

1. ІННОВАЦІЙНІ ПРОЦЕСИ В ЕКОНОМІЦІ

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OPTIMISATION OF DIGITAL DISTRIBUTION BUSINESS PROCESSES

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The methods to increase the revenue of companies in the digital distribution market are determined by the author through consistent monitoring of operating and marketing costs, prudent planning of advertising campaigns, and continuous analysis of current unjustified or excessive expenditures. Furthermore, it is necessary to increase the costs of technological development, the company's technical equipment, and improvements in the distribution channels for digital goods, and to redistribute costs by increasing both operating and marketing costs, as well as technological expenditures. The above findings are based on the author's multi-factor model of digital distribution business processes, and they reflect on the leading companies in the industry. By applying BPMN and the conceptual principle of "pulling" digital goods and services to the market, a model for optimising the digital distribution business processes of an international company is developed.

Key words: digitalisation, information technology, business process modelling, digital distribution, digital infrastructure, business model.

JEL Classification: C50, L86, O33

Statement of the problem. The global digitalisation has a significant impact on all spheres of organisation of modern business processes, including the business process of distribution. Its transformation has led to the emergence of its new form – digital distribution. These business process transformations have significant potential for increasing business efficiency and effectiveness, as well as for radical business transformation. Distributors that adapt to new business conditions in time will be in a more advantageous position to take advantage of globalisation processes and the digitalisation of the world economic system.

1. Digital distribution is a method of distributing content without using physical media. Content distributed over the Internet can be streamed or downloaded and often consists of books, films and television programmes, music, software and video games. Digital distribution platforms play an important role for companies that provide content and related services for different platforms. These platforms help content providers to reach a large number of potential customers easily and quickly. While the companies creating such platforms may have strict control over which devices can be used to access the platform (for example, Apple controls and limits the use of its iOS platform), content providers may seek to promote their products (services) on multiple platforms simultaneously. For instance, video game developers or music industry

companies may consider several alternative platforms to promote their content simultaneously. This means that if multiple platforms can be used to carry the same content, their simultaneous use plays an important role in extending the distribution capabilities of content providers. A company may offer content on multiple platforms, and customers may use multiple devices or networks to access a single platform service. As a result, content can be offered on multiple platforms and the same platform can be used to distribute and offer content from other providers.

Analysis of recent researches and publications. Among the scientists who have devoted their research to the transformation of distribution under the influence of digitalisation, it is necessary to mention Zhenchenko M.I. [1], Kohut Yu.I. [2], Popovskyy Yu.B. [3], Evans P., Gawer A. [4], Baber V.V., Martinez R. [5], Janssens J., Vandacle S., Beken T. [6] and others. Despite the numerous scientific works of foreign and domestic scientists, the optimisation processes of companies in the field of digital distribution require further research.

Formation of the objectives of the article (task statement). Develop a model for optimising the digital distribution business process.

Summary of the main research material. It should be noted that the global digital distribution market is characterised by mergers and acquisitions, which leads to certain difficulties

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in the analysis of some digital platforms [7]. This makes it difficult to analyse the AppStore, for example. This store has more of an infrastructural value for Apple's parent company (although the same cannot be said of its value for development companies). It should also be noted that for some major players in the digital distribution market, the profit from this activity, despite its significant volume, is only ancillary in relation to total revenues. The Amazon subscription services segment (annual and monthly fees for Amazon Prime membership, sales of audiobooks, e-books, digital videos, digital music and other subscription services) can be taken as an example, since the company's main activity is e-commerce (the sale of physical goods over the Internet).

In order to optimise the business process of digital distribution as part of the business model of an international company and to identify the factors that will further increase the profitability of digital distribution companies, it was proposed to use multifactor analysis with the following statistical and mathematical software technologies Gretl 2022a, Microsoft Excel 2019 [8].

In order to carry out the above analysis, the leading companies that offer specific digital goods and services on the Internet market and have digital distribution as their main source of income were selected. These include the following:

– Netflix Inc. (Netflix online cinema of movies and TV shows).

– Google Inc. (Google Play online platform for mobile applications for smartphones based on the Android operating system; Google services; YouTube).

– Microsoft Inc. (sale of software and operating systems (MS Office, MS Windows, etc.); provision of server and cloud storage rental services (MS Azure); provision of online services (Office 365, Xbox Game Pass).

The research identified the quantitative factors that influence the profitability of the digital goods and services offered by the specified companies, and built an economic-mathematical model to identify the most influential factors.

The research focuses on the revenues of the above companies in 2012–2021.

The subject of the study is the interrelationship of the factors studied that have an impact on the development of digital distribution in the world.

To achieve the goal of the study, the following objectives were set:

1) Creation of a multivariate regression model using Gretl 2022a software.

2) Formation of forecast data on influencing factors $X_{1,2,...,n}$ (Microsoft Excel 2019 software is used) and determination of the trend of change of the studied indicator Y in 2022–2023.

3) Determination of the degree of influence of indicators X on the change in factor Y .

The following indicators were selected as the most important factors influencing the change in e-commerce volumes:

1. CR – Cost of Revenue, the company's expenses for operating activities (digital content creation), in millions of USD.

Operating expenses include the cost of producing and distributing licensed programmes and products; the cost of operating product support service centres and product distribution centres; the cost of attracting traffic to websites and purchasing advertising space on the Internet; the cost of supporting online products and services, including data centre costs and licence fees; warranty costs; inventory write-downs; and the cost of providing consultancy services.

2. SM – Sales and Marketing costs, the cost of the company's advertising expenses for the promotion of the created content, in millions of USD.

Marketing expenses consist mainly of advertising costs and certain payments to marketing partners. Advertising costs include promotional activities such as digital and television advertising.

3. RD – Research and Development expenses, the company's expenses on technology development and service improvement, in millions of USD.

Research and development expenses include both internal and external development and programming costs, localisation costs incurred in translating software for international markets, and amortisation of purchased software code and service content.

4. GA – General and Administrative Expenses, the cost of expenses to support the company's administrative activities, in millions of USD.

General and administrative expenses include payroll, employee benefits, share-based payment expenses, holiday and other expenses related to human resources, finance, legal, logistics, certain human resources and other administrative functions, legal and other administrative expenses.

5. Goodwill – the company's business reputation, in millions of USD.

Goodwill is tested for impairment at the reporting unit level (operating segment or one level below the operating segment) on an annual basis and whenever events or changes in circumstances indicate that the fair value of the reporting unit may not be recoverable. Such events or circumstances may include a significant change in the business climate, legal factors, operating performance, competition or the sale or disposal of a significant portion of the reporting unit.

The application of the goodwill impairment test requires judgement, including the identification of reporting units, the allocation of assets and liabilities to reporting units, the allocation of goodwill to reporting units and the determination of the fair value of each reporting unit. The fair value of each reporting unit is estimated primarily using the discounted cash flow method. This analysis requires significant judgement, including estimates of future cash flows based on internal forecasts, estimates of the long-term growth rate of the business, estimates of the useful life over which the cash flows will be generated and the determination of the weighted average cost of capital.

6. NE – Number of Employees of the company, in thousands of people.

It should be noted that the indicators considered are the average annual number of full-time employees in different

departments in all countries where the companies are present and have offices.

Summary indicators for the six influencing factors and the resulting factor – revenue from digital distribution for the companies studied (Netflix Inc., Alphabet Inc., Microsoft Inc.) are shown in Table 1.

Before starting to build a mathematical model, it is necessary to investigate the degree of correlation dependency between the factors investigated. For this purpose, a correlation matrix was constructed in Gretl 2022a and presented in Figure 1.

According to the data of the correlation matrix, the relationship between the studied factors is the strongest (the correlation coefficient is close to 1 and in this case exceeds 0.9) for the indicators: CR (Cost of Revenues) and RD (technology Research and Development costs). A moderate relationship (correlation coefficient between 0.7 and 0.9) exists for the factors SM (Sales and Marketing costs), GA (General and Administrative costs) and NE (Number of Employees).

The given data of the correlation matrix indicate the existence of a sufficiently strong relationship between the studied factors and will be taken into account in the analysis of the degree of influence of the factors on the level of profitability of the company.

On the basis of the given data it can be noted that in the constructed six-factor model the indicators of the cost of maintaining administrative activities, the business reputation of the company and the number of employees of the company are not statistically significant (Gretl marks such factors with asterisks in the right part of the calculation opposite each indicator). Since there are statistically insignificant factors in the built model, an additional study was carried out: the factor with the largest "p-value" is removed from the calculation and the model is rebuilt; the procedure is repeated until only statistically significant factors remain in the model. Therefore, the following factors were removed from the model:

– GA is the cost of maintaining the company's administrative activities.

Table 1 – Profitability indicators of the selected companies and factors of influence in 2012–2021

Company	Year	Revenues from digital distribution, million USD	Cost of revenues, million USD	Sales and marketing, million USD	Research and development, million USD	General and administrative costs, million USD	Goodwill, million USD	Number of employees, thousands of people
		DDR	CR	SM	RD	GA	Goodwill	NE
Netflix Inc.	2012	3 609	2 626	465	329	139	2 900	2,022
	2013	4 374	3 083	504	379	180	3 800	2,045
	2014	5 505	3 753	607	472	270	4 900	2,189
	2015	6 780	4 591	824	651	407	7 200	3,700
	2016	8 831	6 257	1 098	780	316	11 000	4,700
	2017	11 693	8 033	1 436	954	431	14 700	5,500
	2018	15 794	9 968	2 369	1 222	630	20 100	7,300
	2019	19 859	12 440	2 652	1 545	914	24 500	8,600
	2020	24 757	15 276	2 228	1 830	1 076	25 400	9,400
Alphabet Inc.	2012	46 039	17 176	5 465	6 083	3 481	10 537	54,00
	2013	55 519	21 993	6 554	7 137	4 432	11 492	48,00
	2014	66 001	25 691	8 131	9 832	5 851	15 599	54,00
	2015	74 989	28 164	9 047	12 282	6 136	15 869	62,00
	2016	90 272	35 138	10 485	13 948	6 985	16 468	72,00
	2017	110 855	45 583	12 893	16 625	6 840	16 747	80,00
	2018	136 819	59 549	16 333	21 419	6 923	17 888	99,00
	2019	161 857	71 896	18 464	26 018	9 551	20 624	119,00
	2020	182 527	84 732	17 946	27 573	11 052	21 175	135,00
Microsoft Inc.	2012	64 133	17 530	13 857	9 811	4 569	13 452	94,00
	2013	66 997	20 249	15 276	10 411	5 149	14 655	99,00
	2014	67 017	27 078	15 811	11 381	4 677	20 127	128,00
	2015	66 623	33 038	15 713	12 046	4 611	16 939	118,00
	2016	80 767	32 780	14 630	11 988	4 563	17 872	114,00
	2017	88 898	34 261	15 461	13 037	4 481	35 122	124,00
	2018	102 433	38 353	17 469	14 726	4 754	35 683	131,00
	2019	116 678	42 910	18 213	16 876	4 885	42 026	144,00
	2020	132 797	46 078	19 598	19 269	5 111	43 351	163,00
2021	156 818	52 232	20 117	20 716	5 107	49 711	181,00	

Source: developed by the author [9–11]

DDR	CR	SM	RD	GAC	
1,0000	0,9810	0,8902	0,9845	0,8340	DDR
	1,0000	0,8243	0,9641	0,8332	CR
		1,0000	0,9185	0,8254	SM
			1,0000	0,8461	RD
				1,0000	GAC
Goodwill	NE				
0,5107	0,8510	DDR			
0,4340	0,7706	CR			
0,5990	0,9816	SM			
0,4789	0,8752	RD			
0,2740	0,7560	GAC			
1,0000	0,6599	Goodwill			
	1,0000	NE			

Figure 1 – Correlation matrix of the factors examined

Source: developed by the author

- Goodwill – business reputation of the company.
- NE – number of company employees.

Based on the calculations, the most appropriate model for building a forecast is the three-factor model, which has the following mathematical form (Formula 1).

$$DDR = -2,31e + 03 + 2,20 * RD + 1,37*CR + 1,10*SM \quad (1)$$

Before analysing the model, it is important to test for heteroscedasticity – the presence of heterogeneous observations that can lead to random errors and result in inefficient estimates. For this purpose, the built-in White’s test is used, which does not reveal the fact of heteroscedasticity and allows to assert the reliability of the created model and the built forecast indicators.

Based on the constructed model data, the influencing factors have a 98.55% impact on the resulting factor Y (R-squared – coefficient of determination). The others account for only 1.45%. The influence of these factors is also confirmed by the data of the correlation matrix (i.e., the

factors of operating costs and technological research and development costs show a high correlation, the factor of sales and marketing – a sufficiently high correlation), which was constructed before the construction of the mathematical model. In addition, the significance of the created model is confirmed by the satisfactory level of the "P-value (F)" indicator – Fisher’s test, the normative value of which should not exceed 0.05. The normality of the distribution of the residuals is also confirmed by a separate test.

The presented three-factor model is satisfactory for predicting the data, since all regression coefficients are statistically significant, and the coefficient of determination is at a sufficiently high level. The preconditions of the least squares method are met and there is no heteroscedasticity in the model. The graph of observed and calculated model values is shown below in Figure 2.

Thus, based on the data on the companies’ activities, it is important to note that in order to increase revenues in

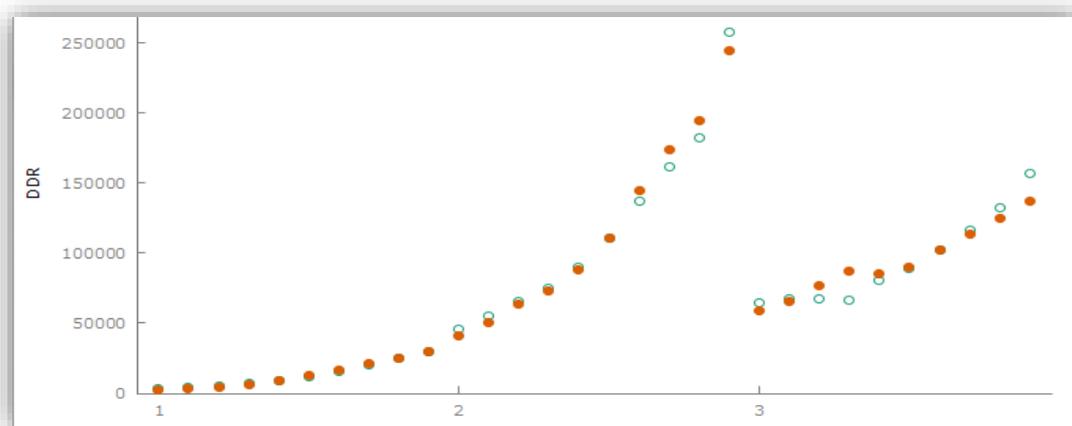


Figure 2 – Graph of values of the built model in Gretl 2022a (Part 1 – Netflix Inc., Part 2 – Alphabet Inc., Part 3 – Microsoft Inc.)

Source: developed by the author

the digital distribution market, companies generally need the following:

1. Balanced control of marketing and operating costs, sound planning of advertising agencies and constant analysis of ongoing operating costs for unjustified or excessive expenditure.

2. Argued for increased spending on technology development, technical equipment of the company and ways to improve the delivery of digital goods to users.

3. Based on the construction of the universal formula (1) of the influence of factors on increasing the amount of income from digital distribution for international companies, it was determined that to obtain a positive effect it is necessary to contribute to the increase of operating expenses, marketing costs and technology.

The modelling results were used to develop a model for optimising the digital distribution business process (Figure 3).

The basis of the business process of digital distribution is therefore the emergence of a need for a digital product on the part of the user. This need can be divided into two main parts: the need for information and the need for tools. For certain categories of digital distribution, the satisfaction of information needs is more characteristic (e.g., video or audio). For some categories of digital distribution, the satisfaction of tool needs is more characteristic (e.g., software). Mobile applications can fulfil two functions at the same time.

After receiving a request from a user, a distributor of a digital product can do one of two things, depending on whether the product is in stock. If the product is available, the process of buying and selling the digital product takes place, after which the user receives the product. To

implement this link in the business process, it is proposed to use operating expenses.

If the digital product is not available, there are also two options for a distributor. Depending on whether the market for the product that meets the user's needs in the digital market has disappeared, either a licence to use the product can be acquired or a new product can be developed.

The first option is exemplified by Microsoft's acquisition of Activision Blizzard for 68 billion USD in January 2022 [12]. Through this purchase, Microsoft gains not only a licence for digital goods in categories that the company did not provide, but also other competitive advantages, such as the ability to develop a "metaverse" – virtual online worlds where people can work, play and communicate, as many of Microsoft's largest competitors already do.

Activision's game library could give Microsoft's Xbox gaming platform an edge over Sony's PlayStation, which has provided access to a steady stream of exclusive games for years.

After obtaining the rights to use the digital product on the market, the distributor can proceed to the stage of buying and selling the product, which has already been described above.

If there is no product on the market, or if the company does not want to buy it from competitors, the other branch of the business process will lead to the development of a new digital product. To implement this approach, it is necessary to increase operating costs and research and development costs. An example of such a business process vector is the plan of Netflix, Inc. to expand its own activities by releasing new types of products for the company, namely games. In 2021, it was reported that Netflix, Inc. (NFLX.O) is looking

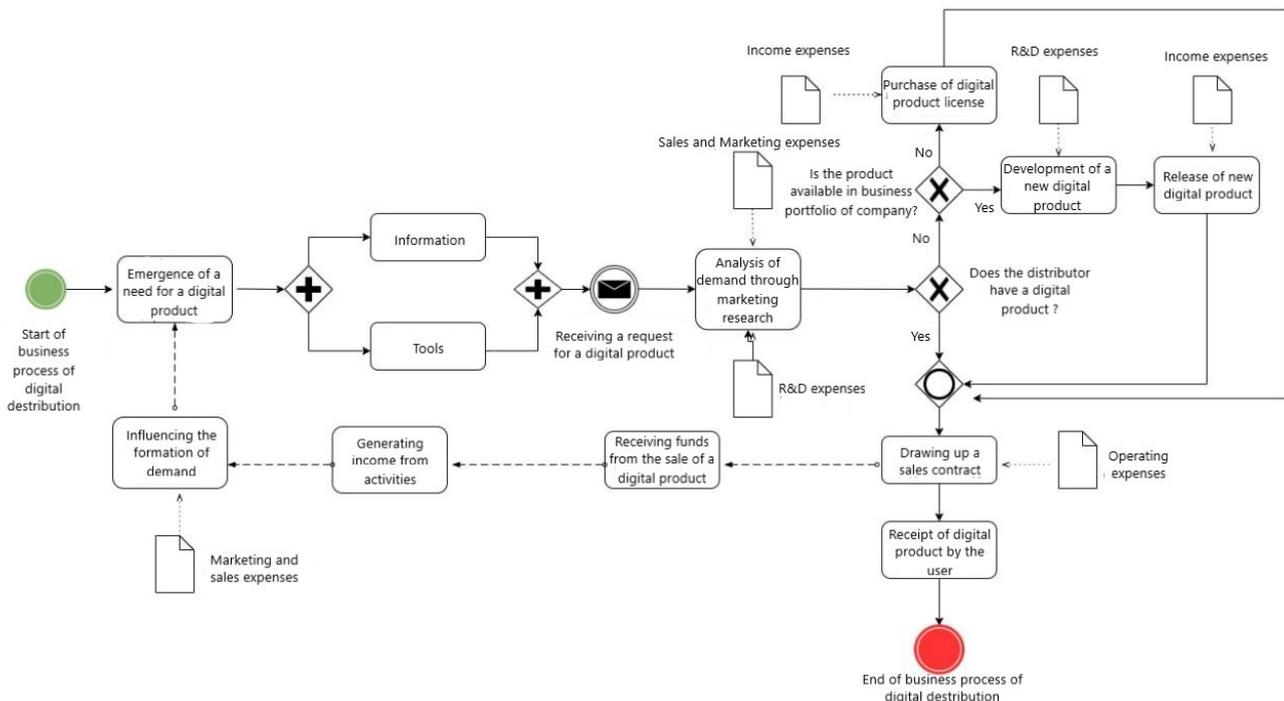


Figure 3 – Model for optimization of the business process of the digital distribution

Source: developed by the author

for an executive to oversee its expansion into video games, a sign that the company is increasing its efforts to expand beyond its traditional streaming business [13].

The step comes as the video game industry has benefited from a surge in demand from gamers stuck at home during the COVID-19 pandemic.

Netflix is planning to distribute games as an option in a package similar to Apple's online subscription, Apple Arcade.

After the development of a new digital product, the distributor can move on to the stage of buying and selling the product, which has already been described above.

An important part of the developed business process of digital distribution is the fact that from the money received from users, international companies need to invest money through marketing expenses to influence users' needs. By exercising such influence, digital distributors will be able to program the user's desires according to the circumstances that are more beneficial to the distributor.

It should be noted that only leading digital distribution companies have the potential to make such an impact. This is the pinnacle of business process optimisation in digital distribution.

Conclusions. Ways of business process optimisation of digital distribution include such directions of digital distribution market companies income increase as control over marketing and operating expenses, rational planning of advertising companies and constant analysis of current operating expenses for unjustified or overtime costs; reasonable increase in spending on technology development, technical equipment of the company and improvement of distribution channels of digital goods to users; redistribution of costs in the direction of increasing operating expenses, marketing and technology costs. Based on the principles of the concept of "pulling" digital goods and services to the market, a model for optimising the business process of digital distribution of an international company has been developed using the BPMN notation. According to this model, the optimisation of the cost of developing a digital product or service should be ensured by prioritising the distribution business process in the company's business model. The first step in this process is to identify the consumer's need for a digital product/service and obtain a demand for it. As a result, the request for development or production of the product or service is transferred to the production business process.

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ОПТИМІЗАЦІЯ БІЗНЕС-ПРОЦЕСУ ЦИФРОВОЇ ДИСТРИБУЦІЇ**Михайло Володимирович Дубель¹**

З метою оптимізації бізнес-процесу цифрової дистрибуції у складі бізнес-моделі міжнародної компанії та визначення чинників, які в подальшому призведуть до збільшення прибутковості компанії цифрової дистрибуції було запропоновано використання багатофакторного аналізу технологіями наступних статистичних та математичних програмних забезпечень: Gretl 2022a, Microsoft Excel 2019. Для проведення зазначеного аналізу було обрано компанії-лідери з надання певних цифрових товарів та послуг на Інтернет-ринку, у яких основним джерелом прибутку є саме цифрова дистрибуція, а саме: Netflix Inc. (онлайн-кінотеатр фільмів та серіалів Netflix); Google Inc. (онлайн-майданчик мобільних додатків Google Play для смартфонів на базі операційної системи Android, Google Services, YouTube); Microsoft Inc. (продаж комп'ютерних програм та операційних систем, (Windows, Office) та інші; надання послуг оренди серверів та хмарних сховищ (MS Azure); надання послуг онлайн-сервісів (Office 365, Xbox Game Pass)). Під час дослідження було виокремлено кількісні фактори, які впливають на дохідність від надання цифрових товарів та послуг зазначених компаній та побудовано економіко-математичну модель з метою виявлення найбільш впливових факторів. Автором зроблено висновок щодо визначення напрямів збільшення обсягу доходів компанії на ринку цифрової дистрибуції (контроль за маркетинговими і операційними витратами, аргументоване планування рекламних компаній та постійна аналітика поточних операційних витрат на предмет невиправданих або понад-нормових витрат; аргументоване збільшення витрат на розвиток технологій, технічне оснащення компанії та шляхи покращення каналів збуту цифрових товарів користувачам; перерозподіл витрат в бік збільшення операційних витрат, витрат на маркетинг та технології), який було отримано із застосуванням розробленої багатофакторної моделі бізнес-процесів цифрової дистрибуції провідних компаній галузі; розроблено у нотації BPMN модель оптимізації бізнес-процесу цифрової дистрибуції міжнародної компанії, що ґрунтується на принципах концепції «витягування» цифрових товарів і послуг на ринок.

Ключові слова: діджиталізація, інформаційні технології, моделювання бізнес-процесів, цифрова дистрибуція, цифрова інфраструктура, бізнес-модель.

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