

SECTION 8. MANAGEMENT

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8.1 Methodical approaches to evaluation of digital transformation of small and medium enterprises

The rapid development of the digital economy contributes to fundamental changes in the existing business strategies of enterprises aimed at the active implementation of digital technologies in all spheres and activities, from operational processes to marketing and customer service. Increasing global competition in digital markets and the complexity of the business environment require enterprises to undergo digital transformation, which helps to optimize business processes, increase productivity and improve customer relationships.

Thanks to the growing level of digital transformation of enterprises, their contribution to the development of the global economy also increases. According to forecasts, around 70% of created value will be based on digital products in the coming decade. If, in 2018, the share of the global GDP attributed to digitally transformed enterprises was \$13.5 trillion, by 2023, this figure is projected to reach \$53.3 trillion (which is nearly four times higher), constituting more than half of the nominal global GDP (Statista, 2023).

The role of SMEs is decisive in the global economy. Across all countries, SMEs contribute to employment, economic growth and social development. In most OECD countries, SMEs contribute more than 50% of GDP, and some global estimates put this figure as high as 70% (OECD, 2023).

In the EU the share of SMEs in the total number of enterprises is 99,8% in 2022. SMEs provide 64.4% of jobs and 51,8% value added in the EU (European Commission, 2023c).

The digital transformation of enterprises contributes to the formation and expansion of digital markets, the acceleration of socio-economic development. Finally, it determines the need for clear and consistent indicators, tools and methodical

approaches to its measurement (OECD, 2020). This will make it possible to form an information and analytical base for assessing the level of digital transformation of enterprises and their contribution to the development of the digital economy of the state based on reliable and accurate data, and to determine areas that will require priority measures to attract investments and create a digital single market.

The need to evaluate digital transformation is declared in the Concept of the Development of the Digital Economy and Society of Ukraine for 2018-2020. It provides for the introduction of a methodology for determining indices, indicators and an approach to assessing the digital development of Ukraine in accordance with international practices, which also includes indicators for evaluating the digital transformation of enterprises. At the same time, methodical approaches to measuring the level of digital transformation of small and medium-sized businesses in Ukraine have not yet been systematized and require further research. This is also argued by the significant contribution of SMEs to the development of the Ukrainian economy. During 2014–2022, the share of SMEs in the economy of Ukraine remained practically unchanged: small enterprises accounted for 95% of the total number of enterprises, medium-sized enterprises - almost 5%. The share of sales of medium-sized enterprises in the total volume of sales in the country in 2022 was 44.4%, for small ones – 19.4%, which is even slightly more than in 2021. The share of employees employed at medium-sized enterprises is approaching up to 50%, more than 25% work in small enterprises in 2022 (State Statistics Service of Ukraine, 2024).

The study of methodological approaches to the assessment of the digital transformation of enterprises is of great importance for the quantitative measurement of progress in the areas of the implementation of digital technologies and integration into the digital business environment, the study of trends and problems of the development of SMEs, the development of strategies, policies and frameworks to support the implementation of digital technologies by SMEs.

In international practice, a number of methodological approaches, tools and indicator systems have been introduced for measuring the digital economy based on the collection of statistical data and the formation of an evidence base (OECD, 2020).

These methodologies cover important components of the digital economy, including the digital transformation of enterprises. However, most of the existing methodologies and approaches do not directly assess the level of digital transformation of enterprises, in particular, investments in digital transformation projects, changes in business strategies, marketing strategies, systems of relationships with customers and partners, the intensity of implementation of digital technologies by enterprises, and also do not take into account the specifics of small and medium-sized businesses.

Separate single indicators of the digital transformation of enterprises are included in internationally known and recognizable indices for measuring the digital economy and digital transformation of society, for example: Global Connectivity Index (GCI), Digital Intelligence Index (DII), Global Innovation Index (GII), WEF / WITSA Networked Readiness Index (NRI), World Digital Competitiveness Ranking (WDCR), UNCTAD B2C E-commerce Index, Digital Platform Economy Index (DPE Index), ICT Development Index (IDI), and others.

To measure the level of achieved digitalization in a country, European Commission developed The Digital Economy and Society Index (DESI). It's a composite measure that summarises indicators related to the digital performance and digital competitiveness of the EU member states. It is compounded of a set of indicators related to the digital policy mix, and has a threelayer structure (European Commission, 2023).

At first level, there are dimensions: Connectivity, Human capital, Integration of Digital Technology, and Digital Public Services. Second level has sub-dimensions, and the third level has individual indicators. The digital transformation of business is evaluated in dimension "Digital transformation of businesses" through 3 sub-dimensions: Digital intensity, Digital technologies and E-commerce, each of what includes indicators. Therefore, the DESI dashboard evaluates the digital transformation of businesses through the following indicators: SMEs with at least a basic level of digital intensity; electronic information sharing; social media; big data; cloud; artificial intelligence; e-Invoices; SMEs selling online; e-Commerce turnover; selling online cross-border (European Commission, 2023b).

As we can see, the level of digital transformation of business is evaluated taking into account small and medium-sized businesses, whose role in the EU economy is very large.

The dimensions are defined by the principal policies for digital economy and society in the EU. European Commission claims that the digital development of the economy and society can only be achieved by interconnected development of these areas (European Commission, 2023a).

Analysing the structure and methodology used for computation of the DESI, we can conclude that the indicators are carefully examined, selected and in accordance with the problem they should measure. DESI considers different significance of certain digitalization aspects has been taken into account due to the weighting system. Finally, all indicators at the lowest level of hierarchy are quantitative, so they provide objective measures of performance in terms of achieved level of digital transformation of business.

The European Commission adopted the Digital Intensity Index (DII), which measures the use of different digital technologies by businesses, for example using artificial intelligence or online sales. In 2022, 70% of all EU businesses reached a basic level of digital intensity. The share for SMEs was 69%, around 20 p.p. below the EU 2030 target, while for large businesses it stood at 98% (Eurostat, 2023).

According to the EU Digital Compass 2030, there are 2 main goals for the digital transformation of businesses: more than 90% of SMEs should reach at least a basic level of digital intensity by 2030, and 75% of EU companies should use cloud computing services, perform big data analysis or use artificial intelligence (Eurostat, 2023).

Large businesses had a bigger share for very high (30%) and high digital intensity (54%) compared with only 4% of SMEs with a very high level and 27% with a high level of digital intensity. Most of the SMEs recorded low (38%) or very low (31%) digital intensity levels. The proportion of SMEs with a basic level of digital intensity ranged from 41% in Greece and 47% in Bulgaria to 89% in Denmark and 90% in Finland (Lone et al., 2023).

Therefore, the assessment of the digital transformation of enterprises in international practice has significant achievements which are constantly developing and improving.

The research paper of Urbach et al. (2009) defines the components of the enterprise's digital maturity models related to its business architecture: economic indicators, customer experience, innovative product, strategy, organization, digitalization of the process, cooperation, information technology, culture, expertise and transformation management. The generalized model of digital maturity based on these indicators is universal and can be adapted to any company to assess progress towards digital transformation (Urbach et al., 2009).

Deloitte presented the transformation model as a comprehensive approach containing four dimensions: organization, economy, digital environment and people, and each dimension has two subcategories (Deloitte, 2023).

The structural model of digital transformation offers six categories: customer, data, value proposition, organization, operations, and transformation management. Each category contains four components that assess the degree of digital transformation and outline a holistic and realistic digitalization perspective for the enterprise (Gimpel et al., 2019).

Chanas S., Hess T. suggest evaluating the companies' readiness to form a digital transformation strategy by determining the ability to adapt business models and reorient them to value creation, as well as the ability to make organizational adjustments. Methodical approach contributes to the development of a strategic plan for the company's digital transformation (Chanas et al., 2016).

The digitalization readiness model takes into account all aspects of the production process and focuses mainly on the technical aspects of the digital transformation of enterprises, and takes into account the actual skill level of employees (Lucas et al., 2013).

The model of digital transformation of an enterprise takes into account four dimensions: the use of technologies, structural changes, financial aspects and changes in value creation (Hess et al., 2016).

Digital transformation management is proposed to be assessed by the Acatech Industry 4.0 Maturity Index from the German National Academy of Science and Engineering. The index helps companies determine at which stage they are on the path to digital transformation. The model allows assessing the degree of digital transformation from a technological, organisational and cultural point of view, with an emphasis on the business processes of manufacturing companies in five functional areas: development, production, logistics, services, marketing and sales (Schuh et al., 2020).

In Ukraine, the process of collecting data on the digital transformation of enterprises remains unsystematized. Because of this, a number of problems arise, such as the lack of a comparative database of indicators of the development of the digital transformation of Ukrainian enterprises with other countries. The insufficient implementation of new and improved tools and methodologies for measuring the digital transformation of enterprises as a factor of economic growth does not allow the formation of an information and analytical base for reflecting the impact of digitalized enterprises on indicators of socio-economic development, as well as the total added value of digital technologies and digital GDP.

Polous O. developed the integral index of digital competitiveness of the Ukrainian enterprises, which includes two groups of indicators that are basic for the formation of the overall integral index:

- indicators of digitalisation of business activity, which demonstrate the readiness of Ukrainian enterprises to use digital tools for conducting business;
- indicators of digital intellectualization of enterprises, which illustrate the readiness of personnel to perceive and use modern information and communication technologies during work and professional development (Polous, 2020).

Ukrainian specialists deepened methodical approaches to assessing the degree of digital transformation of enterprises. Proskurnina N.V. developed a methodology for assessing the degree of digitization of the operating model of the marketing activity of a retail enterprise, which assesses the degree of digitization of each component of the marketing complex (product, place, process, promotion, personnel, physical evidence)

by calculating the integral digitization index, and offers a management decision based on the obtained assessment results regarding the process of digital transformation (development scenario) (Proskurnina, 2020). The model has a narrow focus and does not take into account other important aspects of the digital transformation of enterprises, for example, technical and related to personnel.

Voskoboyeva O.V., Romaschenko O.S. developed the Enterprise Digitization index (IDI), which allows to assess the real level of implementation of digital technologies and competencies at enterprises with the help of three sub-indices:

- 1) sub-index “Infrastructure development”, which indicates the degree of infrastructure development, availability of Internet access and Internet access quality;
- 2) sub-index “Online expenses”, which includes the online trading expenses and online advertising expenses;
- 3) sub-index “User activity”, which is calculated as the weighted average value of lower-level sub-indices: activity of enterprises, activity of consumers and activity of state institutions. All sub-indices are formed from weighted average values of several parameters underlying them (Voskoboieva et al., 2018).

The index allows assessing the level of digital transformation of enterprises by important indicators. However, it does not take into account important internal aspects of digital transformation, for example, marketing, logistics and others related to the business model and human resources of the enterprise.

The above-mentioned works demonstrate a certain inconsistency of indicators, systems and evaluation methods, which indicates difficulties in measuring the progress and level of digital transformation of enterprises. It is particularly difficult to assess the digital transformation of small and medium-sized businesses, because certain factors, which are completely logical and unproblematic for large enterprises, can create difficulties for SMEs, for example, the availability of staff with sufficient digital skills, the use of marketing digital technologies, and others. The considered methods and approaches cover generally important aspects of digital transformation. However, they do not take into account the specifics of small and medium-sized enterprises and do not take into account all possible factors of digital transformation and the

implementation of digital technologies. Measuring the level of digital transformation of enterprises in general is an important scientific task from the point of view of directly assessing the progress of the digital transformation of the national economy and the contribution of SMEs to the development of the country's digital economy. Therefore, it is quite difficult to adapt the existing methods and approaches to assessing the digital transformation of business for SMEs, which requires the development of a separate methodical approach.

Methodical approaches to the assessment of various aspects of the digitalization of enterprises, industries and the economy as a whole are quite thoroughly revealed in the scientific works of foreign and Ukrainian authors, as well as consulting agencies and state organizations.

A significant number of scientific work by foreign and Ukrainian specialists are devoted to approaches and methods of assessing the digital transformation of enterprises, readiness for digitalization, as well as the current level of digital maturity. These estimated parameters are important for the analysis of the current state and the prerequisites created in the country for the development of entrepreneurship, digital transformation and integration into the digital business environment of enterprises of various sectors of the national economy (Kliuchnyk, 2020).

The methodology for assessing the level of digital transformation of small and medium-sized enterprises requires the justification and calculation of indicators of digital transformation of small and medium-sized enterprises and creation of the digital transformation index.

The digital transformation index for small and medium enterprises is proposed to be evaluated by quantitative and qualitative indicators according to three criteria.

1. Management criteria are related to the internal business processes of enterprises, the effectiveness of interaction with clients and work with data, the use of digital products, management systems, analytics systems, services and applications, and other digital technologies.

2. Technical criteria are related to the infrastructural provision of enterprises, which facilitates or, on the contrary, hinders the accelerated entry into digital markets

and the transition to business models, for example, the access of enterprises to the Internet and digital technologies, the provision of employees with digital devices, etc. The criteria of digital competences, knowledge and skills of personnel in the digital sphere include, for example, the availability of education in areas related to digital technologies, the level of digital skills, training in professional development courses in the areas of business digitalization, etc.

3. Marketing criteria are related to the marketing management practices of enterprise as a whole, digital transformation and trade, interaction with customers, etc., and include, in particular, the presence of a digital marketing strategy and the use of digital marketing tools, the use of marketing analytics and others. The main goal of using digital marketing is to help increase the competitiveness of small and medium-sized enterprises in conditions of limited financial and human resources.

To assess the level of digital transformation of enterprises within the framework of each of the criteria, a system of quantitative and qualitative indicators has been developed, with the help of which it is proposed to calculate the Digital Transformation Index. In the table 1 lists the criteria and corresponding indicators.

Table 1

Criteria and indicators for assessing the level of digital transformation of small and
medium-sized enterprises

Criteria	Indicators
Management criteria (I₁)	1. Using of IT products and systems for integrating and digitizing internal business processes and enterprise resource planning (ERP systems)
	2. Using of CRM systems for managing customer relationships
	3. Using of cloud computing services
	4. Using of AI (Artificial Intelligence) services
	5. Using of VR/AR technologies
	6 Using of mobile applications for selling goods and/or services
	7. Selling goods and services online through the Internet (marketplaces, websites, or mobile applications)
	8. Using of integrated digital wallets with website or application for online payments
	9. Conducting research on the business environment online (including competitors, target audience, etc.)

Continuation of table 1

Technical criteria and criteria regarding the digital competences, qualification and skills of personnel (I₂)	1. The level of digital skills among the company's personnel
	2. Basic or specialized education of employees in areas related to digital technologies
	3. Participation of employees in training courses related to business digitization
	4. Access of employees to fixed broadband Internet
	5. Access of employees to mobile Internet
	6. Providing of employees with computers, laptops, and gadgets for work?
	7. Availability of a website in a company
	8. Availability of a business profile on social media
	9. Availability of an online store on a marketplace or relevant platforms
Marketing criteria (I₃)	1. Availability of a developed digital marketing strategy
	2. Using of Internet advertising
	3. Using of affiliate marketing
	4. Availability of SMM strategy
	5. Using of social media advertising
	6. Using of marketing analytics (such as Google Analytics, CRM systems, etc.)
	7. Using of email marketing
	8. Using of analytics systems for planning e-commerce metrics tracking results (such as Google Analytics)
	9. Using of tools for design, content writing, etc.

Source: developed by the author

Each indicator is evaluated on a 3-point scale, where 1 corresponds to the worst value, 3 – to the best.

To take into account the importance of the contribution of each group of criteria to the overall digital transformation index, it is necessary to rank the criteria for calculating the index and calculate the weighting factors. Ranking is a procedure for ordering objects of study, which is performed on the basis of determining preference. The rank in our methodology is the ordinal number of the indicator, arranged in increasing or decreasing importance. To determine the rank of the indicator, it is advisable to use expert decision-making methods. Expert methods such as the simple ranking method and the method of weighting coefficients are most often used in practice (Hrabovetskyi, 2010).

The method of simple ranking (prioritization or determination of experts' ratings on a point scale) consists in the fact that each expert marks indicators (indicators of digital transformation) in the order of preference. The number 1 indicates the most

important indicator, the number 2 – the next in importance, etc. Next, the average rank is determined, that is, the average arithmetic value of the rank of the criterion according to the following formula (1):

$$b_i = \frac{\sum_{j=1}^R a_{ij}}{R}, i = \overline{1, N}, \quad (1)$$

where b_i – the rank assigned to the i criterion; a_{ij} – order of preference for the i criterion by the j expert; R – total number of experts; N – total number of criteria.

The smaller the rank value, the more important the criterion.

The method of weighting coefficients (evaluation) consists in assigning weighting coefficients to all criteria and can be carried out in two ways:

- assignment of weight coefficients to all criteria in such a way that the sum of all coefficients is equal to 1 or 10 or 100;
- assigning to the most important of all criteria a weighting factor equal to a certain fixed number, and to the rest of the criteria – factors equal to fractions of this number.

The generalized opinion of experts is calculated by determining the sum of the weighting factors and dividing it by the number of experts who evaluate the criterion according to formula (1). The higher the value of the rank, the more important this criterion is (Hrabovetskyi, 2010).

The weighting coefficients ω_i , which meet the conditions $0 \leq \omega_i \leq 1$, $\sum_{i=1}^N \omega_i = 1$, and take into account the degree of influence on the digital transformation index, are calculated for all criteria I_i taking into account their overall ranking according to the following formula (2):

$$\omega_i = \frac{2 \cdot (N - b_i + 1)}{N \cdot (N + 1)}, i = \overline{1, N}, \quad (2)$$

where b_i – rank assigned to the i criterion; N – total number of criteria (in our case $N=3$).

According to the results of the research and assigning the appropriate points to all indicators corresponding to the groups of criteria, the sub-index for each group of

criteria is calculated as the ratio of the actual sum of points to the maximum for the group of criteria according to formula (3):

$$I_i = \frac{I_i^{fact}}{I_i^{max}}, i = \overline{1, N}, \quad (3)$$

where I_i^{fact} – actual value of the sum of indicators according to the i criterion; I_i^{max} – maximum value of the sum of indicators according to the i criterion; N – total number of criteria (in our case $N=3$).

The closer the value of the sub-index is to 1, the higher the level of digital transformation of the enterprise according to this group of criteria, and vice versa (Hrabovetskyi, 2010).

The digital transformation index of small and medium-sized enterprises (I_{DT}) is calculated as the sum of sub-indices, multiplied by the corresponding weighting factors, according to three groups of criteria (4):

$$I_{DT} = \omega_1 \cdot I_1 + \omega_2 \cdot I_2 + \omega_3 \cdot I_3, \quad (4)$$

where I_1 – sub-index of management criteria for digital transformation; I_2 – sub-index of technical criteria and criteria of digital skills of personnel; I_3 – sub-index of marketing criteria.

For the interpretation of the assessment results, an interval scale was developed, presented in the table 2. Depending on the value of I_{DT} , the level of digital transformation is determined.

Table 2

Interpretation scale for assessing the level of digital transformation of small and medium-sized enterprises

The level of digital transformation of the enterprise	The value of the digital transformation index (I_{DT})
high level	$0,75 < I_{DT}$
medium level	$0.5 < I_{DT} < 0.75$
low level	$0.25 < I_{DT} < 0.5$
basic level	$0 < I_{DT} < 0.25$

Source: developed by the author

The proposed methodology contributes to the national methodology for evaluating the digital transformation of enterprises. In the future it will contribute to the development and improvement of the information and analytical base for measuring the digital economy and economic growth prospects. The methodology is based on the principles of the digital economy and the international experience of evaluating the digital transformation of business, and takes into account the management, marketing, technical criteria and the criteria of the digital skills of personnel that are important for small and medium-sized enterprises. The key difference between the developed methodology and the existing ones is the consideration of marketing aspects of digital transformation.

Since flexibility, innovation, adaptability and rapid adoption of digital technologies remain the main features of small and medium-sized enterprises, they must be adequately used in the modern business model to increase competitiveness. Small and medium-sized enterprises face the problems of lack of financing, personnel with the necessary competencies, skills and experience in the implementation and use of digital technologies, access to digital networks and technologies. Therefore, they need special attention and a separate methodology for assessing the level of digital transformation. For small and medium-sized enterprises, marketing digital technologies are important factors of competitiveness, which provide the ability to quickly adapt to the dynamic conditions of the external environment, changes in consumer preferences, as well as to better satisfy consumer demand and personalize their marketing strategies. The use of modern digital tools and technologies in marketing makes it possible to transform business models in accordance with marketing trends and new customer experience. Marketing digital technologies allow SMEs to study consumer behaviour and create a unique customer experience, minimize costs and increase the efficiency of staff.

The analysis of methodologies and practices for measuring the level of digital transformation showed that they are somewhat inconsistent among themselves and rely on different data and indicators. They do not take into account the specifics of small and medium-sized businesses, which are sensitive to the lack of human resources.

SMEs have difficulty accessing digital technologies and need specific marketing strategies and digital marketing technologies to provide unique customer experience and compete with large companies with significant financial and human resources.

A methodology for evaluating the level of digital transformation of the company has been developed, which takes into account management, marketing, technical criteria and criteria for the digital skills of the staff.

The methodology will help enterprises to analyze their own experience in digital innovations, assess the level of development of digital technologies and competencies, compare their results and achievements with other enterprises on the market, and determine general trends in the digital transformation of small and medium-sized businesses.

At the national level, the proposed methodology for assessing the level of digital transformation of small and medium-sized enterprises will allow taking into account their specificities and provide an opportunity to build an information and analytical base for monitoring the progress of the implementation of digital technologies by enterprises, identify problems and difficulties, and create effective state strategies, policies and frameworks for the development of small and medium-sized enterprises business in Ukraine.