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## DIGITAL MATURITY OF AN EDUCATIONAL ORGANIZATION AS A BASIS FOR DIGITAL TRANSFORMATION

### MADUREZ DIGITAL DE UNA ORGANIZACIÓN EDUCATIVA COMO BASE PARA LA TRANSFORMACIÓN DIGITAL

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#### ABSTRACT

The modern system of higher education is subject to significant transformation under the influence of digital technologies and their deep penetration into the educational process. The teaching staff of higher education today is subject to significant requirements in terms of digital literacy and skills in the development and application of information systems in the educational process and the methodological development of the educational process organized on their basis. This article focuses on the work of teachers in the digital environment. An important problem is the issue of teachers' adaptation to the dynamically changing digital environment, taking into account the requirements to the level of competence due to the specifics of the digital environment and the already existing level of digital literacy of the teacher. It is noted that in a modern university the teacher is a multifunctional subject performing teaching, methodological, research and administrative tasks, the solution of which is often associated with working in the digital environment of an educational organization. The article presents the results of the study of the digital maturity of an educational organization as a set of organized processes and interrelations between the subjects of the educational process in the totality of technical and technological digital space of the university. The authors proposed a model of "digital maturity of an educational organization", which allows to determine the

level of digital development and directions of digital transformation. The method of digital development assessment is proposed, taking into account the digital environment of teachers within the framework of educational, methodological, administrative, research activities.

#### Keywords:

Digital services, digital maturity, educational organization, digital literacy, digital transformation.

#### RESUMEN

El sistema moderno de educación superior está sujeto a una transformación significativa bajo la influencia de las tecnologías digitales y su profunda penetración en el proceso educativo. Hoy en día, el personal docente de la enseñanza superior está sujeto a requisitos significativos en términos de alfabetización digital y competencias en el desarrollo y la aplicación de sistemas de información en el proceso educativo y el desarrollo metodológico del proceso educativo organizado sobre su base. Este artículo se centra en el trabajo de los profesores en el entorno digital. Un problema importante es la cuestión de la adaptación de los profesores al entorno digital que cambia dinámicamente, teniendo en cuenta los requisitos al nivel de competencia debido a las especificidades del entorno digital y el nivel ya existente de alfabetización digital del profesor. Se señala que en una universidad moderna el

profesor es un sujeto multifuncional que desempeña tareas docentes, metodológicas, de investigación y administrativas, cuya solución suele estar asociada al trabajo en el entorno digital de una organización educativa. El artículo presenta los resultados del estudio de la madurez digital de una organización educativa como conjunto de procesos organizados e interrelaciones entre los sujetos del proceso educativo en la totalidad del espacio digital técnico y tecnológico de la universidad. Los autores propusieron un modelo de “madurez digital de una organización educativa”, que permite determinar el nivel de desarrollo digital y las direcciones de la transformación digital. Se propone el método de evaluación del desarrollo digital, teniendo en cuenta el entorno digital de los profesores en el marco de las actividades educativas, metodológicas, administrativas, de investigación.

#### Palabras clave:

Servicios digitales, madurez digital, organización educativa, alfabetización digital, transformación digital.

#### INTRODUCTION

Modern global trends aimed at the active expansion of digital technologies, which consists in the reconfiguration of business processes in the organization, industry, government on the basis of new information technologies and solutions, inevitably touched the socio-cultural sphere, including education. In the era of rapid development of information technologies and the transition of society to the information way of life, the activities of educational organizations of higher education cannot remain unchanged - moreover, it is in them that the techniques of working with information, familiarization with digital servers, and the formation of competencies of professional activity are practiced.

It is worth noting that the sphere of higher education has actively picked up the trend of digital transformation and this trend, due to objective reasons, intensified during the COVID-19 pandemic. Digital transformation of educational organizations of higher education is a process of social influence mediated by information technologies in order to change the attitudes, thinking and behavior of participants of educational activity. Digital transformation of educational organizations of higher education should be assessed in the framework of the development of information services, information technology base, and, most importantly, the level of use of information systems by teachers and students. The object of digital transformation is the digital environment, which is constantly subject to change. The digital environment is a set of information systems, information technologies and the subjects that

use them. The relationship between the subjects (internal and external to the system), the directions of digitalization, trends and factors affecting the development of the digital space of the university, together determine the environment in which the transformation takes place.

The level of digital maturity, which determines the ability to make decisions about transformational changes, and which is directly influenced by the level of readiness of staff and students to use digital services in education, should be considered as indicators for assessing the real digital transformation in educational organizations. It is reasonable to consider the directions of digital transformation of educational organizations of higher education within the framework of the main and auxiliary business processes, i.e. those areas of activity in which changes occur and digital technologies are implemented (Golyschkova, 2020). These include teaching, research, innovation, methodological support, education, financing, logistical and legal support, office work, promotion and other processes.

It is important to understand that transformation simultaneously affects both business processes of educational organizations and the development of its information systems (Zybin et al., 2023). At the same time, transformation, like any changes, is a system of uncertainty with a set of challenges and threats. The core of change in our case is the human resources of an educational organization, whose intellectual labor allows to carry out digital transformation (Uvarov et al., 2019). At the same time, the effectiveness of digital transformation depends not only on the created conditions for change, but also on the readiness of personnel to accept changes. If the changes themselves can be developed by a relatively small group of people, the implementation processes involve a large number of employees who must be able to use new technologies (Ivanov et al., 2020).

It is worth noting that digital maturity is commonly understood as an educational organization's ability to embrace transformational change, including technical, psychological, and professional and personal (Toktarova & Rebko, 2021). Digital literacy can be assessed by grammar, composition, typing skills and the ability to create text, images, audio and design using technology, as well as experience with digital technology, the use of digital objects in the educational process, the ability to develop scenarios and digital teaching materials.

#### METHODS AND MATERIALS

No unambiguous methodology for assessing digital maturity, which would identify the level of readiness for digital

transformation, has been developed yet. This is due to the fact that assessment scales change faster in time than the level of readiness of a company to digital transformation is measured. The emergence of new information technologies generates the need to take into account their use and changes the approach to the evaluation scale. Only the factor approach remains unchanged in assessing digital maturity.

The most popular methodology for assessing digital maturity is developed by the Massachusetts Institute (MIT Center for Digital Business, part of the MIT Sloan School of Management). Based on the analysis, 3 most representative areas of digital transformation are identified: customer experience, operational processes and business models. Each of these areas contains three elements within itself. Customer experience includes customer contact, sales revenue growth, and the point of digital customer contact. Operational process transformation is based on process optimization, employee enablement, and performance management. Business model transformation is evaluated on digital modification of the company, creation of digital products, digital globalization. A separate emphasis in the methodology is placed on leadership, which is defined as advanced achievements in one of the studied areas.

The Digital Maturity Model (Digital Maturity Model) proposed by Deloitte evaluates the digital success of an enterprise based on 5 factors: customers, strategy, technology, production and structure (culture) of the organization (Khorolets, 2022). In this case, the five main factors-measurers are divided into 28 elements, which in turn are divided into sub-elements. A separate emphasis in the model is placed on strategy, which is the focus of digital transformation. Digital maturity is also defined through indices. For example, KPMG's Digital Business Aptitude (DBA) assessment model combines five assessment areas: vision and strategy, digital talent, key digital processes, agile sources and technologies, and leadership. Digital Transformation Index (Digital Transformation Index), developed by Little (2015), analytical agency, has a larger number of aggregated assessment areas: strategy and leadership, products and services, customer management, operations and supply chain, corporate services and control, information technology, workplace and culture.

A couple dozen more techniques could be listed, but the numbers will always differ. However, what is generally accepted in the models is the way the results are displayed. For each company, the assessment results are presented in the form of a "radar" on which, taking into account the chosen model and its criteria, the company's assessment level, the level of "virtual stars" and the industry average level are marked.

The radar methodology is also used by the Russian company ANO Center for Advanced Management Solutions in its digital maturity assessment model. As part of the model, the Center for Advanced Management Solutions offers an assessment on a scale from 0 to 3 points for key blocks: organizational culture, personnel, processes, products, models, data, infrastructure and tools. The model functionality allows filtering the results to calculate and visualize the level of digital maturity at the level of the organization as a whole, or at the level of departments, divisions, and employees.

As part of the development of digital transformation strategy in science and higher education today the following key areas are considered: development of digital services; infrastructure modernization; data management; human resources management.

In Russia, to assess digital maturity, we use indicators that include digital competencies of teaching staff, digital competencies of applicants and students, educational programs implemented with the use of e-learning and distance learning technologies, the level of development of educational and scientific super-services integrated into the digital infrastructure of Russia and available for collective use, as well as the amount of research carried out in the field of digital technologies. The list of areas of the strategy of digital transformation of the science and higher education sector includes:

- Datahub (a set of processes, regulations, measures, services and infrastructure aimed at improving the quality of data and systematization of work with them for their use in making managerial decisions);
- Digital Transformation Architecture (a comprehensive approach to digital transformation in the industry, coordination, methodological and information support for organizations);
- Digital University (digital services covering all types of business processes of Universities aimed at meeting the needs of participants in the education sector);
- Unified Science Service Platform (a unified system of services for research and development to improve their quality and accessibility, as well as to reduce the costs of fixed and variable costs; a unified research exchange);
- Marketplace of software and equipment (unified information environment of interaction between Universities and suppliers of equipment and software);
- Digital Education (training in digital competencies of students, scientific and pedagogical staff; formation of a competent team to manage the process of digital transformation of the University);

- Service Hub (unified service system for digital transformation of business processes of the Ministry of Education and Science of the Russian Federation and Universities).

World trends towards active expansion of digital technologies application, which consists in reconfiguring business processes in an organization, industry, state on the basis of application of new information technologies and solutions, inevitably touched the socio-cultural sphere, including education.

Nowadays, five different generations, which think, act and cope with new technologies in different ways, operate simultaneously in the business world. They are the traditionalists (1928-1945), the baby boomers (1946-1964), generation X (1965-1980), generation Y (1980-1990), and generation Z (1990-2030). The last two generations, and especially Generation Z, are considered digital. These individuals grew up in an environment where information technology was either being introduced into daily life and professional activities or was already widely used. Both Generations Y and Z use computers and search for information quickly and efficiently, whereas previous generations tended to be much slower, reading more and acting less.

It is necessary to take into account the different abilities, styles, motivations and goals of different generations, using them in the development of the University, in the work on the formation of information leadership of the University and the introduction of new pedagogical technologies based on digital services.

Modern Universities face the problems of technological progress in information technology, technological integration, the dynamics of human resources development from the use of new technologies. In the era of digital technology development, twelve critical qualities and leadership skills such as good communication, control over the sense of urgency, credibility and authenticity, courage in decision making, empathy, contextual intelligence, strategic intelligence, seduction and combination of talents, psychological capital, creative and innovative thinking, and collective leadership are highlighted (Ramirez, 2021). It is the development of these skills that assesses the readiness of the University's human resource potential for transformation.

The contradictory aspects of generational differences can be used at the University, within the framework of increasing the efficiency of educational activities, within the framework of building the learning process simultaneously on the basis of digital and traditional educational technologies. Today's business world is an environment of uncertainty, ambiguous, dynamic and complex, in which faculty

and students must work in teams, adapt to the digital context and work on information and professional skills to anticipate events. A long-term and optimistic strategic vision based on learning through information services should be a priority.

The transition to the digitalization of economic activity for different segments of modern society is a serious challenge that requires digital competencies and skills to work with high-tech information resources.

The problems of achieving digital maturity of an educational organization lie both in the internal motivations of employees and in the level of development of its environment (Tondeur et al., 2023). Often the factor that hinders the implementation of digital innovations in a university is the multiplicity of internal information systems that are not fully coordinated with each other. Modern universities often have an underdeveloped digital infrastructure: a small number of teachers' workstations, lack of mobile gadgets to carry out operational work with digital resources during interim certification, low Wi-Fi signal in academic buildings and other technical inconveniences that discourage people from using technology (Kostina, 2021; Shugal et al., 2023).

One of the most significant barriers to the development of digitalization of universities is the shortage of high-class specialists to maintain and develop the digital environment of an educational organization, due to the high level of payment for IT specialists in the commercial sector.

The possibilities of technology development and its introduction into the educational process are significantly restructuring the universities themselves. Thus, the role and importance of paper-based business processes are changing; new technological opportunities are building new digital business processes. It is the implemented technologies that allow the university to change, not the other way around. Universities cannot design a new business process schema and wait for the right technologies to arrive. Universities function as flexible operating structures that are willing to change, but only when they are assured of the reliability and convenience of new technologies. If technologies depend on a small number of people, the processes are faster. If technologies must be mastered by a large number of personnel of the organization, the processes of implementing new innovations are significantly delayed.

The practice of successful development of digital environment and implementation of digital services in educational organizations of higher education is associated with the development of the following areas:

1. 1. Organization of personnel and financial accounting. Educational organizations have created quite strong systems for the analysis of financial flows and personnel records. The maximum market share is occupied today by the information system "1C: Accounting" and "1C: Salary and Personnel", which is developed by a domestic company and has a wide distribution and service network.
2. 2. Electronic library systems (EBS). Systems that came to the aid of educational organizations and allowed to provide access to educational materials to all students. The systems have their own specifics, are usually oriented to a wide range of readers' interests, are continuously updated and cooperate closely with publishers.
3. 3. Learning Management Systems (LMS). The systems were developed as library resources, but as a result they have strongly diverged from electronic library systems, as they perform the function of organizing the course of the educational process taking into account the time, resource requirements and limitations, contain materials of educational minimum and a strong structure of control of learning material mastering. The first place among LMS is occupied by information systems created on the open source code MOODLE and distance learning system "Prometheus" (Lavrinenko, 2023). A significant share of the market is also occupied by universities' own developments, which partially develop into open education platforms.
4. 4. Systems for recording learning outcomes. The systems are aimed at processing data on the results of interim and final certification, formation of documents (diplomas) on the results of training. The major players on the market are IS "Galaktika" and "1S: University". The systems are developing towards a complete transition to electronic accounting, electronic transcripts and electronic credits. These systems integrate with the state information system GIS SZOS and transfer data to a single federal database.
5. 5. Systems of accounting of research activities of employees and evaluation of performance indicators. These systems do not have major players in the market of technologies for the education system, as a variety of results of university employees' activities are subject to accounting. As a rule, the systems are closely related to the financial part, as they involve the calculation of additional allowances and indicators of an effective contract. Verification of information reliability of such systems is carried out through linking to electronic databases of publications, including RINC. However, the systems are broader than simple accounting of publication activity, as they are aimed at accounting for all types of employee activities.
6. 6. Official websites of higher education organizations. Information systems with their own databases, made in the form of web-development. Information systems are aimed at informing the general public about the activities of the educational organization. An important place among the information presented on the website of an educational organization is occupied by data on human resources and educational programs implemented. Official websites are subject to robotic verification and have a number of special sections with a uniform placement of information on all educational organizations of the country.
7. 7. Websites of admission commissions. Information portals for working with applicants, which are aimed at promptly informing applicants and their families about the competitive selection process for admission to educational programs. The architecture of the sites differs significantly by educational organizations of Russia, which when working with different universities leads to difficulties in finding information, although each one individually can have its own interesting interface. To systematize work, all systems are connected to the state information system "Postupay-online", which is designed to form a unified record of applications across Russia.
8. 8. Videoconferencing systems (VCS). Systems aimed at providing the possibility of group communication of persons located at a distance from each other and providing the possibility of presentation of information to a wide range of persons, geographically distant from each other. VCS systems received the main impetus for use in the period of total isolation in 2020-2021, associated with a viral infection that changed the worldview of the entire educational space of the world.

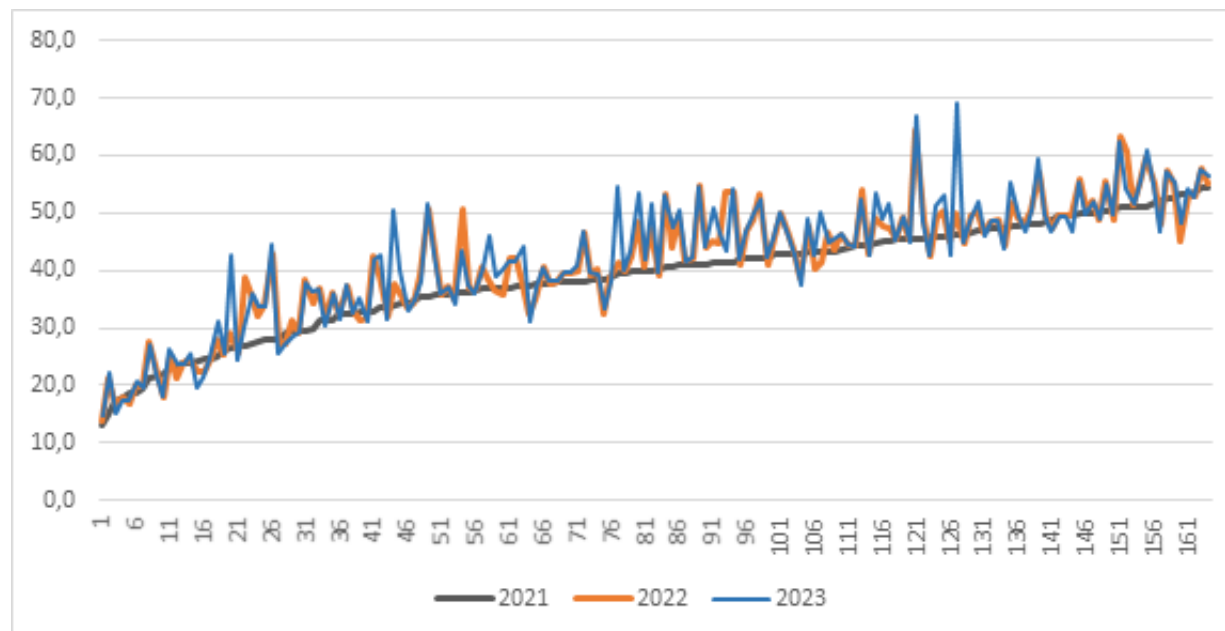
All of the above systems create a digital environment of the university and require from the staff of educational organizations of higher education digital literacy in entering and using large amounts of data. On the basis of information systems, the practice of working with documents is changing and a new digital culture is being formed. And the more widely covered the systems of employees, the greater the need for new digital technologies arises. For example, 3D printing technologies are actively developing. These systems for creating structural elements based on volume printing methods are a professional skill useful for graduates of design and construction type of activity, and interesting to study. VR classes have started to appear in universities, where students work with various remote objects (for example, equipment of a real thermal power plant) in special glasses in virtual reality mode (Putilova et al., 2022). Technologies are well perceived by learners, but require skills to create learning materials for learning. In addition, digital twins are actively developed,

which are created to perform laboratory work and practice skills, and are used until the moment of admission of students to the real equipment (Trifonov & Shorokhova, 2019).

An interesting and little-studied sector in terms of impact is the introduction of robot teachers into the educational process, who are able to communicate with students electronically, create queries and respond to them. In such systems, an important role is played by artificial intelligence, which has entered the information space of educational organizations and changed the world in terms of the ability to perform tasks related to the search and systematization of information (Liu et al., 2022; Ng et al., 2023).

The index of digital services development in educational organizations of higher education in Russia is presented in an orderly manner in Fig. 1. The index is calculated by the indicators of the use of e-learning and distance education technologies in the implementation of educational programs. As can be seen from the Figure 1, educational organizations record different levels of development, with an obvious increase in development in all categories of educational organizations.

Figure 1. Index of digital services development in higher education organizations in Russia for 2021-2023



Source: Own elaboration

The development of information systems is irrevocably changing the activities of educational organizations. New digital technologies are easy to learn by young users and more difficult to learn by older users who have a history of success in a non-digital environment and think about possible undesirable effects of digitalization (Andryukhina et al., 2020). However, the development cannot be stopped and it is necessary to expand the list of teachers' capabilities, i.e. to continuously improve digital literacy. A review of the practice of implementing digital assistants in the activities of educational organizations of higher education allows us to conclude that the digital environment of educational organizations is heterogeneous, variable and unique for each university depending on the specifics of the built business processes (Nazari et al., 2021). Thus, the policy of human resources management in higher education should be diversified and depend on the structure of the digital environment of the university and the peculiarities of the organization of educational, methodological, research and administrative activities.

When assessing the level of digital maturity of an educational organization in terms of the digital component, it is advisable to use a quantitative approach to assessing the level of development within the quality management system. The assessment should be carried out on the basis of a scale integrated into the system of excellence assessment according to the EFQM model. The EFQM system is based on the following areas of development:

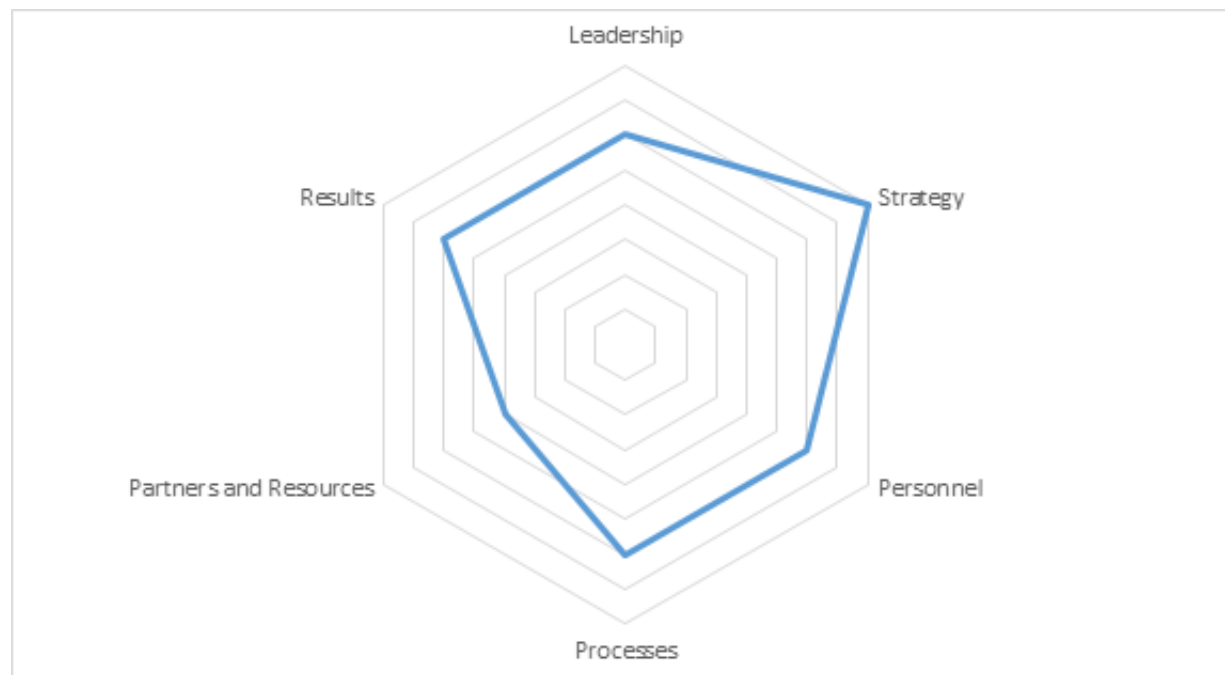
- organizational culture, leadership

- strategy;
- personnel, human resources management
- processes;
- partners and resources;
- results, digital services.

Within the EFQM model, it is advisable to use an approach to correlate opportunities and results, which includes solving the tasks of leadership and search for breakthrough strategies, determining the policy of work with personnel, resources and partners, ensuring the development processes and evaluation of results in terms of achieving the required indicators, as well as ensuring the satisfaction of employees, customers and society. Indicators of digital maturity should be correlated with the results of business process development, which will reflect the dynamics of changes in the overall set of activities within the elements of the university model.

The elements of the EFQM Excellence model reflect the development of organizational course in terms of leadership and selected strategy, human resources, infrastructure development in terms of own resources and partner interactions, processes and products are described by processes and results. The general meaning of the division of indicators corresponds to the logic of creating digital systems and services for their use, as well as the emergence of socio-economic effect from the digitalization of business processes. In accordance with the indicators of the excellence model, it is possible to build a digital profile of the University, which allows to analyze the current level of digital maturity, monitor the dynamics of digitalization, as well as the effects of its implementation in the business processes of the University. An example of the digital maturity profile is presented in Figure 2.

Figure 2. Example of the digital maturity profile of an educational organization in accordance with the Excellence Model



Source: Own elaboration

As an evaluation scale we will use a four-point system (A, B, C, D), which is used in assessing quality assurance in accreditation models and university ratings. Level D shows the initial level of digital maturity and is characteristic of Universities - “digital beginners”. Level C is the basic level of digital maturity development and is characteristic of Universities - “digital conservatives”. Level B - advanced level of digital maturity development, it is characteristic of Universities - “digital leaders”, Level A - leading positions in terms of digital maturity level, it is characteristic of Universities - “digital leaders”. The indicators used for assessment are quantitative, therefore benchmarks for development indicators, for universities in the country or worldwide (depending on the purpose of comparison) should be used

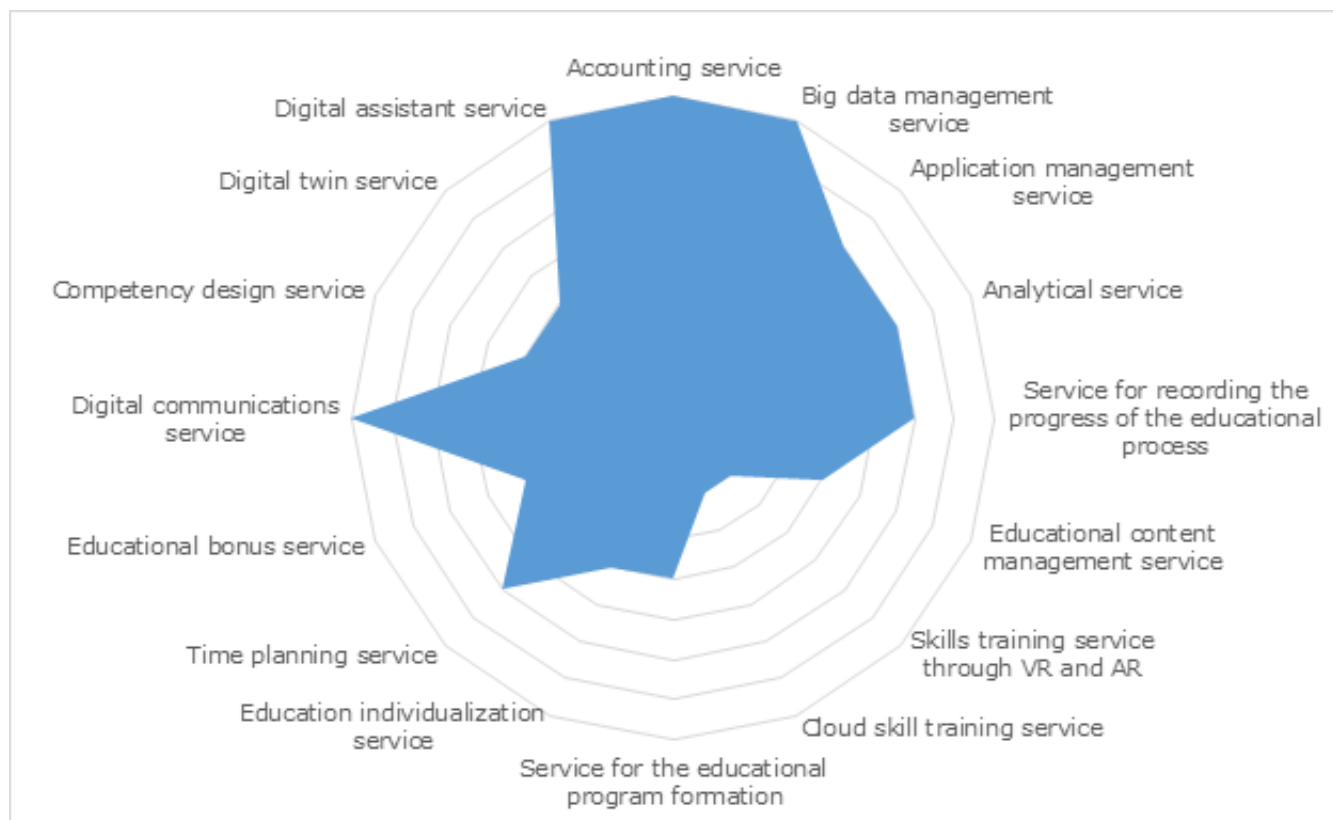
as a comparison. In the absence of benchmark information, the final information can be transferred to groups by the expert method, based on analyzing the opinions of the expert committee making the assessment.

The assessment of quality assurance of educational activities should be considered in a comprehensive manner. It is advisable to take into account the overall level of influence of digitalization processes on the educational organization, as well as the level of digital literacy of the staff. These indicators should be taken into account in the concept of “matryoshka doll” with the inclusion of the indicators of the lower level in the indicators of the higher level, in accordance with the list of evaluation criteria of key business processes.

It should be noted that in a modern educational organization a teacher is a multifunctional subject performing educational, methodological, research and administrative tasks, the solution of which is often associated with work in the digital environment of an educational organization. This approach allows us to use a different number of respondents to build the model, to select questionnaires with a significant deviation of results from the average value, and as a result to obtain reasonable balanced results.

The digital literacy of an employee (teacher) of an educational organization of higher education should be determined by a set of criteria distributed by categories, which include primary skills of working with information on electronic media and educational technologies in the context of cross-cutting breakthrough digital technologies included in the Russian development program (Masalova, 2021; Shindina et al., 2022). The use of categories and testing of knowledge in each of them will allow us to assess the readiness of university human resources for digital transformation Figure 3 presents the profile of digital literacy of employees taking into account the main digital services used in the educational organization by types of business processes.

Figure 3. An example of the profile of digital literacy of teachers taking into account the digital services used.



Source: Own elaboration

It is advisable to use a four-point system similar to the digital maturity assessment scale as an evaluation scale.

The digital environment of the university, including the participants of the educational process, connections between them, and various digital services, determines the requirements for the development of digital competencies of the



teacher. Since the structure of the digital environment of universities is different, the requirements for the development of digital competencies cannot be unified but should be based on the current state of the digital environment, digital transformation objectives, the level of digital literacy of the teacher and the selected areas of development within the scale of excellence.

## CONCLUSIONS

The proposed approach to building a profile of digital maturity of an educational organization, based on the assessment of digital literacy of teachers of educational organizations of higher education and the tasks of developing the quality of business processes allows a multi-factor assessment of the possibilities of changes in the educational environment within the framework of end-to-end breakthrough technologies for the development of information systems and technologies, as well as taking into account the specifics of the tasks solved by the teacher, including teaching, methodological, research and administrative activities. Quantitative assessment of the level of digital literacy allows building a “digital profile” of a teacher, as well as tracking its changes in the process of learning and self-development. The analysis of the experience in the development of digital services developing in educational organizations allows us to argue that when choosing an approach to assessing digital development, it is necessary to take into account the infrastructural factors of digitalization (material and technical factors, information, human resources) and the results of digitization of educational products with the transition to new learning technologies. The conducted research of changes in the digital development of educational organizations over the last 3 years allows us to predict the growth of digital technologies in education and the gradual expansion of digital skills of the subjects of the educational process.

The proposed model of development of digital maturity of an educational organization in the context of the results of digital transformation of business processes of educational organizations allows predicting “development points” within the framework of digitalization of the environment of activities of students, teachers and administrative staff with the allocation of blocks: teaching methods and formation of student experience; research and development; campus and student life; administrative functions; university management and financing; information and communication technologies.

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