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## THE FORMATION OF DIGITAL BUSINESS FACTORS

**Abstract.** The article is concerned with identifying and studying factors affecting digital business formation and development process in order to form tools for affecting the digital business. The novelty of this research paper is establishing causes increasing the volume of digital business and the dependence of its growth rate on the existing factors. The authors define the concept of digital business as an entrepreneur activity (providing electronic commerce, electronic services) in the Internet for making a profit with the help of information and communication technologies that blur boundaries between the real and virtual worlds. The digital business structure is studied and analysed. It is generally distinguished 4 sectors (electronic financial services; electronic commerce; electronic education and training; other electronic transactions). The authors prove that modern digital business model has been transformed from a 4-sectoral into a 3-sectoral one, including electronic commerce, electronic financial services, electronic education and training. It is suggested to study and define factors affecting the development of digital business according to seven-stage sequence of digital business evaluation. The hypothesis concerning a set of digital business factors is proposed and 24 factors affecting digital business are identified, among which 8 factors mostly affect the digital business market of the European Union. The authors also distinguish influencing factors which are common for all three sectors of digital business, such as: Internet use by individuals, proportion of people using the Internet to order goods or services, the level of household Internet access. The methodology of the given research is based on scientific and verification principles, comparative, structural and system analysis.

Applying economic and mathematical methods, it has been investigated the correlation between the digital business and the main factors affecting it. The correlation density between the outcome feature and influencing factors using a determination coefficient is estimated. The given research proves that factors are multicollinear between each other. It has been revealed the correlation between the EU digital business volume and chosen factors.

**Key words:** digital business, electronic business, electronic commerce, electronic banking, electronic education and training, digital business factors.

### Introduction

Business activity is undergoing a transformation stage from the real sector to the digital business. Business processes are carried out via electronic networks, and virtual trading is superseding traditional one [17]. The relevance of this research work is that defining factors affecting the formation of digital business in the context of European integration will allow us to understand the reasons for increasing the volume of digital business and the dependence of its growth rate on the existing factors. Nowadays, the digital business gives us more opportunities for doing business more effectively and efficiently, as information and communication technologies involve more consumers and promote offered goods and services.

The European Union demonstrates annual growth of digital business and holds leadership

positions in e-commerce scope [16]. Germany, France and Spain are leaders in the field of online sales among the EU-members. Germany ranks the fifth position among the largest world leaders in digital business [15]. However, the annual growth rate of e-commerce is slowing down. For establishing causes of this phenomenon, first of all, it is necessary to find out what exactly influences this factor.

The aim of our study is to define the concept of digital business and its trends, to establish the sequence of digital business evaluation, to make a list of factors affecting digital business, and among these factors distinguish those that characterize the structure of the European Union digital business. As a result, a digital business model by sectors will be formed. After choosing those factors affecting all sectors of the model, calculating the linear dependence between the impact factors and the scope of the European Union digital business, and considering those factors we will be able to form tools for influencing the digital business.

#### **Analysis of recent research and publications, problem statement.**

The leading Western and Ukrainian scientists have been engaged in the research of the digital business development. This problem has been studied by many foreign scientists, among them: Gartner [1], Manuel Castells [3], Dave Chaffey, Tanya Hemphill, David Edmundson-Bird [4], Peter Cunningham, Friedrich Fröschl [5]. Ukrainian scientists have also made a significant contribution to the research of the digital business, in particular I. A. Kasatonova [6], S. N. Baburin [7], E. P. Holubkov [8], M. N. Indrysov [9], D. D. Yevtushenko [10], I. D. Fedyshyn [11], V. H. Voronkova [12]. A. Zahorodnii and H. Partyn analyze crypto currency as one of the modern tools of the digital business in their works [13]. A. Chushak-Holoborodko, O. Didukh, R. Zaderetska research outsourcing as one of the development trends in digital business [14]. However, there are still unsolved problems in this field. As digital business is actively developing even today, it

is an important task to define the factors affecting its formation and development process.

#### **Research on the formation of digital business factors.**

The concept of digital business is mainly associated with electronic commerce, but it is broader in its content because it includes its website in the Internet, a virtual shop, company management systems, the use of electronic advertising, marketing, “business-to-business” or “business-to-consumer” models. The digital business differs from the traditional business activities mainly because it requires the use of information and telecommunication units in all business processes.

Many authors often identify digital business with electronic and virtual ones, but today, the most current term is a digital business. Consider different definitions of the digital business in Table 1.

Worth noting is that one of the key defining features of the digital business is the use of information technologies that blur boundaries between the real and virtual worlds, such as: virtual fitting rooms, 3D tours, virtual consultants, etc. Thus, we suggest defining the concept of the digital business.

According to our own research, we suggest defining the term digital business as an entrepreneur activity (providing electronic commerce, electronic services) in the Internet for making a profit with the help of information and communication technologies that blur boundaries between the real and virtual worlds.

Having analyzed research papers devoted to digital business sectors in the European Union, we distinguished the following 4 sectors:

- S<sub>1</sub> – electronic financial services;
- S<sub>2</sub> – electronic commerce;
- S<sub>3</sub> – electronic education and training;
- S<sub>4</sub> – other electronic transactions.

The structure of EU digital business by sectors is presented in Table 2.

Considering the above provided statistical data, it is possible to design a digital business structure that existed before 2014 and a currently exist structure (Fig. 1.)

**Digital business definitions according to the authors**

Author	Definition
Manuel Castells [3]	The nature of the e-business is an Internet-interaction and network connection between producers, consumers and service providers
Dave Chaffey, Tanya Hemphill, David Edmundson-Bird [4]	Digital business – improving the competitiveness of the organizations through providing innovative digital technologies inside and outside with involving partners and customers and digital mass media promotion
Peter Cunningham, Friedrich Fröschl [5]	Electronic business – whirlwind of changes to the business world brought by the Internet, enabling new and diverse ways of trading
S. N. Baburn [7]	Electronic business is a business that has a predominant distribution with using information, network and telecommunication technologies and models
V. H. Voronkova [12]	The principle of online business is to provide interactive communication among manufacturers, consumers and service providers via the Internet
E. P. Holubkov [8]	Internet business is a profitable economic activity that also offers other benefits and is carried out with using Internet tools and technologies
M. N. Idrysov, S. A. Shavshyna [9]	Online business is the activity of any semi-product based company that purchases and offers goods on the markets, with the maximum use of information systems and technologies, as well as production technologies
D. D. Yevtushenko [10]	Electronic business is a type of information technology based enterprise to transform enterprise relationships with suppliers, partners, and customers for improving overall business performance and business processes (production, inventory management, product development, risk management, finance, knowledge and human resources management)
I. B. Fedyshyn [11]	Electronic business is a type of companies' economic activity through computer networks, in particular the Internet, for profit. It is an electronic economic activity conducted by means of information and communication technologies for profit
Gartner, Inc. [1]	Digital business is changing the way organizations use and think about technology, moving technology from a supporting player to a leading player in innovation, revenue and market growth
I. A. Kasatonova [6]	Electronic business is a business activity that uses global information networks opportunities to transform internal and external business relationships for making a profit

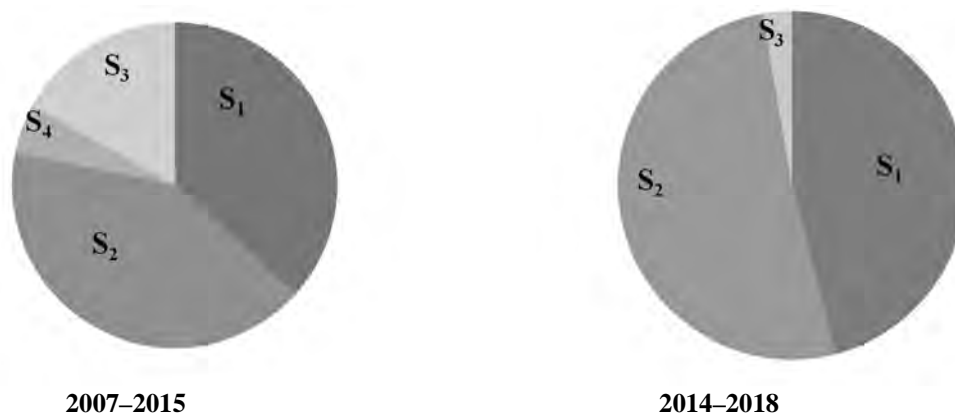
Table 2

**The structure of EU digital business by sectors during 2007–2018, in %**

Years Sector	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
(S <sub>1</sub> )	25	29	32	36	36	40	42	44	43	46	46	46
(S <sub>2</sub> )	30	32	36	40	42	44	47	50	50	51	51	51
(S <sub>3</sub> )	3	3	4	4	5	6	6	6	7	3	3	3
(S <sub>4</sub> )	42	36	28	20	17	10	5	0	0	0	0	0

Note: own analysis according to the data [2].

### The formation of digital business factors



Symbols: S<sub>1</sub> – electronic financial services; S<sub>2</sub> – electronic commerce; S<sub>3</sub> – electronic education and studying; S<sub>4</sub> – other electronic operations.

Fig. 1. Digital business model by sectors in 2007–2018

Note: own analysis according to the data [2]

Thus, by 2014, there was a four-sectoral EU digital business model, and since 2014 till today, there are three sectors, because the electronic commerce sector has completely absorbed other electronic transactions.

Studying and defining of factors that influence the development of digital business are suggested to be done according to the sequence shown in Fig. 2.

In the process of developing a hypothesis regarding a set of factors affecting the European Union digital business, we have analyzed and generalized a specific economic literature. Due to the results of publications analysis and our own digital business factor monitoring, there were identified 24 factors affecting digital business: (1) the level of household Internet access, (2) proportion of people using mobile devices to access the Internet on the way, (3) Internet use by individuals, (4) proportion of people using the Internet to sell goods or services, (5) proportion of people using the Internet for Internet-banking, (6) proportion of people using the Internet to order goods or services, (7) proportion of people using the Internet to order goods or services from other EU countries, (8) proportion of people using the Internet to take online courses, (9) enterprises that received online orders (not less than 1 %), (10) turnover share of e-commerce enterprises, (11)

broadband access enterprises, (12) enterprises, which business processes are automatically connected with the processes of their suppliers and/or customers, (13) enterprises using software solutions such as CRM for analyzing customer data with marketing purposes, (14) using social media by types of advertisements, i.e. the Internet advertising of enterprises, (15) the GDP of Europe, (16) share of exports of goods and services, (17) share of imports of goods and services, (18) employment rate, (19) gross domestic R&D expenditures, (20) the main GDP aggregates per capita, (21) resource productivity, (22) real GDP per capita, (23) purchasing power parities (PPPs), (24) convergence factors.

It should be noted that factors 1–14 directly affects the European Union digital business (factors 1–8 are caused by individuals, factors 9–14 by enterprises, factors 15–24 are the EU macro-economic factors which have an indirect impact on the digital activity).

Using factor analysis, we identified the factors influencing various fields of digital business. Having analysed 24 factors selected for the study, we selected 8 of them that mostly influence the digital business market of the European Union.

The distribution of factors by digital business sectors is shown in Fig. 4.

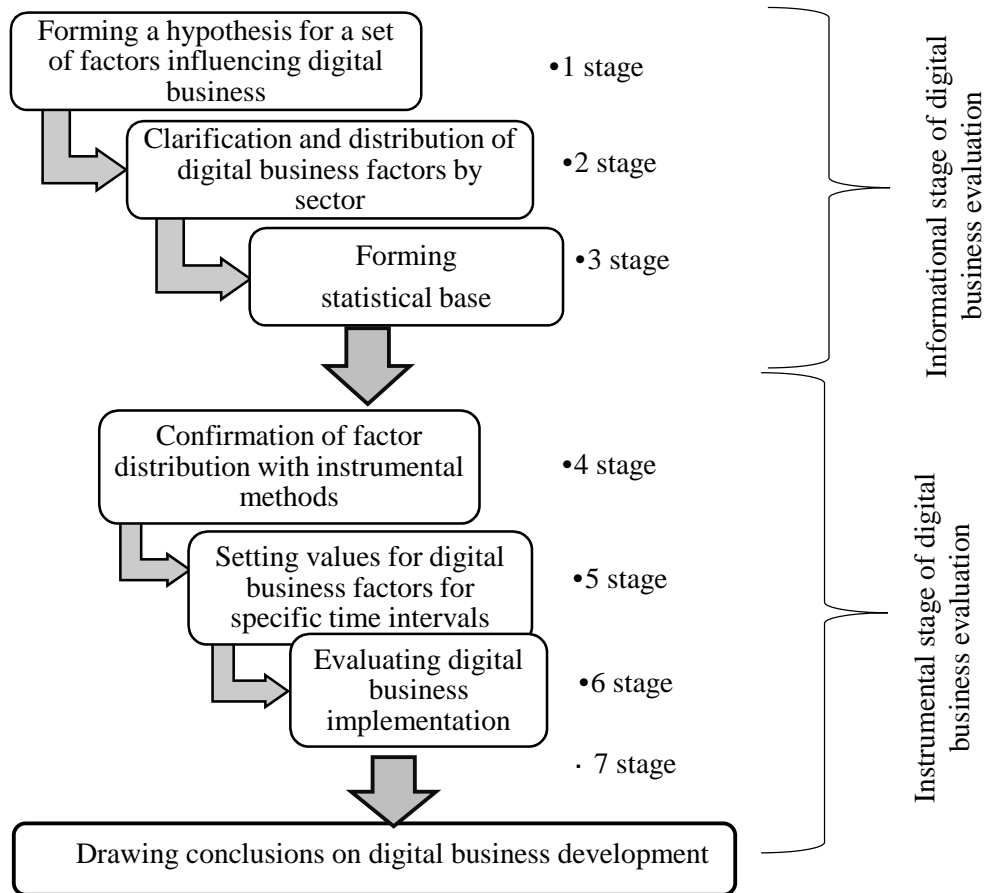


Fig. 2. Sequence of digital business evaluation

Note: own analysis

Electronic financial services (S <sub>1</sub> )	<ul style="list-style-type: none"> <li>•the level of household Internet access (1)</li> <li>•use of the Internet by individuals (3)</li> <li>•people using the Internet to order goods or services (6)</li> <li>•people using the Internet for Internet-banking (5)</li> </ul>
Electronic commerce (S <sub>2</sub> )	<ul style="list-style-type: none"> <li>•the level of household Internet access (1)</li> <li>•people using mobile devices to access the Internet on the way (2)</li> <li>•Internet use by individuals (3)</li> <li>•people using the Internet to sell goods or services (5)</li> <li>•people using the Internet to order goods or services (6)</li> <li>•people using the Internet to order goods or services from other EU countries (7)</li> </ul>
Electronic education and training (S <sub>3</sub> )	<ul style="list-style-type: none"> <li>•the level of household Internet access (1)</li> <li>•people using the Internet to sell goods or services (5)</li> <li>•Internet use by individuals (3)</li> <li>•people using the Internet to order goods or services (6)</li> <li>•people using the Internet to order goods or services from other EU countries (7)</li> <li>•using the Internet to take online courses (8)</li> </ul>

Fig. 4. Factors influencing digital business by sectors

Note: own analysis according to the data [2]

We also carry out analysis of the impact of those factors being in all sectors of the digital business (Y), namely: Internet use by individuals (X<sub>1</sub>), proportion of people using the Internet to order goods or services (X<sub>2</sub>), the level of household Internet access (X<sub>3</sub>), their growth rates are presented in Table 3.

Table 3

**Growth rate of the researching factors**

Year	Growth rate Y	Growth rate X <sub>1</sub>	Growth rate X <sub>2</sub>	Growth rate X <sub>3</sub>
2010	0.2159	0.0462	0.0606	0.1111
2011	0.1869	0.0441	0.0429	0.0500
2012	0.1732	0.0282	0.0411	0.0476
2013	0.1812	0.0274	0.0395	0.0682
2014	0.1449	0.0400	0.0253	0.0638
2015	0.1390	0.0128	0.0247	0.0600
2016	0.1547	0.0380	0.0241	0.0377
2017	0.0075	0.0244	0.0235	0.0364
2018	0.0243	0.0119	0.0230	0.0526

Note: own analysis according to the data [2]

According to given data in Table 3, we argue that the growth rate of all factors has been declining over the analyzed period, due to the World Financial Crisis of 2008–2009. To date, rallies being organized due to the deterioration of the population's solvency have been observed in the European Union. As a consequence, citizens' purchasing power and the growth rate of online orders and generally online trading are reducing.

The correlation between performance feature and independent factors looks like the following:

X <sub>1</sub> Y	X <sub>2</sub> Y	X <sub>3</sub> Y
0.648	0.536	0.713

The strongest Y correlates with X<sub>3</sub> (the growth rate of household Internet access), because for people it is more convenient to buy goods or services online at home rather than at work or in public places. Therefore, the more households are

provided with the Internet, the higher the rate of e-commerce growth is.

We estimate the availability of a total multicollinearity using  $\chi^2$  – criterion with a reliability of 0.95. Following calculations:  $\chi^2_p > \chi^2_{cr}$ , i.e.  $8.525 > 7.81$ . Therefore, with reliability of 0.95 we can assume that there is multicollinearity between the factors. Using F- and t-statistics with  $p = 0.95$  we find pairs of factors, among which there is multicollinearity, if such pairs exist, we remove one of the factors. According to the calculations, it follows that  $F_2 > F_{cr}$ ,  $6.888 > 3.86$ , and  $F_3 > F_{cr}$ , i.e.  $4.303 > 3.86$ . Consequently, it means that X<sub>2</sub> and X<sub>3</sub> are independent multicollinear variables with others. For eliminating multicollinearity, factor X<sub>3</sub> is excluded from consideration.

We create a matrix of the model parameters:

$$\hat{A} = \begin{pmatrix} -0.019 \\ 1.98 \\ 2.82 \end{pmatrix}.$$

A linear model of the European Union digital business looks like this:

$$Y = 1.98X_1 + 2.82X_2 - 0.019.$$

It is estimated the correlation density between the outcome feature and influencing factors using a determination coefficient that is 0.587.

The determination coefficient is determined by the formula:

$$R^2 = \frac{\sum \hat{a} (\hat{y}_i - \bar{y})^2}{\sum \hat{a} (y_i - \bar{y})^2}.$$

Since R<sup>2</sup> is within the range of 0.5–0.7, it follows that there is a moderate correlation between outcome feature and influencing factors.

We check the adequacy of the constructed model using the Fisher's test. According to the results of calculations, we get  $F > F_{cr}$ , i.e.  $6.41 > 3.68$ . Therefore, it means that the designed paired linear regression model is adequate to the aggregate statistical data.

We find out the predictive value of Y<sub>10</sub> and the confidence interval for the forecast, forecasting that X<sub>1</sub> and X<sub>2</sub> will increase by 0.01 point.

There is a confidence interval for linear regression:

$$-0.147 \leq y_p \leq 0.238.$$

Thus, with a given contingency of 0.95, the true value of the dependent variable  $Y$ , that is the growth rate of digital business volume, ranging from -0.147 to 0.238.

We determine the partial coefficients of elasticity for the given forecast:

–  $E_1 = 5.11$ , it means that digital business growth will change by 5.11 % if the increase in using the Internet by individuals (factor  $X_1$ ) changes by 1 % with the steady increase in the percentage of people using the Internet to order goods or services (factor  $X_2$ );

–  $E_2 = 3.84$ , it means that digital business growth will change by 3.84 % if factor  $X_2$  (proportion of people using the Internet to order goods or services) changes by 1 % with the steady values of factor  $X_1$  (using the Internet by individuals).

### Conclusion and prospects for future research.

Digital business has been developing rapidly since the beginning of the 21st century. Digital business is an entrepreneur activity (providing electronic commerce, electronic services) in the Internet for making a profit with the help of information and communication technologies that blur boundaries between the real and virtual worlds. Conducting our investigation, we found out that digital business model transformed from a 4-sectoral into a 3-sectoral one, including electronic commerce, electronic financial services, electronic education and training. The electronic commerce sector has completely absorbed the sector of other electronic transactions. The main trends in the EU digital business development are: increasing of electronic financial services use; increasing of network trading, declining of electronic education and training. The reduction in the volume of electronic education and training indicates a possible transformation of this sector into a new field.

There are influencing factors which are common for all three sectors of digital business, such as: Internet use by individuals, proportion of people using the Internet to order goods or services, the level of household Internet access. During the research, it was identified that factors are multicollinear between each other. Therefore, Internet use by individuals and proportion of

people using the Internet to order goods or services were the only factors used for the analysis. As a result, the correlation between the EU digital business volume and chosen factors was revealed: with increasing growth rate of the Internet use by individuals by 1 %, the digital business growth rate increases by 5.11 % (at unchanged growth of proportion of people using the Internet to order products and services); and with increasing growth rate of proportion of people using the Internet to order goods or services by 1 %, the growth rate of digital business development increases by 3.84 % (at unchanged values of Internet use by individuals).

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