The European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2021.02.02.114

NININS 2020

International Scientific Forum «National Interest, National Identity and National Security»

INFORMATION SUPPORT OF DIGITAL TRANSFORMATION OF UNIVERSITY

Denis M. Shotylo (a)*, Andrei V. Mandrykin (b), Svetlana V. Sviridova (c),
Olga.V. Pastushkova (d), Viktor A. Smyshlyaev (e), Yuliya V. Pahomova (g)
*Corresponding author

(a) Voronezh State Technical University, Voronezh, Russia, shotylodm@mail.ru
(b) Voronezh State Technical University, Voronezh, Russia, andrey-man@inbox.ru
(c) Voronezh State Technical University, Voronezh, Russia, svsh1977@mail.ru
(d) Voronezh State Technical University, Voronezh, Russia, ovpast1999@gmail.com
(e) Voronezh State Technical University, Voronezh, Russia, witeco@yandex.ru
(g) Voronezh State Technical University, Voronezh, Russia, yulia198007@mail.ru

Abstract

The article addresses the issues of digitalization of educational organizations and the development of the concept of a digital university. It determines the need for the formation of the strategic goal of digitalization of university, the formation of a system of sub- goals, as well as the determination of strategic priorities. The article highlights key vectors of digital university development. It describes information-organizational model of a digital university, which includes data-based management systems; digital educational technology; individual educational trajectories; competencies of the digital economy. In this article we assess informational aspects of the description of the model elements. It is concluded that, when functioning, the information-organizational model integrates the digitalization elements of the educational, enlightening, research, managerial, social activities of a university and accelerates the transition of a university from innovative to digital. A system of ten key competencies of a digital university has been formed. The directions of information support for the digital transformation of a university and the development of digital competencies by various categories of users for the development of various groups of digital competencies are highlighted. The necessity of using the services of the University of the National Technology Initiative 2035 in the process of digital transformation of a university is substantiated. The conclusion is drawn on the need for active and passive motivation to increase digital competence, the importance of accounting and reducing online risks when using digital platforms, services, sites.

Keywords: Digital transformation, digital university, digital competencies, information support

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

In the context of the development of digital economy, the digital transformation of all spheres and areas of activities, the digitalization of educational organizations is becoming increasingly important. The development of the National Technology Initiative, the vectors of the formation of STI markets, the trends in the development of digital competencies within the framework of the University 20.35 project (UNTI 2035) allow regional universities to define and declare their own agenda for digital development and the formation of university competencies for students, employees and the public (Ministry of Economic Development…; Aiqun, 2018).

When implementing the transformation process, attention should be paid to achieving the strategic goal of digitalization of a university, the formation of a system of sub-goals, as well as the determination of strategic priorities (Katkalo, 2018; Shotilo et al., 2018). The strategic goal of a university's digital transformation is to achieve a university's leadership in science, innovative technological solutions in industry and construction, the development of digital education and the formation of digital competencies in the training and retraining of highly qualified personnel, as well as the implementation of innovative investment research projects through the formation of the digital space of a university for the development of the digital economy of a city, region, parts of a country and a country as a whole.

Sub-goal system when moving to a digital university:

1. Formation and implementation of a digital university model, including:

1.1. Development of a control system for a digital reference university based on data;

1.2. Introduction of digital educational technologies;

1.3. Development and implementation of individual educational trajectories;

1.4. Formation and development of digital competencies.

2. Training a wide range of highly qualified personnel for the digital economy across the region and country.

3. Development and implementation of innovative investment research projects for the development of the digital economic space of a region (Sviridova et al., 2019).

4. Development of the university's network interaction with state authorities, educational organizations, industrial partners within the digital space of the region and Russia.

5. The formation of the image of a university as a driver of digital development of a region (The development strategy…).

The key vectors of digital university development are:

- High quality training and retraining of personnel with the necessary competencies for the digital economy, taking into account trends in a regional labor market.
- The source of the digital development of industry, construction and agriculture in a region based on the high quality of digital learning and the successful implementation of research, technological and social projects using digital technologies
- Implementation of end-to-end technologies in the key markets of the National Technological Initiative (NTI) – Air net, Energy net, Food net, Tech Net and others;

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

- Integration of educational organizations in a region in promoting digital educational technologies and the formation of a qualitatively new educational space;
- The formation of digital mentality and the development of digital literacy of the population of a region for faster adaptation to the introduction of digital technologies in the socio-economic sphere (Change management in the digital economy…; Monitoring global trends in digitalization…).

2. Problem Statement

A systematic integrated representation of a digital university model involves a description of the relationships of all elements, a set of direct and feedback connections, which allows determining the stages of the university's transition to a digital educational organization, the effectiveness of individual events and digitalization in general.

The main goal of building the informational and organizational model of a digital university is to integrate the digitalization elements of the educational, enlightening, research, managerial, social activities of the university into the existing system in the process of the university's transition from innovative to digital (The development strategy…; Izmailov & Ashmarina, 2016).

Each element of the model includes a set of tools from which the core of the transition to digitalization is formed, to which all other tools join. Formed elements of the model will help to identify targets and key performance indicators.

3. Research Questions

Based on the basic digital competencies, the authors propose a system of key competencies of a digital university, reflecting the specifics of the university, the status of an educational organization (federal, research, reference university), existing elements of a digital university model, as well as the prospects for the development of digitalization of the economy in the university and in the region (Table 01).

The main groups of people who need the development of digital competencies at the university and beyond (Change management in the digital economy…; Katkalo, 2018):

- At the university – students and undergraduates (1–6 courses), scientific and pedagogical workers and graduate students, employees (administrative and managerial staff),
- Among the population – schoolchildren, adults, pensioners and pre-pensioners, persons with disabilities;
- In the regional environment – educational organizations of a region, the business community of a region, regional and municipal authorities.

The given set of digital competencies of a university should be adjusted, refined, expanded in the process of implementing the digital transformation program. Separately, information support measures should be formed to increase digital literacy for students, scientific and pedagogical workers, administrative and managerial staff, as well as for different groups of the population in conducting educational activities of the university.

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Table 1. Key competencies of the digital university

Digital Competency	Description of competences
1. Digital Literacy	Knowledge of the specifics of the digital environment, its features in a digital university The ability to search and analyze data, information and digital content The ability to manage university data, information and digital content (Digital Week in the Moscow Region, 2018)
2. Creation and use of digital content	Knowledge of the content and features of creating digital content in different environments The ability to create, analyze and edit digital content
3. Digital footprint and digital portfolio building	The ability to form a high-quality digital footprint Knowledge of the requirements for creating a digital portfolio for different purposes
4. Digital Decision Making	Knowledge of the specifics of making various types of decisions in the digital environment Ability to solve technical problems of the digital environment Skills in identifying needs and selecting the necessary digital tools to address them (Shotilo et al., 2018)
5. The formation of an individual digital development trajectory	Knowledge of the possibilities of building individual (unique) development trajectories The ability to form an individual educational trajectory The ability to form an individual scientific trajectory Skills for the implementation of unique trajectories for the development and implementation of educational, research and commercial projects
6. Continuing Education and Self-Development in a Digital Environment	Knowledge of the specifics of continuing education The ability to build a trajectory of education and self-education throughout life The ability to search for opportunities for self-development in a digital environment The ability to receive continuing education in the digital environment of the university and beyond
7. Digital Communications Development	Knowledge of digital interaction features: The ability to exchange information in the digital environment of the university Skills of various forms of collaboration using digital technology (Monitoring global trends in digitalization…)
8. Digital Competency Development	The ability to identify Gaps in Digital Competency The ability to carry out the development of digital competence
9. Creating a University's Digital Ecosystem	Knowledge of the structure and elements of a university's digital ecosystem The ability to integrate new elements into the digital ecosystem of a university (The concept of the University…) Skills of integrating educational, research and commercial projects of the university into the external digital environment
10. Digital Security	The ability to ensure information security in a digital environment Knowledge of the criteria and procedure for ensuring personal safety in a digital environment Knowledge of the need and conditions for protecting personal data and user privacy in a digital environment

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

4. Purpose of the Study

In order to implement the strategic priorities of the digital transformation of the university, we need to develop a model of information support.

The information and organizational model of a digital university is a complex system of interconnected elements of an educational, managerial, socio-cultural, and information-technical nature.

The model allows highlighting and describing the key areas of the university's functioning during the transition to a digital university, namely:

1) Data-based management systems;

2) Digital educational technologies;

3) Individual educational trajectories;

4) The competencies of the digital economy.

Each element of the model makes it possible to describe the main blocks of work on the digital transformation of a university, the content of the necessary work, the sequence of its implementation, the degree of detail.

Important informational aspects of the description of model elements are: highlighting the problems of this area of the university; determining available and necessary resources for filling an element (information, personnel, material, technical, financial), determination of the timing of individual events, volumes and sources of financing (co-financing), planned results in qualitative and quantitative terms, outcomes (educational, scientific, managerial, economic, budgetary, social) (Aiqun, 2018; Serebryakova & Avdeev, 2018).

5. Research Methods

There are different recommended directions of information support for the digital transformation of the university and the development of digital competencies by various categories of users:

1. Introduction of key digital competencies into educational programs (for students and learners).

2. Making changes to the organization of educational and research activities in order to master digital competencies (for scientific and pedagogical workers).

3. The formation of digital competencies of employees (for administrative personnel) (Institute of Digital Competencies; Jie, 2011).

The groups of digital competencies to be adapted are digital literacy, the creation and use of digital content, digital communication and collaboration, solving digital problems and improving digital security.

Table 2. Information support of the development of Digital Literacy in university

Information users group	**Information interaction in the development of Digital Literacy**
Students	Viewing, searching and filtering data, information and digital content: formulating the need for information, searching for data in a digital environment, accessing the content; creating and changing one's own information retrieval strategies.
	Evaluation of data, information and digital content: analyzing, comparing and critically evaluating the reliability and fidelity of data sources, information and digital content; analyzing interpreting and critically evaluating data, information and digital content

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Scientific and pedagogical workers	Data, information and digital content management: organizing, storing and retrieving data, information and content in a digital environment; organizing and processing them in a structured environment
Administrative and managerial staff	Digital data management: managing data, information and content in a digital environment

It is necessary to consider in detail the features of information support for the formation and development of a set of competencies for different groups of users in the digital transformation of a university (Tables 02–06)

Table 3. Information support for creating and using digital content

Information Users Group	Information interaction in the process of creating and using digital content
Students	Interaction through digital technologies: to interact through various digital technologies and define appropriate digital means of communication within the digital framework
	Netiquette: to know the rules and norms of behavior in the process of using digital technologies and communication in digital environments (Katkalo, 2018; Sviridova et al., 2019)
Scientific and pedagogical workers	Digital Collaboration: to use digital tools and technologies to work together, as well as collaboratively produce resources and studying materials
	Adaptation of communication strategies to a specific audience: to understand and take into account the audience diversity in the digital environment in the process of communication and cooperation (Izmailov & Ashmarina, 2016)
Administrative and managerial staff	Ensuring the exchange of information in a digital environment: to exchange data, information and digital content through appropriate digital technologies; to act as an intermediary exchange

Table 4. Information support of communication and cooperation in the digital environment of a university

Information users group	Information interaction in the process of communication and cooperation in the digital environment
Students	Interaction through digital technologies: to interact through various digital technologies and define appropriate digital means of communication within the digital framework
	Netiquette: to know the rules and norms of behavior in the process of using digital technologies and communication in digital environments (Katkalo, 2018; Sviridova et al., 2019)
Scientific and pedagogical workers	Digital Collaboration: to use digital tools and technologies to work together, as well as collaboratively produce resources and studying materials
	Adaptation of communication strategies to a specific audience: to understand and take into account the audience diversity in the digital environment in the process of communication and cooperation (Izmailov & Ashmarina, 2016)
Administrative and managerial staff	Ensuring the exchange of information in a digital environment: to exchange data, information and digital content through appropriate digital technologies; to act as an intermediary exchange

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Table 5. Information support for problem solving and development in the digital environment of a university

Information users group	Information interaction in the process of solving problems and development in the digital environment
Students	Searching for opportunities for self-development in a digital environment: to search for opportunities for self-development in a digital environment
Scientific and pedagogical workers	Identifying gaps in digital competency: to understand which digital competencies need to be developed
	Determining the needs and selecting the necessary digital tools to meet them: to select the necessary digital tools to meet the needs
	To personalize digital environments
Administrative and managerial staff	Solving technical problems: to identify technical problems that arise when working with digital devices, and to solve them (Monitoring global trends in digitalization…; Shotilo et al., 2018)

Table 6. Information support of a digital security of a university

Information users group	Communication in the digital security process
Students	Personal Security: to understand risks and threats in a digital environment
Scientific and pedagogical workers	Ensuring information security in a digital environment: to be aware of measures to ensure data security (Change management in the digital economy…; Serebryakova & Avdeev, 2018)
Administrative and managerial staff	Ensuring the protection of personal data and user privacy in the digital environment: to ensure the protection of personal data and privacy in the digital environment; to understand how to safely use personal information
	Device protection: to Protect devices and digital content
	Protection of health and well-being: to avoid health risks and threats to physical and psychological health in the process of using digital technologies; to be able to provide protection against potential dangers in the digital environment
	Environmental protection: to be aware of the impact of digital technology on the environment and ecology

Thus, the information support for the development and use of digital competencies during the transformation of the university can vary significantly for students, scientific and pedagogical workers, and administrative and managerial staff.

6. Findings

The main tools of the digital transformation program of the university that should be implemented (Yang et al., 2012):

- Development of a passport of digital competencies for students, teachers, employees;
- Creation of digital content for educational programs of primary and secondary education;
- Filling the electronic educational environment of MOOCs;
- The introduction of NTI services in university management and educational activities;
- Creation of a digital footprint of a student and teacher and the formation of a digital portfolio;
- Creation of a unified information environment of a university.

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

- In order to successfully complete the digital transformation of university, it is necessary to use the services of the University of the National Technology Initiative 2035 (UNTI 2035), among which stand out:
- Access to digital content: the inclusion of online courses blended learning modules and micro-degree programs into the main educational programs and programs of continuing education in universities.
- Providing universities with access to the digital content of the UNTI 2035: a catalogue of courses / modules / programs at various levels;
- A service of pedagogical design and activity practices: the service platform of the UNTI 2035 provides a description and customization of the pedagogical design of educational activities and environments in order to assess and increase the involvement of participants in the educational process and the effectiveness of training based on the collected digital footprint;
- A service for collecting and analyzing a digital footprint: a methodology and tools for collecting and analyzing a digital footprint of educational activities and experience. Service involves additional training for the collection and analysis of a digital footprint;
- "Boiling point" on the basis of the university: to create a collective work space "Boiling point" on the basis of the university, which will become part of the "Boiling Point" network working on the basis of essential standards of communication and working space organization;
- Training and accreditation of project activity mentors: an online program for the training of project activity mentors. As a result, the student receives the status of "mentor" on the platform "Talent" and is allowed working on the model of the NTI club with schoolchildren and students;
- The university movement of the Union of Young Professionals (World Skills Russia) (University Skills): the University skills project allows higher education organizations to create and participate in World Skills Competencies as part of the World skills Russia university movement, which are either Future Skills or in demand on the market;
- "Artificial Intelligence": a network project for developing competencies and advancing technologies in the field of artificial intelligence.

These services are necessary for organizing activities within the university. At the same time, the digital competencies of educational organizations are required to be broadcast to the public – schoolchildren, retirees, preretirement age employees, working citizens, persons with disabilities.

7. Conclusion

A digital university's purpose is to develop educational programs for basic and additional professional education, taking into account the development of digitalization, introducing new courses in the educational process, and developing educational activities in the field of digital competencies (The development strategy…).

As for the development of digital competencies for employees of higher educational organizations, students, various categories of the population, it can be noted that there are two types of motivation to increase digital competence – active and passive motivation.

https://doi.org/10.15405/epsbs.2021.02.02.114
Corresponding Author: Denis M. Shotylo
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

A user with a higher level of active motivation feels that he/she is able to function efficiently in the digital environment and knows how to do everything that is necessary to master it. A person with a lower level of active digital motivation creates for him/herself the illusion of his competence in the digital space. Both types of active motivation, as well as insufficient motivation in the presence of illusory competence are associated with the experience of dealing with online threats and risks that are common when receiving digital services.

Passive motivation to increasing digital competence is formed by users with low digital competences who are willing to learn only spontaneously. At the same time, a person often does not notice digital risks or does not face online risks (due to a not very wide range of user activity).

The specific motivation of the user to improve his/her digital competence is associated with a more rare use of Internet resources, as well as with less confidence as a user of ready-made services. At the same time, frequent access to online to use the services may lead to unwillingness to set new, more global or specific goals in their training, the development of their digital competence.

When using digital technology, it is important to remember the need to develop digital competencies, digital literacy and to avoid online risks.

References

Aiqun, Z. (2018). An IT Capability Approach to Informatization Construction of Higer Education Institutions. *Proc. Computer Sci*., *131*, 683–690.

Change management in the digital economy: problems and approaches to their solution: Analytical report. (n. d.). Retrieved on 13 January, 2020, from https://www.google.com/ url?sa=t&rct=j&q=&esrc=s&source=web&cd= 6&ved=2ahUKEwjYt9Xt8vHlAhVoo4sKHQZTAukQFjAFegQIARAC&url=https%3A%2F%2Fsk.ru%2Ffoundation%2Flegal%2Fm%2Fsklegal11%2F22956%2Fdownload.aspx&usg=AOvVaw306mp_w-W0ZMMPYWTMDCPi

Digital Week in the Moscow Region 2018: the use of the latest digitalization technologies in the leading sectors of the economy and social sphere of the Russian Federation. (n. d.). Retrieved on 12 January, 2020, from https://www.sostav.ru/ publication/tsifrovaya-nedelya-v-podmoskove2018-ispolzovanie-novejshikh-tekhnologij-tsifrovizatsii-v-vedushchikh-otraslyakh-ekonomiki-isotsialnoj-sfere-rossijsjjjj

Institute of Digital Competencies. http://www.fa.ru/org/dpo/ick/Pages/Home.aspx (accessed 10.01.2020).

Izmailov, A. M., & Ashmarina, S. I. (2016). The mechanism of management of information and knowledge resources. *Bull. of the Voronezh State Univer.*, *1*(67), 261–266.

Jie, X. (2011). Informatization Management Thinking of Strengthen Personnel Service in Colleges and Universities. *Proc. Engineer.*, *15*, 2757–2761.

Katkalo, V. S. (2018). Digital skills training: global challenges and best practices. *Analytical report for the III Int. Conf. More than Learning: How to Develop Digital Skills* (122 p.). ANO DPO “Sberbank Corporate Univer.”.

Ministry of Economic Development: a digital university will appear in Russia by 2022. https://futurerussia.gov.ru/national projects/588753 (accessed 12.01.2020).

Monitoring global trends in digitalization, Rostelecom. (n. d.). Retrieved on 13 January, 2020, from https://www.company.rt.ru/upload/iblock/d79/2018.pdf

Serebryakova, N. A., & Avdeev, I. V. (2018). The content of structural transformations of the region’s economy that are adequate to the requirements of digitalization. *Bull. of VGUIT*, *80*(4(78)), 408–412.

Shotilo, D. M., Kraynova, V. E., & Skurydin, A. V. (2018). Trends in the development of artificial neural networks in the digital economy. *Ekonominfo*, *15*(4), 65–69.

Sviridova, S. V., Pastushkova, O. V., & Krasnikova, A. V. (2019). Key competencies of a digital university in educational and enlightenment activities. *FES: Finance, Econ., Strategy 16*(10), 5–15.

The concept of the University of the National Technology Initiative 2035. (n. d.). Retrieved on 10 January, 2020, from https://2035.university/upload/iblock/ 0a9/0a9231d2 eecaf8e5165a2cf 38a 5e488f.pdf

The development strategy of the information society in the Russian Federation for 2017–2030 (approved by Decree of the President of the Russian Federation dated 09.05.2017, no. 203). ATP "Garant". (n. d.). Retrieved on 15 January, 2020, from https://www.garant.ru/products/ipo/prime/doc/71570570 / # 1000

Yang, W., Jun, Y., & Zhenhua, L. (2012). Research on the Planning and Construction of Platform of Comprehensive Informatization Service in Colleges and Universities. *Proc. Engineer.*, *29*, 69–73.