

Transformation of the business models in the context of achieving sustainable development

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Abstract

The deepening of crises and pandemics, the growth of armed conflicts actualize the ability of business to adapt to these changes, as well as the repurposing of industries in accordance with the goals of sustainable development. Industry 4.0 also creates a business environment based on innovation and adaptability to change. The lack of conflict identification in business leads to the creation of the wrong strategy and tools, losses and unprofitability. The article presents the results of a comparative analysis of the business models transformation for enterprises from different industries in the context of achieving sustainable development. The aim of the study is to identify factors that change the key elements of the business models under the influence of Covid-19 and Industry 4.0, as well as to adapt to meet the conditions of the sustainable development triangle. In the process of describing business models of enterprises, the authors proposed an approach based on the concept of sustainable development. Characterization of individual transformations of business models is based on the results of generalization of enterprises performance indicators by five sectors of the economy according to GICS. This allows for international comparability of research results. The authors found that business models of enterprises were transformed under the influence of COVID-19 and Industry 4.0. The analysis of CANVAS models allowed to identify the main transformational changes: an open system with multiple inputs and outputs, an interactive-innovative environment, a customer-oriented approach with a focus on millennials, the formation of a full range of End-to-End solutions in three areas (Operations, Solutions Delivery, Innovations). The authors confirmed the hypothesis that the business models of enterprises in the consumer and energy sectors have not adapted to the negative impact of COVID-19 and are difficult to adapt to Industry 4.0. Enterprises in other sectors of the economy have adapted to change and transformed their own business models as a result of the impact of COVID-19 and Industry 4.0.

Keywords: business; model; transformation; CANVAS; COVID-19; Industry 4.0; sustainable development; economic sector; hospitality industry; tourism

1. Introduction

The COVID-19 crisis has affected societies and economies around the globe and will permanently reshape our world as it continues to unfold. Military conflicts also negatively affect the economy. Moreover, the relationship between military spending and development indicators is stronger (weaker) in less (more) developed economies. Experts also proved the relationship between military spending and economic, health, education, environmental and social indicators of sustainable development (Elgin et al., 2022). In the conditions of war, the adaptation of business models is relevant due to the fact that there is no sufficient support from the state.

Sustainable Economy and Industry 4.0 are causing a change in business philosophy, which is exacerbated by the impact of the COVID-19 pandemic, reducing the gap between financial and economic crises, changing the environmental and social environment. Transformation of enterprises in order to achieve the desired business model is a complex process that consists of maximizing the positive consequences of the transition and minimizing the negative consequences of destabilization (Khovrak & Chernenko, 2021; Polinkevych et al., 2021). This process is influenced by many factors, which can be divided into three groups, namely the factors of macroenvironment, mesoenvironment, and microenvironment.

If the factors of the microenvironment can be controlled, the meso- and macroenvironments are difficult to manage. The American Chamber of Commerce in Ukraine together with Deloitte conducted a survey on the impact of COVID-19 on business in Ukraine. It is stated that the majority of respondents have already taken measures to minimize the impact of the COVID-19 pandemic: restricting business travel, providing opportunities for remote work, office security and providing up-to-date information to employees. All of them are the most necessary measures to support staff in Ukraine. Respondents noted that the main challenges in implementing support actions in the company are the complexity of organizing and implementing remote work. Under the influence of the COVID-19 pandemic, business reduces sales and cash flow (61%), makes it impossible to serve consumers / customers (52%) and continues normal business management (46%). When asked to adjust their business performance targets in 2020, 65% of member firms said they plan to support the target, and 14% plan to moderately reduce targets (Deloitte, 2020). However, it should be noted that dynamic technical development in a post-industrial society also has many negative consequences. This applies not only to the technologies themselves, such as the impact on socio-psychological change through social networks but also covers almost all socio-psychological aspects. The natural environment is changing accordingly (Szromck, 2021). Although the three research areas have identified impacts on micro-, meso-, and macro-ecosystem business model change, they vaguely refer to each other when discussing the implications of their findings and showing business model change in the context of change. The processes in which companies exist are interconnected not only with the natural environment, but also socio-psychological, technological, and managerial. Modification of one of them affects the change of the other. Accordingly, all sectors of the environment of companies should interact on the basis of the concept of sustainable development (Činčalová, 2020; Činčalová, 2021; Kasych et al., 2019). Universities play a significant role in changing societal priorities (Sitnicki, 2018, Trunina et al., 2020). However, it is not about a narrow understanding of this concept by reducing it to the impact only on the environment (Grzebyk & Stec, 2015; Trunina et al., 2019; Portna et al., 2021; Dropulić, 2020), but about the broad meaning of this concept, which is based on the use of innovative approaches (Lutsyshyn et al., 2019; Achkasova, 2020; Buzko et al., 2019) to achieve sustainable development. The research of these scientists confirmed the fact that an in-depth comprehensive study of the change in the business model of a business is needed, taking into account all spheres of activity and under the influence of competitive and partner enterprises.

Sustainability research raises the question of the importance of sustainability through improved delivery timeliness, increased productivity and improved organizational atmosphere as a result APM (Zakrzewska et al., 2022). However, they do not reflect the changes in the business model that are taking place comprehensively under the influence of the COVID-19 pandemic, military operations, Industry 4.0, sustainable development, turning them into a holistic system, rather than isolated changes. Accordingly, we aim to use synergies and trade-offs as explanatory variables to measure the transformation of business models.

2. Materials and Methods

The aim of the study is to identify factors that change the key elements of the business models under the influence of

Covid-19 and Industry 4.0, as well as to adapt to meet the conditions of the sustainable development triangle (the relationship between economic, social and environmental sustainability). The process of correlation of the elements of the triangle of sustainable development was considered in the works of researchers from the standpoint of social responsibility (Trunina & Khovrak, 2019), marketing technologies (Horyslavets et al., 2018; Trynchuk, 2017), risk (Bednarczyk et al., 2021). To achieve this goal, we identify two complementary goals: (1) identifying factors influencing the business model in Ukraine before and after Covid-19 and (2) transforming the business model to achieve innovation efficiency in sectors of the economy under the influence of sustainable development and Industry 4.0 (Klapkiv et al., 2020; Kalayda, 2021).

The study was conducted on the example of Ukraine. Based on the authors' study of data from 11 Ukrainian enterprises in different types of economic activity, a model of business transformation under the influence of changes resulting from Covid-19, Industry 4.0, and the economy of sustainable development was proposed. The European Business Association has determined that the most affected are those areas of business that are subject to direct restrictions due to the introduction of quarantine measures (Epravda, 2020): 1) entertainment and cultural institutions (theaters, cinemas, exhibitions, various entertainment events, fitness clubs, etc.) - from a complete stop to a decline in revenue by 50-80%; 2) hotel and restaurant business - the situation is almost similar, as it imposes restrictions on crowds. According to the government's decision, only cooking and delivery to the customer are allowed; 3) tourist services - an absolute drop in the quarantine period due to the closure of borders and interregional connections within Ukraine; 4) the sphere of providing cosmetic services - visitors have already experienced a decline of more than 50%; 5) passenger transportation, insurance, construction, non-governmental educational institutions, etc. At the same time, trade in food, medicines, hygiene products, e-commerce, and delivery of goods to consumers do not suffer significant losses. The same agency provides a clear list of companies that have benefited or lost due to the Covid-19 pandemic.

The authors selected enterprises from five sectors for a sample. The industrial sector is represented by Roshen Corporation (Roshen, 2022) (PJSC Kyiv Confectionery Roshen, PJSC Vinnytsia Confectionery Roshen, PJSC Kremenchuk Confectionery Roshen, PJSC Vinnytsia Dairy Plant Roshen, LLC Biscuit Complex Roshen), Nestle Corporation (Nestlé, 2022), PJSC Lviv Confectionery Svitoch, PJSC Volynholding (TM Torchyn, LLC Tec hnocom (TM Mivina)), PJSC Ukrzaliznytsia (Uz, 2022); commodity sector – LLC ATB-Market (ATB, 2022), LLC Fozi-Food (Fozzy, 2022); energy sector – JSC NJSC Naftogaz of Ukraine (Naftogas, 2022); consumer sector - Hilton hotel in Ukraine (Hilton, 2022), travel agency ANEX Tour in Ukraine (Anextour, 2022); financial sector – PJSC CB Privatbank (Privatbank, 2022), NJSC Oranta (Oranta, 2022). The analysis of the structure of business models used the concept of the CANVAS model, which allowed to evaluate the components of the model, to expand the elements of sustainable development and Industry 4.0, as well as opportunities to share knowledge on open innovation. These 10 enterprises belong to international corporations operating in the Ukrainian market and 7 are national (PJSC Ukrzaliznytsia, JSC NJSC Naftogaz of Ukraine, NJSC Oranta, PJSC CB Privatbank, LLC ATB-Market, LLC Fozi-Food). Thus, there is an international and national influence on the formation of the business development model in Ukraine. Sectors of the economy meet the world standard of

industrial classification (Global Industry Classification Standard) (Msci, 2022). This allows authors to compare results internationally. The vast majority are medium and large enterprises, with more than 50 employees and a net income from sales of 8 million and more than 40 million euros, and a book value of assets of 4 million euros and more than 20 million euros (Zakon, 2018). Such enterprises are actively implementing innovations in all areas of activity that are important in terms of sustainable development. They provide economic, social, and environmental sustainability. Based on the brand ratings of the magazine "Power of Money" formed the top 25 innovative companies in Ukraine - both domestic and international, which are actively implementing innovations in Ukraine. The main criterion in the selection was not only the presence of innovative plans for the future but also already successfully implemented innovations in production technologies, products or services provided. The role of the company in the life of the country, the amount of investment in innovative projects (Danylkiv et al., 2021), the company's participation in specialized exhibitions, and the importance of implemented innovations to strengthen the economic and technological potential and international prestige of Ukraine were also taken into account. Data from open sources were used, including official information of companies, media reports, opinions of industry experts. Leaders in the implementation of innovations are companies in such sectors of GICS as the commodity sector (international brewing company AB InBev Efes, Carlsberg Ukraine, Obolon, Agro-Region, agro-company Ker-nel, Agroholding MHP), industrial sector (Italian group of companies De'Longhi, Korean company Hankook Tire, South Korean manufacturer of home appliances and electronics LG, Samsung Electronics, technology company Philips, construction group "Synergy"), energy sector (DTEK Naftogaz, Regional Gas Company, filling stations WOG), financial sector (Moneyveo lending company, Motor (transport) insurance bureau of Ukraine (MTIBU), Ukrgasbank,), information sector (Microsoft IT corporation, Metinvest Digital IT company), raw materials sector (PET packaging company RETAL), healthcare sector (pharmaceutical company Gideon Richter, pharmaceutical manufacturer Farmak, biotechnology company Enzyme), telecommunication services (telecom operator of Ukraine Kyivstar) (Dsnews, 2020). Unfortunately, hotels and restaurants, travel companies, consumer sector enterprises are not innovative companies in Ukraine (Grzebyk & Stec, 2014). According to a study by the European Business Association, these companies received the greatest negative consequences from the restrictions due to the Covid-19 pandemic (Dankiewicz et al., 2021).

Industry 4.0 is the leading trend in the Fourth Industrial Revolution. Its characteristic features are the development of information and communication technologies, automation, and robotization of production processes. These are fully automated productions, where the management of all processes is carried out in real-time and taking into account changing external conditions. Cyberphysical systems create virtual copies of objects in the physical world, control physical processes, and make decentralized decisions. They are able to unite in one network, interact in real-time, self-tuning and self-learning. An important role is played by Internet technologies that provide communication between staff and machines. Enterprises produce products in accordance with the requirements of the individual customer, optimizing the cost of production. Experts identify four basic technologies that are expected to bring about revolutionary changes: the internet of things, digital ecosystems, and platforms, data driven decision. According to the World Economic Forum, most of the technologies of the Fourth Revolution will become commonplace in 2027. This means that there will be not only

smart homes but also smart cities, unmanned vehicles on the streets, artificial intelligence in offices, and supercomputers in pockets (It, 2022). The Industry 4.0 concept is not limited to direct production in the company, but it also includes a complete value chain from suppliers to customers and all business functions and services of the enterprise. The concept of Industry 4.0 has spread to sectors of the economy other than the industrial sector, such as Automotive 4.0, Logistics 4.0, and Education 4.0. They all have in common with Industry 4.0, only slightly different in the use of information and communication technologies, search, collection, and analysis of real-time data. It can be expected that most companies will gradually implement elements of Industry 4.0, based on existing hardware and software solutions, thus ensuring sustainable development (Rojko, 2017, pp. 87-88).

The survey on the factors influencing the transformation of the business model is random and stratified according to GICS, the size of the firm, the level of innovation. This survey offers key indicators in business in 2018 and 2020. The analysis is based on a set of data from 5 sectors according to GICS.

In our study, three methods of building a business model were used: (1) comparative based on CANVAS, (2) indexical for evaluating the effectiveness of business models of enterprises before and under the influence of COVID-19 and Industry 4.0, (3) expert methods to study the impact of COVID-19 and Industry 4.0 on the business model.

3. Results

Transformation of business models occurs through five main elements: costs, services, customer service, accommodation, and real estate. The first element of the business model is costs, because the business model will be effective when costs are optimized. If it is necessary to reduce costs and at the same time ensure the stability and implementation of the savings program, then it is worth using the implementation strategy. A business promotion strategy will help to balance costs, which will free up funds for investment, which will be directed to efficient business processes. If the goal of cost transformation is to introduce a flexible financial platform that will ensure growth and investment in innovative potential, then a growth strategy is used in cost management.

To transform an element of the service business model, it is worth evaluating the feasibility of using price-structured insourcing and outsourcing, as well as developing a plan for business transition to them. First of all, it is worth evaluating strategic alternatives through clear management priorities. They identify specific actions to achieve them, comparing the costs of self-regulation and outsourcing. Negotiations are conducted according to the plan after establishing the expediency of using outsourcing. Next, experts compile requests for information, develop, negotiate and implement effective agreements with third-party suppliers. In this step, balance between service quality, operational results and price is ensured, and then the outsourcing plan is drawn up. It takes into account governance, stakeholder involvement, change management and other factors affecting business efficiency and sustainability. After that, experts implement new approaches or optimize existing supplier management in order to achieve optimal and stable service quality.

Working with clients involves the formation of common service centers (CSCs), which support business and provide a platform for future growth. The main techniques of cooperation with clients are a side view of the problem, questions and

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answers (3-5 main questions and a few additional ones), summarizing, paying attention to his problems and willingness to help, deny yourself, ahead of customers, do not use the construction "yes, but... », direct technique.

Accommodation and real estate provide a justification for the feasibility of ownership or lease of premises from the standpoint of minimizing costs and convenience of location for customers. An important factor here is the availability of communications, which are located near business centers. Conventionally, the areas of attraction of buyers can be divided into three groups: near, middle, and far. The near zone is a part of the area of operation in which 60-65% of business clients are concentrated and which is 0.5 (2-4 abroad) km or 10 minutes away from it. The average area of attraction concentrates about 20% of its customers and stretches for 0.5-

2.0 (2-6 abroad) km or 15-20 minutes' drive. The far zone in the cities stretches for 10-25 km, outside the city - 50-80 km. It is inhabited by non-permanent, casual consumers of products and services, those who have a favorable transport connection, as well as buyers for whom the object is on the way to work and back (Yashkina, 2013, pp. 384). This division is quite acceptable and affects the description of business models.

Accordingly, the authors conducted research on the factors influencing the transformation of the business model. To do this, all surveyed enterprises are divided into 5 sectors in which the study was conducted: industrial, commodity, energy, consumer, and financial sectors. Table 1-10 presents the business models of selected enterprises by sectors and we will build a consolidated CANVAS model for a particular sector.

Key partners Agro-industrial complex Foreign commodity food producers	Key actions Creating interaction platforms	Key propositions Blogging platform Own coffee shops	Customer relationships Support service, self-service	Customer segments Women, children and young people of working age
	Key resources Human, financial		Channels Social networks, Website	
Cost structure Implementation of innovative technologies, renewal of fixed assets		Revenue streams Trade revenue through trade establishments		

Table 1. CANVAS business model for the industrial sector in the period before COVID-19 and the transition to Industry 4.0.
Source: Own study.

Key partners Agro-industrial complex Foreign commodity food producers	Key actions Creating platforms and blogs	Key propositions Internet cafes, YouTube channel, Tik-tok channel, virtual sales and internet tasting establishments, online 24/7 ordering of products, access to the range, analysis of the representation of goods and services, online consultations	Customer relationships Support service, self-service	Customer segments Millennials
	Key resources Human, informational		Channels Social Networks, Website	
Cost structure Creation of new platforms for sales of products and provision of services, Marketing and sales		Revenue streams Trade revenue through online sales		

Table 2. CANVAS business model for the industrial sector under the influence of COVID-19 and Industry 4.0. Source: Own study.

Key partners Suppliers of food and non-food products, insurers, carriers	Key actions Maintaining competitive prices, expanding the trade network to different cities	Key propositions Minimum time for customer service, low prices with high quality, cash	Customer relationships Self-service, counseling	Customer segments All age groups of people
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	Key resources Human, financial, information	payment	Channels Promotional booklets, offer stores, sundress marketing, social networks	
Cost structure Building a chain of stores, Marketing and sales			Revenue streams Trade revenue from stores	

Table 3. CANVAS business model for the commodity sector in the period before COVID-19 and the transition to Industry 4.0.

Source: Own study.

Key partners Financial and credit institutions, technological partners, investors, suppliers of food and non-food products	Key actions Maintaining competitive prices, expanding the range of consumers, focusing on digitally literate users	Key propositions Discount system, fast courier delivery, non-cash and cash payment, full digitalization of all internal processes: from approvals of internal documents to contracts with contractors in online format	Customer relationships Self-service, counseling via chatbots, operators	Customer segments Millennials
	Key resources informational, human		Channels Social networks, web pages, YouTube channel	
Cost structure Development of online sales, virtual stores		Revenue streams Online sales		

Table 4. CANVAS business model for the commodity sector under the influence of COVID-19 and Industry 4.0. Source: Own study.

Key partners Consumers and producers of energy resources, households	Key actions Market pricing, analysis and collection of information, informing consumers about the used resources	Key propositions Discount system, cash and non-cash payment	Customer relationships Through call centers, self-service	Customer segments All age groups except children
	Key resources Human, informational		Channels Mass media, social networks, telephone applications	
Cost structure Advertising, operating costs, research and development		Revenue streams Payment for energy resources in cash and non-cash		

Table 5. CANVAS business model for the energy sector in the period before COVID-19 and the transition to Industry 4.0.

Source: Own study.

Key partners Consumers and producers of energy resources, households	Key actions Market pricing, analysis and collection of information, informing consumers about the used resources	Key propositions Discount system, cashless payment, modern technological solutions and the latest equipment to reduce drilling time, reduce risks and drill wells where it was previously impossible to do so	Customer relationships Through online centers, self-service, telephone applications	Customer segments All age groups except children
	Key resources Human, informational		Channels Media, social networks, through chatbots	
Cost structure Advertising, research and development, Internet technology		Revenue streams Payment for energy resources in non-cash form		

Table 6. CANVAS business model for the energy sector under the influence of COVID-19 and Industry 4.0. Source: Own study.

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Key partners Travel agencies, food processing industry	Key actions Low prices with high quality	Key propositions Minimum service time, satisfaction of all customer requests, discount system, innovative service solutions (ResMax)	Customer relationships Direct contact with consumers	Customer segments People of working age
	Key resources Information, financial		Channels Social networks, sundress marketing	
Cost structure Operating costs, advertising		Revenue streams Percentage of concluded agreements, revenue from the provision of services or sales of products		

Table 7. CANVAS business model for the consumer sector in the period before COVID-19 and the transition to Industry 4.0.
Source: Own study.

Key partners Travel agencies, food processing industry	Key actions Low prices with high quality, online tours, catering	Key propositions High quality at a reasonable price, creating the effect of spectacles, innovative service solutions (ResMax)	Customer relationships Indirect contact with the consumer through call centers, Internet, chatbots, phone calls, correspondence	Customer segments Millennials
	Key resources Information, financial	mobile applications with a pre-order function	Channels Social networks, sundress marketing, online tours, culinary channels	
Cost structure Costs of software development, wireless systems		Revenue streams Percentage of concluded agreements, revenue from the provision of services or sales of products		

Table 8. CANVAS business model for the consumer sector under the influence of COVID-19 and Industry 4.0. Source: Own study.

Key partners Households and legal entities	Key actions New products, creation of package services at a reduced price	Key propositions Customer service in branches, creation of applications for popularization of electronic banking	Customer relationships Coordinated work of call centers, service in branches, formation of feedback channels through correspondence, telephone calls	Customer segments All categories of the population
	Key resources Information, human		Channels Social networks, website, information materials	
Cost structure Advertising, service platforms, operating costs		Revenue streams Cash and non-cash payments, percentage of concluded agreements		

Table 9. CANVAS business model for the financial sector in the period before COVID-19 and the transition to Industry 4.0.
Source: Own study.

Key partners Households and legal entities	Key actions New products, creation of package services at a reduced price	Key propositions Creation of online banks, service without branches, absence of payment for settlement and cash service, online crediting in a few seconds, registration of the electronic European protocol at road accident	Customer relationships Coordinated work of call centers, chatbots, feedback channels	Customer segments All categories of the population
	Key resources Information, human		Channels Social networks, website, information materials	
Cost structure Costs of information support, marketing and advertising		Revenue streams Cash and non-cash payments, percentage of concluded agreements		

Table 10. CANVAS business model for the financial sector under the influence of COVID-19 and Industry 4.0. Source: Own study.

Based on the analysis of CANVAS models of all studied sectors, it can be concluded that the approaches to doing business have changed. In particular, most companies have become more active in using cyberphysical systems, planning resources and automating most processes, developing contactless systems, and introducing artificial intelligence (Kaigorodova et al., 2021). Most companies are introducing innovations that save time, effort, and money not only for themselves but also for key partners. Consumers of services have also changed under the influence of COVID-19 (Dankiewicz et al., 2020) and Industry 4.0 (Plonka et al., 2022). In particular, millennials have become the main consumers of services for the industrial, commodity, and consumer sectors. Millennials, or Generation Y, are people aged 18-35 who are early proponents of the technology. They are self-sufficient, travel a lot, plan trips without the help of travel agencies, often combine work and leisure, love personalization, functionality, want to gain new experience. It is projected that by 2025, half of all travelers will be representatives of Generation Y (Soft-industry, 2019). The business model has been transformed under the influence of sustainable development pillars, which include: social, environmental, and economic sustainability. The economic pillar of sustainability implies economic growth, which is caused by the growing needs of people and the need to meet them to a greater extent than before. The social pillar of sustainability requires an optimal balance between poverty and environmental degradation and economic instability. It must ensure adequate health care, education, gender equality, peace, and stability throughout the world. According to Kolk A., social sustainability is not about meeting the needs of everyone (Kolk, 2016). Most likely, its goal is to provide favorable conditions for everyone to be able to meet their needs if a person desires it. Anything that hinders this capacity is considered a barrier and needs to be addressed so that individuals, organizations, or communities can make progress towards social sustainability. The concept of environmental sustainability refers to the natural environment and its productivity and sustainability to support society. It is associated with the resilience of ecosystems, declining waste, warming of the atmosphere and oceans, declining ice levels, rising sea levels, increasing ocean acidification and greenhouse gas concentrations, rising temperatures, which

usually affect the timing of reproduction among animals and plants, schemes animal migration and species distribution and population size. The main innovative technologies that provide the optimal combination of economic, social, and environmental pillars of sustainable development under the influence of COVID-19 and Industry 4.0 are:

1) improvement technologies. They assume constant work on improvement of technical processes at the enterprises: the maximum introduction of energy-saving technologies, adjustment of waste-free production, development of secondary processing, and reuse of resources (Polinkevych, 2016b);

2) technologies of innovative development. They include creating unique forms of doing business in the form of Dream House, which combines places for collaboration (Polinkevych, 2014; Danyl'kiv et al., 2020), training area, Silent Room, psychologist room, modern MHP cafe and gyms, remote work, the introduction of chatbots for customer service (Dankiewicz et al., 2020). Companies offer a set of solutions for business, combined on the principle of "Office where you are". Such solutions help businesses to be flexible in management, to manage their time and resources more freely, not to depend on a physical office;

3) digitization technologies. They contain digitization of logistics, trading, document management in decision making (Tkachenko, 2016; Baranovsky et al., 2020). All information about the processes taking place in the company should be collected in a single innovation ecosystem. In seconds, from anywhere in the world, a person can go to a virtual environment, see all the reports and analytics, videos, and photos. All processes at the enterprises are automated. For example, Kernel Digital AgriBusiness allows the driver to stand in an electronic queue to the elevator and receive a message on the phone at the right time. The weight of the product is determined automatically, the data is entered into the system, and the terminal knows that the car or train with a certain cargo has already left. All IT systems are integrated with each other and exchange information in real-time (Dsnews, 2020);

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4) financing technologies. Among them are advantage in financing eco-projects in the form of "green" projects and building a "green" and secure future for Ukraine;

5) decision-making technologies. Formation of a full range of End-to-End solutions in three areas: Operations (infrastructure, IT systems, cybersecurity, and support), Solutions Delivery (digital transformation project management) (Volosovych et al., 2021), Innovations (Polinkevych, 2016a; Sotnyk et al., 2022) (prototyping innovations within their own R&D / Co-Innovation Lab) (Vnukova et al. 2020). New forms of business organization in the tourism and hospitality industry (Boiko et al., 2018) are aimed at guaranteeing the market (postponement of booked rooms or reimbursement of their cost, optimized loyalty programs, community support), implementation of mandatory health and safety measures, and internal reorganization (reductions, unpaid leave, waivers of capital investments, virtual tours), support and orientation in the field of services for millennials. The German company TUI Cruises conducts sea cruises "journey to nowhere" with the

use of cameras with thermal imagers, abstinence from excursions to the coast, parties, and shows from the cabins on TV with calm music that creates peace and helps reduce traffic (Sushchenko, 2020). The experience of using the SG Clean manager in hotel and restaurant complexes in Singapore is useful. It monitors indoor processes, is responsible for temperature screening and health control of employees, outsourcing, cleanliness and hygiene measures, compliance with health and safety recommendations for tourists, and compliance with government orders related to COVID-19. The main innovative solutions were: "tourist bubble" between safe countries New Zealand and Austria, "tourist cards" or certificates in Hungary and Croatia for partial compensation for recreation in the domestic tourism market, HoReCa "open-air" in Lithuania, individual tourism millennials in China and Thailand (Sushchenko, 2020).

Table 11 shows the results of the analysis of the performance of business models of enterprises in different sectors according to the proposed sample.

Enterprise	2018			2019			2020		
	Net financial result, thousand UAH	Number of employees, persons	System performance	Net financial result, thousand UAH	Number of employees, persons	System performance2	Net financial result, thousand UAH	Number of employees, persons	System performance2
Nestle Ukraine LLC	163325	2160	75.6	339408	2280	148.9	348409	2290	152.1
PJSC Confectionery Lviv Svitoch	128339	818	156.9	127222	994	128.0	129523	998	129.8
LLC Technocom	17776	1250	14.2	66461	1117	59.5	68523	1067	64.2
PJSC Volynholding	102211	805	127.0	92176	705	130.7	98135	698	140.6
PJSC Confectionery Kyiv Roshen	11125	751	14.8	8330	497	16.8	5257	485	10.8
PJSC Vinnitsia Confectionery Roshen	4237	1825	2.3	7844	1560	5.0	4717	1520	3.1
PJSC Kremenchuk Confectionery Roshen	329	426	0.8	3114	450	6.9	4399	468	9.4
PJSC Vinnytsia Dairy Plant Roshen	25706	260	98.9	-1567	210	-7.5	46195	370	124.9
PJSC Ukrzaliznytsia	203854	264599	0.8	2988247	255013	11.7	-8796190	251465	-35.0
JSC NJSC Naftogaz of Ukraine	11567	876	13.2	63294	657	96.3	-22712	650	-34.9
PJSC CB Privatbank	12789	22600	0.6	32609	22553	1.4	28500	22498	1.3
NJSC Oranta	-31671.2	1338	-23.7	240.5	1407	0.2	45841.2	1409	32.5
Hilton	769	413891	1.9	886	424791	2.1	-720	395841	-1.8
LLC Fozi-Food	-209677	85	-2466.8	776180	23	33747.0	795179	26	30583.8
LLC ATB-Market	180127	51900	3.5	4405413	49246	89.5	5461600	58800	92.9

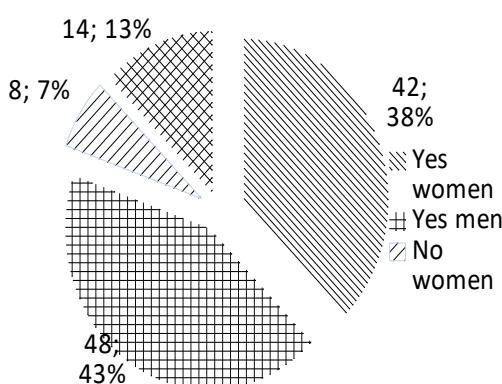
Table 11. Performance of business models of enterprises before COVID-19 and under the influence of COVID-19 and Industry 4.0

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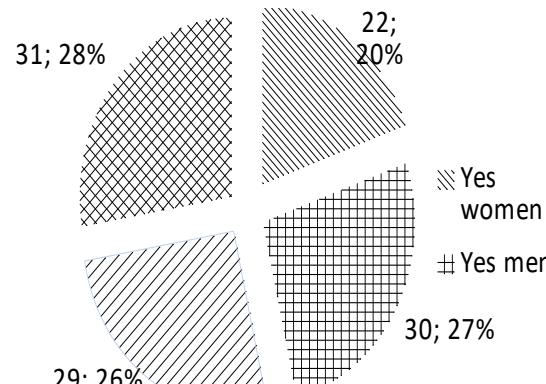
Based on the data analysis in table 11, companies can be divided into two groups according to the criterion of changing system performance: 1) under the influence of COVID-19 and Industry 4.0 decreased system performance (PJSC Kyiv Confectionery Roshen, PJSC Lviv Confectionery Svitoch, PJSC Ukrzaliznytsia, JSC NJSC Naftogaz of Ukraine, Hilton); 2) under the influence of COVID-19 and Industry 4.0, system performance improved (Nestle Ukraine LLC, LLC Technocom, PJSC Volynholding, PJSC Vinnytsia Confectionery Roshen, PJSC Kremenchuk Confectionery Roshen, PJSC Vinnytsia Dairy Plant Roshen, PJSC CB Privatbank, NJSC Oranta, LLC Fozi-Food, LLC ATB-Market). According to the criterion of the direction of changes in indicators and productivity of the enterprise system are divided into two groups: 1) the productivity of the system has the opposite tendency to change indicators (PJSC Lviv Confectionery Svitoch (increase – decrease), PJSC Volynholding (decrease – increase)); 2) system performance has the same tendency to change performance (PJSC Kremenchuk Confectionery Roshen, PJSC Ukrzaliznytsia, JSC NJSC Naftogaz of Ukraine, Hilton, Nestle Ukraine LLC, LLC Technocom, PJSC Vinnytsia Confectionery Roshen, PJSC Kremenchuk Confectionery Roshen, PJSC Vinnytsia Dairy Plant Roshen, PJSC CB Privatbank, NJSC Oranta, LLC Fozi-Food, LLC ATB-Market). Particular attention should be paid to the first group of enterprises on the criterion of the direction of changes in indicators and system performance, when indicators increase and productivity

decreases. This indicates the presence of signs of closure of enterprises. The highest level of system productivity is observed in the industrial sector (Nestle Ukraine LLC, PJSC Lviv Confectionery Svitoch, PJSC Volynholding, PJSC Vinnytsia Dairy Plant Roshen) and commodity sector (LLC Fozi-Food, LLC ATB-Market), negative – in the consumer sector (Hilton), energy sector (JSC NJSC Naftogaz of Ukraine) and at one enterprise in the industrial sector (PJSC Ukrzaliznytsia). Thus, it can be concluded that the business models of enterprises in the consumer and energy sectors have not adapted to the negative impact of COVID-19 and are difficult to adapt to Industry 4.0. Enterprises in other sectors of the economy have adapted to change and transformed their own business models of COVID-19 and Industry 4.0.

In order to confirm the analysis of these enterprises, the authors conducted a survey of 112 respondents in September-October 2020, of which 58 men and 54 women (52% of senior management and 48% of lower managers). The questionnaire contained the following questions: whether there were changes in the business model under the influence of COVID-19, whether the business model of enterprises is positively affected by Industry 4.0?, whether the company is able to transform the model to overcome the negative impact of COVID-19? whether the business models balance economic, environmental, and social pillars of sustainable development? (Figs. 1, 2).



(a)



(b)

Figure 1. Impact of COVID-19 and Industry 4.0 on the business model: (a) Has there been a change in the business model under the influence of COVID-19? (b) Does Industry 4.0 have a positive effect on the business model of enterprises? Source: Own study.

The majority of respondents noted that in Ukraine business has transformed its own model under the influence of COVID-19. In particular, this conclusion was reached by 37% of women and 43% of men. Only 7% of women and 13% of men did not agree that under the influence of COVID-19 they were forced to transform the business model. At the same time, 27% of women respondents and 26% of men believe that Industry 4.0 has a positive impact on business. 28% of women

managers and 19% of men managers' report a negative trend in Industry 4.0. It should be noted that this is almost half of the respondents. If in the first case we can assume that the majority of respondents are inclined to believe that their business has changed under the influence of COVID-19, then in the second case on the impact of Industry 4.0 opinions differed. Men are more committed to the fact that business has transformed under the influence of COVID-19 and Industry 4.0.

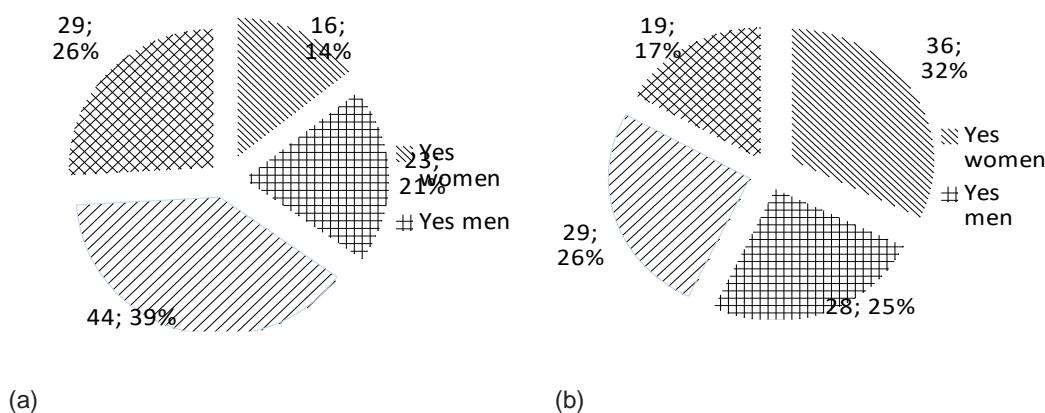


Figure 2. The ability of enterprises to transform the business model under the influence of COVID-19 and Industry 4.0: (a) Is the company able to transform the model to overcome the negative impact of COVID-19 and Industry 4.0? (b) Does the business model take into account the balance of economic, environmental and social pillars of sustainable development? Source: Own study.

A minority of respondents said that in Ukraine companies are able to transform their business under the influence of COVID-19 and Industry 4.0. In particular, this conclusion was reached by 14% of women and 21% of men. Only 39% of women and 26% of men disagreed that they were able to transform their businesses under the influence of COVID-19 and Industry 4.0. At the same time, 32% of women respondents and 25% of men believe that the balance of economic, environmental, and social pillars of sustainable development in their business model is observed. 26% of women managers and 17% of men managers say the opposite. It should be noted that this is slightly less than half of the respondents. If in the first case it can be assumed that the majority of respondents are not able to transform their business under the influence of COVID-19 and Industry 4.0, then in the second case opinions on maintaining a balance of economic, environmental and social pillars of sustainable development differ. Women are more prone to the fact that businesses are not able to transform themselves under the influence of COVID-19 and Industry 4.0 and keep the balance of the pillars of sustainable development.

4. Discussion

Comparison of analytical data and literature review with the results of own research shows that business models of enterprises are transformed under the influence of COVID-19 and Industry 4.0. As a continuation of the research by Činčalová (2020), Činčalová (2021), Kasych et al. (2019) is a combination of different business model transformation technologies to achieve a better result. Among them, consideration of natural, socio-psychological, technological and managerial aspects for building sustainable business models of business in the context of sustainable development. We support the opinion of such authors as Grzebyk & Stec (2015), Trunina et al. (2019), Portna et al. (2021), Dropulic (2020), Lutsyshyn et al. (2019), Achkasova (2020) that sustainable development should be considered broadly and not reduced to a narrow definition due to the impact on the environment. Accordingly, we found that modern business models have shortcomings that do not contribute to sustainable development and focus on survival rather than improvement.

Analysis of CANVAS models has identified key transformational changes that will ensure sustainable development and contribute to the formation of sustainable

competitive business models under the influence of COVID-19 and Industry 4.0.

The business model was transformed under the influence of COVID-19 and Industry 4.0 into a model with the following elements: 1) open system with numerous inputs and outputs, 2) interactive and innovative environment, 3) customer-oriented approach, 4) formation of a full range of End-to-End solutions. The main element of the open system is to maintain a balance of economic growth indicators with the social and environmental conditions of the enterprise. Creating modern forms of doing business in the form of Dream House or "Office where you are", which combine the socio-psychological side (rooms with psychologists, modern MHP cafe and gym, Silent Room), economic (places for collaboration, training areas, chat-boots for customer service, remote work) and environmental ("green" projects, energy-saving technologies, waste-free production, recycling and reuse of resources). New forms of business organization in tourism and hospitality industry, aimed at the development of domestic tourism, mutual trust between countries, management on the principles of SG Clean. In an interactive and innovative environment, when making decisions, it is necessary to use cyber-physical systems, plan resources and implement automation of most processes, develop contactless systems, use artificial intelligence, the Internet of Things, digitization of logistics, trade and document management. Today, the main consumers of services in the industrial, commodity and consumer sectors of the economy are millennials. That is why solutions should be focused on them. End-to-end solutions should be formed in three areas: Operations (infrastructure, IT systems, cybersecurity, and support), Solutions Delivery (digital transformation project management), Innovations (prototyping innovations within its own R & D / Co-Innovation Lab).

The authors proved that the negative impact of COVID-19 most affected the enterprises of the consumer (tourism and hotel and restaurant business) sector, transport, energy sector, small and medium enterprises. At the same time, enterprises in the industrial, commodity, and financial sectors were able to transform their businesses under the influence of COVID-19 and Industry 4.0.

The authors confirmed the hypothesis that the business models of consumer and energy companies have not adapted to the negative impact of COVID-19 and are difficult to adapt to Industry 4.0. Enterprises in other sectors of the economy have adapted to change and transformed their own business models

under the influence of COVID-19 and Industry 4.0.

5. Conclusions

Accordingly, the authors have developed recommendations that will facilitate the transformation of business models under the influence of COVID-19 and Industry 4.0. Choosing contractors (especially suppliers) companies should not be guided by the lowest price and the highest quality of services and products. Keep in mind that the company adds value to all other stakeholders: for example, encouraging suppliers to eliminate harmful practices for the environment and the local community, cooperation with key partners to ensure the environmental safety of production. The offer of values in business models should determine not only values for the client and the enterprise, but also values for the community. Ensuring the well-being of the community creates a business environment that is conducive to innovation, environmental and socio-psychological well-being. Operating costs must be justified by the growth of income flows, a favorable socio-psychological climate, and the security of relationships between stakeholders. Transformed models must take into account customer requests and be flexible and transparent, formed on the basis of corporate culture aimed at ensuring economic, social and environmental pillars of sustainable development.

There are controversial issues related to the limited nature of the study and the dissemination of its results to other countries. It should be noted that the transformed business models in Ukraine have their own legal and social conditions, which may differ from other countries. The study was aimed at assessing the content of typical components of the business model for sectors according to the GICS classifier, taking into account the specifics of the activity. On this basis, it is possible to compare the transformation of business models in Ukraine and other countries by economic sectors. Business in Ukraine by sectors is described by the CANVAS model, which considers the general state of the sector, but may differ from specific enterprises belonging to it. All these limitations require further research.

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