

# System-Integrated Methodological Approach Development to Calculating the Digital Transformation Index of Businesses

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**Abstract.** The current state of digital technology in domestic business is dramatically different from the world one. As there is currently a problem with the low digital literacy of society and business executives at all levels, the use of a European methodology for determining the digital intensity index with appropriate indicators is not entirely acceptable for domestic businesses. Given the lack of data on the ownership of certain digital technologies by 2017, it is unclear whether domestic businesses are ready to integrate the global digital development trends, according to which the EU determines the relevant indices. For this reason, it is necessary to develop its own methodology for determining the index of digital business transformation with appropriate indicators, which would take into account the current state of affairs, reflect with in-depth analysis of the level of digital transformation of business structures, while being flexible to respond promptly to new phenomena and the emergence of new digital technologies so that in the future it will be harmonized with international methodologies for comparing Ukraine with the most developed countries of the world.

**Keywords:** Digital transformation, Digital Agenda of Ukraine 2020, digital tools, digital literacy, Digital Transformation Index.

## 1 Introduction

The task of developing a methodology for calculating the Digital Transformation Index [1] was envisaged for implementation in 2017-2018 within the framework of the “Action Plan for the Implementation of the Concept of Development of the Digital Economy and Society of Ukraine for 2018-2020: Item# 1. “Regulatory, organizational and methodological support”: Task #3: a) Identify indices, indicators and methodology for assessing digital development and maturity in Ukraine in accordance with international practices (Digital Economy and Society Index [2], Networked Readiness Index [3], Broadband Penetration Index [4], Computer Literacy Index [5], etc. [6]); b) Ensure regular assessments of digital maturity and determine Ukraine's digital development projections by 2020; Task # 4 “Identify and implement statistical methodologies and statistical observations to obtain statistics on Ukraine's digital development,

taking into account international practices” [7; 8]. However, till these days, the tasks remain documented only and require rapid implementation.

Establishment and approval of the national methodology for determining the index of digital transformation of business will allow to assess the level of digital maturity of business structures, which in turn will be an impetus for further study of the impact of digital technologies on the economy.

The annual Digital Business Transformation Index would serve as a tool for monitoring and evaluating business performance in the digital economy, helping to identify barriers to small and medium-sized businesses, formulating a list of prioritized economic, legal and regulatory measures (reforms) to improve digital implementation technologies in business activities of domestic business structures and would facilitate the integration of domestic business into the digital economy of the world.

## 2 Methodology of the Digital Maturity Index Calculating

The subject of study is economic entities (micro, small and medium-sized enterprises, with the status of legal entities and individuals) of Ternopil region.

The assessment will be based on the results of a comprehensive sociological survey. Complex sociological research includes the means of both quantitative and qualitative data collection that characterize the level of digital transformation of business, namely: • Interviews of managers (owners) of small and medium-sized enterprises and individual entrepreneurs; • Focus groups with representatives of business and business associations; • In-depth interviews with representatives of central and local government and local self-government.

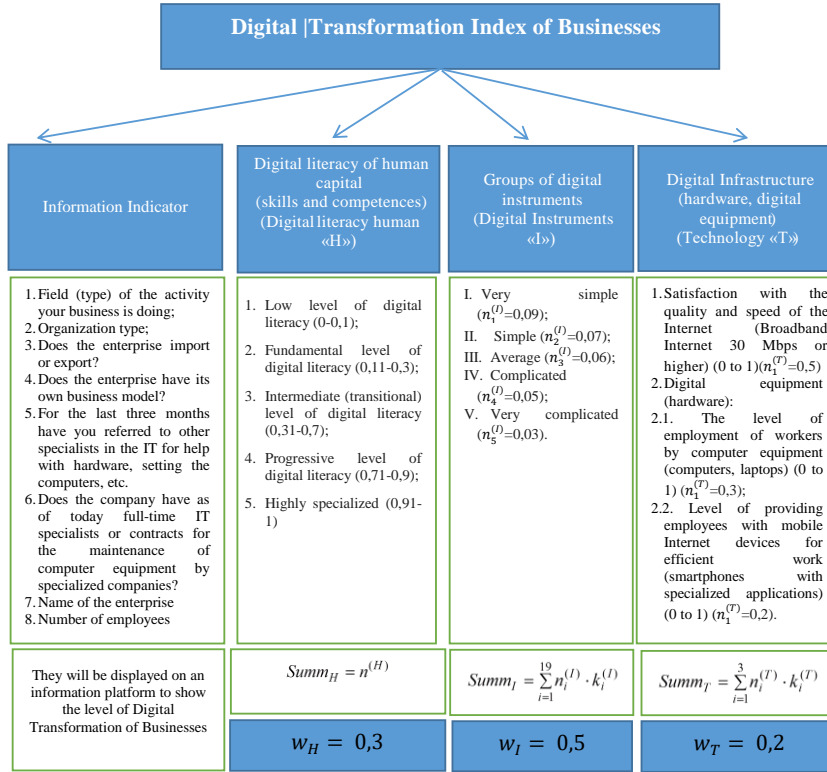
An innovative questionnaire was developed to collect annual statistics to determine the Digital Transformation Index. This questionnaire consolidates the main points of the existing survey forms used in the EU «Community survey on ICT usage and E-commerce in enterprises») [9] and Ukraine «The use of information and communication technologies at the enterprises in 20\_») [10]. The main advantage is that the analysis of this innovative form (questionnaire) will help to determine the real picture, namely, the qualitative use of digital tools in the activity of domestic business structures and will help automatically calculate the Index of digital transformation of business structures. It is this format that will identify the problem areas and develop practical recommendations for those who will undertake the survey.

The indicators for determining the Digital Transformation Index of business structures can be divided into 4 groups (see Fig. 1).

Based on consolidated structural indicators of digital transformation of business organizations, it is possible to devise a formula for determining the generalized Digital Transformation Index of business:

$$HIT = Summ_H \cdot \omega_H + Summ_I \cdot \omega_I + Summ_T \cdot \omega_T \quad (1)$$

where «*HIT*» – index of digital transformation of business;



**Fig. 1.** Groups of indicators for determining Digital Transformation Index of businesses (Note: developed by the authors).

$Summ_I$  – summary of the status of the functioning of digital instruments integrated into the business processes of the organization;

$Summ_T$  – summary indicator of the functioning of the digital infrastructure of a business organization;

$\omega_H$  – weight factor indicator H;

$\omega_I$  – weight factor indicator I;

$\omega_T$  – weight factor indicator T, where

$$\omega_H + \omega_I + \omega_T = 1. \quad (2)$$

Given (2) in our case, the weight factor indicator H will be 0.3 ( $\omega_H = 0.3$ ), because "Digital" literacy (or "digital" competence) is recognized by the EU as one of 8 key competences for a fulfilling life and professional activity. Weight factor indicator I is 0,5 ( $\omega_I = 0.5$ ), because it is the use and implementation of certain groups of digital tools in the structure of the business processes of the organization that transform the existing business model of the organization and act as an imperative for innova-

tive development of the organization. The weight factor indicator T will be 0,2 (  $\omega_T = 0.2$ ).

The human literacy rate of an organization's human capital assets is determined by the formula

$$Summ_H = \sum_{i=1}^{m_H} n_i^{(H)} \cdot k_i^{(H)} \quad (3)$$

where  $n_i^{(H)}$  – an indicator of the digital literacy level of an organization's human capital assets;

$k_i^{(H)}$  – weight factor indicator  $n_i^{(H)}$  ;

$m_H$  – number of expert opinions.

Summary of the status of the functioning of digital tools integrated into the business processes of the organization

$$Summ_I = \sum_{i=1}^{m_I} n_i^{(I)} \cdot k_i^{(I)} \quad (4)$$

where  $n_i^{(I)}$  – an indicator of the level of functioning of digital tools in an organization;

$k_i^{(I)}$  – weight factor indicator  $n_i^{(I)}$  ;

$m_I$  – number of digital instruments.

Summary indicator of the functioning of the digital infrastructure of a business organization

$$Summ_T = \sum_{i=1}^{m_T} n_i^{(T)} \cdot k_i^{(T)} , \quad (5)$$

where  $n_i^{(T)}$  – an indicator of the level of functioning of digital tools in an organization;

$k_i^{(T)}$  – weight factor indicator  $n_i^{(T)}$  .

$m_T$  – number of digital infrastructure.

34 respondents (entrepreneurs of Ternopil region) were surveyed in order to approve the appropriate methodology in the framework of the study on determining the level of digital transformation of business structures. [11; 12].

To determine the consolidated indicator of the digital literacy status of the human capital of the organization (H) we use formula (3). Evaluating the answers of the executives to the questions of the developed questionnaire, in our case  $m_H = 1$ ,  $k_i^{(H)} = 1$ . That is why

$$Summ_H = n^{(H)} ,$$

where  $n^{(H)}$  – expert assessment of the level of employee digital literacy.

We believe that managers are the right people who are experts in assessing the skills and competencies of their own staff.

Analyzing the answers of the conducted sociological research, calculating and assigning to the respective groups of digital tools the weights for a clear gradation of the importance of digital tools (main drivers) in the context of transformation of business processes of an organization formula:

$$Summ_I = \sum_{i=1}^{19} n_i^{(I)} \cdot k_i^{(I)},$$

where  $k_i^{(I)}$  – is the value of the weighting factor for the digital instrument groups.

In accordance with formula (5) consolidated indicator of the functioning of the digital infrastructure of the business organization, the indicator "T", calculated by the formula:

$$Summ_T = n_1^{(T)} \cdot k_1^{(T)} + n_2^{(T)} \cdot k_2^{(T)} + n_3^{(T)} \cdot k_3^{(T)}, \quad (6)$$

where  $n_1^{(T)}$  – Internet rate and quality satisfaction (Broadband Internet 30 Mbps or higher) (0 to 1);

$n_2^{(T)}$  – indicator of the level of job security for employees of computers (computers, laptops) (0 to 1);

$n_3^{(T)}$  – an indicator of the level of provision of employees with mobile Internet devices for effective work (smartphones with specialized applications) (0 to 1).

$k_1^{(T)}$  – weight factor indicator  $n_1^{(T)}$ . The quality of the Internet is a necessary precondition for smooth implementation of the processes of digital transformation, therefore  $k_1^{(T)}$  equals 0,5

$k_2^{(T)}$  – weight factor indicator  $n_2^{(T)}$  Digital infrastructure (business structure hardware), therefore  $k_2^{(T)}$  equals 0,3.

$k_3^{(T)}$  – weight factor indicator  $n_3^{(T)}$ . Providing business structure employees with mobile Internet devices for efficient work (smartphones with specialized applications), therefore  $k_3^{(T)}$  equals 0,2..

The calculations on all indicators of the Digital transformation of business structures are shown in Table 1.

**Table 1.** Summary data on indicators “H”, “I”, “T” of interviewed respondents.

# Respondents	The value of the indicator «H»	The value of the indicator «I»	The value of the indicator «T»	The value $H_n I_n T_n$
1.	0,4	0,225	0,5	$H_3 I_4 T_3$
2.	0,6	0,276	0,75	$H_2 I_4 T_2$
...	...	...	...	...
34.	0,6	0,669	0,665	$H_5 I_3 T_2$

Note: calculated and structured by the authors based on the research

The summary as well as the level of the Digital Transformation Index by all respondents and indicators are shown in Table 2

**Table 2.** The value of the Digital Transformation Index for the respondents.

Levels	$H_n$	<b>H</b>	$I_n$	<b>I</b>	$T_n$	<b>T</b>
Very high (0,81-1)	$H_1$	(26)	$I_1$		$T_1$	(4; 6; 21; 7; 12; 16; 19; 20; 22; 24; 27; 8; 26; 32; 33 9 )
High (0,61-0,8)	$H_2$	(25; 27; 33 3; 2)	$I_2$	(25; 26)	$T_2$	(2; 3; 10; 13; 18; 28; 29; 31; 34 )
Medium (0,41-0,6)	$H_3$	(15; 24; 28 4; 1; 7)	$I_3$	(7; 24; 27; 34)	$T_3$	(5; 1; 14; 15; 25)
Low (0,21-0,4)	$H_4$	(8; 9; 10; 13; 14; 21; 29; 30; 31; 32 5; 6)	$I_4$	(1; 2; 4; 8; 9; 10; 13; 14; 15; 19; 20; 22; 28; 31; 33; 21)	$T_4$	(11; 30)
Very low (0-0,2)	$H_5$	(11; 12; 16; 17; 18; 19; 20; 22; 23; 34)	$I_5$	(3; 5; 6; 11; 12; 16; 17; 18; 23; 29; 30; 32)	$T_5$	(8; 17; 23)

Note: calculated and structured by the authors based on the research

The analysis of the results showed that the level of the majority of respondents is lower than the average level of digital transformation. Therefore, immediate changes in governance and significant work are needed to implement available digital technologies and tools, as well as to increase the digital literacy of human capital.

### 3 Conclusions and Recommendations

The results of the research will help to get a better understanding of the problems and the real state of digital maturity of business structures on the example of SMEs of Ternopil region, to develop a methodology for finding the digital maturity index of a particular enterprise or industry as a whole, as well as to develop specific recommendations (roadmaps) for implementation that will promote the growth of digital maturity and further transformations at the micro and macro levels.

In a future version of this article, we consider it necessary to conduct research based on the collection and analysis of real business transformation digital statistics for a particular region, and to develop a digital platform to automate the process of data collection, processing and automatic definition of the Business Transformation Digital Index and to obtain specific recommendations (roadmaps) to increase the level of the Index. Implementation of appropriate roadmaps will increase the digital transformation index and increase business competitiveness.

The results of this research will help create an appropriate eco-culture for determining digital maturity, create healthy competition between respondents to compare the results of the Index, and help raise the level of digital literacy of business owners and, accordingly, the human capital assets of organizations.

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