CHAPTER THIRD ASYMMETRIC HORIZON OF DIGITAL TRANSFORMATION AT THE MACRO AND MICRO LEVELS

DOI: https://doi.org/10.30525/978-9934-26-287-6-3

3.1. The digital matrix in the light of the new economic augmented reality

Recent changes in the economy and society have caused adequate changes in the world economy. Today's economic concepts and categories are replaced by new ones, which can be generalized as the emergence of a new economy. This digital economy has its specific definitions, laws, models of world development, economic development as a science and as an industry that gains pace in history (*Koliadenko, 2016*). In the 21st century, the interest of researchers and economists to digital transformation has significantly increased in economic research. After all, digitalization provides real opportunities for economic growth.

There is a wide space for innovation activities of corporations in all sectors of the economy to be implemented through dialogue with the government, intersectoral cooperation and joint development of large projects on the basis of "deep" digitalization. In the last two years, the global hype about Blockchain technology and cryptocurrencies has not abated, and the financial regulators of the most advanced economies hardly keep up in responding to new challenges. The high-speed mobile Internet has caught the world in its "invisible web", expanding the banking market and challenging conventional approaches. The extensive use of sensors, distance learning and Big Data have been changing the paradigm of risk assessment and assets management.

Organizations are getting "unmanned", which minimizes staff costs and speeds up the service process. In addition, we shall keep in mind that digital economy has been radically changing the nature of labor and remuneration. If our planet became de-energized, the world would plunge into universal madness and global chaos. We have got used to technology so badly that can refrain from eating rather than from reading messages on the screen of a mobile phone. Mankind has adapted and learned to live with technology, fully digitizing our way of life.

Today, within the post-nonclassical discourse, the practice of postmodernism as an epistemological concept of real space research is transformed into a meta-modern paradigm based on cognition and creation, in the economic context, of virtual economy and its basic component, financonomics, the space of financial relations, that is more and more evidently separated from the real sector economy into a specific area of research (*Paton, 2016*). Digital economy is the result of transformational processes of the general-purpose state-of-the-art technologies in the field of information and communication, the formation of which testifies to a new level of the use of information technologies in all areas of socio-economic activity. Robotics, artificial intelligence, cloud technology, 3D printers, and BlockChain have been already come into general use. Smart cities, courier drones, and driverless cars "printed" in one day at home are our tomorrow reality. Fantasy novels have come true. Technological progress has conquered the world of business and forced all industries to change.

In the 21st century, such a categorical apparatus as "virtual reality" and "augmented reality" has deeply rooted into economic and engineering academic literature. The terms "expanded reality", "improved reality", "enriched reality" are sometimes used as synonyms.

The term "augmented reality" is used to describe all projects aiming at supplementing the reality with any virtual elements. Augmented reality is an integral part of mixed reality that also includes "augmented virtuality" (when real objects are integrated into a virtual environment). There are several definitions of augmented reality. In 1997, Ronald Azuma (*Azuma, 1997*) identified augmented reality as a system that combines the virtual and the real things; interacts in real time; operates in 3D. Paul Milgram and Fumio Kishino give a slightly different interpretation. They interpret virtual reality as a space between reality and virtuality, between which there are augmented reality (closer to reality) and augmented virtuality (closer to virtuality).

We believe that virtual reality of the multiuser world is based on the exchange of virtual goods within the on-line environment. It creates an opportunity to interact with the artificial world through virtual platforms with available information funds of on-line innovation market and to work with cloud technologies. We use augmented reality as a contactless information interaction that gives an illusion of direct entry and real-time presence in a stereoscopically represented "digital world" with the help of complex multimedia operating environments. We interpret "enriched reality" as a digital space created by computer technology, which has all hallmarks of reality as one that can be penetrated and transformed through globality and interactivity. "Improved reality" means

a reality that is modeled in real time due to the impact of a computer on human consciousness (for example, a person wears “electronic gloves”). “Extended reality” can interact with all other realities, affect the world around us and have feedback. Augmented reality as a component of mixed reality is a combination of virtual and real spaces through hardware and software, telecommunications, computer networks, and shapes the digital economy.

Digital economy is a system of relationships in the field of production, sales, and supply of products through computer networks, using digital technology. Digital economy is an economy in which the key factors of production are digital data and their use, which enables a significant increase in efficiency/productivity in economic activities. Noteworthy is the definition of digital economy as the possibility of creating a measurable real world or its digital model that with the introduction of new dimensions, in addition to the three-dimensional physical world, creates opportunities to account the features of the real environment, which were inaccessible before and both physical and business processes that take place in it (*Kupryianovskyi et al., 2017*[b]).

Global innovation centers in Silicon Valley, New York, and London continue to accumulate global venture capital, talents, and innovative corporations of the planet. Countries and cities, which focus on innovation development, create exclusive conditions for the introduction of start-up ecosystems. Corporations have been shifting to open innovation platforms, learning to develop new solutions involving the society of global talent. Foreign investors more and more often choose target teams with creative ideas and support potential opportunities instead of detailed business plans.

The experience of Switzerland, Germany, Canada, Finland, and Great Britain has shown that digital economy is characterized by much faster return on investment in specific projects and a higher profitability of individual projects (*Kupryianovskyi et al., 2017*[a]).

The models of cloud services in the above mentioned countries include as follows:

- Infrastructure as a Service (IaaS) renders computing resources in the form of virtual resources with a given configuration, required quantities, and software;
- Platform as a Service (PaaS) provides a platform for developing, testing, deploying and supporting applications as services;
- Software as a Service (SaaS) involves the provision of software as a service (*Efimushkin et al., 2017*).

Modern government agencies in different countries have focused on simultaneously improving the quality of services, optimizing the number of

employees and reducing costs. “Digital” platforms (ERP, CRM) systems allow solving these problems and dramatically raising efficiency through reducing operating costs and execution time. Government agencies use “digital” platforms to simplify and to optimize internal processes, to improve communication with citizens, and to reduce costs (*HITECH office, 2016*). The cost of access to infrastructure depends on both the level of income and the development of infrastructure, as well as on territorial specificity (mentality, traditions, norms of behavior, and prohibitions). Theoretically, the cost of access shows the balance between supply and demand in the Internet services market and varies consistently with changes in other indicators, but this is not always the case.

For successful development of Ukraine’s digital economy, it is necessary to provide the following conditions: development of on-line services (services of social significance, public services); transition of government bodies and departments to digital technologies; development of the Internet of Things in the individual consumer sector (IoT) and in industry (IIoT); creation of domestic software, modern and promising information and telecommunication technologies to replace foreign products (*Efimushkin et al., 2017*).

Ukraine 2030: the Doctrine of Balanced Development (*Kalvariia, 2017*) states that for national economy, large-scale adoption of new technologies can intensify the development of the services sector, reduce transaction costs (online financial services, delivery of goods by drones), increase overall efficiency and effectiveness in combating corruption (digital payment for administrative services), as well as improve access to education (online courses). The Doctrine assumes following areas of digital development are important for Ukraine: additive technologies, new nano- and biomaterials, renewable energy, highly automated production; robotics (technology of artificial intelligence and intelligent systems); IT development (cloud technologies, mobile communication, and new generation of laptops); humanization (genetic engineering, nano- and biopharmacology, synthetic biology); and the go green initiative (low-carbon waste-free production, ecosystem remediation, and pollution control).

Similar to the well-known “Magic Cube” designed by Hungarian sculptor Erno Rubik (*Wikipedia, 2018*), it can be stated that the formation of an effective digital economy is possible provided there are achieved simultaneous harmonious relations “science – business”, “government – science”, “government – business”, “education – science”, “education – government”, “education – business” (obtainment of cube faces of the same color). As a result, a special environment – digital cubic space of the new economic augmented reality – is formed (Figure 26). It gives innovative

opportunities for communications, exchange of knowledge, ideas, and experience between government, universities, and business through the use of digital computer technology in real time, space, and laws of existence.

On the horizontal axis (Figure 26), point $Pц_1$ denotes the initial state of the digital products / services market before the implementation of

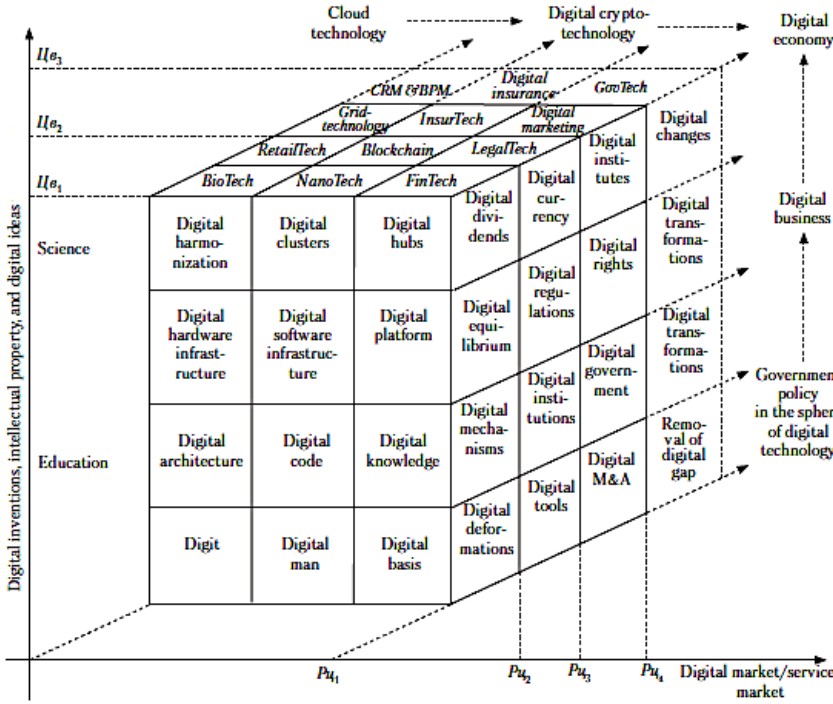

Figure 26 – Digital cubic space that forms new economic augmented reality

Source: author's developed

$Pц_1$ is the reference point of the status of digital products/services market before the appearance of disruptive technologies used in education, business, and governance;

$Pц_2$, $Pц_3$, $Pц_4$ are the points of variations in the status of digital products/services market, as a result of implementation of critical digital and cloud technologies;

$Цв_1$ is the initial number of patented discoveries, inventions, and ideas;

$Цв_2$, $Цв_3$ – are the increased numbers of digital discoveries, inventions, and ideas in various industries.

the latest technologies in education, business, and government, and points $Ри_2$, $Ри_3$, $Ри_4$ show changes in the status of the digital products / services market as a result of implementation of critical digital and cloud technologies. On the vertical axis, point $Цв_1$ corresponds to the initial number of inventions, discoveries, and patented ideas, and points $Цв_2$, $Цв_3$ indicate growing number of digital inventions, discoveries, and ideas in various industries.

Speedup of digitalization of Ukraine's economy is possible through an effectively functioning digital cubic space that implies the integrated use of software and IT solutions to make learning (education) more qualitative and interesting, city life more comfortable, doing business and to advance to a new level of interaction between the community and the government. The digital cubic space of the new economic augmented reality is a way of development, progress, and transition to a new level of civilization rather than a trend.

This space contributes in every way to the creation and distribution of digital goods / services. At the same time, science and education act as generators of knowledge, innovative ideas, and digital initiatives, the owner of intellectual property in the commercialization of which both government (government support in the form of digitalization policy) and business (profit through Institute of Digital Market) are interested and actively involved. It should be noted that for the full operation of the digital environment, education requires systematic efforts on the stable functioning of the digital system in the regions, based on effective interaction of major participants in digitalization and digital business aiming at creating new business lines.

Digital infrastructure (Figure 26) provides the necessary conditions for the implementation and operation of smart innovations. Main components of the digital infrastructure are applications (services, application software, data management); data centers (servers, data storage centers, data processing centers, redundancy); information and communication networks (Internet, broadband networks, sensor networks, data networks, Wi-Fi); and information collection systems (sensors, gadgets, smart video surveillance systems, terminals). The "soft" and "hard" digital infrastructure and electronic business operations are connected by means of hardware, software, telecommunications.

We believe, in the digital cubic space, it is necessary to focus on the latest BlockChain technology as basis for the economy digitalization. BlockChain is a critical digital technology that is the basis of digital products / services, such as: BioTech, NanoTech, RetailTech, FinTech, LegalTech, Digital-marketing, Grid-technologies, GovTech, e-ID, TeleHealth, ePrescription, e-democracy, and Digital insurance. The

content and specific features of the cutting-edge technology that form a digital cubic space are given in Table 15.

Digital products/services and their types are presented in Table 16.

The BlockChaintechnology of a distributed peertopeer public network can store information about transactions on a permanent basis, without the possibility of its change, as it is protected by cryptographic means. BlockChain networks provide many options for various purposes, especially in the public sector (ereferendums, epetitions, evoting, egovernment, etc.). The advantage of this technology is that it ensures an unprecedented level of information protection and allows users to create fully decentralized systems. A high resistance of the system to attacks allows its use in such sensitive areas as efinance, public procurement, ebudgets. A quarter of the worldclass BlockChain projects has Ukrainian origin. Therefore, Ukraine is the territory where research into this technology shall continue and new developments shall be

Table 15 – Some Cutting-Edge Technologies that Define the Formation of Digital Economy

Advanced technology type	Content and specific features of advanced economy
1	***2***
BlockChain technologies	Form a new space of trust for digitization of large databases (cadasters, property registers, etc.) *BlockChain* technology is a digitized, decentralized event register that operates online within a single network of nodes (e.g., computers) and is constantly updated with new blocks (events, transactions) in chronological order without centralized accounting. With regard to *BlockChainplatforms*, the key unresolved issue is personal responsibility or collective irresponsibility. The use of *BlockChain* enables transition to a new model of “shared” economy that prevents the monopolization of certain market segments, like in the case of Uber (which is an aggregator of information). Thus, we can predict escalating competition between the existing digital platforms and *BlockChain* platforms.
RegTech	Special regulatory technology that helps financial institutions meet regulatory requirements by data verification and protection, automation of reporting. *RegTech* provides companies with the necessary tools to address regulatory issues and to comply with legal requirements, bringing together the commercial, fiscal, and financial regulations.

(End of Table 15)

1	2
RegTech	*RegTech* technologies help to quickly and easily integrate and to adapt readymade solutions for full compliance with all standards of financial regulators and are used to combat money laundering. Financial institutions are increasingly interested in *RegTech*, as it gives a competitive advantage and allows them to generate and submit reports, to identify and eliminate risks, to effectively comply with everchanging regulatory requirements.
SupTech	*SupTech* is a supervision technology, a variant of RegTech technology for financial regulators that allows users to automate and to optimize administrative and operational procedures, to digitize data and working tools, and to improve data analytics.
FinTech	The benefits of *FinTech* for financial institutions are reduced transaction costs for finding and attracting customers; technological solution to the problem of information asymmetry while interacting with customers and with financial markets in general, which was previously solved by rationing methods (although *FinTech* does not exclude this approach). The benefits for customers are getting the products they really need, without any additional fees and unnecessary payments that increase the real interest rate; round-the-clock access to financial resources 7 days a week and 365 days a year. This is especially important for smart companies that implement the principles of digitized customeroriented work. The main disadvantage of *FinTech* companies is the limited use of their services today.
WealthTech	Technology for managing personal funds and wellbeing of an economic entity or an individual.
Advanced industrial technologies of Industry 4.0 – cyber-physical systems (CPS)	3D-technologies (printing), genetic engineering, customized pharmacy, Internet of Things, creation of a quantum processor. This list of cuttingedge technologies that radically change production in the near future may be extended.
Neurocomputer interface	Brain-computer technology is the control of objects through commands directly from the brain, robotics, artificial intelligence.
Biotechnology	Genetic engineering, organ and tissue engineering, creation of prostheses and artificial organs.
Biometrics	The technology involves digital capture and storage of unique characteristics of customers (e.g., retina, voice, facial features) primarily to enhance the security (and convenience) of financial transactions.

Source: grouped by authors

Table 16 – Digital Products/Services and Platforms Created in the Course of Economy Digitalization

Advanced technology type	Content and specific features of advanced economy
1	*2*
Digital platforms	In the context of the key principles of digital economy, digital platforms are based on IT infrastructure, on the one hand, and are the basis for not only ecommerce and ebusiness, but also for the whole range of communications in the triangle "business – consumers – government", on the other hand. The digital procurement platform provides the following benefits for the customers: maximization of the number of suppliers and the possibility of their expansion without increasing the cost of attracting them; optimization (minimization) of procurement costs; automated selection of supplier; reduction of corruption risks.
Platform companies as basic link of new economy	The digital platform is a convenient place for the formation of digital barter when digital values unaccounted by national statistical services and fiscal authorities are exchanged. This creates problems for the formation of a fair system for meeting public needs through tax revenues.
Digital education platform	Platform is a technological capability for *value proposition* to customers, based on the use of *open source* solutions, machine learning, and cloud technologies with required security level. Allows employers to search potential candidates and to check the quality of their training online. Also, the digital educational platform can act as a crowdfunding platform for business cofinancing of promising areas of education. Using BlockChain technology enables automatic transfer of certain cryptocurrencies to the authors of training courses, depending on the number of students who have completed the training. Students can automatically receive certificates/ diplomas subject to the requirements of smart-contracts.
Digitalization of medical services on *eHealth* platform (National electronic health-care system)	Introduction of *BlockChain* technology while forming a personal electronic medical card; equipping the *eHealth* system with rating tools from licensed healthcare facilities, doctors, and pharmacies; patient register (does not contain medical information); register of health-care entities of any form of ownership (including private offices, self-employed, LLCs, etc.), which provide medical care at the primary level of the healthcare system; register of medical officers who provide primary healthcare (mainly, doctors); register of

(End of Table 16)

1	2
Digitalization of medical services on *eHealth* platform (National electronic health-care system)	contracts and agreements between healthcare institutions and the National Health Service of Ukraine, between the primary care physician and the patient; register of medicines; register of prescriptions for medicines reimbursable by the government.
Neurocomputer interface	"Brain – computer" technologies enable control of objects through commands directly from the brain, robotics, artificial intelligence.
(Application Program Interface (API) Digital money (in particular, cryptocurrencies) and new financial instruments *Cryptography*	A set of readymade protocols, functions, and structures, which determine the interaction of different programs. Money of this type will lead to radical changes in the financial market and speed up the investment processes. It differs from conventional currencies as not created or controlled by any government. Protects information by converting it to a secure format (for example, by encryption).
Smart contracts	These are contracts that are executed automatically in the *BlockChain* environment, under certain conditions. This type of contract enables direct exchange of values. At the same time, there is an opportunity to simplify and increase reliability of realization of B2B and B2G transactions. Digitizing information and combining it into systems (graphs) that compete with each other is a new era in searching and accessing information.
Artificial intelligence (AI)	Capabilities of computer programs to perform tasks such as problem solution, language recognition, visual perception, decision making and language translation. AI has many applications and is increasingly used in the financial sector (robotic consulting, transaction authentication).
Internet-banking (e-*banking*, or *on-line Banking*, or *web-banking*) Ecosystem New logistics	One of the types of remote banking, which provides access to accounts and transactions at any time and from any computer via the Internet, using a standard browser, such as *Google Chrome, Internet Explorer, Opera, Mozilla* etc. This technology enables bank customers to manage their accounts by electronic means, via the Internet. Digital-organization based on a technology platform that allows real-time formation of the best offer for client through connecting external providers, on the basis of big data. Based on standard infrastructure solutions (Uber, car sharing, drones).

Source: prepared by authors based on (Vyshnevskyi et al., 2018; Liashenko et al., 2018; Toronto Leadership Centre, 2019) and their own research

created. The public sector and the national institutional environment shall create the most optimal, efficient, transparent, and highquality conditions for implementing such projects (*HITECH office, 2016*).

The evolution of FinTech development, its key elements, the structure of FinTech market by types of companies have been successfully demonstrated by authors using matrix method (Table 17).

Thus, digital economy based on network-cluster structures for interaction of all involved in digitalization, within digital cubic space model, can be one of effective tools on the way towards innovationdriven digital economy in Ukraine. With targeted government support of digital development institutions, it is possible to achieve the widespread use of modern scientific technologies in production processes for manufacture of competitive products (*Egorov, 2011*), thereby significantly increasing share of digital services/products in the total gross domestic product.

Successful digital transformation programs mean the creation of successful processes, new products and services. To achieve the desired results in all areas of the economy and in the life cycles of corporations, products and services, it is necessary to expand the scope of rights and opportunities concentrated in the point where all the organization resources are strategically directed to work together in today's digital market (*Kupryianovskyi et al., 2017*[a]). It is also important to believe that this can be achieved through digital citizenship that is characterized by digital literacy interpreted as the ability to work with a large amount of information obtained from several sources; the ability to assess its reliability and usefulness using established criteria; the ability to solve problems that require skills for searching information related to an unfamiliar context, in the presence of ambiguity and without explicit instructions (*Kupryianovskyi et al., 2017*[b]).

Convergence with an activated blockchain connection transforms the value chain. Autonomous robotics, AI, IoT, and BlockChain digitize logistics and distribution, reducing its importance and thus increasing the ability of corporations to make a profit. Manufacturers are able to get more value that they create, while consumers pay less. In long run, technical deflation will be in the depth of exponential curve, as 3D printing, together with virtual and augmented realities, makes its design cheaper and allows printing products at home. It is a certain new technology that in future will be determined by economic benefits (*Kupryianovskyi et al., 2017*[c]). The stages of transformation of digital technologies are shown in Table 18.

While implementing the digital transformation model, it is necessary to take into account comprehensive adaptive capabilities that allow responding to inevitable changes. These capabilities provide the resources

Table 17 – FinTech Matrix Structure in Terms of Time, Key Elements, and FinTech Market Structure

FinTech evolution	Evolution FinTech			
	FinTech 1.0	**FinTech 2.0**	**FinTech 3.0**	**FinTech 3.5**
1	***2***	***3***	***4***	***5***
Time	1866–1967	1967–2008	2008 – till now	FinTech 3.5
Territorial allegiance	Global economy, advanced economies	Global economy, postindustrial countries	Postindustrial countries	Developing countries / Emerging markets
FinTech market structure by types of companies	Formation and development of financial institutions and payment systems	Platforms (online systems that allow users to raise money and to get access to products aggregated together)	Payments and currency (mobile and electronic payment systems, cryptocurrency, transfers). Analytics (Big Data oriented data collection and analysis technologies). Applications (new software that enables optimizing the processes of back- and middle-offices). Middle office is a bank subdivision where business processes, procedures, regulations, directories, printed forms, organizational and staffing documents, which underlie the preparation and decision-making are concentrated. Examples of MO units are Borrower Verification Unit of Security Department, Risk Management Unit, Credit Scoring Unit, etc. Examples of MO information systems are system of position accounting, system for checking borrower's credit report history, scoring system, etc. In practice, many domestic banks do not have MO. Its functions are divided between front office and back office		

(End of Table 17)

1	*2*	*3*	*4*	*5*
Key elements	Infrastructure, computerization	Conventional, innovative, Internet	Mobile devices, Startups	Digital, new members
Examples	Transatlantic cable (1866), telex (circuit-switched network designed to send and receive text messages, conceptually similar to a telephone network, but with teletypes as subscriber devices (1966)	First ATM (1967), SWIFT (1973), On-line banking (1983–1985) Internet / Dot. Combubble (1999)	iPhone (2007), BitCoin (2009)	*MyBank, WeBank* (2015) Chinese online banks without physical outlets
Changes	Communications, interactions, interdependencies	Innovatization	Financial crisis 2008, smart-phones, iPad, netbook, mobile Internet devices	Digitalization, mobility advantages, tablets, ultrabooks

Source: prepared by authors based on (Vyshnevskyi et al., 2018; Liashenko et al., 2018; HITECH office, 2016; Leonenko et al., 2016; Toronto Leadership Centre, 2019; Arner et al., 2015) and their own research

to involve all the structural strata in order to implement continuous improvement and innovation while forming digital entrepreneurship and make it possible to constantly adapt to changing customer needs and new opportunities in the global digital market (*Kupryianovskyi et al., 2017*[a]). The expected result of the effective operation of economy in the digital cubic space that forms a new economic augmented reality, is the formation of digital citizenship and digital entrepreneurship in Ukraine (Figure 27).

Having a website gives corporation the following opportunities:

- Customer service;
- Online supply of products and services to customers;
- The ability of visitors to form orders for goods and services online and to monitor the status of orders;

Table 18 – Gradual Transformation of Digital Technologies Based on Disruptive Changes

Stage of transformation	Step-by-step description	General ideas of gradual transformation of digital technologies	Specific features of transformation of digital technologies
1	*2*	*3*	*4*
1st wave transformation (2000–2010)	*Front office:* 1. Mobile technologies 2. Digital marketing 3. Digital engagement of customers	*Front office* is a group of departments or processes in the organization, which are responsible for direct servicing of clients/customers	1. The activity focused on the front office and the quality of customer service. 2. Organizations sought digital opportunities through strategic acquisitions (e.g., startups). 3. Startups entered the market and played a significant role.
2nd wave transformation expected in 2020)	*Back office:* 1. Digital transformation of corporation 2. Digital supply channel *Middle office:* 1. Leading business models 2. Digital business strategy	*Back office* is an organization unit that conducts business processes, increases productivity by optimizing workflows and eliminating inefficient manual operations throughout the lifecycle of business processes. *Middle office* is a group of divisions or processes, which is responsible for risk management, estimate of profits and losses and for IT development. The middle office attracts resources from both the front and the back offices.	1. Digital focus only at the front office does not provide a competitive advantage. 2. In order to implement a full-scale digital transformation, organizations are required to focus on restructuring operations that go beyond customer service. 3. Organizations will spend more on digital technology in the middle office and back office than in the front office.
	Omni-business	*Omni-business* business is approach based on integrity and consistency of user's experience	Its main advantage is that users are free to switch between information channels, such as mobile device, laptop, social networks and off-line store.

Source: author's developed

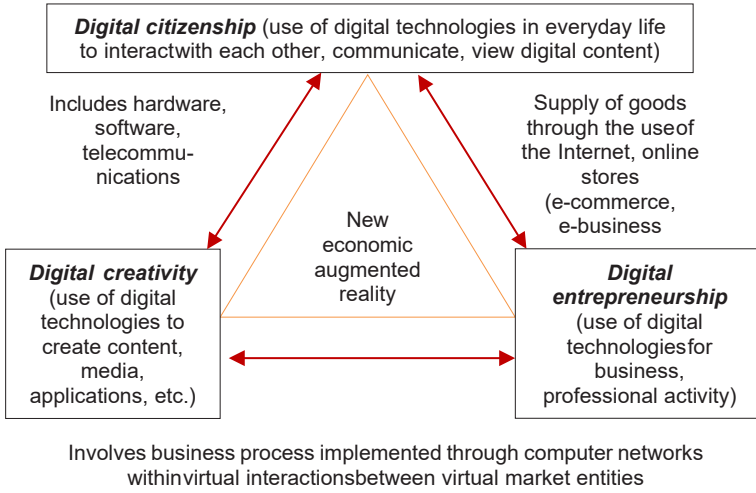

Figure 27 – Expected result in the course of effective operation of the economy in the digital cubic space

Source: prepared by authors based on (Koliadenko, 2016; Vasylenko, 2017; Leonenko et al., 2016)

- Personalized information content of the website for loyal customers;
- Links to the website in social media;
- Announcement of job vacancies or application for vacancies online;
- Staff training and acquisition of digital competencies.

Thus, the digital era of society is changing the approach to doing business, requires the use of information technology and modern means of communication. The use of ICT and the Internet by businesses to maximize the automation of business processes within corporation and to build relationships with other businesses, consumers, and government agencies through the use of advanced ICT is crucial for building digital economic relations.

As a result, it should be noted that the economy that uses digital technologies is called “digital economy”, and the industry that creates, implements, and maintains them is named “digital industry”. Digitalization and development of “digital” economy (antonym is “analog” economy) require titanic organizational and legislative efforts from the government, but success is impossible unless the government relies on the innovative and creative potential of domestic business and citizens (*HITECH office, 2016*).

Authors are deeply convinced that the digital cubic space of the economy of new augmented reality is the driving force of Ukraine's competitiveness, innovation, productivity, and swift economic growth in the global digital virtual and real environment.

Despite impressive scientific achievements of today, it is still important in the future to conduct research aiming at understanding the ideology of the *shared economy*, in order to form a digital reality in Ukraine. There is a need to find high-quality tools for speeding up the digital development of Ukraine, as well as to focus attention on the development of highquality and effective legislative and institutional opportunities for digitalization of the national economy. Further research is needed to find answers to the following questions: "What is the difference between an innovation system and an ecosystem?" "How to work in the ecosystem and with the innovation ecosystem?" "How can a corporation, city, and country influence and benefit from digital development of innovation?".

3.2. Digital virus of business processes of enterprises of the Industry 4.0 ecosystem

The structure of Ukrainian economy is raw materials: more than 60% of exports are raw materials, and our GDP is 98% correlated with the raw material price index in the world. No matter how hard we try, when world raw material prices fall, our economy falls. Ukraine is constantly deindustrialized and we are already losing our industry. Today the same system errors are observed in business, which do not allow business to grow economically and technologically and develop innovatively. What exactly are these mistakes? The answer is as follows:

Mistake 1. Financial statements, or rather its absence. According to our statistics, 34% of entrepreneurs do not have financial statements. Entrepreneurs often understand how much money goes into the account, but few keep track of net operating income. In the future, this leads to confusion in financial flows. In pursuit of the goal of large system business, it is necessary to deal with finances and "deeply digitize" them.

Mistake 2. 32% of businesses do not have a development strategy, an idea of the reserves of economic growth. And this is something without which even the "coolest" businesses find it difficult to conquer the market. This will be especially difficult if competitors have a strategy. In particular, in our opinion, it is worth taking into account the fact that you have to work in the same conditions in virtual reality.

Mistake 3. 20% of business owners are not ready for a partnership. According to their mentality, Ukrainians are really individualists, but we

need to understand that by attracting strong specialists, we can grow economically twice as fast, digitize business processes, automate them in terms of the formation of Industry 4.0.

Mistake 4. More than 12.5% of entrepreneurs do not understand the market, let alone virtual-real and the peculiarities of its operation. To achieve success, it is necessary to focus on the trends that can be traced in the field in which the company operates, what competitors do and what opportunities there are in foreign markets.

The readiness of Ukrainian enterprises for large-scale application of Industry 4.0 depends on: the degree of involvement in the digitalization of Ukrainian industry and energy of the IT sector and science; creating conditions for the accelerated development of industrial high-tech segments as key to the development of digital economy in terms of virtual reality; support for innovation and export activities of innovators 4.0; creation of "road maps" of digital transformation in priority areas; accelerating the transition to European standards in the field of 4.0 (*Briukhovetska et al., 2020*).

In today's business environment, on the one hand, companies have identified a list of necessary changes: technological (automation, digitalization, investment incentives and reduction of operating costs) and no less important service (building relationships and communication with customers). On the other hand, the state through regulatory changes creates an environment that would stimulate business to develop and invest.

Industry 4.0 as part of the fourth industrial revolution includes many technologies, main purpose of which is to create a single space for data exchange and virtual visualization of business processes and objects, and also provides for the creation of robotic systems combined with Internet technologies in the format of "smart" enterprises. Currently, all countries of the world are developing industry taking into account trends of new industrial era – the transition to fully automated digital production, controlled by intelligent ecosystems in real time in constant interaction with the environment, going beyond one enterprise, with the prospect of merging into global industrial network of things and services (*Briukhovetska et al., 2020*).

One or even ten successful examples are not enough to make the ecosystem of Industry 4.0 operational. The country as a whole should be assessed comprehensively and objectively. For example, Finland, which is only five times larger than Lithuania, has 50 times more startups in Silicon Valley. Here is an indicator of success (*Special Edition Kyiv International Economic Forum "Destinations", 2018*). The experience of innovation implementation is presented in Table 19.

Table 19 – Features of innovation implementation in Agrohub

Agrohub was created for introduction of innovations		
1. Consulting. Innovation Agenta – enterprise analysis, identification of needs and innovation priorities, development of startup maps.	*2. Scouting and innovation development.* Innovative Solutions Database – base of available innovative solutions, ready for application; "Growing" new ideas: MHP Accelerator in conjunction with Radar Tech.	*3. Popularization and changing culture.* Video course How to Startup together with MHP, trainings "Practical methodology of innovation implementation".

Source: author's development

Today, a number of companies that have decided to digitize their activities are called to the results of digital transformation include:

• Execution of orders on time – up to 97%;

– Reduction of downtime;

• Transparent control and accounting of resource movements;

• Reduction of resource reserves by 10%;

• Analysis and elimination of bottlenecks in the operation of equipment;

• Improvement of OEE by 10-15%.

Among the problems that arise during the digitalization of business processes of enterprises indicate: historical orientation of production to mass, "running" sizes and large batches; large-scale production load; the complexity of cooperation and logic between production sites.

Policies to strengthen innovation in the conditions of digital modernization of enterprises are given in Figure 28. To qualitative and effectively operating tools of innovative-digital transformation in the conditions of virtual reality name:

• A single system of on-line order management for all enterprises: application registration – technical examination – planning – performance control – shipment;

• Smart Factory, Predictive Maintenance, IIoT, CRM, SCM.

For LMICs such as Ukraine:

• Diversifying continuously into higher value-added activities;

• Innovating through the adoption of existing knowledge elsewhere in the world and increasingly through the development of local technological capabilities;

• Regionalization;

• Reforming product, labour and financial markets as well as development schemes;

• Focusing on sectors with export potential.

Skilled workforce	Supportive business environment
Strong and efficient system for knowledge creation and diffusion	Policies to encourage firms to engage in innovation and entrepreneurial activities

Figure 28 – Policies to strengthen innovation in terms of digital modernization of enterprises

Source: author's development

Significant volumes and analytics are used in the framework of digital transformation. Responsibility for its accuracy and clarity always lies with the leader. The ideal picture of data collection and the system of predictive analytics of consumption forecasting is based on the algorithms formed as a result of the analysis of current situation.

The issue of forming the principles of analysis – is a matter of priorities of the company, which are based on the platform of analysis of the situation and the requirements of the regulator. Today, the biggest challenge is to generate this data, create a model for automated retrieval of information about the state of networks, transfer this information to a single database and analysis of the entire array. This could provide information on the most critical ones that need to be replaced.

The problem is that other countries started this path 13-15 years ago, and in Ukraine investment conditions haven't even been created for a large-scale start of such programs, but country wants to do everything quickly. That is why it is so important to change the investment system and priorities. Levels of digital transformation in part of the formation of enterprises of the ecosystem of Industry 4.0 (Figure 29).

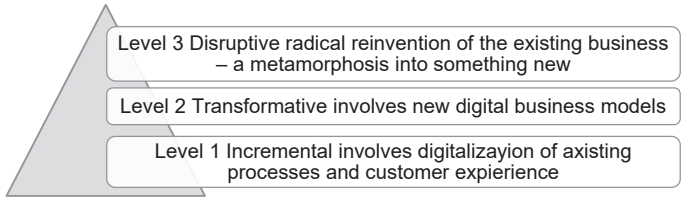

Figure 29 – Digital transformation in terms of the formation of enterprises of the ecosystems of Industry 4.0

Source: compiled by authors based on (Accenture, 2020[a]; Accenture, 2020[b]; Kraus et al., 2018; Milgram et al., 1994)

As part of the problem, we consider it appropriate to analyze the opportunities and benefits of using Azure cloud platform in enterprises

(Table 20), which includes more than 200 products and cloud services designed to help create new solutions for current and future challenges. before the company during digitization of business processes. This platform allows you to create and run applications and manage them in multiple clouds, locally and on the periphery, using convenient tools and platforms in virtual reality.

Azure supports open source technologies, so companies have the opportunity to use tools and technologies they prefer and they (tools, technologies) are useful. This allows enterprise to run virtually any application that uses its data source with the existing operating system on the device. When using Azure, the company always has a choice.

Digitalization of business processes of enterprises has certain threats, one of the main – cybersecurity. The more open the exchange of information and communication channels, the greater risks.

The comprehensive protection services provided by Azure team of experts include precautionary measures, which are trusted by businesses, government organizations and startups. Security and privacy are very important to Azure. Microsoft adheres to the highest levels of trust, transparency, compliance with standards and regulatory requirements with the most complete set of proposals for compliance among cloud service providers.

Azure provides solutions for all industries through proven combinations of cloud products and services. Businesses are able to solve their industry business challenges instantly and are always ready for the challenges of the future, implementing innovations through Azure solutions. Today, Azure is perhaps only hybrid cloud that is so well-coordinated that provides unsurpassed performance for developers, provides comprehensive multi-level security tools, including maximum coverage of compliance requirements among all cloud service providers. In addition, Azure is not as expensive as AWS when used with Windows Server and SQL Server workloads (*Azure.microsof, 2020*).

Laboratory Information Management System (LIMS) is a specific application that provides a simple extension of the system from a single computer to many service systems with a large number of enterprise customers. Types of client applications with different functionality are presented in Table 21. Microsoft SQL Server is used to store regulatory information and metadata. The results of laboratory tests are also stored in Microsoft SQL Server, but can be stored in parallel on the real-time data server of the corporate MES.

Requests from customers are processed in Digital Lab by a server data processing module (licensed by the number of simultaneous connections), which can be supplied with extensions to implement tasks of laboratory business process automation and for integration with MES, top-level ERP systems.

Table 20 – Possibilities of using Azure cloud platform during digitization of business processes of enterprises of the ecosystem of Industry 4.0 in the conditions of virtual reality

Problems:	1. Difference between environment; 2. Dev dependencies; 3. Lack of tools on your platform; 4. Predictable environment; 5. Speed of development.
History of containers	1979 – chroot in Unix v7; 2000 – Free BSD Jails; 2003 – Borg (predecessor of Kubernetes); 2006 – Process Containers; 2013 – Docker; 2014 – Kubernetes; 2015 – Windows Containers.
Containers in Azure App Services	1. Both Windows and Linux; 2. Deploy from any registries; 3. Use deployment slots and slot swaps Auto-scale; 4. App Service Log Streaming; 5. Connect directly into your containers.
Container Instances	1. Starts in seconds; 2. Billed by seconds (CPU/Memory); 3. Good for data processing jobs; 4. Work with Logic Apps; 5. Virtual Kubelets for AKS.
Docker Orchestrators:	Docker Swarm, DC/OS, Kubernetes.
Kubernetes:	1. Open-source system for automating deployment, scaling, and management, of containerized applications; 2. Easy command line interface; 3. Declarative configuration via YAML/JSON files.
K8s Aspects:	Cluster, Nodes, Pods, ReplicaSets, Deployments, Services, StatefulSets, Volumes, Jobs/Cron, DaemonSets, Namespaces.
Serverless Apps on Top of K8s:	Kubelets, Fission, Apache OpenWhisk, Funktion (deprecated).
Azure Kubernetes Service (AKS):	1. 100% Kubernetes; 2. Easy deployment and management; 3. Scale with confidence (Azure Traffic Manager, Virtual Kubelets); 4. Secure with Azure AD; 5. Accelerate development with connected environments (Azure Dev Spaces).
Container Use Cases:	1. “Lift and shift”; 2. Refactor existing applications for containers; 3. Develop new container-native applications; 4. Microservices architecture; 5. Continuous integration and deployment; 6. Repetitive jobs and tasks.
Why to use in Clouds?	1. Cost effective; 2. Smoother development experience; 3. Many IT specialists available; 4. More tools at our disposal; 5. Runs anywhere.

Source: compiled by authors based on (Azure.microsof, 2020)

Table 21 – Client applications in terms of their various typical functionality

Types of client applications of different functionality			
Full-featured APM engineer for administration, configuration and system configuration	Laboratory assistant APM for data entry and settlement	APM view to get results as screens and reports	APM web browsing

Source: author's development

The convergence of Web 3.0 technologies and service architectures will introduce new business models, information exchange and social networks based on the Internet of Services (IoS). In the future, network architectures will promote full integration of the Internet of People, the Internet of Things and the Internet of Services.

Ability to integrate Grid and Cloud computing into NGN; introduction of adaptive technologies for the creation of information systems. The concept of a smart enterprise involves virtual integration of structures and processes with adaptive information links and a common set of standards that are produced as a result of joint activities of distributed competence centers (*Missikoff et al., 2012*).

Today, SYNTEGRA, a data integration service that provides interactive analytics, can help modernize data storage and management, optimize company reporting, and provide real-time analytics. SYNTEGRA provides data models and dashboards. This service is available by subscription. SYNTEGRA is implemented using Microsoft Data Services and Power BI.

SYNTEGRA includes: data integration; creation of data models, metrics; automation of data update; cloud infrastructure; technical support; training of business users to work and edit dashboards.

Advantages of using SYNTEGRA data integration service for business: reporting with updates every hour; group access rights policies; interactivity, availability of reports via the web; professional data model collection; high-tech data integration on a cloud platform.

No less interesting than the previous software solution presented by us in today's virtual real conditions, is the solution of Aruba for tracking contacts in the fight against COVID-19.

Aruba technology helps to locate (Aruba access points 300/500 series): a platform for tracking contacts and analyzing location data based on two technologies (BLE, WiFi); allows you to implement flexible solutions based on Aruba Partner Ecosystem using USB interface.

Aruba is a solution for tracking office contacts in the office using WiFi technology (Table 22), which is implemented by the chain type:

Access points “listen” to WiFi devices of users → The application in the cloud or on the server analyzes location data transmitted from Aruba Central or Airware, using AI/ML models → Personnel service receives a message about an employee who is ill → Tracking contacts (searching for contacts of all employees with infected colleagues) → Tracking locations (determining the average time spent by a sick employee in different areas office).

Table 22 – Aruba contact tracking technology: a comparison of WiFi and BLE

	WiFi based	BLE based
Cost	Included	Asset Tags Meridian Licenses
Accuracy	~10 m accuracy	~2-5 m accuracy
Deployment	Central: Feature drop On-prem: Airwave upgrade / Central dashboard	Meridian asset tracking Enable BLE radios on APs
Additional Hardware	None	Asset tags
Data Exportability to other BI tools	CSV & Templates for PowerBI and Tableau	CSV & Asset tracking APIs
Est. Availability	July / August	July (beta)

Source: author’s development

Aruba is a solution for tracking employee contacts in the office using Meridian BLE (Bluetooth Low Energy) technology is as follows:

Employees receive BLE tags → Aruba access points “communicate” with employee tags → Meridian cloud application determines the location of tags → Data is transmitted for processing and visualizations in the external application → Personnel receives a message about a sick employee → Personnel determines the number of the employee’s tag and searches for contact information in the external application → Tracking contacts (searching for contacts of all employees with infected colleagues) → Tracking locations (determining the average time spent by the sick employee in different areas of the office).

Key features of Aruba are that:

1. Uses BLE (Bluetooth Low Energy) technology.
2. Modern points of Aruba WiFi 300 & 500 series provide the necessary coverage.

3. The solution is scaled to 1,000 labels.

4. Battery life 3-4 years.

5. Exact indication of the location on the map, not the approximate area.

BLE is:

1. Bluetooth Low Energy – one of the two Bluetooth standards, often called Bluetooth Smart.

2. Used for wireless transmission of information over short distances. Depending on the type of BLE lighthouse from 25 to 300 m.

3. Uses 2.4GHz band. To reduce level of energy consumption and increase the efficiency of information transmission, the entire frequency range is divided into 40 channels, divided between it by 2MHz.

4. Available on all smartphones and tablets released since 2012.

5. There are 2 BLE standards: iBeacon (Apple), Eddystone (Google).

6. Battery life: from 3-4 days (printed beacons) to 8 years.

7. The cost of a lighthouse is from 2 to 40 dollars.

BLE beacon includes the case (there are cases for external use), the processor on the basis of ARM, Bluetooth Smart module, the antenna which is connected to the processor, the power supply battery. Aruba Meridian allows you to get a map of the room, find the necessary objects/goods, route from the current location, API for integration with other applications. Aruba Meridian:

• The first task is to create your access token;

• To generate your access token, from the Meridian Editor web console, in the left-hand navigation pane, click Beacons, and then click Generate your access token to get started;

• The values you'll need are shown in the Controller Configuration section.

SMEs need tailored policies to support innovation in terms of the formation of Industry 4.0 and Main policy choices for innovation tools of the ecosystem of Industry 4.0 are presented by us in Table 23 and Figure 30. We believe in "angel capital", which in the seventh world is a decisive force in the range from 0 to 100 thousand euros and is able to make a significant contribution to the development of startup industry. For example, the United Kingdom has significantly increased the efficiency of investment, creating benefits for "angels" 7 years ago. The investor, in fact, gets a choice: either pay a few thousand taxes, or invest in a startup. This not only ensured the inflow of investment, but also allowed to involve a large number of people in innovation. As a result, everyone won – both business and the state (*Special Edition Kyiv International Economic Forum "Destinations", 2018*).

Table 23 – SMEs need tailored policies to support innovation in terms of the formation of Industry 4.0

	Financing	Other
Non-innovative SMEs		Build basic capabilities and provide incentives to innovate
Innovative SMEs	Project-based Financial support Loan guarantee	Develop innovation networks
NTBFs	Equity financing (venture capital, business angels) Seed capital Tax neutrality	Incubators, science & techno parks
Science-based Spin-offs		Conducive regulation in public research organization

Source: author's development

The beginning of the real implementation of standards in Ukraine in the field of industrial automation began on September 1, 2019 by the order of UkrNDNC № 249. It was this order that put into effect national standards harmonized with European and international standards, the method of confirmation and validity in Table 24.

In addition to legislative reform, a key factor is stability in both the political arena and the economy. As Ukraine currently ranks 76th in the ease of doing business index, there is still work to be done. Further simplification of the regulatory framework will lead to market liberalization and, thus, will contribute to the formation of a more attractive business climate for foreign investors.

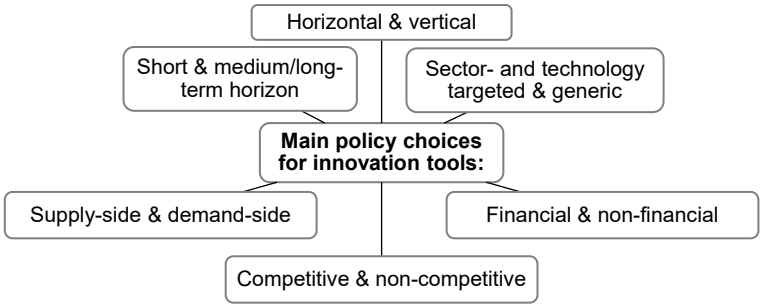

Figure 30 – Main policy choices for innovation tools of the ecosystem of Industry 4.0

Source: author's development

In addition, a stable and predictable tax regime and customs clearance process will also contribute to investment attractiveness, and a number of positive changes are already being taken into account (for example, replacement of corporate income tax and income tax of non-residents with a source of origin from Ukraine (income repatriation tax in Ukraine) by income distribution tax to limit the outflow of funds from Ukraine and encourage reinvestment of profits again in the company their development).

However, it is necessary to explain the perception of the reality of investing in Ukraine in world economic space. Some investors believe that the risks of doing business are unacceptably high in Ukraine, often based on a limited understanding of risks and/or a willingness to consider ways to transform companies and stimulate economic growth. Responsible promotion of Ukraine as an attractive area for investment is a collective commitment of business community (*Special Edition Kyiv International Economic Forum "Destinations", 2018*).

Table 24 – Implementation of national standards and their harmonization with European and international standards aimed at accelerating the digitalization of enterprises

DSTU EN 61508-1: 2019 (EN 61508-1: 2010, IDT; IEC 61508-1:2010, IDT)	Functional safety of electrical, electronic, programmable electronic systems related to safety. -//- Part 1. General requirements
DSTU EN 61508-2: 2019 (EN 61508-2: 2010, IDT; IEC 61508-2:2010, IDT)	-//- Part 2. Requirements for electrical, electronic, programmable electronic systems related to safety.
DSTU EN 61508-3: 2019 (EN 61508-3: 2010, IDT; IEC 61508-3:2010, IDT)	-//- Part 3. Software requirements
DSTU EN 61508-4: 2019 (EN 61508-4: 2010, IDT; IEC 61508-4:2010, IDT)	-//- Part 4. Definition and abbreviation
DSTU EN 61508-5: 2019 (EN 61508-5: 2010, IDT; IEC 61508-5:2010, IDT)	-//- Part 5. Examples of methods for determining security completeness levels
DSTU EN 61508-6: 2019 (EN 61508-6: 2010, IDT; IEC 61508-6:2010, IDT)	-//- Part 6. Guidelines for IPP 61508-2 and IEC 61508-3
DSTU EN 61508-7: 2019 (EN 61508-7: 2010, IDT; IEC 61508-7:2010, IDT)	-//- Part 7. Overview of methods and measures
DSTU EN 61512-1: 2019 (EN 61512-1: 1999, IDT; IEC 61512-1:1997, IDT)	Prescription production management. -//- Part 1. Models and terminology
DSTU EN 61512-2: 2019 (EN 61512-2: 2002, IDT; IEC 61512-2: 2001, IDT)	-//- Part 2. Data structure and how-to

(End of Table 24)

DSTU EN 61512-3: 2019 (EN 61512-3: 2008, IDT; IEC 61512-1: 2008, IDT)	-//- Part 3. Models and presentations for general and local recipes
DSTU EN 61512-4: 2019 (EN 61512-4: 2010, IDT; IEC 61512-4: 2009, IDT)	-//- Part 4. Recipe production records
DSTU EN 62264-1: 2019 (EN 62264-1: 2013, IDT; IEC 66226-1: 2013, IDT)	Integration of enterprise and production management systems. -//- Part 1. Models and terminology
DSTU EN 62264-2: 2019 (EN 62264-2: 2013, IDT; IEC 66226-2: 2013, IDT)	-//- Part 2. Objects and attributes for integrating enterprise and production management systems
DSTU EN 62264-3: 2019 (EN 62264-3: 2017, IDT; IEC 66226-3: 2016, IDT)	-//- Part 3. Models of activity management of production operations
DSTU EN 62264-4: 2019 (EN 62264-4: 2016, IDT; IEC 66226-4: 2015, IDT)	-//- Part 4. Attributes of object models for integration of subsystems of production operations management
DSTU EN 62264-5: 2019 (EN 62264-5: 2016, IDT; IEC 66226-5: 2016, IDT)	-//- Part 5. Commercial and production transactions
DSTU EN IEC 62443-4-1: 2019 (EN IEC 62443-4-1: 2018, IDT; IEC 62443-4-1: 2018, IDT)	Safety of industrial automation and control systems. -//- Part 4-1. Requirements for the residential cycle of development of safe products.
DSTU ISO 22400-1: 2019 (ISO 224001-1: 2014, IDT)	Automated production control systems. KPIs for production process management. -//- Part 1. Overview, General Provisions and Terminology
DSTU ISO 22400-2: 2019 (ISO 224001-2: 2014, IDT)	-//- Part 2. Definition and description
DSTU ISO 22400-3: 2019 (ISO 224001-10: 2018, IDT)	-//- Part 10. Describe work operations for getting data

Source: author's development

The reason for this was the turbulent economic and political situation that Ukraine has faced recently, which has undoubtedly affected the opportunities of domestic investors and the appetite of foreign investors in the market of mergers and acquisitions.

Only on this basis it is clear that in the future Ukraine may become a more significant player in the global investment landscape (*Schaeffer, 2017*). The focus of innovation policy in terms of the formation of Industry 4.0 should depend on the stage of the country's development is shown in Figure 31.

STAGE 1	STAGE 2	STAGE 3
Building management and organizational capabilities; Start collaborative projects; Need to develop STEM skills and engineering; Need for basic infrastructure – NQI and incubation; Elimination of barriers to physical, human and knowledge capital	Building technological capabilities; Incentivize R&D projects; Link industry academia; Improving quality of research, innovation and export infrastructure	Long-term R&D and technological programs; Minimize innovation gap between leaders and laggards; Collaborative innovation projects

Figure 31 – The focus of innovation policy in terms of the formation of Industry 4.0 that depends on the stages of development of the country (should depend on the stage of the country's development)

Source: author's development

The socio-economic effects of the development of Industry 4.0 in the conditions of virtual reality should include:

• The growing rate of expansion of cluster network space;

• Wide introduction of advanced IT technologies in business processes of enterprises that transform the basic features of economic processes and expand communication opportunities, gradually advancing the world community to new digital era;

• Global transformations or shifts, which are accompanied by the emergence of innovative business models, disruptive impact on traditional business strategies and radical changes in production, consumption, marketing and marketing;

• Formation of a hybrid environment in which new economic and social ecosystems are created, based on modern IT technologies, adapted to interaction through digitized financial and material resources and functionally aimed at creating added value (*Huley et al., 2018*) and the search for reserves of economic growth.

Useful examples of different countries regarding national strategies and their implementation in terms of economic growth are presented in Table 25.

Direct economic effect of digitalization of key business processes in enterprises is difficult to assess, so it is advisable to focus on indirect economic effects, including indicators of the level of quality and productivity of their work in terms of different industries. Qualitative changes in the course of digital transformation in general should be assessed through indicators of business and community satisfaction

with the implemented programs, which include: creation of digital infrastructure, support of domestic developers and manufacturers in IT field, regulatory mechanisms, training of competent personnel, digital specialists, development of e-medicine, IT systems in transport and e-logistics, energy efficiency, e-security, e-education and many other areas of life (*Huley et al., 2018*). Digitalization is precisely the element that can significantly positively affect quality and efficiency of planning and management processes in the enterprise. The ultimate goal of the implementation of digitalization processes in economic activities of enterprises is to gradually increase the profitability of production and improve investment attractiveness in various sectors of the economy.

Table 25 – OECD is working with countries on National Strategies and their implementation in terms of economic growth

1. Supporting the implementation of National Strategies: *Georgia* Financial literacy survey using the OECD Toolkit in 2016; National Strategy designed and launched in 2016; Preparing an Action Plan to outline concrete implementation steps, roles of responsibility; Creating a finding model for implementation
2. Evaluation of National Strategies: *Hong-Kong/Netherlands/Peru/UK* Evaluation approach to be integrated the NS, linked to indicators/feedback mechanisms; No one approach for all but clear lines of responsibility, multiple and transparent flows of data, incentives for accountability; Manageable governance structure and open feedback from implementing stakeholders; Communication strategy for evaluation results; Dedicated funding
3. Improving the financial literacy of youth and in schools: *Armenia/Kyrgyz Republic* Developing core competencies, based on the OECD CCs for youth Agreeing on clear lines of responsibilities Adapting, existing school curricula Committing, resources to teacher-training Developing content Evaluating pilots

Source: generalized by author's

As a result, it should be noted that indeed the digitalization of business processes of enterprises opens new horizons and opportunities for the formation of added value in almost all sectors of the economy. In addition, in the post-pandemic period, digital technologies will become an integral

part of the socio-economic life of Society 5.0 and identify key vectors for the development of government digital policy. Digitalization is becoming a driver for the development of Industry 4.0, as it is able to increase the efficiency of the economy at all levels of aggregation, the formation of new quality and standard of living. The use of digital technologies lays the foundations for the process of modernization of traditional sectors of the economy and stimulates the emergence of new innovative industries that accelerate Ukraine's economic growth and bring to a new level of competitiveness in global economic system in virtual reality.

Based on the results of our research, we came to the conclusion that the lack of state support for enterprises seeking to introduce digital technologies into production slows down the digitalization process in Ukraine; imperfection of the regulatory framework for digitization of industry and production in terms of the formation of Industry 4.0; lack of priority of digitalization in the strategy of state development; technological backwardness from the leading countries of the world, because in some sectors of the economy we have 3 and 4 technological systems. Considering the positive effect of digitalization for business, we can identify a number of opportunities: increase productivity; reducing the level of fraud, increasing the level of transparency and ease of operations; production automation; expanding sales channels through new opportunities that open up virtual reality.

3.3. Digital entrepreneurship and X.0 Industries in virtual reality

Global digital transformation in the direction of transition from Industry 4.0 to X.0, possible due to the accelerated transformation of production on the basis of innovation, digitalization and glocalization. Modern companies are ready for significant investments and solutions. Evidence of this is the $ 1.2 trillion that business spent in 2017 on transformation technologies alone; 96% of organizations consider digital transformation as critical; 42% of managers who formed new positioning of their companies as "essentially digital" or "primarily digital"; 63% of managers consider main obstacle in digital transformation "difficulties in transition to agile corporate culture"; 36% "overcoming resistance to new methods of work" considered the second important problem; ⅕ managers are convinced that digital transformation projects are a waste of time; the best leaders of "digital emigrants" are 28% more likely to be successful in building relationships; "innate digital" leaders are 20% more likely to become "digital emigrants" more active and flexible.

Urgency of the problem of this study is evidenced by the fact that 86% of CEOs (Chief Executive Officer) consider digital technology

as a priority № 1 for business development; 30% of organizational change projects succeed; 16% success of digital transformation projects in companies is even less; 43% of transformation projects fail because project does not take into account the peculiarities of corporate culture; 33% of digital transformation is not sufficiently involved in top management. The data presented by us show that there is an urgent need to present the practical features of innovative-digital entrepreneurship as a key link in the future of Industry X.0 in the face of new global challenges such as living and working in virtual reality.

Industry X.0's innovation network helps companies to use and implement and scale the latest digital technologies and services quickly and efficiently. Thanks to the brightest individuals-innovators, the latest technologies and deep industry experience, united in an immersive innovation space, we are able to transform enterprises in the direction of their digitalization. This can also be achieved through the use of creative energy of advanced technology to ensure continuous digital transformation, new growth and improved customer service. In addition, it is immersive technologies that are technologies of full or partial immersion in the virtual world or can be considered as different types of mixing of real and virtual reality. Immersive technologies are also called augmented reality technologies. Their list includes virtual and augmented reality, as well as 360°-video.

The formation of Industry X.0 is of great socio-economic importance for society, as it allows to provide the population with new quality of services, digitized economic relations, promote the acceleration of digital entrepreneurship, increase trust in all branches of government through the initiative of the President of Ukraine and strengthen the competitiveness of domestic products in foreign markets, giving services/products signs of innovation.

In addition, the emergence of new type of economy, namely digital economy, has become a scientific response to cluster, platform, ecosystem production, STEM education, digital entrepreneurship, industrial Hightech, RetailTech, LegalTech, InsurTech, GovTech, IoT. This, in turn, leads to systematic emergence of new digital technologies that allow Industry X.0, growth of digital competence of the population.

Industry X.0 is a new approach to organizing production in virtual reality environment. It is based on highly intelligent integrated new products and digital ecosystems, which form a fully innovative digital value chain, add new competencies and implement profound cultural changes in the direction of becoming new virtual reality. Reality-Virtuality is interpreted by Paul Milgram and Fumio Kishino (*Milgram et al., 1994*) as a space between reality and virtuality, between augmented reality (closer to reality) and augmented virtuality (closer to virtuality).

We believe that virtual reality of the multiplayer world is based on the exchange of virtual goods within on-line environment. It creates an opportunity to interact with the artificial world through virtual platforms with available information funds on-line innovation market, the ability to work with cloud technologies (*Kraus et al., 2020*).

Consumers are already used to living in digital world. Now industrial enterprises, as well as their employees, need maximum digitization. This new format of "industrial consumerism" undermines decades-old habits, traditions and operating models of enterprises and companies. Not only the reasons for digital transformation in the manufacturing sector are important to industrial enterprises. Each company must find its own way to move to digital rails (*Accenture, 2020*[a]) and form their own ecosystems with professionals with digital competencies.

"Live" devices, smart assets, smart services, data management are the basis of the concept of Industry X.0. This type of device and service is equipped with software-controlled and Internet-connected sensors that collect various data, analyze it and send it to other connected devices. It is important to implement digital R&D processes, ie to implement a new approach to product lifecycle management. In fact, in new era of "live" data-driven devices, product development begins with digital lifecycle management strategy in the digital enterprise.

This strategy is designed to provide a hyper-personalized user experience. We are talking about the complete digitization of the product life cycle in digital enterprise in new virtual reality. We are convinced that today it is urgent to ask questions like this: Is digitalization part of the DNA of a modern enterprise that creates the latest product/service? How to achieve digitization of business activities? What are the competencies of digital employee of the company? We will try to answer these and other questions in this publication.

Exploring innovative-digital entrepreneurship as a key link in the formation of virtual reality of Industry X.0, it should be noted that there are important differences between innovation in services and manufacturing:

1. Service-sector innovation derives less from investments in formal R&D. More reliance on acquisition of knowledge/IP from outside sources acquisition and collaboration.

2. Human resource development is especially important to service firms. Indications that a lack of highly skilled personnel is a major impediment to service innovation in most OECD economies.

3. The role of newly established firms in innovative activity is greater. Entrepreneurship is a key driver of service innovation (but small firms tend to be less innovative than larger firms).

4. IPR protection is more important, especially on software and business method patents. Changes in policy regimes governing software-related patents and business method patents would impact service-sector firms, regardless of their actives.

Key innovation problems and limitations that need to be addressed on the way to the formation of Industry X.0 in virtual reality are presented in Figure 32.

In addition, the innovation system of any country requires coordinated action from a range of entities:

– *Demand for innovation:* consumers, government (final demand), producers (intermediate demand).

– *Framework conditions:* financial environment – taxation and incentives; propensity to innovation and entrepreneurship; mobility.

– *Industrial system:* large companies; mature SMEs; new, tech-based firms.

– *Intermediaries:* research institutions; technology transfer support organizations; technology services providers.

– *Education & research:* TVET; higher ed. & research; public research.

– *Political system:* government; governance; STI policies.

– *Infrastructure:* finance; intellectual property regime (IPR); innovation & business support; rules & norms.

Industry X.0's innovation network today has more than 20 innovation spaces strategically located around the world and is part of Accenture's annual innovation investment of more than $ 1 billion. Table 26 presents the world's innovation and digital spaces, which form the Industry X.0 network.

Table 26 – Global innovative-digital spaces that shape the virtual reality Industry X.0

City	Name of innovative-digital space	Specialization and focus on innovation in the following areas
1	*2*	*3*
Anne Arbor	Forge	Connect digital products and services
Bangalore	Innovation Center	Digital engineering, digital manufacturing and various digital operations
Barcelona	Analytical Innovation Center	Analytics and supply chain, digital production and various kinds of digital operations
Bilbao	Industry X Innovation Center	Connect digital products/services, digital engineering, digital production and operations

(Continuation of Table 26)

1	*2*	*3*
Budapest	Center of Excellence in Industrial Automation	Digital engineering, digital production and operations
Cluj	Center of Excellence in Industrial Software	Connect digital products and services, digital engineering, digital manufacturing and operations
Columbus, Ohio	Forge	Connect digital services and products
Des Moines	Forge	Connect digital services and innovative products
Detroit	Industry X Innovation Center	Connect digital products and services, digital production and digital operations
Dublin	Dock	Artificial intelligence, analytics and the Internet of Things with a focus on connecting employees, “deep” manufacturing, digital entrepreneurship
Essen	Industry X Innovation Center	Digital engineering, digital production and operations
Garching	Industry X Innovation Center	Connect digital products and services, digital engineering, digital manufacturing and operations
Houston	Center for Innovative Resources	Digital production and connection of digital products/services
Istanbul	Industry X Innovation Center	Connect digital products, digital production and digital operations
London	Industry X Zone	Connecting digital products and services, digital engineering, digital manufacturing and operations
Modena	Industry X Innovation Center	Digital production and operations
Paris	Industry X Innovation Center	Digital engineering, digital manufacturing and digital operations, digital product connectivity and digital services
Perth	Innovation Center	Digital transformations of energy companies, digitalization of mining industry in terms of strengthening their competitiveness and growth

(End of Table 26)

1	*2*	*3*
San Francisco	Innovation Center	Digital production and operations, digital engineering, digital services and product connectivity
Shanghai	Digital Center of Greater China	Digital engineering, digital product and service connectivity, digital manufacturing and digital operations
Shenzhen	Innovation Center	Digital products and services, digital engineering, digital manufacturing and digital operations
Singapore	Center for Innovative Resources	Center of production and operations
Sofia Antipolis	Resources of innovation center	Digital engineering, digital production and operations
Tokyo	Innovation Center	Digital manufacturing and operations, digital engineering, digital product and service connectivity
Turin	Center for Automotive Industry Solutions	Connect digital products and services

Source: compiled by the authors based on (Accenture, 2020[c]; IAMOT, 2020)

Key principles of transformation management, we propose to include: prioritization of projects (business results, not technical implementation, CAM, business cases, MVP); responsibility for the result (COS, CSI, OLA, SLA, MVP); right to error (R&D, Innovation); confirmed approach (pilot circulation); cross-functional approach (project office; roles, stages, goals, results). Technologies that change traditional business in the direction of its digitization are presented in Table 27.

As part of the research problem in this publication, it should be noted that of course, without proper financial analysis, strategy and understanding of the company's bills can be paid, but management will not always be able to make the right decisions for the most successful and effective problem solving, cost reduction and withdrawal business to new level, namely digital. In addition, mistakes and lost opportunities for the company become more likely. The strengths and weaknesses of "digital managers" at the stage of formation of Industry X.0 in the conditions of virtual reality are presented in Table 28.

Table 27 – Technologies that change the business in the direction of its digitization

Elements of business processes	Technology
1	*2*
Management	BD, ML, RA, Rent
Finance and Accounting	BD, ML, AL, SC
Strategy	BD, AL, BD, AI, Analytics interpretation, ML, SH
Marketing & Sales	BD, Soft, New channels, targeting, personalization, online, time
Logistics	Automatically storages, delivery, better logistic, just in time, drones, Storage like services
Production	Automatically, robots, 3D printings, custom design, quality control, ML
Security	Cyber, IT, BD, sensors, video, AI, SH
Right	AI, ML, chat bots, SC, BD
Frames	BD, remount, office cut, ML, AI, SC, e-learning
Purchases	Just in time, storage outsourcing

Source: author's development

Identifying key innovation issues and constraints

I. Innovation infrastructure and financing innovation: innovation infrastructure; quality system; financing innovation.

II. Firm innovation capabilities: technological capabilities; management and organizational capabilities; capacity to learn and to collaborate; role of markets.

III. Capability to generate knowledge: by firms; in education and training organizations; in public research institutions.

IV. Capability to learn and disseminate knowledge: technical & vocational training; higher education; agricultural extension services; capacity to learn on the job; technology transfer opportunities.

V. Governance of innovation: identifying priorities; designing and implementing innovation policies & instruments; policy coherence and coordination; innovation indicators, monitoring and evaluation.

Figure 32 – Key innovation problems that need to be addressed in the context of the formation of Industry X.0

Source: author's development

Table 28 – Strengths and weaknesses of "digital managers" at the stage of formation of Industry X.0 in the conditions of virtual reality

Strengths and weaknesses of "digital managers"	
+	-
pure-play digital / vc / tech R&D	
experience in digital (pure-play) business; high customer orientation; deep understanding of modern technologies and innovations	poor understanding of traditional business with long chains and production processes
technology ventor	
deep and detailed understanding of technology, innovation	potentially a "technological" narrowness of vision limited solely by technology
consulting / science / education	
technological awareness and a wide range; strategic thinking; powerful communication skills and vision of negotiations	lack of experience in implementing and implementing changes
cio / cto / ciso	
technological literacy and a wide range; knowledge of technological architecture; considerable experience in the implementation and implementation of projects	lack of understanding of the needs of the consumer/client
successful in digital transformation	
strategic thinking; understanding the impact of technology on business processes and customer/consumer behavior	lack of understanding of technological architecture

Source: author's development

Financial reporting alone is not always the best source for assessing the state of digital business or forecasting its trend. These are sophisticated tools that can be used in conjunction with other available data that need to be processed and analyzed for optimal answers. For example, a profit and loss statement and balance sheet may show a profit, but if you don't look deeper, it's likely that a decision will be made, as they say, "based on a picture, not a feature film".

A good example: staff reductions are not always the best solution if the decision is not made in combination with capacity analysis (including revenue flow analysis), matching resources to business goals. Management needs an impartial third party that interprets and

explains exactly what the data indicates and what full impact it can have on the business.

For these reasons, CFO 360 (Chief Financial Officer – Chief Financial Officer/Vice President of Finance, Chief Financial Officer, Deputy Chief Financial Officer) was founded by Bob Pantaliano, a US CFO with 25 years of experience (*Pantaliano, 2020*).

The goal of CFO 360 is to enable small and medium-sized companies that cannot afford to hire a full-time CFO for competitive support. Knowledge of B. Pantaliano, a professional American financial and operational advisor, is based on many years of experience in strategic management of functions of financial and operational director.

The developer is convinced that each company needs a unique plan, and each task requires an individual solution. With extensive experience working with organizations in the service, non-profit and manufacturing sectors, he proposed the so-called CFO 360, which provides flexibility to work on a project or permanent basis, on site or remotely, spending as much time as mutually agreed and required for any choice of services to best meet customer needs. CFO 360 allows you to work honestly, stating fees, deadlines and expectations from the beginning and working closely with clients. In fact, the level of service is so high that it allows you to limit the number and types of tasks taken to provide the highest level of professional attention and service.

We consider it necessary to note that CFO – 3600 has several levels, namely:

1. Strategic level (10%): strategic thinking, deep understanding of business models, innovation (financially sound), leadership skills and ability to implement.

2. Communication level (30%): ability to communicate, deep understanding of best business process practices, managerial skills.

3. Technical level (60%): 80% of financial staff perceive the CFO according to the level of his professional competencies.

Table 29 presents CFO Time-management for today and expectations for future.

CFO tools:

• Increase competencies within the financial service and delegate (dependence on individuals);

• Actively use outsourcing (the ability to build partnerships);

• Actively use cloud solutions (readiness of architecture, economy) (Table 30).

Changes in the role of CFO are as follows:

• Strategic positioning/analysis: environmental analysis (competitors, market, regulation) – helps to find opportunities and threats; analysis

Table 29 – CFO Time-management

	Now	There must be
1	*2*	*3*
Financial analytics	30%	30%
Strategy	10%	50%
Accounting	30%	10%
Financial statements	30%	10%

Source: author's development

of resources and competencies – helps to identify strengths and weaknesses;

• Determining the expectations of major stakeholders;

• Strategy choice: strategic options (organic development, purchasing, vertical integration); evaluation of options and choice.

Regarding the competencies of CFO – 3600 innovation and digital enterprises in the formation of Industry X.0 in virtual reality are as follows: skills of planning, forecasting, business process management; focus on success and strategic thinking; ability to effectively conduct dialogues and establish business contacts. However, in the group of financial competencies of the CFO at a digital enterprise and allotment remain:

Table 30 – Expectations in the near future from the use of tools in the activities of innovative-digital enterprise

Direction	Internal competencies	Cloud solutions	Outsourcing
1	*2*	*3*	*4*
Cloud ERP, CRM, CMS		+	
Cloud tools for analyzing information – Power BI		+	
Team management tools – MS Team		+	+
Strategic planning	+		+
Business Intelligence	+		
Valuation of investment returns	+		
Accounting		+	+
Payroll calculation		+	+
Compilation of financial statements	+		+

Source: author's development

• Organization of risk management system;
• Mastery of methods of valuation and value management of the company;
• Knowledge of international financial reporting standards.

The managerial competencies that should be inherent include:
• Ability to form a team and work in it;
• Strategic thinking;
• Reasonable disposal of their time;
• Ability to delegate authority;
• Ability to effectively negotiate, both with external counterparties and internal;
• The ability to find ways to develop the enterprise, company.

For digital enterprise, specialists with a wide range of competencies are valuable for the implementation of global tasks of business entity, such as the formation of financial policy, setting up a system of budgeting and accounting in the enterprise. It is these needs that necessitate digital transformation of the enterprise from Office 365 (Table 31).

However, in order to be able to quickly and efficiently implement digital management through the Boards of Directors (Figure 33) requires a number of innate and mastery, acquisition and expansion of such competencies as:

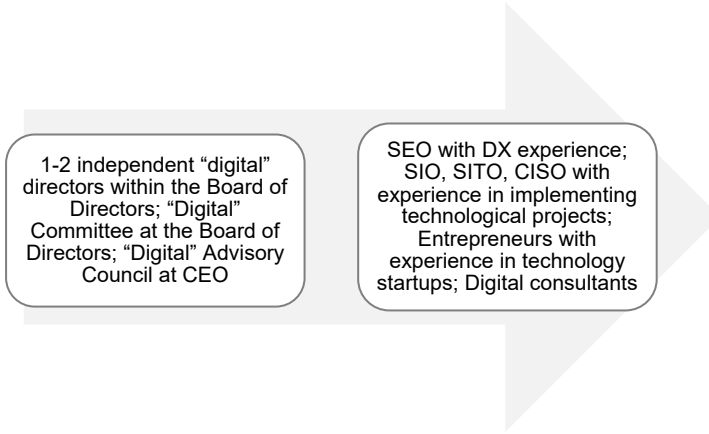

Figure 33 – Implementation of “digital management” through the Board of Directors

Source: author’s development

- Communication;
- Cold-bloodedness;
- Discipline;
- Confidence;
- Innate leadership qualities;
- Possession of developed analytical skills;
- Ability to maintain professionalism under any circumstances;
- Modernity, innovation, competence (ability to use modern technologies);
- Team player, the inherent team spirit;
- Fluent in several foreign languages;
- Curiosity.

Table 31 – Digital transformation of the enterprise with Office 365

Tasks that are being decided within the framework of digital transformation project of enterprise:	1. Migrate part of on-premises IT infrastructure services to the cloud: Exchange Online and Office 365 2. Improve mobility and communication for 250+ internal users with external customers and mercenists: Skype for Business 3. Configure cloud integration with your own mobile applications 4. Ensure dynamic expansion and more flexible connection of external users
Top challenges and threats from implementing Office 365 Enterprise	1. Narrow and strict timeframes 2. Features of deployment on different types of tools (Windows, Android, iOS, MacOS) 3. The need to carry out work remotely
The expected result of migration in Office 365	1. Start digital transformation of the company 2. Improve the functionality and integration of internal systems 3. Optimize support costs
Office 365 as a Technology Transformation Tool: *1. Office 365 E3* *2. Enchange Online* *3. Skype for Business* *4. Microsoft Intune*	Changing the paradigm of labor relations: not working for a company, but cooperation: 1. The growing potential of Microsoft teams is to allow people to suddenly create their own groups, manage the workforce (depriving management of the need for micro-management). 2. Skype, Yammer – means of free communication between people. 3. Open opportunities for broadcasting creative ideas – convenient processes, forms, applications. 4. One drive – a single data access drive without file servers with personal folders. 5. Personal productivity – task lists, calendars.

(End of Table 31)

Results:	1. Building a Hybrid Exchange Infrastructure: Debugged Integration with On-Premises Systems and Own Applications 2. Creation of a basic policy on remote management of mobile means 3. Created installation package Office 365 Pro Plus 4. Migration of mail boxes of the selected group (250+) users 5. Full technical support from Info pulse is provided 6. Training of technical specialists was conducted
Values for entrepreneurship	1. Migration has passed without disrupting business processes – invisibly for end users. 2. Unified sphere work on different types of means is ensured (Windows, Android, iOS, MacOS) 3. Improved communication between users: external and internal 4. The benefits of cloud technologies are provided: great flexibility, safety, reliability, access anywhere 5. Savings on the cost of migration and license 6. Optimized technical support costs 7. Increased handling and security of mobile means

Source: author's development

It is in the course of formation of digital entrepreneurship, formation of competencies, improvement of knowledge, acquisition of new skills that are the steps that need to be taken for both career advancement (Figure 34) and the formation of digital entrepreneurship in new virtual reality of 21 century, which is also exacerbated by both global economic challenges and COVID-19 pandemics.

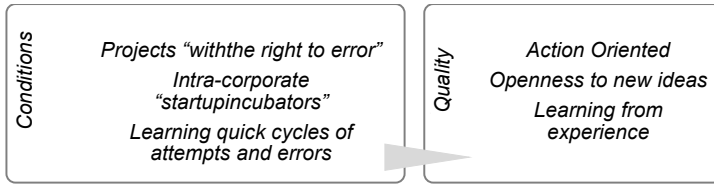

Figure 34 – Reserve potential

Source: author's development

Due to the difficult financial and economic situation, the values of both CFOs and employees with digital competencies are growing many times

if they also have the basics of strategic marketing, crisis management and risk management.

It is impossible to achieve high efficiency and confidentiality without security through the implementation of innovative projects within the digital enterprise. The implementation of the achievement of confidentiality through the work of the Security Institute is presented in Figure 35.

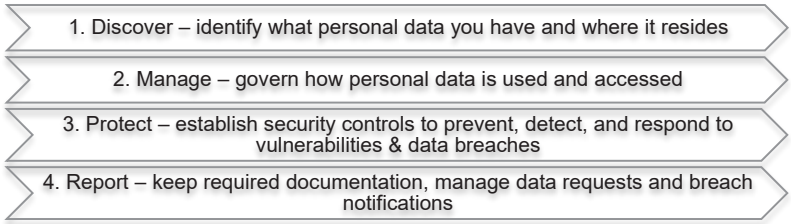

Figure 35 – The process of achieving confidentiality in digital enterprise

Source: author's development

Pursuing the goal of fastest possible development of digital entrepreneurship as a key part of Industry X.0. in the context of virtual reality, we consider it necessary to suggest key areas in which to reform innovation policy (Figure 36).

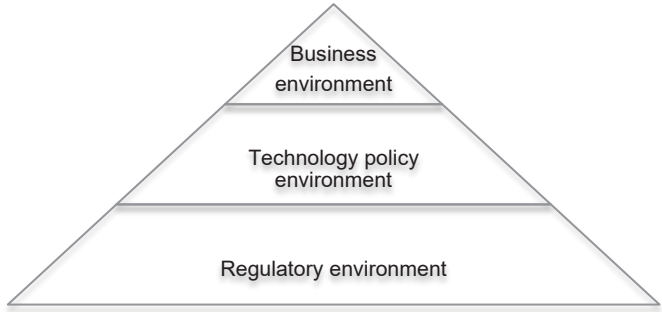

Figure 36 – Levels of innovation policy in terms of the formation of digital entrepreneurship in virtual reality

Source: author's development

Business environment (Finance, strategies and institutions):
– Vibrant capital markets;
– Chum and change accepted, embraced;
– High level of entrepreneurship;
– Cooperation and collaboration part of culture;
– Strong ICT adoption, especially among business;
– Strong managerial skills.

Technology policy environment (Supportive key building blocks of innovation):
– Education and skills;
– Technology research and commercialization infrastructure;
– Digital technology infrastructure and ecosystem.

Regulatory environment (Innovation enabling framework for organizations):
– Pro-innovation tax system;
– Competitive and open trade regime;
– Ease of starting business;
– Transparency and rule of law;
– Support for competitive product;
– Limited regulations on the digital economy;
– Government procurements based on performers standards.

In the world of data-driven digitization, all traditional industrial enterprises in new virtual reality must become part of a single digital ecosystem, and many of them require separate platforms. Using the platform in combination with the ecosystem, you can make your business a generator of innovation and growth.

Two-thirds of world's leading next-generation companies believe that building trusting, mutually beneficial relationships with all business participants is the key to digital success. Many industries are increasingly turning to platforms and ecosystems to drive further innovation and digital growth. In the 21st century, revolutionary changes are "in full swing", changing the rules of the game in a competitive modern virtual-real market. You need to be able to predict change and be at the forefront.

In conclusion, it should be noted that indeed the development of innovative-digital entrepreneurship is the foundation on which national Industry X.0 is built, in addition, in today's new virtual reality. Digital component of Industry X.0 is the element that helps companies use, quickly deploy and scale the latest digital technologies and services. Thanks to the brightest innovators and their high professionalism, the latest technologies and existing industry experience, companies can innovate using advanced technologies to ensure continuous digital transformation, new growth and improve customer service.

As a result of the formation of digital entrepreneurship as a key component of Industry X.0 in terms of virtual reality is expected to stimulate innovation (product diversification, innovative business models, flexible organizational structure); formation of consumer value (increased choice, convenience, market transparency, distribution of resources and financial assets); opening of markets (possibility of access to the market of small and medium digital business entities, expansion of export opportunity); reduction of transaction costs (low information, communication, logistics costs); increasing the density of disparate economic digital agents, intensifying interactions through digital technologies in new virtual reality; digital transformation of the role and significance of the state, change of relations of society, business, science and the state in the direction of their digitization; improving well-being (allocation efficiency, standardization, trust, efficient use of digital technologies, generation of quality information data, which can be of added value); digital transformation of the institution of intermediaries through the integration and unification of interaction processes throughout the value chain; growth of labor productivity and efficiency of innovative entrepreneurial activity.

Whether the goal is to digitally transform operations, upgrade products, improve customer and employee service, or implement new business models, it is the innovative space of digital enterprises that is the ideal place to explore and realize new business opportunities.