

Source: Based on program of the Digital Kazakhstan

Development of human capital

Task 1. Increased digital literacy, in middle, technical and vocational, higher education:

Table 3. Goals of development of human capital

Target Indicator	Responsible executor	Source of information	Units of measurement	2016/ 2017	including by years				
					2018	2019	2020	2021	2022
1	2	3	4	5	6	7	8	9	10
1. Share of schools that have introduced basic programming in primary education	MES	MES data	%	_	_	24	48	73	100
2. Increase in the number of professionals with basic ICT competencies	MES	MES data	thou.people	250	260	270	280	290	300
3. Number of ICT professionals graduated (annually)	MES	MES data	thou.people	17	18	20	22	25	30

Source: Based on program of the Digital Kazakhstan

Restructuring and modernization of production will continue with a view to improve productivity and environmental performance. This direction assumes creating conditions for stimulating digitalization industry (introduction of Industry 4.0 elements) to enhance its competitiveness by improving control of production processes, reducing losses, reducing production costs, increasing productivity, efficiency and safety of production and other. Main elements of Industry 4.0 include additive technologies, collaborative robots, hardware-optimized equipment, unmanned vehicles, predictive maintenance, machine training and artificial intelligence, cloud technologies, digital and virtual engineering, intelligent planning and production control, integration of production process

management information systems, industrial Internet, monitoring of systems status, complementary and virtual reality, etc. Digitalization industry will focus on developing its own technologies and competencies, ensuring coordination among participants in industrial and innovation ecosystem, removing barriers, popularizing digital technologies and developing appropriate enabling measures.

In order to achieve the set Programme goals for staff qualification and at the same time, taking attention on the during the Covid situation, the education system will be fully updated in accordance with the best world practice. New education will respond to the needs of digital economy, focusing primarily on skills in analysing information and developing creative thinking rather than memorization facts and formulas. In order to increase digital literacy, develop creativity and critical thinking of the younger generation, the subject "*Fundamentals of Programming*" will be gradually introduced from the 2nd grade. Curricula (5-11 grades) will also be updated, primarily 49 in the revision of programming languages to include STEM elements (robotics, virtual reality, 3d printing and others). In order to develop and support talented youth, regular hackathons, competitions and contests, as well as various robotics and programming clubs will be held. At the same time, teachers' skills in new digital technologies will be continually upgraded to improve and absorb new knowledge. In the area of technical and vocational education, the same activities will be carried out to increase the access of students to resources and knowledge as for secondary education (including hackathons, olympiads, competitions and their training infrastructure). In addition, model curricula and programmes will be updated on the basis of professional standards and labour market requirements. New model curricula and programmes will focus on the training of specialists in the area of design, administration and testing, taking into account the development of coding skills. However, the subject of "*Informatics*" will be introduced to provide basic digital skills to technical and vocational education professionals. Further training will be provided to teachers on Education programmes that have competence in the use of ICT. In higher, postgraduate education, model curricula and programmes will also be updated on the basis of professional standards and requirements of the labour market, taking into account the introduction of "*Information and communication technology*" discipline in all occupations. In order to ensure the graduation of required specialists, the content of education programmes in ICT fields will be reviewed. In order to bring the industry and education closer to the Education process of the country, representatives of enterprises will be recruited from extrabudgetary funds through opening of centres of competence at the university level. In addition, ICTs will be opened by chairs of universities in enterprises where courses for students in ICT-based projects in the economic sectors would be conducted. Improving the digital literacy of the population (training, retraining) In the area of retraining, local executive bodies will continuously provide education and retraining in digital skills to the population, including unemployed. This event would also involve representatives of small and medium-sized businesses. In order to increase Education opportunities for all those who wish to acquire the

necessary skills, a national open education platform will be established to provide online courses, primarily providing basic training in engineering and technical areas involved, with the involvement of large groups of the best professors from Kazakh universities and representatives of production. With that, by applying the concept of lifelong learning, enterprises will conduct corporate training for professionals, reinforcing the communicative and technical skills of the profession. In general, the Programme will open up opportunities for increased interaction between Education institutions and entrepreneurs to train competitive professionals.

2. METHODOLOGICAL PART OF THE ASSESSMENT OF THE IMPACT OF PANDEMIC ON EDUCATION SYSTEM IN THE CASE OF THE REPUBLIC OF KAZAKHSTAN

This chapter outlines the steps taken to achieve the goals of the study which will be highlighted and discussed. This includes the process of getting respondents for this research, their population and the sampling techniques used. The method of research design, data collection technique, research instruments used, and data analysis method utilized in order to achieve the target goals and objectives for this study will also be outlined and discussed by the researcher. These keywords influenced the organization of subtopics in this chapter.

As stated in the first chapter of this study, the objectives of this study are to determine the effect of the Covid-19 Pandemic on EdTech, to evaluate the distance education method used in this crisis effect on the students of the Republic of Kazakhstan and also to offer some recommendations for distance education courses conducted for the during the Covid-19 pandemic to improve their quality.

The above-stated objectives guide the formation and design of survey questions in order to obtain the desired response data to achieve these objectives.

2.1. Research design

The study will apply *mixed research methods*. This method opted because it gives a voice to study participants and ensure those study findings are grounded in participants' experiences.

- For the *qualitative method* will be conducted document analysis type (it is a form of qualitative research in which documents are interpreted by the researcher in order to express and articulate the subject of the assessment (Bowen, 2009) with public records (the official, ongoing records of an organization's activities. Examples include mission statements, annual reports, strategic plans).
- For the *quantitative method*, data will be conducted from the results of a questionnaire-based study with 384 (or more) students from the Republic of Kazakhstan. An area of interest such as the accessibility to education technology, the effect on the students' motivation, or the change in teaching methodology and evaluations, are measured in the study. The findings especially show that some significant problems exist because of the quick transformation of the Education system from face-to-face to online.

2.2. Study population

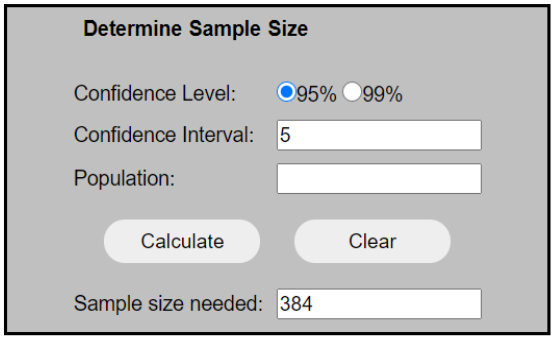
This involves the total sum of individuals who were selected for the sample of the study. The study population includes *schoolkids* and *students* who are most affected by the pandemic on the education system. The population was selected so that the researcher could get answers to research questions.

2.3. Sampling technique

The target group is people of different ages (schoolchildren and students). The type of sampling method implored in this research is *Stratified Random Sampling* (this method allows for high representativeness). The population is branched into two non-overlapping, homogeneous groups (strata) from the strata age and Education achievements (secondary general education in Kazakhstan contains 3 stages: primary/elementary (grades 1-4), middle (*grades 5-9*) and high (*grades 10-12*). Final members are *schoolkids* and *students)*.

2.4. Sample size

For this research, a sample of 384 people will be taken for the interview. The calculation was based on the formula provided by the Public Service of Creative Systems survey software. It helps to determine how many people to survey in order to get results from the target population.



Source:Based on creative research systems

Fig.10. Sample size calculator

Here are the formulas used in Sample Size Calculator:

$$SS = \frac{Z^2(p)*(1-p)}{c^2} \quad (1)$$

$$SS = \frac{1.96^2*0.5(1-0.5)}{0.05^2} = 384.16 \sim 385 \quad (2)$$

Where:

Z - Z value (e.g. 1.96 for 95% confidence level)

Table 4. Confidence level

Confidence Level	z-score (±)
0.70	1.04

Table 4. is continued on the next page

Continuation of Table 4.

0.75	1.15
0.80	1.28
0.85	1.44
0.92	1.75
0.95	1.96
0.96	2.05

Source:Based on creative research systems

p - percentage picking a choice, expressed as decimal (.5 used for sample size needed)

c - confidence interval, expressed as decimal (e.g., .04 = ±4)

2.5. Source of data

The sources of the collected data will be **primary data** obtained directly from respondents through questionnaires and **secondary data**, which includes materials collected in the field of education, technology and pandemic.

2.6. Questionnaires

For this research, the questionnaire contained structured questions in order to obtain information on the impact of the pandemic on the education system and the effectiveness of the implementation of distance learning. The questionnaires will be provided to the respondents with a guarantee of confidentiality, anonymity, and convenience. This method will allow the researcher to collect a large amount of information from many people in a short period of time and with minimal cost, which also makes it easy to quantify and analyze the results from a more scientific point of view.

In my research, I used three main types of questions: multiple-choice, numeric open-end and text open end. Examples of questions are given below:

1) Пожалуйста, выберите один из вариантов ниже/ Please select one of the options below.
   - Студент/ Student
   - Школьник/ Schoolkid

Key point: The study population includes schoolkids and students who are most affected by the pandemic on the education system.

2) Я беспокоюсь, что пандемия Covid-19 повлияет на мое образование на долгие годы/ *I'm worried the Covid-19 Pandemic will impact my education for years to come*

Key point: The field of higher education can be called one of the areas that remained most affected by the pandemic. Moreover, it was one of the less prepared to move all activities into an online format. For this reason, it was very important to find out how this affected students and schoolchildren.

3) Оцените, пожалуйста, работу вашего вуза/школы по организации перехода на дистанционное обучение во время пандемии?/ *Please evaluate the work of your university/school in organizing the transition to distance learning during a pandemic?*

Key point: The question helps to consider how the universities of Kazakhstan coped with the forced changes in the Education process in order to note the positive practice in this direction and identify problematic issues and issue recommendations for future development.

4) Как переход на дистанционное обучение повлияло на качество получаемых знаний?/ How has the turn to distance learning affected the quality of the acquired knowledge?

Key point: The question helps to identify how we can improve and make some changes in education system and create a convenient environment for the future generation.

5) Сталкивались ли вы с техническими проблемами во время учебы? (Перебои в работе интернета, спец.программ и сайтов)/ *Have you faced technical problems during your studies?*

Key point: The question helps to determine the technical issues that faced respondents during the distance learning process.

6) Какие образовательные инструменты и источники использовались в вашем учебном процессе? (Пожалуйста, перечислите все варианты)/ *What Education tools and sources were used in your teaching process?*

Key point: The question helps to understand what type of EdTech tools were used mostly during the distance education process and was it enough for fulfilling all work.

7) Оцените, пожалуйста, уровень удобства использования образовательных порталов и источников в учебном процессе?/ *Please evaluate the level of ease of use of Education portals and sources in the Education process?*

Key point: The question helps to understand which part of EdTech tools they need to take into consideration for further improvement.

8) Насколько вы были удовлетворены учебными материалами, предоставленными во время пандемии?/ How satisfied were you with the training materials provided during the pandemic?

Key point: The question helps to determine how satisfied the respondents were with the material provided and whether we need to make changes to this process.

9) Обладали ли учителя достаточными знаниями об инструментах/источниках онлайн-обучения?/ *Did the teachers have sufficient knowledge of online learning tools/sources?*

Key point: This question helps determine if educators have sufficient digital literacy knowledge to use all EdTech tools.

10) Довольны ли вы системой образования в Казахстане?/ *Are you satisfied with the education system in Kazakhstan?*

11) Есть ли что-нибудь, что вы хотели бы изменить в методе обучения, применяемом во время пандемии?/ *Is there anything you would like to change about the training method used during a pandemic?*

Key point: This question helps to identify key aspects and issues of the education system in Kazakhstan from respondents' views and following this to provide recommendations on what do we need to do for further improvement.

2.7. Data analysis

Data will be presented statistically for an accurate explanation. The collected data will be presented in tables and graphs using words, numbers and percentages. In addition, a five-point rating scale will be proposed that will allow a person to express how much they agree or disagree with a certain statement.

Empirical findings and data analysis

This chapter presents a presentation of research findings, data analysis, discussion and materials collected from the questionnaires of student's opinion.

Questionnaire Survey Result In this section, the data from the survey will be collated and presented as a table and graphs.

3. RESULTS AND ANALYSIS OF EFFECT OF COVID-19 PANDEMIC ON EDUCATION TECHNOLOGY IN KAZAKHSTAN

3.1. Result of the survey collected from the students/ schoolkids opinions

This section aims to evaluate the empirical findings of the study. The purpose of this study is to analyze the impact of the Covid-19 pandemic on the education system and determine the effectiveness of distance learning methods during this crisis. This guides the construction of the research instrument and interpretation of the data obtained from respondents.

The research questions that guide the design and analysis of this study as stated in the introductory chapter include the following:

- *How has the Covid-19 Pandemic impacted on EdTech in Kazakhstan?*
- *How did the Covid-19 process, and the distance education method applied in this process affect the students of the Republic of Kazakhstan?*
- *What are students' opinions on distance education courses given to them during the coronavirus (Covid-19) process, the presentation ways of these courses, materials used in courses and how can courses be made with higher quality?*
- *What recommendations can they give to improve the education system?*

In this chapter, the findings and data obtained from this study will be evaluated, presented and discussed. The study population includes school kids and students who are most affected by the pandemic on the education system.

The chapter begins with a brief overview of the data collected from participants in the research, and the demographic characteristics of the respondents will be highlighted and reviewed. The results of the respondents' responses will be examined and a brief summary of the finding from the response data.

Response rate to survey

Within the framework of this research, a questionnaire was prepared:

1) For university students;

2) For schoolchildren.

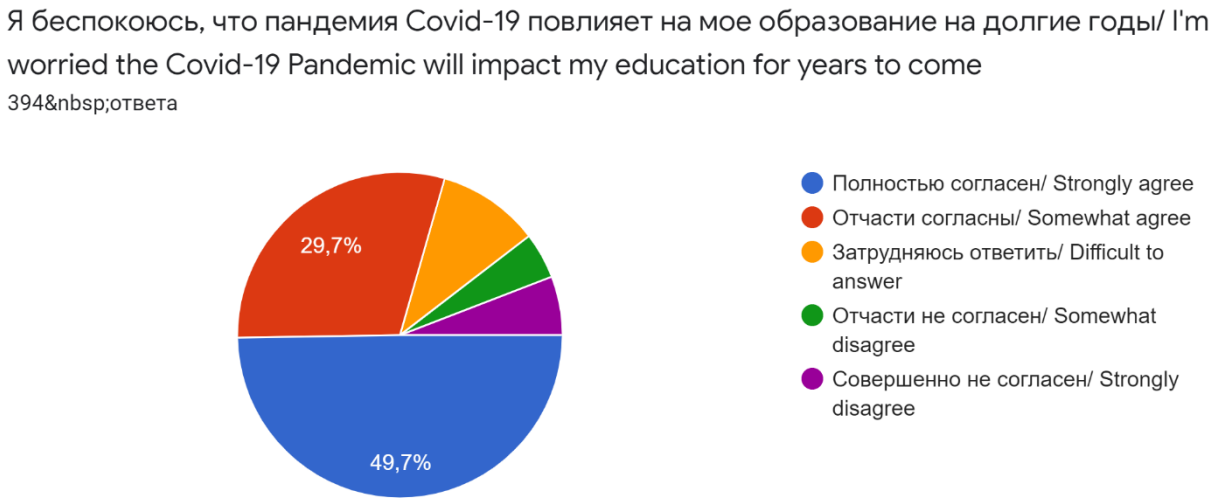
The questionnaire consisted of 11 questions (*closed-end and open-end*) in *Russian* and *English* to make it easy for the respondents to understand. The survey was compiled on the *Google Forms platform* and sent to respondents *by email addresses*. *A total of 394 responses* were received from two groups of respondents: from **students** (**213 people**) and from **schoolchildren** (**181 people**). Based on the responses received, general trends in the development of distance and online education were identified and recommendations for further development were developed.

Findings on respondents' opinions on the Covid-19 process and the distance education method applied in this period are presented below. These findings are demonstrated in graphs.

Source:Based on Google Forms survey (prepared by the author)

Fig.11. Illustartion of a sample size

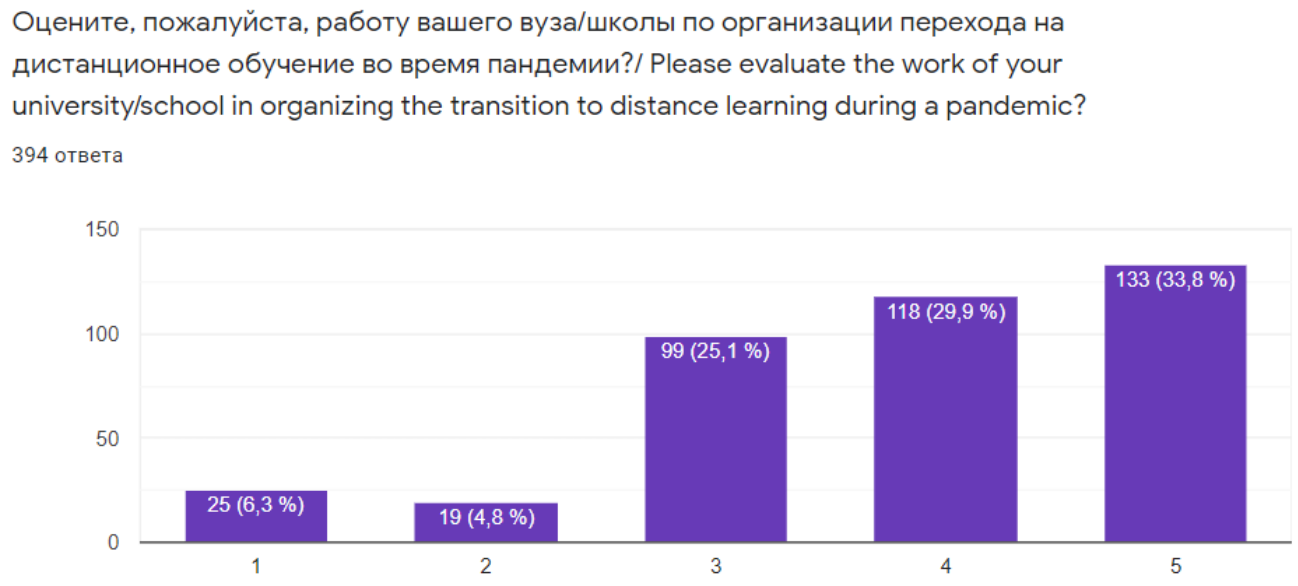
According to the Fig.11 we can see the percentage of the participants from each group (*schoolkids* and *students)* who are most affected by the pandemic on the education system and the total number of the respondents 394 *(213 students - 54,1%; 181 schoolchildren – 45,9%).*



Source:Based on Google Forms survey (prepared by the author)

Fig.12. Graph of the impact of the Covid-19 on the Education in Kazakhstan

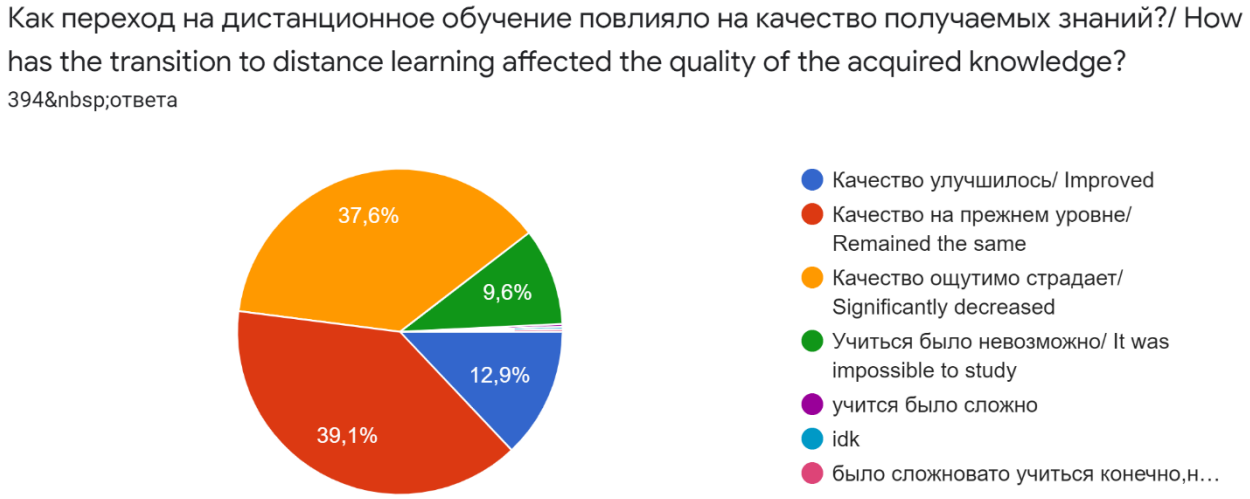
According to Figure 12, 49.7% of students agree that the Pandemic will affect their education for years to come. 29.7% of the students chose that they partly agree, 10.2% of the students found it difficult to answer this question, and 5.8% and 4.6% of the students think quite the opposite.



Source:Based on Google Forms survey (prepared by the author)

Fig.13. Graph of the evaluation of the organization process on turning to the distance learning process during the Covid-19 (Pandemic)

According to Figure 13, 133 respondents (33.8%) rated the institution's ability to be highly organizational in the transition to distance learning during a pandemic. The rest of them (111/29.9%) and (99/25.1%) were rated 3-4 points. (25/6.3%) and (19/4.8%) of the students rated the readiness of the transition by 1-2 points out of 5.

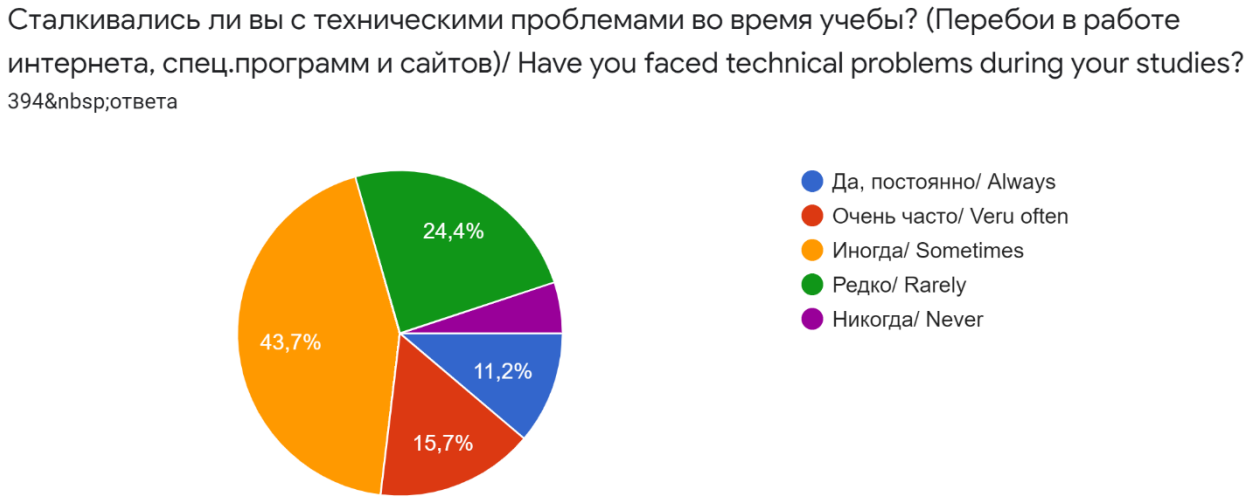


Source:Based on Google Forms survey (prepared by the author)

Fig.14. Graph of the effect of the Covid-19 on the quality of the acquired knowledge

According to Figure 14, the participants assessed the quality of the knowledge gained during the pandemic and according to the survey, 39.1% (154) said that the quality remained at the same level, but 37.6% (148) of the students noted that the quality of the knowledge gained significantly suffers. I would like to note that more than half stated that the quality suffered significantly compared to the traditional

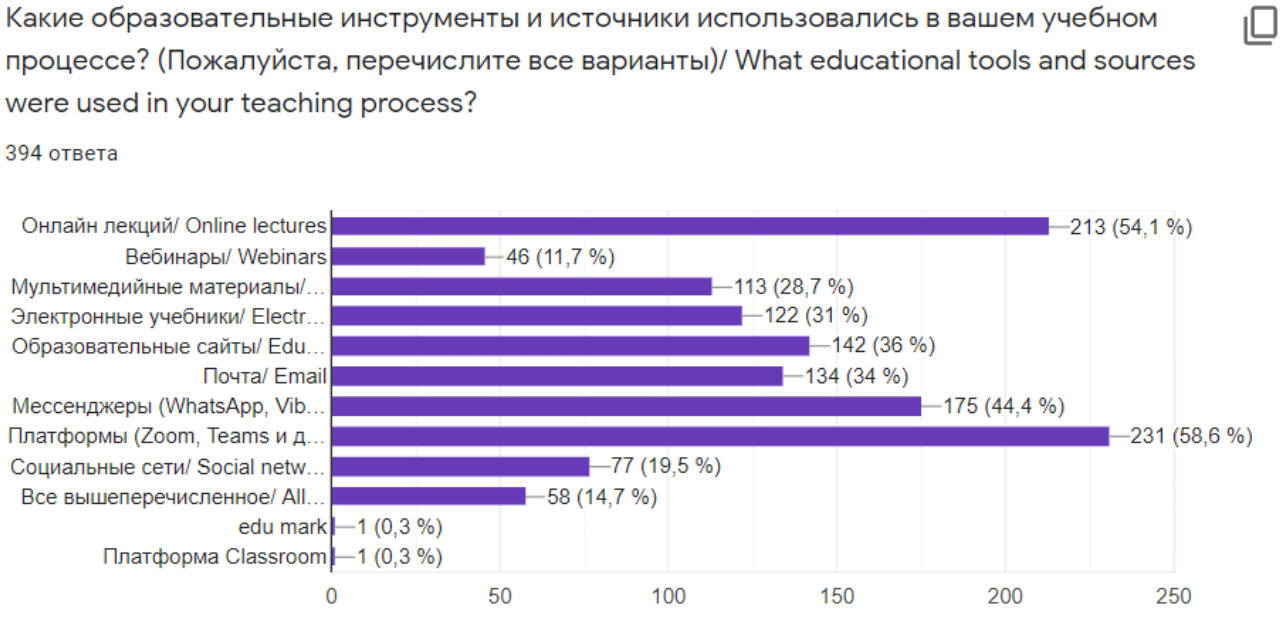
method, since 9.6% (38) of the students answered that it was impossible to study and only 12.9% (51) answered that the quality improved



Source:Based on Google Forms survey (prepared by the author)

Fig.15. Graph of the frequency of the technical issues during distance learning process

According to the following Figure 15, the participants had to answer how often they encountered technical problems during the Education process According to the survey, 43.7% (172), almost half of the participants answered that they sometimes faced technical interruptions and problems, the rest 15.7 % (62) and 11.2% (44) answered that they faced problems very often and constantly, and only 11.2% (44) and 5.1% (20) answered that they rarely encountered technical problems or did not encounter them at all.

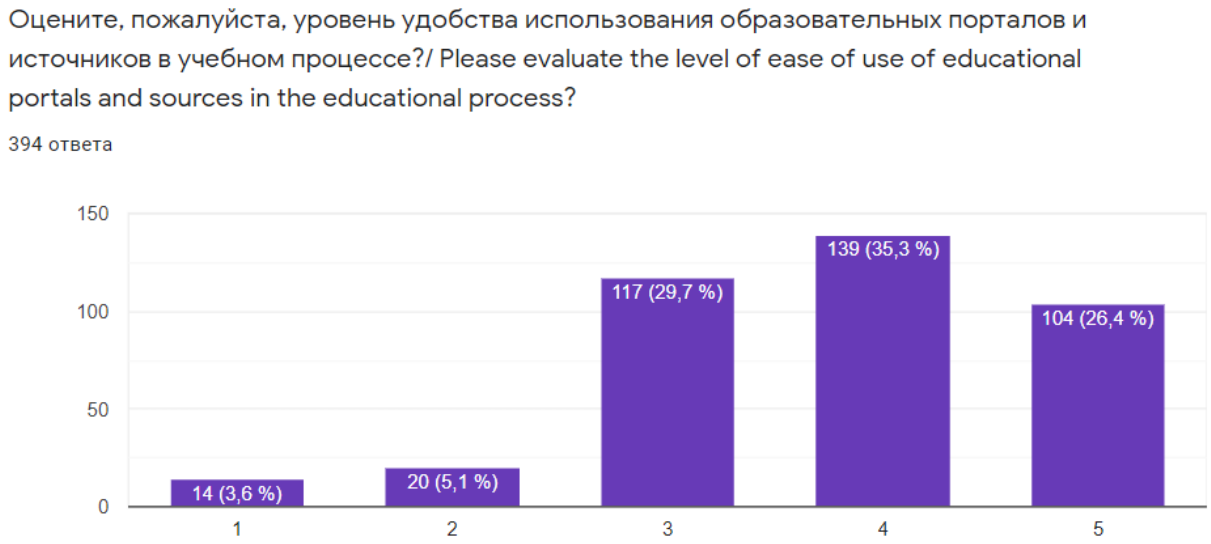


Source:Based on Google Forms survey (prepared by the author)

Fig.16. Graph of the most used EdTech tools during Covid-19 (Pandemic)

According to the following Figure 16, the participants had to answer what Education tools and sources were used in the Education process and according to the survey a large number of participants/

more than half, 58.6% (231) and 54.1% (213) indicated Online lectures using special platforms such as: Platonus, Moodle, Microsoft Teams, Zoom, Webex Cisco, and more. Also, some used multi-media materials, electronic textbooks, Education sites (such as *Balapan, EL ARNA, Daryn.Online, Kundelik, BilimLand*).



Source:Based on Google Forms survey (prepared by the author)

Fig.17. Graph of the level of usability of Education portals and sources in the Education process

According to the following Figure 17, the participants had to rate the level of ease of use of Education portals and sources in the Education process, and according to the survey, a larger number of participants, 35.3% (139) and 26.4% (104), were satisfied with the convenience and begging to use Education portals and sources in the Education process.

Source:Based on Google Forms survey (prepared by the author)

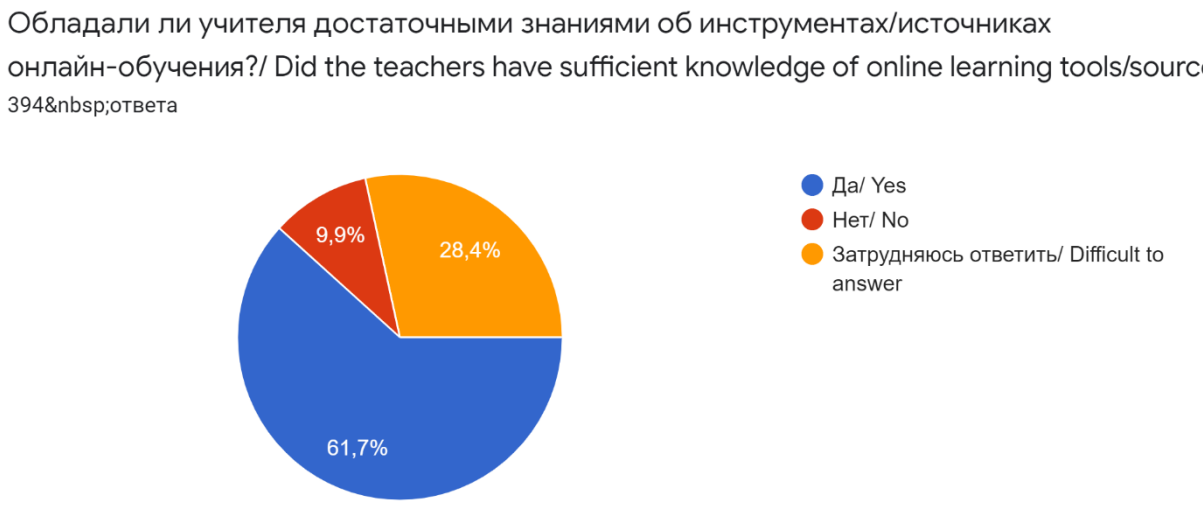
Fig.18. Graph of the level of satisfaction with the training materials provoded during the pandemic

According to the following figure 18, participants were asked to rate how satisfied they were with the training materials provided during the pandemic. According to the survey, 32.2% (127) and 31.5% (124) of the students were quite satisfied with the teaching and Education materials in the Education process, and only 5.1% (20) and 3.6% (14) of the students answered that were not satisfied with the materials.

Source:Based on Google Forms survey (prepared by the author)

Fig.19. Graph of the level of satisfaction with the education system in Kazakhstan

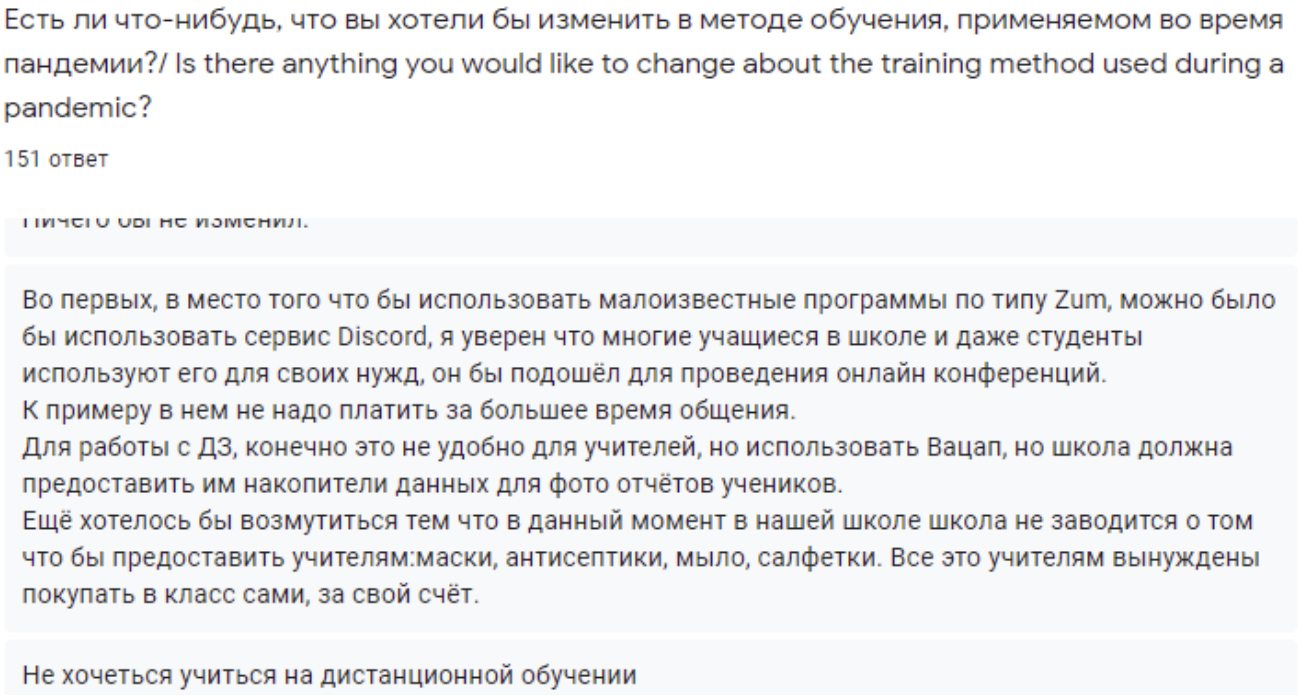
According to the following figure 19, the participants were to assess the knowledge of the teaching staff on the command of Education tools / sources of online learning in the Education process. According to the survey, more than half, or rather 61.7% (243) of the students answered yes, and 28.4% (112) and 9.9% (39) of the students noted that they found it difficult to give an exact answer or were not at all satisfied.



Source:Based on Google Forms survey (prepared by the author)

Fig.20. Graph of the level of knowledge of teaching staff on the use of online learning tools.

According to the following figure 20, the participants had to choose how they feel about the Education system in Kazakhstan and whether they are satisfied at the moment. According to the survey, 46.4% (183) of the students and 15.5% (61) answered that they were satisfied / satisfied with the Education system, but the other part 21.6% (85) and 9.6% (38) noted that they were not satisfied, or they find it difficult to answer about this.



Source:Based on Google Forms survey (prepared by the author)

Fig.21. The opinions are given by respondents regarding e-learning process

According to the following figure 21, the participants were asked to share their views on the current situations and their attitude/recommendations to this. According to the survey, responses were received such as:

- **Respondent #1:** *"The interest of teachers in teaching students, as some teachers do not understand how to teach students online and all stop doing it".*
- **Respondent #2:** *"I would like everyone to switch to offline training, because online training does not provide as much knowledge as offline training".*
- **Respondent #3:** *"It is difficult to understand everything without practice, so you need to at least visually demonstrate the work where the use of technology is required".*
- **Respondent #4:** "*It is better to study at school and gain knowledge, where they explain in detail and clearly what and how. It will be difficult to pass exams while studying online".*
- **Respondent #5:** *"Because of this virus, we were forced to study remotely. Of course, it became more difficult to study, since all the same online lessons are not like regular offline ones. Because of this, gaps in learning became visible. And I think that both students and teachers had a hard time. I think during this time the quality of knowledge has deteriorated".*

- **Respondent #6:** *"I would like the teachers to treat this issue responsibly, and not assign all this to the students".*
- **Respondent #7:** *"Instead of using little-known programs like Zoom, it would be possible to create domestic Education portals, I am sure that many students at school and even students have encountered technical problems many times".*
- **Respondent #8:** *"A more user-friendly app for learning".*
- **Respondent #9:** *"During distance learning, for some reason, they gave homework when we already spent almost the whole day for the sake of studying. Teachers were late on schedule and assignments were often dispatched in the late afternoon or night. It was difficult for both teachers and students. We had books but often we could not understand them".*
- **Respondent #10:** *"In terms of programs, they are not finalized. In general, our Education system is not ready for such a training system".*
- **Respondent #11:** *"There are a lot of problems: the poor quality of teaching materials from an academic point of view: Overloaded schedule, etc.".*
- **Respondent #12:** *"So that teachers send video lessons with explanations and pay more attention to the knowledge of information".*

3.2. Review of the main changes in Education technologies and the possibility of rethinking the education system in Kazakhstan

The pandemic has put universities in difficult conditions, forcing them to adapt to the current events in the shortest possible time, spend significant funds for accelerated digitalization, and often make decisions without considering the possible consequences. This situation had a negative impact on international cooperation in the field of education and science: international travel was cancelled, exchange programs and academic mobility of students and teaching staff were suspended, many programs in the field of research cooperation were also suspended.

The impact of the pandemic on the higher education system is specific in different parts of the world and differs from country to country. However, the general vector of these changes can be traced: all universities in the world were forced to adapt to the changes in the shortest possible time, spend significant financial and human resources to accelerate digitalization, and often make decisions without taking into account the possible consequences. The form of distance learning, the types of technical means for its implementation, the assessment of the student's assimilation of the acquired knowledge, the conduct of final exams and the recruitment of applicants for the next academic year turned out to be another type of acute issues that required immediate solutions.

The pandemic has shown that distance education can well compete with traditional education. Moreover, it has become a driver of a worldwide shift towards online learning. Despite the fact that distance education was not so popular until 2020, today's reality shows that this form of education is already a necessity. Although no one can prematurely guarantee the consequences and results of online learning, there is no doubt that they will appear in the short term.

Effective implementation of online learning requires a large amount of time and resources, as well as support from key stakeholders interested in the development of quality online education. **Consequently, universities/schools will have to cope with the following primary tasks in the current situations:**

1) Lack of regulation and practice of work in this format. In the current legislation, there is no concept of "*distance learning*", respectively, there are no programs, regulations, methods and instructions.

2) The factor of readiness of the secondary education system itself: the transition to distance learning in a crisis has shown that the ICT training of teachers is not high enough, especially in rural schools.

3) These are external factors: the factor of Internet communications, infrastructure, lack of computers and equipment for communication.

4) The lack of domestic IT platforms for organizing simultaneous streaming connections for a large number of students, the lack of digital Education content and full-fledged software for conducting classes via the Internet.

In order to solve these problems, it was necessary to urgently prepare materials, programs, shoot video lessons, develop new rules for teaching, assessment and instructions, conduct training courses for teachers, deploy special Internet platforms for distance learning and conduct explanatory work with parents.

Taking into account the existing problems and opportunities, after studying international experience, recommendations of **UNESCO** and the **World Bank**, we decided to use several distance learning technologies at once:

— Training via the Internet;

— Training through television channels and radio;

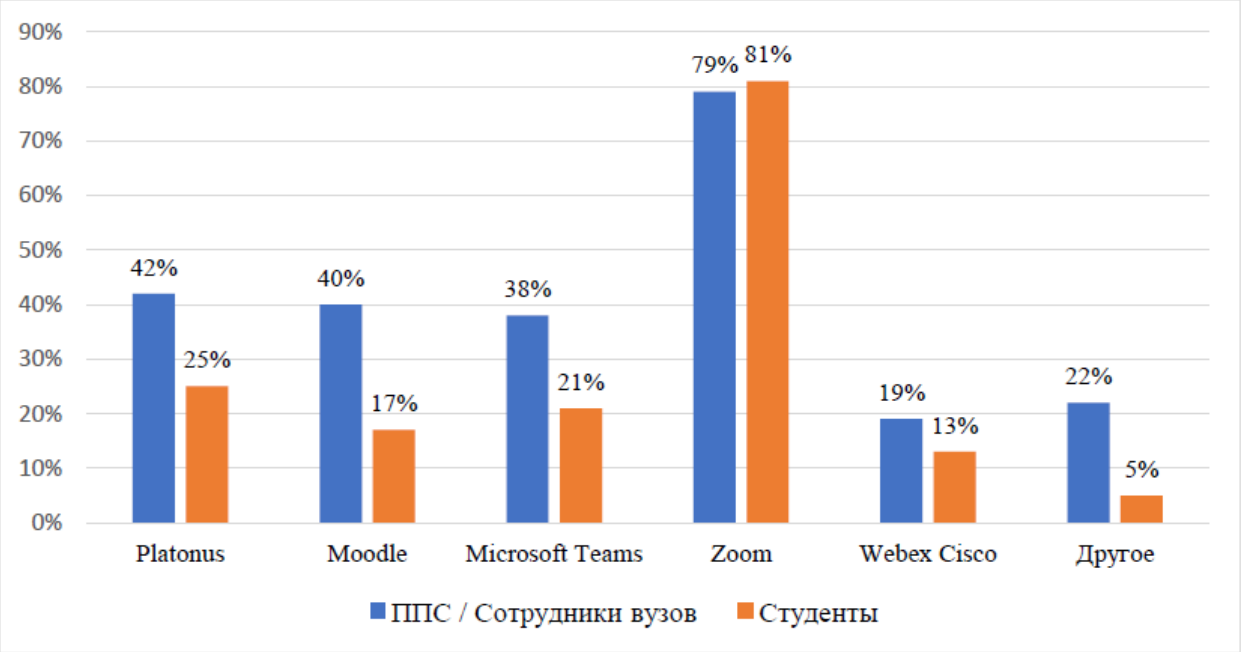
— Regular training in remote villages, as well as sending Education materials through the post office in settlements where there are no schools.

The overwhelming majority of schoolchildren, namely 2.4 million people, study via the Internet. They have access to the deployed Internet platforms "*Daryn.Online*", "*Kundelik*" and "*BilimLand*". At these sites, schoolchildren find video lessons that correspond to the curriculum, after watching the video lessons, they receive assignments from their teachers and answer questions about the material covered.

If necessary, you can review the video lesson and discuss existing issues with teachers. In some schools for children with special Education needs, teachers predominantly conduct lessons through foreign streaming systems. For example, *Microsoft Teams, Zoom, Meet by Google Hangouts*, etc.

Education through television lessons on the «*Balapan*» and «*EL ARNA*» channels has been widely used. In addition, with the support of the relevant ministry and the «*RTRK Kazakhstan*» corporation, the retransmission of TV lessons on local channels was organized. Now more than 800 thousand schoolchildren are studying through these video lessons.

According to statistics from the Independent *Agency for Quality Assurance in Education*, ZOOM is the most popular platform for distance education, as can be seen in (*Figure 16, 21)* This is evidenced by the responses of 79% of teaching staff and university staff and 82% of students. In addition to ZOOM, universities are actively using platforms such as *Microsoft Teams, Webex Cisco*. It is important to emphasize here that if the above three programs gained their particular popularity only because of the pandemic, then *Platonus* and *Moodle* were actively used by universities long before the transition to a distance teaching and learning format. It is important to note that a number of universities also use self-developed platforms.



Source:Based on Agency for Quality Assurance in Education

Fig.22. "What programs and platforms did your university use in the distance education process?"

Among the number of such universities is the Caspian University (*Caspidot, Bigbluebutton*), Karaganda University. Academician E. Buketova (*Idl.ksu.kz*), International Education Corporation (*Freeconferencecall, Google Class*), Satbayev University (*PolytechOnline, Emtihunter*), Toraigyrov University (*dot.tou.edu.kz*).

According to the data obtained, respondents believe that the COVID-19 crisis has had the greatest impact on areas such as teaching, learning, and organization of practice (see Fig. 14, 12, 21).

The overwhelming majority of respondents, both among schoolchildren and students, answered that the Covid-19 pandemic has the greatest impact on the organization of practice. This may indicate the difficulties of organizing distance education in certain specialties - for example, medical, technical and creative. The transition to a distance format in practice-oriented universities may negatively affect the assimilation of some disciplines.

Replacing practical lessons with a video demonstration does not solve the problem of developing practical skills. Thus, it can be assumed that the transition to distance learning will be most reflected in universities that train specialists in the field of engineering, medicine and art.

Regarding the problems that were discovered during the transition to a distance education format (see Fig. 15, 17, 18). Overall, both groups of respondents cite platform outages as their biggest problem. This can be explained by the fact that the platforms were not designed for the simultaneous operation of thousands of users. Before the massive transition to distance learning, platforms were used in the implementation of a small number of courses and modules. The teaching staff and university staff also point to the lack of the necessary technical equipment among teaching staff and students. Violation of academic integrity, which is one of the most pressing topics in distance education, since this format implies more freedom on the part of students, full access to various information sources during training and assessment, as well as significantly less supervision from teachers, was noted as a problem according to the agency. There is also the problem of insufficient knowledge of working with a personal computer from the teaching staff.

A question about the final exams.

According to the World Bank, there are three main alternative approaches to addressing this issue in a quarantine environment.

— Cancellation of exams. For example, Norway, like many other countries, has cancelled all written exams for students in grade 10 (*the final year of junior high school*) and for students in all three grades of high school.

— Transfer of exams.

— Conducting exams in a modified format. In some countries, they will be conducted online.

In the case of Kazakhstan, to pass the unified national testing, graduates will not need to present an identity card. This was reported by the press service of the Ministry of Education of Kazakhstan.

According to the Kazakh Minister of Education Askhat Aimagambetov, now in our country, unified national testing will be carried out using an electronic face recognition system. To register in this system, a student will need to go through the registration procedure on the portal

www.ent2020.testcenter.kz, then create a *Digital ID for himself* in his personal account and *select the language for passing the test*.

After that, you will need to take a portrait photo and a snapshot of an identity document so that the system makes sure that the student's photo matches the passport data (see Fig. 23, 24).

20. Education:

- ***Higher Education:***

Buying persona #1 (*Administration/Rector*) - *Through:*

- *Easy to use teacher/student portal*
- *Tracking student attendance*
- *Authenticating the right student during virtual event (i.e., Exam, Lecture, Meetings etc.)*
- *to accelerate and modernize the online application process (especially for online courses)*

Solution #1 – (Exp.: For entering the teacher/student portal, library)/ *Ondato Facial Biometric Authentication* *to monitor attendance of students and staff in a simple and secure way.*

Solution #2 – (Exp: Exam/ Final project defense)/ *Ondato Secure Remote Meetings* *to verify the right student from unauthorized persons through a fully automated advanced authentication tool.*

Solution #3 – *Ondato Remote Photo Identification* *solution to save time and create customer friendly experience by secure and automated digital onboarding process.*

Source:Based on Ondato use cases according to the industry (prepared by author)

Fig.23. Example of using «Ondato» in education (Higher Education)

- ***Primary & Secondary Edu/K-12:***

Buying persona #1 (*Administration/Director*) - *Through:*

- *Easy to use teacher/student's personal account;*
- *Tracking attendance/ Providing parents/guardians confidential and real-time access to information tied to their child(ren) through their own account.*
- *Authenticating the right user during virtual event (i.e. Test, Class, Meetings etc.)*
- *Checking the background of teachers*

Solution #1 – (Exp.: For entering the user portal)/ *Ondato Facial Biometric Authentication* *to monitor attendance of children and staff in a simple and secure way.*

Solution #2 – (Exp.: For taking the trial United National Test)/ *Ondato Secure Remote Meetings* *to verify the right user from unauthorized persons through a fully automated advanced authentication tool*

Solution #3 – *Ondato Remote Photo Identification* *solution to screen the teacher background against multiple sources (e.g., adverse media, criminal background, etc.)*

Source:Based on Ondato use cases according to the industry (prepared by author)

Fig.24. Example of using «Ondato» in education (Primary & Secondary Edu/ K-12)

It is more difficult for modern children to learn the usual format. They do not accept long lectures, paper textbooks and teachers who tell theoretical facts. Instead, they are attracted to interactive activities and digital services. This is what prompted Education institutions to start introducing new technology-based methodologies.

Billions are invested in such services and technologies every year. The strongest positions in online education today are in the United States and the Asia-Pacific region (*China, Japan, Malaysia, Singapore*). These countries as a whole account for more than 70% of the world EdTech market.

According to analysts, the great interest in the field today is caused by several factors:

— First, consumers themselves create the demand for new technologies, requiring Education institutions to improve teaching methods, classrooms, and related services.

— Secondly, investors are interested in this area because it is more stable and safer than finance (another area that is rapidly developing).

— Thirdly, social relations in society are developing in such a way that there is digitization of familiar connections: people are increasingly moving online and digitizing their skills.

According to the BusinesStat estimates about 85% of this market is sponsored by government funds. Thanks to budgetary funding of state Education institutions, teachers' salaries, utility bills, administrative expenses, and so on are paid. In addition, Education institutions receive funding from the system of state grants, the share of which in the structure of income is quite high.

Despite the fact that within the framework of the state program for the development of the education market and the "*Digital Kazakhstan*" program, modern projects are being introduced to develop the IT direction in education, the Education system has many problems. For example, staff shortages, weak infrastructure and outdated curricula. All this leads to the "isolation" of Education processes from the real needs of the labor market and business.

To make the market more competitive, it is necessary to reduce government funding, introduce new training programs, IT solutions and technologies. The main challenge is to make the market dependent on private funds. And this, in turn, will force Education institutions to develop and compete for each student.

According to the survey and agency's report, the main advantages of distance teaching/learning:

— Among the teaching staff and university staff, the development of students' ability to think and an increase in their independence were highlighted as advantages of the transition to distance education.

— In terms of personal and professional development, the students noted the training of digital skills and digital literacy, the opportunity to engage in creativity and self-development by increasing free time.

— Speaking about the quality and content of training, respondents note that the use of modern software and hardware makes e-education more effective. New technologies make it possible to make visual information vivid and dynamic, to build the Education process itself, taking into account the active interaction of the teaching staff with the training system.

The main disadvantages of distance teaching/learning

— The respondents are often noted as a lack of personal communication and social interaction, which is one of the most important competencies of the direction of human-to-human sciences.

— Also, the student noted that the opportunities for practice-oriented learning and experimental work for natural faculties have decreased. A separate point is noted for technical issues - some representatives of the teaching staff are not satisfied with the quality of the Internet and proctoring, an increase in the time of working at the computer, with a large flow of students, the lack of the ability to control everyone present in real time in the classroom.

— In addition, among the answers emphasized psychological discomfort from the fact that listeners can be not only students, but also outsiders, the lack of an audience atmosphere necessary to establish contact with students or teaching staff.

— Students also note as a disadvantage physical discomfort from being in front of the computer for a long time and the lack of live contact with teachers, the difficulty of participating in general discussions and involving all students in the Education process. Some students emphasize the difficulty in self-expression in distance learning, the lack of creative activity.

— It is important to note that many students cite a lack of social life as the main disadvantage of moving to distance learning.

The main trend of EdTech in Kazakhstan

The IT market of Kazakhstan is one of the few that is experiencing the coronavirus crisis not only without significant losses but even with positive dynamics. Start-up companies, both new and developing, in the first half of 2020 managed to attract about 5 billion tenge of investments. Moreover, most of the transactions fell on the period of the pandemic.

EdTech startups are the main trend of the Kazakhstani IT market in 2020. In response to the problems that have arisen with distance learning for schoolchildren and students, dozens of projects have appeared. "More and more schools and universities are resorting to the services of IT companies, in the learning process they use virtual and augmented reality technologies. In the 7th stream of the Astana Hub accelerator, there were many good projects in the field of EdTech, these are "*Oquda*", „*Oqylyq*", „*Able*" and „*In-Vr*". All such projects, as Pavel Koktyshev, a representative of „*Zerde"* said, will be included in the „*Tsifrlik Bilim*" program, which will include various Education initiatives, including

retraining people to work in the digital sphere. Among the successfully launched education projects, "Daryn.online", a distance learning platform in the Kazakh language, which includes all basic subjects from grades 1 to 11 according to the state standard. The Ministry of Education and Science also supported the startup "*Qlang*", which allows you to study with a teacher online, performing exercises on an interactive whiteboard and communicating with the teacher via video chat.

But, perhaps, the most interesting startup in this area is "*In-Vr*", also a graduate of the hub's acceleration. Already next autumn, undergraduates of universities will test streaming in virtual and augmented reality. 360-degree video transmission technology will allow students to feel like they are in the classroom and can participate in the discussion. At that moment, they themselves will be at home, wearing a VR-helmet or putting a smartphone on the map-board. It is noteworthy that this startup in a remote location can also be used in order, for example, to watch a football match with the effect of being in the stands or any spectacular event. And the authors of "*In-Vr*" plan to make money from each sold ticket to such virtual events.

In general, with the development of digital technologies in the Kazakhstani education sector, many new players and niches appear. **Here are some examples:**

— Services for the creation of Education content for textbooks and online publishing houses;

— Services for learning management: online check of class attendance, electronic diaries and platforms with Education content;

— Services that help schoolchildren and applicants to determine their profession;

— Services that help schoolchildren when entering universities. These can be portals and forums with useful information;

— Services or institutions that provide free and paid online courses;

— Technological products for education: interactive whiteboards, study tablets, etc.

In what direction will EdTech develop within 5 years?

- **Renewal of the school**

Recently, parents are increasingly convinced that the format of modern schools is outdated. Over the past 50 years, the school load has more than doubled, which is why the psychological pressure on children has increased many times over. This negatively affects the psyche of schoolchildren and is one of the reasons for the increase in infant mortality from suicides.

That is why one of the main directions of EdTech is the "*restructuring*" of schools and the introduction of new formats into the Education process. For example, "*Gen Z"* prefers to learn through play. Therefore, in the future, the Education process will change and include vocational guidance technologies through games, the use of gadgets and interactive teaching methods. At the same time, the

learning process itself will become more personalized, and the office-lesson system, on the contrary, will disappear, as well as traditional teaching tools (chalk, desk, blackboard). This, in turn, will greatly affect the status of the teacher in teaching: in the future, the teaching profession will be transformed, and one of the main requirements for specialists will be the ability to use technology.

- **Transformation of universities**

Increasingly, employers say that education does not play any role in hiring. For example, you don't need a college degree to get a job at Apple or Google. The main thing is practical skills, personal qualities and a desire to work. As a result, young professionals understand that it is more important to have experience when applying for a job than to have a diploma from a prestigious university. Thus, people are increasingly abandoning formal education, and the "paper" diploma is losing its significance.

In the near future, education will become flexible and will focus exclusively on the specific needs of students. This will completely transform the approach of universities to the Education process: “unnecessary” and unpopular subjects will disappear, and theoretical lectures will give way to practical exercises. Therefore, people will cease to strive for a diploma as an ultimate goal, and the main thing will be the desire to gain practical knowledge and experience of real problems.

This will change the format of interaction between universities, government, and business. The state will more often begin to support various acceleration programs, start-ups, and programs for young professionals. Businesses, in turn, will begin to create university-based curricula and resources to train future specialists on their own.

- **Legalization of online education**

Online education is the main trend in the EdTech field. Because it is not only convenient but also allows you to take into account the needs of all people - even with special needs - and give everyone the same access to knowledge. This trend also affected Kazakhstan - local universities are already working on programs that can be completed online, and various startups are creating online platforms for learning. In the next few years, the importance of this market will grow.

In the future, this approach will make it possible to abandon full-time education in favor of home-based education. And this, in turn, will require an improvement in the regulatory framework: the adoption of a law on the legalization of home education and the equating of online education with formal types of education. Thus, Kazakhstanis will be able to get their diplomas online, and local universities will be forced to improve their programs in order to be able to compete with services.

- **The project "Unified integrated Education online system"** will be launched. Cloud Education resources for schoolchildren, parents, teachers (videos, Education games, online tests, lesson scenarios, etc.) will receive regular updates. The quality of information systems for remote learning formats will increase. The digital Education environment will function in parallel with the traditional analogue, if

necessary supplement it, opening access to new channels of communication and feedback between teacher and student.

- **Free courses, summer camps for schoolchildren** on the development of digital skills will be organized: coding, programming, robotics, 3D printing and more. Robotics cabinets will be equipped with the necessary tools (lego mindstorms ev3, Arduino, etc.).
- **The widespread connection of schools** to digital education will provide an opportunity for parents and students to choose a distance learning format. Distance learning will receive further development and regulatory legal support as part of a possible training format with ensuring education quality control.
- To ensure access to digital resources, **the Digital Teacher project** will be launched, aimed at improving the quality of education for children from socially vulnerable families. To individualize education, taking into account the needs of each child, a "Digital Portfolio" will be developed and implemented, which will open access to high-quality Education online content.
- Planned a gradual transition to teaching **using the cloud system in all school subjects**, open access to Education content. The cloud system will include digitized teaching materials, student learning achievements, LMS platforms and other digital resources.
- **School libraries will be transformed into information centers**.
- The Education achievements of the student and **all information about him will be tied to the ID of each student**. It is planned to create an electronic portfolio for the accumulation and storage of materials demonstrating the level of professionalism of teachers. The basis for digital transformation will be the National Education Database (NEDB), which will allow tracking the trajectory of students' development, analyzing and predicting their learning, taking into account individual needs. Integration of all information systems of education with the NED will be ensured to ensure high-quality monitoring and flexible management of the education system.

CONCLUSIONS

This chapter concludes this study presenting a brief conclusion based on the objectives, research questions, reports and results of this study. The importance of this research in the context of the effect of the Covid-19 Pandemic on the Education system itself in Kazakhstan will be described. Recommendations for further development of distance education will be examined at the end of this chapter.

Head of State K.K. Tokayev at the final meeting of the State Commission on the State of Emergency, emphasized that:

"*Education should be made much more flexible, it is important to develop protocols and methods for teaching children and students remotely, to complete the real digitalization of all Education institutions in the country. It is necessary to forcefully introduce modern remote sensing technologies. It is necessary to revise the content of Education programs, to make them accessible and interactive"* (**Concept for the development of education in the Republic of Kazakhstan until 2025,** speaking on May 11, 2020).

The actions and reactions of society during the pandemic gave rise to demand in society for the education system from the standpoint of the priority of issues of morality, law and morality. The new stage in the development of education for 2021–2025 will provide for the provision of lifelong education and the logical completion of the reforms begun, which will lead to the following fundamental changes in the field of education and science:

1) It is necessary to introduce into the legislation the concept of "distance education" and further normative regulation of this process.

2) Along with the changes in the normative legal acts, it is necessary to prepare domestic digital Education platforms, including for the organization of streaming connections. Not all countries can afford to maintain an external channel sufficient to simultaneously connect millions of schoolchildren, so it is important to develop an in-country system. This includes work on digitizing textbooks. At the same time, there should not be a simplified translation as just a scanned version of a textbook with the same traditional structure, on the contrary, information in them should be presented in the form of pictures, texts, video, audio, animation, and the system of links and search should allow you to instantly jump from one fragment of the textbook to another, to give the opportunity to repeat the material covered from previous classes.

3) It is necessary to improve the competence of our teachers to work in the conditions of distance learning. Work in this direction has already begun. All Education programs, from university programs for the preparation of future teachers and ending with programs of advanced training courses, include

special modules on the organization of distance learning, methodology for working in DOT, pedagogical technologies, as well as on IT competencies.

4) Changing the structure and content of the Education process to distance learning. Obviously, distance learning does not mean simply translating traditional content, methods and programs into teaching over the Internet. This is an oversimplified and ineffective understanding of the process. To work in the new regime, new teaching methods, new pedagogical technologies, diagnostic and monitoring procedures must be developed, programs, the structure of the lesson must be changed, and a transition to more flexible and individualized standards must be made.

5) It is necessary to transform the culture of school education, to form effective feedback between students and teachers to work in a distance learning environment. It is also important to find reliable identification tools when taking exams and monitoring academic achievement.

6) Updating the academic policy of universities, taking into account the possibility of achieving the planned learning outcomes both by traditional methods and remotely. Thus, the individualization of training will take place. For example, the independent work of a schoolchildren/student with a teacher, which was usually scheduled and carried out in person, can optionally be transferred to the format of distance and truly independent study. As well as a certain limited number of courses in universities, students may choose to be allowed to study in a distance format or credit the learning outcomes of MOOCs.

7) It is necessary to prepare answers to the new challenges of internationalization. The higher education system will face the problem of transforming international cooperation as a result of the "islandization" of states. Perhaps, the academic mobility of students will be reduced. Joint and double-degree Education programs and, in general, the international strategy of universities will also rely largely on digital technologies. Kazakhstani universities should transfer their programs to the online format as soon as possible. The task of becoming a regional Education hub is not removed. In this case, universities must themselves determine the demand for courses and use all the available potential.

8) The ministry's information system needs to be improved: the inclusion of databases of diplomas, electronic textbooks, various video simulators, complete digitalization of public services, monitoring of Education achievements, testing, certification, etc. There is a need to create a platform for generating the content, where teachers can independently create their own materials and share their experiences with each other.

9) Creation of digital situational centers and infrastructure development. It is important to provide equipment with the necessary equipment: servers, communication channels, proctoring systems and communication equipment. The corresponding requirements, perhaps, should be included already in the licensing of Education activities. To effectively build a learning trajectory, consolidated information is

needed, the so-called "digital footprint", which should include data about the content, learning tools, results obtained and the degree of student engagement.

In general, when assessing the impact and consequences of new learning conditions, it is necessary to move away from the excessive romanticization of distance technologies, their absolutization and from the adoption of hasty conclusions. I would like to emphasize that now it is especially important to conduct scientific research with the wide involvement of experts and the public.

It should be understood that no one cancels the traditional form of full-time education. Children, parents, teachers, employees of the ministry, they all understand that today a more effective and convenient format is traditional full-time education at school. Remote technologies are considered as an additional opportunity, an alternative, a condition for ensuring the flexibility of programs. It should be noted that the role of teachers and schools in distance learning does not decrease, but, on the contrary, only increases. Kazakhstan will apply these technologies, when necessary, for example, when schoolchildren miss classes due to weather conditions, or in a situation where a child is studying at home for health reasons, or in order to provide additional opportunities for students of small schools, etc.

Recommendations for the further development of distance education from survey respondents:

— Among the recommendations of respondents, there is possible to create domestic Education portals/apps.

— The teaching staff note the need to develop regulatory requirements at the republican level in order to create a single standard and a single Kazakhstani system of distance education.

— Students, in turn, recommend more extensive use of interactive teaching methods in order to increase student interest.

— Also, using modern technologies to visually demonstrate the work.

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Kanafina A. Analysis of the effect of Covid-19 Pandemic on the Education Technology in Kazakhstan / Master Thesis on Electronic Business management. Supervisor Dr. T. Mendelsonas. – Vilnius: Faculty of economic and business, Mykolas Romeris University, 2021.

ANNOTATION

This Master's thesis analyses and evaluates the impact of the Covid-19 pandemic on Education technology (referred to as EdTech) and determines the effectiveness of distance learning methods during this crisis. In this case, not only the Education tools used are subject to the influence, but also the very concept of building an Education system.

The first part of the thesis summarizes the theoretical aspects of EdTech, including the types and necessity of developing this area. The second part of the thesis examines the growth factors for the Education Technology market globally and the use of education technologies under the "Digital Kazakhstan" program. The third part of the thesis presents the methodological part of the assessment of the impact of the pandemic on Education Technology in the case of the Republic of Kazakhstan by outlining the steps to achieve the goal of the research. The fourth part of the thesis assesses a result of the survey collected from the students and schoolchildren opinions, as well as the main changes in the education system itself.

The research work will be useful to the heads of Education organizations, as well as to everyone who is engaged in researching current trends in the Education services market.

Key words: Education technology (EdTech), impact, distance learning method, Education system.

Kanafina A. Analysis of the effect of Covid-19 Pandemic on the Education Technology in Kazakhstan / Master Thesis on Electronic Business management. Supervisor Dr. T. Mendelsonas. – Vilnius: Faculty of Public Governance and Business, Mykolas Romeris University, 2021.

SUMMARY

The COVID-19 pandemic has affected all sectors of the economy and turned our way of life upside down. The blocking that was subsequently adopted certainly taught us all to live in a new way. As a result, during this period, many public and professional spheres not only managed to resist but also to adapt to the new reality. Although the instinct for self-preservation was necessary to overcome new difficulties during the pandemic, the collectivity and speed of decision-making played a more significant role.

Primary and Higher education can be identified as one of the areas that have remained the most affected by the pandemic. Moreover, they were one of the less prepared to translate her activities into an online format. The effect of all the measures and measures taken by the world community to support the activities of higher education, obviously, have yet to be assessed. However, at the moment, the measures that have been taken to ensure that the education system does not become cardinal can be analyzed and can only be strengthened in the context of the global crisis.

Distance and online education are already the main forms of education in many countries. New methods and innovative approaches to the implementation of digital education are being actively implemented by higher education institutions. In this regard, the basic research problem and relevance of the topic were raised - how has the Covid-19 Pandemic impact on EdTech in Kazakhstan?

The main object of this research work is the impact of the Covid-19 Pandemic on EdTech in Kazakhstan. This discovery will help to understand, rethink, draw conclusions, develop new strategies, and implement them in the Education process by reaching our aim of the research.

The objectives of the research include reviewing the literature and theoretical aspects of FinTech and analysing the use of EdTech to identify positive practices, as well as, evaluating the main object of the research through the most appropriate method and determining the effect of pandemic based on the survey result.

The empirical research was performed to test the following hypothesis: According to sources, the impact of the pandemic on EdTech is both a crash and a challenge, but it also opens up huge opportunities for us to fundamentally rethink the education system as the crisis served as a stimulus for innovations that society puts before the education system to prepare the younger generation for independent life and professional activity as citizens with a high degree of digital literacy. This hypothesis was confirmed based on the survey result which is a structured questionnaire from the methodological part of the thesis in order to obtain information on the impact of the pandemic on Education technology and the

effectiveness of the implementation of distance learning as it is especially important to consider how the universities of Kazakhstan coped with the forced changes in the Education process in order to note the positive practice in this direction and identify problematic issues that should be paid more attention in the future.

The analysis showed and presented the results of the study, as well as provided recommendations for further research on this issue.

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SANTRAUKA

COVID-19 pandemija paveikė visus ekonomikos sektorius ir apvertė mūsų gyvenimo būdą aukštyn kojomis. Vėliau priimtas blokavimas tikrai išmokė mus visus gyventi kitaip. Dėl to per šį laikotarpį daugelis viešųjų ir profesinių sferų sugebėjo ne tik atsispirti, bet ir prisitaikyti prie naujos realybės. Nors savisaugos instinktas buvo būtinas, norint įveikti naujus sunkumus pandemijos metu, kolektyviškumas ir sprendimų priėmimo greitis suvaidino svarbesnį vaidmenį.

Pradinis ir aukštasis mokslas yra viena iš labiausiai pandemijos paveiktų sričių. Be to, jie buvo vieni iš mažiau pasiruošusių jos veiklą perkelti į internetinį formatą. Visų priemonių ir priemonių, kurių imasi pasaulio bendruomenė remdama aukštojo mokslo veiklą, akivaizdu, dar reikia įvertinti. Tačiau šiuo metu priemonės, kurių buvo imtasi siekiant, kad švietimo sistema netaptų kardinali, gali būti analizuojamos ir gali būti sustiprintos tik pasaulinės krizės kontekste.

Nuotolinis ir internetinis švietimas jau yra pagrindinės švietimo formos daugelyje šalių. Aukštosios mokyklos aktyviai diegia skaitmeninį ugdymą, pasitelkiant naujus metodus ir inovatyvius būdus. Šiuo atžvilgiu buvo iškelta pagrindinė tyrimo problema ir temos aktualumas – kaip Covid-19 pandemija paveikė EdTech Kazachstane?

Pagrindinis šio tyrimo objektas – Covid-19 pandemijos įtaka EdTech Kazachstane. Šis atradimas padės suprasti, permąstyti, padaryti išvadas, sukurti naujas strategijas ir jas įgyvendinti ugdymo procese, siekiant tyrimo tikslo.

Tyrimo tikslai – apžvelgti literatūrą ir teorinius FinTech aspektus bei išanalizuoti EdTech panaudojimą pozityvioms praktikoms nustatyti, taip pat tinkamiausiu metodu įvertinti pagrindinį tyrimo objektą ir nustatyti pandemijos poveikį remiantis tyrimo rezultatais.

Empirinis tyrimas buvo atliktas siekiant patikrinti šią hipotezę: Šaltinių teigimu, pandemijos poveikis EdTech yra ir žlugimas, ir iššūkis, tačiau tai taip pat atveria mums didžiules galimybes iš esmės permąstyti švietimo sistemą, nes krizė paskatino naujoves, kurias visuomenė teikia švietimo sistemai, kad jaunoji karta būtų parengta savarankiškam gyvenimui ir profesinei veiklai, kaip aukšto skaitmeninio raštingumo piliečiams. Ši hipotezė buvo patvirtinta remiantis apklausos rezultatais, kurie buvo gauti iš struktūrizuotos anketos iš baigiamojo darbo metodinės dalies, siekiant gauti informacijos apie pandemijos įtaką ugdymo technologijoms ir nuotolinio mokymosi įgyvendinimo efektyvumą, nes tai ypač svarbu. apmąstyti, kaip Kazachstano universitetai susidorojo su priverstiniais ugdymo proceso

pokyčiais, kad būtų galima pastebėti teigiamą šios krypties praktiką ir nustatyti problemines problemas, kurioms ateityje reikėtų skirti daugiau dėmesio.

Analizė parodė ir pristatė tyrimo rezultatus, taip pat pateiktos rekomendacijos tolesniems šio klausimo tyrimams.

ANNEXES

ANNEX 1

Table 5. The level of digital literacy of the population of the Republic of Kazakhstan at the age of 6-74 years

	Proportion of population with skills			
	2017	**2018**	**2019**	**2020**
The use of any 4 types of technologies listed in the note	74.9	73.6	76.1	77.6
Using the basic list of species (1, 2, 3 and 6 items in the note)	60.8	68.1	70.4	73.7
Using a personal computer, smartphone, tablet, laptop; standard programs; receiving services and services via the Internet	77.1	79.6	82.1	84.1
Using a personal computer, smartphone, tablet, laptop; standard programs	79.9	83.2	86.4	88.2

Source: MES statistical data

Note*:*

1) Using a personal computer, smartphone, tablet, laptop;
2) The use of standard programs (text and table editors, and so on);
3) Receiving services and services via the Internet;
4) Solving the problems that have arisen to protect the computer and personal data;
5) The use of software and hardware solutions in professional activities;
6) The use of any digital devices (digital cameras, digital camcorders, webcams, digital television, DVD-players, projectors, and so on).

ANNEX 2

Table 6. The level of digital literacy of the population in the context of regions

	The level of digital literacy of the population (*the proportion of users who have the skills to use a personal computer, smartphone, tablet, laptop; standard programs; receiving services and services via the Internet***) of the total population**					
	aged 6 and over	*aged 6-74*	*aged 6 and over*	*aged 6-74*	*aged 6 and over*	*aged 6-74*
	2018		**2019**		**2020**	
The Republic of Kazakhstan	**77.3**	**79.6**	**79.9**	**82.1**	**82.0**	**84.1**
Akmola	66.1	68.9	71.9	74.7	72.3	74.9
Aktobe	76.1	78.0	77.9	80.0	79.1	81.0
Almaty	84.7	86.7	85.6	87.9	86.0	88.0
Atyrau	79.4	81.2	81.1	82.6	81.7	83.1
West Kazakhstan	75.9	76.4	75.8	78.4	76.1	78.8
Zhambyl	76.5	78.2	78.0	79.8	79.5	80.9
Karaganda	68.3	70.6	75.8	78.5	80.4	83.2
Kostanay	76.5	80.8	78.8	82.9	82.2	85.8
Kyzylordinskaya	77.2	78.6	79.1	80.1	82.4	83.0
Mangystau	76.9	78.1	77.5	78.7	78.5	79.6
Pavlodar	76.5	79.6	79.4	82.4	80.5	83.5
North Kazakhstan	70.8	74.8	73.4	77.1	75.3	78.8
Turkestan	75.4	76.9	76.3	77.7	80.7	82.1
East Kazakhstan	74.0	77.8	79.2	82.5	80.6	84.1
Nur-Sultan	84.0	85.4	87.8	88.7	90.4	91.3
Almaty city	84.4	87.2	86.3	89.0	88.7	91.4
Shymkent	79.2	80.8	80.0	81.5	80.9	82.3

Source: MES statistical data

ANNEX 3

Table 7. Percentage of computer users

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Share of computer users aged 6-74,%				51.3	62.6	63.2	64.1	74.2	76.2	78.2	80.3	82.2	85.8
Share of computer users aged 6-15 years *,%	-	-	-	71,0	40.1	50	52.8	60.5	65.3	73.8	76.9	80.8	86.4
Share of computer users aged 16-74,%	18.7	19.4	43.7	47.4	67.1	65.9	66.5	77.2	78.7	79.3	81.2	82.5	85.6

***** *The proportion of computer users aged 6-15 has been formed since 2011.*

Source: MES statistical data

Table 8. Share of Internet users*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Share of Internet users aged 6-74							50.6	61.9	63.3	63.9	72.9	76.8	78.8	81.3	84.2	88.2
Share of Internet users aged 6-15 years **	-	-	-	-	-	-	55.8	32.0	42.5	43.6	53.1	62.1	67.9	72.9	75.0	85.3
Share of Internet users aged 16-74	4	8.3	13.7	15.1	18.2	31.6	49.5	67.9	67.6	68.1	77.2	80.2	81.5	83.4	86.6	89.0

***** *taking into account mobile Internet users*

*** The share of Internet users aged 6-15 has been formed since 2011.*

Source: MES statistical data

ANNEX 4

Table 9. Share of Internet users aged 6-15 years by region

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The Republic of Kazakhstan	**55.8**	**32.0**	**42.5**	**43.6**	**53.1**	**62.1**	**67.9**	**72.9**	**75.0**	**85.3**
Akmola	65.1	36.5	49.0	50.3	53.0	59.4	62.8	70.7	76.4	80.3
Aktobe	56.8	40.5	39.7	37.4	51.4	61.3	68.1	69.7	75.7	82.6
Almaty	42.3	34.1	36.0	42.3	55.2	54.3	67.5	74.6	69.7	86.8
Atyrau	47.3	27.6	37.7	39.7	50.1	68.2	75.7	70.5	72.5	87.2
West Kazakhstan	62.8	44.9	46.9	41.1	63.7	57.3	58.8	68.5	76.2	82.8
Zhambyl	57.0	25.7	39.4	41.4	40.5	59.6	60.1	77.4	71.8	85.6
Karaganda	71.5	32.1	48.0	52.6	48.1	63.8	65.0	70.3	63.0	91.2
Kostanay	72.9	37.7	52.1	55.5	70.7	63.5	72.4	72.5	77.1	86.5
Kyzylordinskaya	49.7	31.1	30.5	32.0	43.0	62.9	65.7	64.7	65.9	71.9
Mangystau	47.4	31.6	40.2	41.9	47.9	64.5	64.4	67.6	70.8	84.1
South Kazakhstan	45.6	27.7	38.4	36.2	52.2	51.9	67.3	77.4	80.9	85.6
Pavlodar	78.7	37.4	56.4	60.3	54.0	62.9	67.7	67.4	75.2	90.6
North Kazakhstan	61.1	29.7	55.0	53.0	36.3	68.0	73.2	83.7	84.2	87.0
East Kazakhstan	54.3	33.8	42.1	41.6	55.2	60.1	70.3	70.5	77.5	87.6
Astana city	69.1	40.7	41.3	49.8	86.7	64.7	77.9	78.6	89.4	91.3
Almaty city	66.5	42.3	55.7	53.5	88.5	72.6	66.1	65.4	77.9	86.3

Source: MES statistical data

ANNEX 5

Table 10. Share of Internet users aged 16-74 by region

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The Republic of Kazakhstan	**15.1**	**18.2**	**31.6**	**49.5**	**67.9**	**67.6**	**68.1**	**77.2**	**80.2**	**81.5**	**83.4**	**86.6**	**89.0**
Akmola	20.3	21.2	29.0	50.8	76.4	75.4	76.0	62.4	72.1	72.4	74.5	80.0	85.6
Aktobe	18.5	19.1	39.2	59.3	81.3	79.8	80.1	69.5	81.2	83.7	83.8	88.2	89.4
Almaty	7.3	11.5	26.4	48.7	57.8	56.0	57.3	87.3	88.2	88.9	88.2	89.8	89.2
Atyrau	18.7	25.0	28.0	66.0	85.0	82.8	82.9	71.6	74.2	75.0	80.4	83.3	78.6
West Kazakhstan	16.6	13.8	35.2	59.4	72.2	70.8	71.0	93.9	69.4	75.6	78.8	81.3	84.2
Zhambyl	12.3	12.3	23.8	28.2	59.4	57.6	57.8	67.6	71.4	73.2	82.0	84.9	86.2
Karaganda	17.7	23.1	35.9	53.6	68.4	68.1	68.4	72.4	74.1	74.3	74.6	84.3	93.5
Kostanay	14.1	26.1	26.9	45.2	81.9	80.4	80.5	78.0	87.1	87.8	88.0	88.6	87.2
Kyzylordinskaya	12.8	11.6	21.6	32.7	72.1	76.6	76.7	77.7	80.7	79.4	81.8	81.9	82.7
Mangystau	27.7	20.9	37.4	51.6	61.9	77.7	77.9	71.4	74.8	75.0	82.5	86.0	86.5
South Kazakhstan	7.5	16.4	23.0	43.5	54.8	51.8	52.5	86.1	85.4	84.9	84.4	86.6	94.6
Pavlodar	25.1	19.8	30.3	58.0	68.3	70.5	70.8	70.2	76.9	77.1	78.8	82.3	88.6
North Kazakhstan	17.5	16.3	36.0	49.1	74.8	73.1	73.3	82.0	79.7	81.0	85.3	91.7	94.6
East Kazakhstan	16.3	21.2	31.4	43.4	71.7	71.0	71.4	70.4	77.2	78.7	80.9	82.6	83.3
Astana city	11.6	12.3	41.0	52.2	68.5	68.1	68.9	86.9	89.2	90.1	90.1	92.3	95.3
Almaty city	23.0	23.7	49.0	63.3	71.6	73.1	73.6	80.9	86.2	87.1	87.7	89.5	92.9

Source: MES statistical data

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