



QUALITY MANAGEMENT IN UNIVERSITIES 5.0 THROUGH SUSTAINABLE INNOVATIONS: PERSPECTIVE OF STRATEGIC ACADEMIC LEADERSHIP

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ABSTRACT

This article elaborates on the transformation of universities' roles in the context of the transition to the concepts of Industry 5.0 and Society 5.0, which leads to the need to rethink approaches to higher education quality. Modern universities go beyond the limits of primary missions, are connected with the production and dissemination of knowledge, and are active agents of social progress, sustainable development, and digital transformation. We analyse the evolution of the criteria of quality in the sphere of higher education, which are supplemented by the parameters of sustainable development, inclusiveness, environmental responsibility, digital transformation, and the level of satisfaction of the participants of the educational process. The necessity for the expansion of traditional models of quality management with the principles of Quality and Human-centric Management is substantiated. A model of quality management in Universities 5.0 which is based on digital transformation and sustainable innovations, human capital management, and structural units, which combine transformational, strategic, and operational elements, is presented. Special attention is paid to the achievement of the third and fourth missions of universities within the Quintuple Helix model.

The methodological framework of this research contains the theoretical provisions of quality management, innovations management, public governance, digital economy, the concept of sustainable development, etc. The theoretical framework of this paper is defined by agreement with the Quintuple Helix Innovation Model, the paradigm of Quality 5.0, and the stakeholder theory. The methodological tools include system, integration, process, and competence-based approaches, as well as methods of analysis, comparison, observation, and generalisation.

The scientific value of this paper consists in the formation of the author's concept of quality management in Universities 5.0 as a multi-level system, which combines value statements, technological tools, and socio-institutional factors to achieve strategic academic leadership in modern conditions.



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1. INTRODUCTION

In modern conditions, there is a large-scale shift in the perception of the role of traditional social institutes. These changes influence universities as well. Implementation of the approaches of Industry 5.0 and Society 5.0 forms a new balance between technological and human development, which involves the combination of digital, environmental, and social values within one system. The inclusion of the principles of these approaches in the practical activities of modern universities allows them to fully use the advantages of digital transformation, assigning them humanistic dimensions and sustainability (Carayannis & Morawska-Jancelewicz, 2022).

At the same time, traditional approaches to quality management in higher educational establishments, which are based on standardised procedures and automatization in the conditions of Industry 4.0, do not sufficiently conform to current challenges, which are peculiar to the global environment. They do not take into account the important role of the human factor in ensuring technological progress and do not focus on interaction with the natural environment and society, which keeps the potential for improving the quality of education only in the processes and their digitalisation. Unlike this, the concept of quality that is based on Industry 5.0 uses human-centredness, ethical norms, and environmental priorities during the establishment of strategic directions for higher education development. Its focus is on ensuring the strategic leadership of universities, which is based on stable interaction with the environment and sustainable innovations (Fiałkowska-Filipek, 2024).

Quality management in Universities 5.0 puts emphasis on the human factor, as the main driving force of innovations, which, through a combination of the components of cyber-physical space, allows achieving high economic results in the conditions of environmental and social well-being. Application of digital technologies (big data, blockchain, artificial intelligence, cloud services, etc.) is set onto rethinking of own mission, wide integration of the Sustainable Development Goals into strategic provisions of university's development, and creation of sustainable digital educational platforms which can unite efforts and interests of universities' stakeholders and society on the whole (Carayannis & Morawska-Jancelewicz, 2022). The University 5.0 concept offers conditions for the development of open innovative systems, within which the triple model of the cooperation of business, education, and government is supplemented by interaction with public agents and environmental factors. This requires new approaches to reconsideration of the quality of universities' activities, which is supplemented by digital solutions and sustainable innovations.

2. METHODS AND LITERATURE REVIEW

The problem of achieving strategic academic leadership and the quality of education in the conditions of Industry 5.0 contains a range of complex scientific and practical tasks, which require the application of an interdisciplinary methodological framework. This methodology is based on theoretical provisions of management (in particular, quality management and innovative management), public management, the digital economy, and cybernetics, which are set into the concept of sustainable development, corporate social responsibility, innovative sustainability, etc. Theoretical substantiation of rethinking the role of universities in modern society is realised through agreement of the concept of the Quintuple Helix Innovation Model (within which knowledge circulates in the environment of the interaction of universities, business, government, civil society, and natural environment), the paradigm of Quality 5.0 (which involves the inclusion of digital, social, and humanitarian aspects into the system of quality), and the stakeholder theory (which emphasizes the active involvement of all stakeholders, including students, potential employers, representatives of public groups and public authorities, in the development of policy and methodology of quality). The methodological apparatus of this research is formed by a range of approaches and methods, which include system and integrative, process-oriented and competence-based approaches, as well as the methods of analysis, synthesis, comparison, observation, and generalisation.

The current problems of quality management in Universities 5.0, which are based on the active use of sustainable innovations in the context of achievement of strategic leadership, have a strong theoretical justification. Thus, in the context of the influence of the concepts of Industry 5.0 and Society 5.0 on the quality of higher education, recent scientific studies determine a new paradigm of development, which includes education, science, and society (Alves et al., 2023; Carayannis & Morawska, 2023; Carayannis & Morawska-Jancelewicz, 2022; Tovmasyan et al., 2022; Ruso et al., 2024). These approaches emphasise humans as a centre of innovative processes and focus on the necessity for integration of digital technologies with the principles of sustainable development, inclusion, and environmental responsibility (Arıcı & Kitapci, 2021; Maljugić et al., 2024). A paradigmatic shift takes place in Universities 5.0: the traditional role of higher education establishments is transformed into the model of active social and innovative leadership, which models the scenarios of society's development (Ruano-Borbalan, 2024; Shahidi Hamedani et al., 2024).

From the position of quality management in higher education based on the principles of Quality 5.0, the focus is on the expansion of the limits of traditional quality management through the integration of digital technologies and social and humanitarian aspects

(Stefanovic et al., 2024; Arsovski, 2023). Higher education is under the influence of this concept, which involves the inclusion of the criteria of sustainability, innovative activity, and satisfaction of all participants in the educational process (Khairova et al., 2019; Fiałkowska-Filipek, 2024). From the position of digital transformation in education, innovations, and development of universities, it is established that digital transformation is the key driver of the modernisation of educational systems in the context of Universities 5.0 (Fernández et al., 2023; Mamaeva et al., 2020). Implementing novel digital technologies, platforms for big data analysis, blockchain solutions, and flexible motivational systems foster the effectiveness of educational and scientific processes (Gagnidze, 2023). These technologies automatize the processes of quality control and form the basis for the development of sustainable innovations, which support society's intellectual capital.

Assessment of the role of universities in public processes and innovations based on the Quadruple/Quintuple Helix interaction model shows that universities are not limited to the function of transfer of knowledge – they actively perform the role of social innovative platforms, which interact with business, government, civil society, and natural environment (Morawska-Jancelewicz, 2022; Paleari et al., 2015). The Quintuple Helix model emphasises sustainable development through the integration of these interactions, focusing on universities' role in the formation of new values, ethical norms, and social senses (Savicheva & Chesnokova, 2017). In this context, quality management in universities must reflect not only academic but also socio-cultural and environmental dimensions of their activities.

The goal of this paper is to evaluate the specifics of quality management in universities which function in the conditions of transition to the concepts of Industry 5.0 and Society 5.0. This leads to the necessity for expanding the list of universities' missions and the triple spiral of their development through the comprehensive consideration of social and environmental aspects and the corresponding reconsideration of quality criteria regarding educational, scientific, and socially beneficial activities of higher education establishments. This is also connected with digital transformation, which determines the priority of sustainable innovations' influence on universities' development in the context of their achievement of strategic academic leadership. Fulfilment of this goal, combined with the above paradigmatic changes, requires the completion of several tasks, which include the identification of universities' role in social development in modern conditions, the establishment of the specifics and demands for the functioning of higher education in the conditions of Industry 5.0, description of the University 5.0 concept, generalisation of approaches to quality management in these universities, and determination of the influence of sustainable innovations

on quality management in higher education establishments.

3. RESULTS

Understanding quality is closely connected with value statements, which define the list of its parameters, their hierarchy and dynamics. In the system of higher education and science, similar to other public processes, fundamental transformations take place. They are caused by the large-scale implementation of digital technologies. These changes concern not only the tools of receiving education and conducting scientific research but also the essence mechanics of educational and scientific progress. This involves the expansion of communication networks and rethinking the definition of “knowledge”, the means of its production and adaptation in the academic community.

The retrospective of universities' development shows the existence of several stages of reviewing their role in public processes. Thus, the initial value of higher educational establishments, which formed in the Middle Ages, was connected primarily with the preservation and transfer of philosophical knowledge in the sphere of scholasticism (logical justification of faith). In this period, the role of universities in most cases was restricted to the formation of spiritual and secular elite. The Modern Period (16th – 18th centuries) led to an increase in interest in natural sciences and medicine. Research trends began to arise in universities, and their role was connected with rational thinking and experiments. The 19th century marked a new age in universities' development, which was linked to the formation of the concept of research at Humboldt University. In these conditions, higher educational establishments became the centres of the modernisation of the state, the formation of national identity, and the creation of different sciences. The 20th century was peculiar for the massification of higher education. In this context, universities provided an impulse for economic development, satisfying the labour market's demand for skilled employees. Universities also received an important role in the “knowledge triangle” (education – research – innovations), which strengthened their contribution to the innovative development of the world. At present, universities are not only centres of production and dissemination of knowledge but also global institutes and tools for commercialisation of knowledge and digitalisation of education (Paleari et al., 2015).

According to the transformation of understanding the role of universities, the view of the notion of higher education quality changed. Starting from the age of a research university, the feature of universities' quality was their ability to create new knowledge and retain a scientific reputation. During the period of mass higher education, the quality of universities' activities received tools for standardisation in the form of accreditation, and its main parameters became compliance with regulatory

demands, the number and success of graduates, etc. To characterise quality, modern global universities use metrics connected with international educational rankings (QS, THE, Shanghai), publication activity in Scopus and WoS databases, international mobility of students, participation in grants and start-ups, etc.

There is a complex system of evaluating the quality of higher education, based on the provisions of the Bologna process (1999). It involves the harmonisation of metrics and approaches in quality management of universities, application of the mechanisms of accreditation of educational establishments and educational programmes, which take into account lecturers' qualification, integrity and structure of educational programmes, assessment of results of studying, financial stability, and effectiveness of the institutional management of educational establishments. European universities use the European Standards and Guidelines – official documents of the European Network for Quality Assurance (ENQA), which involves education's quality assurance based on internal procedures, external assessment based on accreditation tools, and transparency of universities' activities and application of independent methods of their assessment (Savicheva and Chesnokova, 2017). A separate component of the system of quality support of higher education establishments is formed by the standard ISO 21001:2018 "Management systems for educational organizations". This standard is aimed at the improvement of educational processes, competency of personnel, and support of the level of students' satisfaction and risk management (International Organization for Standardization, 2018). Thus, quality management in universities forms a complex system of formal and informal procedures and metrics, which, in the aggregate, ensure a high level of provision of educational services and completion of scientific works, which conform to society's demands in the context of the current trends.

Given the active digital transformation, which encompasses all spheres of human life, the functions and a view of the quality of universities' activities also change. According to this, the role of higher educational establishments is strengthened in the triple spiral "university-business-government", and researchers and students are actively involved in the creation of knowledge through crowdsourcing, open science, and cloud tools. In these conditions, universities often perform the role of innovative platforms and mediators of intellectual development, forming the corresponding innovative ecosystem.

An important role in the digital transformation of universities' role belongs to the concepts of Industry 4.0 and 5.0. Within transformations, caused by the Fourth Industrial Revolution, the labour market and intellectual processes are actively influenced by automatization, robotization, artificial intelligence, big data, the Internet of Things, and other technologies. This leads to the

necessity for developing transdisciplinary competencies (which are manifested through the integration of knowledge, digital skills, and flexibility of thinking), modernisation of the tools of knowledge transfer and training, and the use of digital technologies for quality of education management and scientific activities. The understanding of universities' activities' quality is supplemented by the criteria of flexibility and adaptability, and the corresponding metrics of successfulness take into account digital competences and graduates' readiness for productive employment in the digital industries. Transition to Industry 5.0 shifts the emphasis of educational and scientific activities, increasing the impact of the values of sustainable development, human role in technological progress, and equality, which is achieved through the tools of inclusiveness and ethics. In these conditions, evaluation of the quality of universities' activities, which includes parameters of effectiveness, demand, and adaptability, is supplemented by the parameters of public usefulness and integration of the human factor into digital processes.

These factors predetermine the formation of a new concept of higher education development, which, similar to Industry 5.0 and Society 5.0, is called University 5.0. This concept is based on the combination of the values of the previous model of University 4.0 (based on large-scale digitalisation of educational and scientific progress) with the values of sustainable development, inclusiveness, and human-centredness, which directs the activities of higher education establishments not only at the needs of the labour market but also at social and environmental needs of mankind. Thus, it characterises not only the technological stage of universities' development but also the paradigmatic shift in their mission.

The notion of University 5.0 emerged in the 2020s under the influence of the ideas of Industry 5.0, which was a response to the narrow economic approach within University 4.0. The emphasis of University 5.0 is on sustainability. It is viewed as a priority of economic development, connected with the fight against threats, adaptation and acceleration of development with the emergence of new crises and risks (Gagnidze, 2023). Thus, the activities of new-generation universities are based on the processes of formation of flexible educational and scientific ecosystems, which can quickly react to external challenges, contribute to sustainable development, and ensure the integration of human capital into digital technological innovations.

Quality management in universities' activities in the conditions of Industry 5.0 is manifested most completely through the influence of the Society 5.0 concept on the integration of economic, educational, public, and technological changes, which characterise the modern period of development. According to this, quality management is realised through different directions and components, which form the corresponding model in

Universities 5.0 (Fig. 1). The theory of quality management goes beyond the limits of the popular concept of Total Quality Management (TQM), supplement it with the provisions of the concept of Socially Oriented Quality (SOQ) (Stefanovic et al., 2024), which is oriented towards value statements, inclusiveness, eco-friendliness, and innovativeness.

Within the given model, quality management in Universities 5.0 is based on the connected concepts, which evolve with Industry 4.0 and are based on Industry 5.0, Society 5.0, and Quality 5.0 (Shahidi Hamedani et al., 2024). Strategic benchmarks of this model stem from values peculiar to the fifth stage of technological development, which are manifested in sustainable development, inclusiveness, innovativeness, public responsibility, and desire towards integration within one ecosystem. The model is based on digital transformation,

based on big data, blockchain solutions, and digital platforms, which are implemented in the system of education and science and help automatize the monitoring of quality, ensure transparency and accelerate decision-making, and sustainable innovations, which cover transdisciplinary research and envisage active involvement of students in innovative activities and the use of the open innovations concept based on Living Labs to test and scale the environmental and socially responsible solutions. An important element of the model is human capital management, which involves the development of internal innovative communities, formation of flexible systems of personnel motivation, strengthening of digital competencies, development of Design Thinking, and an increase in ability for adaptation, which is realised through scenario planning, mentoring programmes, etc.

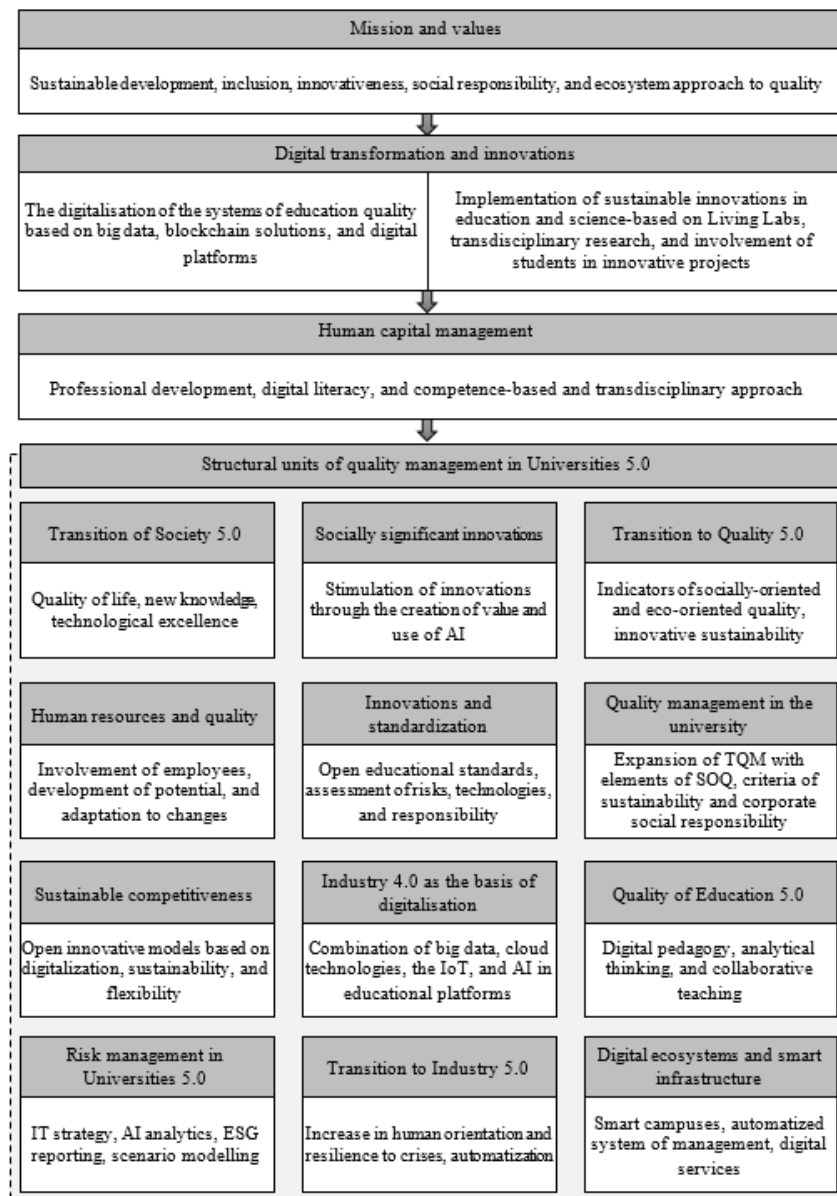


Figure 1. The model of quality management in Universities 5.0
Source: Compiled by the authors based on Gagnidze (2023)

Additionally, the model of quality management in Universities 5.0 covers twelve functional units, which unify transformational, strategic, and operational elements, which characterise transitional aspects of innovative development, transformation of quality management in universities, rethinking social, market, and infrastructural processes, etc. According to this, quality management in Universities 5.0 is viewed as a multi-stage process, which covers strategic vision, technological transformations, human capital development, and continuous assessment of results aimed at the improvement of the system. Within the given functional units, it is possible to see the connection between the development of humanistic approaches through the strengthening of the value and quality of life, employees' involvement in quality management, actualisation of the innovative vector through stimulation of the development of social significant and responsible technologies, the use of digital technologies based on human-centrism, and evolution of the approaches to quality of education which takes into account social and environmental indicators, is realised within sustainable development and corporate social responsibility, and takes into account digital capabilities and specifics of man-machine interaction.

As of now, universities integrate into global transformational processes, which leads to a significant expansion of their role in society. In these conditions, traditional functions (missions) of higher educational establishments – teaching (transfer of knowledge and training specialists for the labour market) and research (creation of new knowledge) – are supplemented with new dimensions, forming the third and fourth missions (Ruano-Borbalan, 2024). The third mission of the university is connected with its active participation in public processes. It is realised through the principles of social responsibility, contribution to regional innovative development, and formation of interactive ecosystems, which ensure sustainable interaction between universities, stakeholders, and society on the whole. The fourth mission offers a new paradigm of universities' development, which assigns them the ability to form new values, sense, and ethical statements, contribute to social well-being, and sustainable development, and focus on human dignity as a strategic priority of educational evolution.

One of the relevant approaches to the quality of universities' activities in the conditions of Industry 5.0 is the concept of Quality and Human-centric Management (Q2HM). A specific feature of this approach is the focus not only on compliance with standards but also on consideration of the value-based influence of educational institutions on public processes, which is manifested in the achievement of sustainable development indicators, support of inclusiveness, interaction with the community, and promotion of ideas of ethical behaviour. This concept conforms to the fourth mission of the university and characterises it from the position of the growth of

influence of higher educational establishments on public processes, which is especially relevant in the conditions of large-scale transformations.

Modern studies point to the expedience of using this approach in the system of quality management in Universities 5.0. This conforms to the model of Quintuple Helix (Carayannis & Morawska-Jancelewicz, 2022), in which higher education establishments harmonise their activities in the sphere of education, science, social interaction, and innovative development, adhering to the principles of sustainable development. It also conforms to the ideas of human-centredness and resilience of innovative development, which are actively implemented in the educational strategies of universities' development. Q2HM is also the basis for the formation of the Quality 5.0 concept (Maljugić et al., 2024) through the integration of social, humanistic, and environmental values, which are combined with the current processes in the sphere of education and science. Thus, the application of Q2HM as a concept of quality management in Universities 5.0 allows them to effectively react to global challenges and form an environment of trust and innovativeness, which are necessary for achieving sustainable academic leadership.

Transition to the concepts of Society 5.0 and Industry 5.0 is characterised by substantial influence on the activities of universities and support of the quality of educational and scientific services, which are connected with all missions of the university. Within the educational mission, the change of the paradigm and digitalisation offer new opportunities, which involve the corresponding setting of pedagogical practices, improvement of the level of digital literacy, implementation of sustainable development metrics in the educational process, the use of educational platforms that are based on AI, alternate and virtual reality, cloud technologies, etc, and employment of the principle of openness for educational platforms and resources. In the context of the scientific and research mission, sustainable digital innovations expand the capabilities of open science, ethical use of AI, mobility and inclusiveness. Within the third mission of universities, sustainable digital innovations offer flexible interactive platforms for the interaction between education and science and the public through educational projects, live laboratories, programmes of social entrepreneurship, etc. In the context of the realisation of the fourth mission, the capabilities of sustainable innovations have an essential role, for they offer conditions for joint design and creation of a sustainable future and perform the role of open systems that can accumulate and transform resources to effective solutions and tools for formation of Society 5.0.

In the context of digital transformations, the role of universities in supporting social innovations becomes very relevant. It is based on three main functions:

1. Creation and dissemination of knowledge aimed at support of innovations;

2. Provision of access to tangible and non-tangible assets;
3. Support of social innovations through the tools of consulting and involvement of stakeholders (Carayannis & Morawska-Jancelewicz, 2022).

At that, universities not only foster the development of innovations but also directly form demand for them, popularising the corresponding values.

The conditions of technological transformation of the sphere of higher education and public processes determine the priority of digital tools in the context of the search for reserves of improvement of the quality of universities' activities. Given the concept of Industry 5.0, the character of these innovations is coordinated with sustainable development and social responsibility. These views conform to the concept of sustainable innovations, which can generate long-term positive effects in the sphere of education, scientific activities, and public development, which is combined with economic and environmental effectiveness. Integration of sustainable innovations into the system of quality management in Universities 5.0 has a complex character, which is connected with the diverse missions of universities and specifics of the academic community. It takes place within three main components: educational, scientific, and technological. The educational component is based on the use of interdisciplinary platforms, which combine professional aspects with sustainable development. Here improved methodologies of training are used, including simulation environments, problem-oriented training, etc. The scientific component includes the development of research networks, implementation of responsible science principles, scientific ethics, and stimulation of transdisciplinary research. The technological component is based on sustainable environmental solutions, based on cloud technologies, energy efficiency, application of big data analytics, and integration of blockchain technology into the system of managerial decision-making and reporting for transparency and clarity of processes (Fernández et al., 2023).

The development of quality management systems in Universities 5.0 due to the tools that are based on sustainable innovations raises the effectiveness of monitoring and control of educational and scientific processes. In these conditions, the assessment of education's quality involves the expansion of traditional indicators, connected with students' successfulness, publication activity, etc., with parameters of energy efficiency, inclusiveness, ethics, etc. Employment of AI tools, based on human language recognition, allows for objective real-time assessment of the level of students' and teachers' satisfaction with the educational and scientific processes in the university. These tools offer better opportunities for setting the system of quality management in universities, its adaptation to the conditions of specific students, and knowledge exchange and cooperation at a global scale.

4. DISCUSSION

Many issues considered in the context of the study of quality management in universities in the conditions of Industry 5.0, which are realised due to sustainable innovations to achieve strategic academic leadership, are within an open discussion, predetermined by the complexity of the given problem. Therefore, understanding of University 5.0 is not stable and generally accepted; the notion of sustainable innovations is also discussed, and quality management of educational services and scientific activities is at the stage of active systemic transformation. Thus, the very fundamental aspects of the outlined problem require reconsideration and clarification. Apart from this, an important role of universities in the context of public processes and intellectual development leads to the expedience of the formation of a new paradigm of assessing the quality of their services, which would take into account traditional aspects and modern influences and would be able to assess the level of universities' fulfilling their missions in education, science, public activity, or interaction with the natural environment.

Another aspect of the discussion is the issue of technological risks, which are connected with cyber security, data privacy, ethical aspects of using artificial intelligence, protection of intellectual rights, etc. These challenges are inseparable from technological progress; they emerge as a result of innovative progress and require additional innovative efforts, which, on the one hand, checks the rate of innovative progress, and, on the other hand, determines its additional directions.

Resilience of innovations in the conditions of Industry 5.0 forms a separate direction for research, which requires additional research and discussion. Attention should also be paid to the issue of assigning innovations to the category of sustainable innovations, the formation of the methodology of ranking of the resilience of innovations, and the assessment of their influence on the level of universities' quality management. A relevant problem is the economic assessment of application sustainable innovations. This assessment allows understanding the prospects of using sustainable innovations in higher education and science from the position of the ratio of expenditures for their development and implementation to effects achieved due to innovations of this type.

5. CONCLUSION

Based on the retrospective of universities' development, we established the presence of several stages, within which the mission of higher education establishments was assessed differently. At present, the influence of universities on public processes is assessed beyond the limits of knowledge production and dissemination. Their role is associated with modelling the scenarios of society's development, given an increase in digital

transformation, and the formation and promotion of the values of sustainable development, inclusion, and environmental responsibility. Given this, the criteria of higher education quality should also be reconsidered and expanded by including the indicators of sustainable development, innovative activity, the level of satisfaction of the participants of educational and scientific progress, etc.

In the conditions of the quick change in the paradigm of higher education, the traditional system of assessing quality, which is based on the mechanisms of standardization and accreditation, requires expansion with the criteria of flexibility, adaptability, and consideration of social factors, connected with educational and scientific activities. In the context of the triple spiral of "university-business-government", digitalisation strengthens the role of universities as innovative platforms that can offer effective mechanisms and tools for involving a wide range of interested parties in intellectual development.

Transition to the Industry 5.0 and Society 5.0 concepts has a significant effect on universities' development. In these conditions, apart from the active use of digital technologies, values of sustainable development become increasingly important, the role of humans in the educational and scientific process is strengthened, and attention is focused on the public usefulness of universities. The paradigmatic shift of higher educational establishments and the formation of the University 5.0 concept take place. In these conditions, quality management based on TQM principles is supplemented by social components, which take into account value statements, inclusiveness, innovativeness, and

environmental friendliness. The proposed model of quality management in Universities 5.0 is a multi-level system, which involves strategic vision, digital transformation, human capital development, and sustainable innovations. Quality management in this model involves the use of digital platforms, big data, and blockchain solutions for the automatization of the processes of monitoring quality, implementation of sustainable innovations to raise society's intellectual capital, and support of human capital in the sphere of higher education through the development of digital competences, mentoring, and flexible motivational systems.

Expansion of the list of universities' missions through active involvement in public processes (the third mission) and the ability for the formation of new values, ethical norms, and senses (the fourth mission) is agreed with the concept of quality management based on Quality and Human-centric Management (Q2HM). This supplements the indicators of the quality of university activities with the parameters of value-based influence on public processes and conforms to the Quintuple Helix model, in which higher educational establishments interact with society and the natural environment based on the principles of sustainable development. The outlined change in the educational paradigm and digital transformation strengthen universities' capabilities within each mission, and positively influence the quality of their services. Integration of sustainable innovations into the system of quality management in Universities 5.0 is the main factor in an increase in their effectiveness. These innovations correspond to the principles of Industry 5.0 and include educational, scientific, and technological components.

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