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## THE ROLE OF IMPROVING THE QUALITY OF BUSINESS PROCESSES AND PRODUCTS IN THE POST-WAR RECONSTRUCTION OF UKRAINE

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**Introduction.** After Ukraine's victory in the war, it will be necessary to build a new economy of the country, which will be stronger and more stable than before the war. For this, the quality of business processes and products must be high. The modern trend of the market economy: the product must be made in such a way, which is justified economically, ecologically and socially. In the conditions of the war and post-war reconstruction, ensuring high quality should become a national idea, which will allow the rapid recovery of Ukraine's economy.

**The purpose of the study** is to justify the important role of improving the quality of business processes and products in the conditions of Industry 5.0 and the post-war reconstruction of Ukraine.

**Research methods.** To obtain scientific results, the historical method, theoretical generalization, induction, deduction, analysis and synthesis were used in the research.

**Result.** In the process of research, the development of approaches to quality management was considered in the historical aspect in the context of industrial revolutions. Industry 5.0 is a concept that seeks to combine human abilities, advanced technologies and care for the environment and bring them back into production. The processes of ensuring the high quality of the company's products, environmentalization of production, and digitization of activities play a decisive role in the transition of enterprises to the principles of

Industry 5.0. The primary role is assigned to human resources. Success on the market, victory over competition and sustainable development can be achieved by enterprises that have ensured systematic quality management, which enables the production of high-quality, environmentally safe products in an ethical manner, and have also been able to green, digitize and humanize the process of designing, manufacturing and selling products that issued, or services provided. Quality 5.0 is a combination of comprehensive quality management with the concept of sustainable development, which is based on the trinity of economic, environmental and social spheres.

**Conclusions.** For the post-war recovery of Ukraine's economy, the high quality of business processes and products should become a national idea. This will allow enterprises to switch to the principles of Industry 5.0. Quality management in the conditions of Industry 5.0 should be human-centered and eco-economic. Comprehensive quality management is being merged with methods of greening production and digitalization of activities, which makes it possible to produce high-quality products in a transparent and ethical way and meet the requirements of all stakeholders – consumers, shareholders and the company's own staff, state bodies and local communities.

**Keywords:** Industry 5.0; quality; environmentalization; digitalization; human resources.

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16	0	2

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## РОЛЬ ПІДВИЩЕННЯ ЯКОСТІ БІЗНЕС-ПРОЦЕСІВ ТА ПРОДУКЦІЇ У ПОВОЄННОМУ ВІДНОВЛЕННІ УКРАЇНИ

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**Вступ.** Після перемоги України у війні потрібно буде будувати нову економіку країни, яка буде сильнішою і стабільнішою довоєнної. Для цього якість бізнес-процесів та продукції повинна бути високою. Сучасна тенденція ринкової економіки: товар повинен бути зроблений таким і тільки таким способом, який виправданий економічно, екологічно і соціально. В умовах війни та післявоєнної розбудови забезпечення високої якості повинно стати національною ідеєю, що дозволить швидко відновити економіку України.

**Метою дослідження** є обґрунтування важливої ролі підвищення якості бізнес-процесів та продукції в умовах Індустрії 5.0 та повоєнному відновленні України.

**Методи дослідження.** Для одержання наукових результатів у дослідженні використано історичний метод, теоретичне узагальнення, індукцію, дедукцію, аналіз та синтез.

**Результат.** У процесі дослідження розглянуто розвиток підходів до управління якістю в історичному аспекті в контексті промислових революцій. Індустрія 5.0 – це концепція, яка прагне поєднати людські здібності, передові технології та турботу про екологію і повернути їх у виробництво. Вирішальну роль для переходу підприємств на принципи Індустрії 5.0 відіграють процеси забезпечення високої якості продукції підприємства, екологізація виробництва, цифровізація діяльності. Першорядна роль

відводиться людським ресурсам. Успіх на ринку, перемогу конкурентній боротьбі та сталий розвиток можуть мати підприємства, які забезпечили системне управління якістю, що дає змогу випускати якісні, екологічно безпечні вироби в етичний спосіб, а також змогли екологізувати, цифровізувати та гуманізувати процес проектування, виробництва та реалізації продукції, що випускається, або послуг, що надаються. Якість 5.0 є поєднанням всеосяжного управління якістю з концепцією сталого розвитку, в основі якого знаходиться триєдинство економічної, екологічної та соціальної сфер.

**Висновки.** Для післявоєнного відновлення економіки України висока якість бізнес-процесів та продукції повинна стати національною ідеєю. Це дозволить підприємствам перейти на принципи Індустрії 5.0. Управління якістю в умовах Індустрії 5.0 має бути людиноцентричним та еколого-економічним. Проходить зрощування всеосяжного управління якістю з методами екологізації виробництва та цифровізації діяльності, що дає змогу виробити якісну продукцію в прозорий і етичний спосіб та задовольнити вимоги всіх стейкхолдерів – споживачів, акціонерів та власний персонал підприємства, державні органи та місцеві громади.

**Ключові слова:** Індустрія 5.0; якість; екологізація; цифровізація; людські ресурси.

**Introduction.** Victory in the war with the Russian Federation will not return Ukraine to pre-war times. After the victory, it will be necessary to build a new economy of the country, which will be stronger and more stable than the pre-war one. For this, the quality of business processes and products must be high. The modern trend of the market economy: the product must be made in such and only such a way, which is justified economically, ecologically and socially. In the conditions of war and post-war development, ensuring high quality should become a national idea, which will allow to quickly restore the economy of Ukraine and move to the principles of Industry 5.0.

**Resources and methods.** The works of such domestic and foreign scientists as A. Weimerskirch, A.V. Vakulenko, L.M. Witkin, E. Daming, J. Juran, S. George, M.L. George, J.M. Jobe, J.R. Evans, K. Ishikawa, W.B. Zahochai, Yu.B. Kabakov, P.Ya. Kalita, T.P. Kalita, O.M. Kryvoruchko, E. Laptyski, O.M. Livinsky, W.M. Lindsay, D.P. Loiko, T. Luyster, O.I. Momot, Neumann Earl, K. Rampersad, H. Taguchi, L.A. Trachenko, A.Yu. Chorny, M.I. Shapoval, Sh. Shingo, R.V. Shulyar, O.M. Yazvinska et al.

However, the question of the importance and role of the quality of business processes and products in the post-war reconstruction of Ukraine has not been fully studied and requires further research and development.

The purpose of the study is to identify the peculiarities of quality management of business processes and products in the conditions of Industry 5.0 and to determine the role of quality in the post-war reconstruction of Ukraine. Based on the goal, the following tasks were set and solved: the study of the historical approach to quality management in the context of industrial revolutions, the characteristics of Industry 5.0 and the analysis of the features of quality management of business processes and products in the conditions of Industry 5.0.

**Results and discussion.** Information about the transition to the principles of Industry 5.0 began to spread in 2017. The European Commission started work on relevant documents in 2021. Industry 5.0 is a concept that seeks to combine human abilities, advanced technologies and care for the environment. Industry 5.0 seeks to bring human, social and environmental aspects back into production. Industry 5.0 does not replace Industry 4.0, but improves and complements it, adding the goals of sustainable development, sustainability and "green transition" (gre4ka.info, 2023).

Industry 5.0 enables businesses to become more resilient, flexible and adaptable by improving supply chains and increasing corporate social responsibility. Goals of Industry 5.0:

- Rapid response to social and economic challenges, such as pandemics or wars.
- "Green production", circular economy.

- Expansion of corporate social responsibility of enterprises and organizations.
- Increasing scientific and technical innovations.
- Improvement of the education system.
- Introduction of new economic thinking.

Humans are expected to perform intellectual work that requires critical thinking and non-standard approaches, while machines are expected to safely assist humans in performing precise, complex and dangerous tasks. Obviously, this requires qualified personnel and appropriate training (gre4ka.info, 2023).

The principles of Industry 5.0 are relevant for Ukraine, which is in a state of war. These principles need to be quickly and widely implemented, since it will not work to bring the economy to the level of developed countries based on the principles of Industry 3.0 or even Industry 4.0, because in Ukraine there is a lot of destruction, loss of human and other resources as a result of the war. For a quick transition to the conditions of Industry 5.0, it is important to ensure high quality of business processes and products and services.

In the international standards ISO 9000: 2015, quality is considered as the degree to which the totality of the object's own characteristics satisfies the requirements (Table 1) (UkrNDNTs, 2016). International and domestic scientists and practitioners (Bondarenko and Svyryniuk, 2014; Zabotin, Hrosytska, Trushliakova and Sypko, 2008; Laptyski, 2006; Livinskyi, Savenkov, Palchyk and Chertkov, 2018; Momot, 2007; Panchenko, 2018; Sarancha, 2006; Sychenko and Tkachenko, 2006; Topolnyk, 2012) in the field of quality proceed from the position that the quality of an object, in particular products and services, is determined by its consumer properties. This statement is correct, since from the point of view of the consumer, the fact that the object satisfies their needs, which can be established or predictable, is important. The concept of "quality" has many aspects (Table 1), so in each definition one of the aspects is highlighted and none of the definitions has the necessary completeness and accuracy. This is explained by the following arguments: the extreme importance of the category itself; a large variety of objects that have inherent quality; subjective perception of properties of objects by each individual; the degree of development of society, etc.

In modern conditions of scientific and technological progress, the role of the technical and technological aspects of quality is gradually decreasing, while the economic, social, ecological, and moral aspects are increasing. The transition of enterprises and organizations to sustainable development is the need of the hour.

To ensure the high quality of business processes and products, it must be managed. In the process of research, the development of approaches to quality

management was considered in the historical aspect in the context of industrial revolutions and summarized in a Table 2.

Table 1

**Characteristics of quality aspects**

Aspect	Explanation
Technical	Improvement of technique leads to improvement of quality
Technological	A high level of technology leads to an increase in quality
Economic	Quality is an economic category, all measures to ensure and improve quality are associated with costs, so they must be effective and cost-effective
Ecological	Society has a stable need for environmentally friendly, safe products. Consumers also demand that the production process of products be transparent, ethical and environmentally friendly
Social	The result of quality management at the enterprise is the satisfaction of consumer needs for high-quality products, which, in turn, leads to an increase in the quality of life. Achieving loyalty of consumers and company personnel
Moral	Low-quality products are immoral because the material, financial, labor, and human resources invested in them were used inefficiently. Observance of ethical and moral norms at the stages of the life cycle of goods
Political	Quality has a decisive influence on the competitiveness of enterprises and organizations, the sum of which competitiveness forms the competitiveness of the country and, accordingly, affects the political situation in the country and its international position
Scientific and technical	Scientific and technical progress is a source of quality improvement. The increase in the level of quality ensures the acceleration of scientific and technical progress
Legal	The protection of consumer rights in the world and in Ukraine has a normative and legal basis
National	The peculiarities of the thinking of each nation and nationality affect the setting of goals in the field of quality and the methods of their achievement

Source: developed by the author based on (Zabotin, Hrosytska, Trushliakova and Sytko, 2008; Livinskyi, Savenkov, Palchyk and Chertkov, 2018; Momot, 2007; Panchenko, 2018; Sarancha, 2006; Sychenko and Tkachenko, 2006; Topolnyk, 2012; <https://www.uaq.org.ua/index.php/uk/>; Deming, 1993).

*Quality in the conditions of Industry 1.0* – Second half of the 18th century – during the XIX century – stage of rejecting products. The purpose of the stage is to prevent defective products from reaching the consumer. At the factories of Samuel Colt, the idea of assembling weapons from parts of standard sizes arose. Before assembly, the parts were checked by controllers using gauges. Later, this idea was put into production by Henry Ford and other entrepreneurs. A new profession is emerging – quality controllers, which have begun to merge into quality departments. The methods of control, the metrological base of measurements are being improved. The practice includes fines for defective products.

*Quality in the conditions of Industry 2.0* – the end of the 19th – the beginning of the 20th century – quality control stage – there is still a need to

reject products that do not meet the requirements of regulatory documentation. The purpose of control is to prevent defective products from entering the market. The radical difference between this stage and the previous one is the approach in which product quality is ensured by the quality of its production processes. In 1924 Walter Shewhart proposed control charts as a process quality control tool.

Table 2

**Quality management in the context of industrial revolutions**

Industrial revolutions	Period	Features of the revolution	Quality	Quality management tools
Industry 1.0	The second half of the 18th century. – throughout the XIX century	Production based on mechanization and the use of steam and water energy	Quality 1.0	Product rejection. Use of passing and non-passing gauges, upper and lower limits of tolerances.
Industry 2.0	The end of the XIX – the beginning of the XX century	Use of electricity Flow production	Quality 2.0	Product quality control. Control charts of V. Shukhart, statistical methods of quality management.
Industry 3.0	From the 1980s – the first decades of the XXI century	Production based on IT technologies and automation	Quality 3.0	Quality management using international standards ISO 9000, comprehensive quality management, quality awards.
Industry 4.0	2010–2021	Production based on cyber-physical systems, robotics, sustainable development	Quality 4.0	Comprehensive quality management, sustainable development, quality management system of business processes based on the principles of sustainable development, environmentalization of quality.
Industry 5.0	2021 and up to now	Production that combines human abilities, advanced technologies and care for the environment	Quality 5.0	Comprehensive quality management in the context of sustainable development, environmentalization of quality, digitization of activities, human-centered approach.

Source: prepared by the author.

*Quality in the conditions of Industry 3.0* – From the 1980s – the first decades of the XXI century – the stage of quality management – is characterized by an increase in the volume of production, therefore the goal of quality management at this stage is not just to prevent defective products from reaching consumers, but to not produce defective products. For this, quality must be managed at all stages of product creation and sale. In 1987, the international

organization for quality ISO developed and adopted international standards for quality management systems of the 9000 series, which determined where the world's only defined approach to the functioning of quality management systems at enterprises and organizations was reflected. Satisfying the demands of consumers is the main purpose of the functioning of quality management systems. Voluntary certification of quality management systems is spreading.

*Quality in the conditions of the Industry 4.0 – 2010–2021 year – stage of comprehensive quality management, active development of quality management at the international level.* In the conditions of Industry 4.0, which is characterized by the development of information and communication technologies, automation and robotization of production processes, satisfaction of consumer requirements is the main purpose of the functioning of quality management systems. Comprehensive quality management combined with sustainable development, greening of production. Comprehensive quality management TQM (Total Quality Management) is an approach to the management of the organization, aimed at quality, which is based on the participation of all its employees and is aimed at achieving long-term success by satisfying the requirements of consumers, benefiting the personnel of the enterprise, local communities, government bodies and society as a whole. This is an approach to the management of the organization, which is based on building a corporate culture of the enterprise aimed at quality. Training of personnel throughout their career becomes a determining factor in improving the quality of products and business processes. An important strategy of TQM is to ensure corporate social responsibility and sustainable development of the enterprise. The prize for high quality has become widespread based on the results of a competition among enterprises at the national or international level, which evaluates the efforts and achievements of enterprises in the field of quality assurance and improvement. Quality awards are established to stimulate the development of quality, the introduction of progressive methods of production management, which reflect the ideology of quality. This is the Japanese Edwards Deming Quality Award, Malcolm Baldrige American Quality Award, European Quality Award of the European Foundation for Quality Management EFQM.

*Quality in the conditions of Industry 5.0 – 2021 – to date –* In quality management at the stage of Industry 5.0, the stage of greening and digitalization of comprehensive quality management continues. Success on the market, victory over competition and sustainable development can be achieved by enterprises that have ensured systematic quality management, which enables the production of high-quality, ecologically safe products in an ethical manner, and have also been able to green, digitize and humanize the process of designing, manufacturing and selling products that issued, or services provided. The role of

human resources in Quality 5.0 management is paramount. Works [1, 5] are devoted to issues of social policy and environmentalization of production. Quality 5.0 does not cancel but complements Quality 4.0 and is a combination of comprehensive quality management with the concept of sustainable development, which is based on the trinity of economic, environmental and social spheres. Digitization of activities is important, as it is a defining trend in the development of human civilization. Today, digital technologies are a mandatory component of business processes and form modern models and mechanisms of enterprise management.

**Conclusions.** For the post-war recovery of Ukraine's economy, ensuring the high quality of business processes and products is the basis for the sustainable development of enterprises and ensuring the transition of the economy to the principles of Industry 5.0. – a concept that combines human abilities, advanced technologies and care for the environment. Industry 5.0 brings human, social and environmental aspects back into production. Industry 5.0 does not replace Industry 4.0, but improves and complements it. In the conditions of war and post-war development, ensuring high quality should become a national idea, which will allow to quickly restore the economy of Ukraine and move to the principles of Industry 5.0. Quality management in the conditions of Industry 5.0 should be human-centered and eco-economic. Quality management is merging with methods of greening production and digitalization of activities, which makes it possible to produce quality products in a transparent and ethical manner and to meet the requirements of stakeholders - consumers, shareholders and the company's own staff, state bodies and local communities.

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