# CHAPTER FOURTH DIGITIZATION AND ECONOMIC GROWTH: ILLUSION AND REALITY

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## 4.1. New digital technologies: the main outpost of the innovative future of economic agents

In modern business in Ukraine are widely used technologies of information retrieval systems Internet, advertising and sale of goods on Internet, electronic payments, electronic tenders, electronic card payments (including payroll), automated systems of salary accounting and reporting processes, electronic systems of protection and fire safety, electronic systems of information collection of control and measuring devices, mobile and selector communication, etc.

The concept of digital twinning has already become widespread in industrial production, but its benefits for the logistics industry are just beginning to show. For example, DHL in its Next Generation Wireless Logistics Review identified digital twinning as a new direction for growth. Digital duplicate is useful where access to main system is difficult or impossible (as in the case of a spacecraft), or it is costly (creating a costly product with a high degree of complexity: a large conveyor, powerful turbine or aircraft engine, and the cost of design error is very high), or it is associated with destructive phenomena (crash tests of new car models involve the destruction of expensive physical samples).

Digital double allows to reduce as much as possible delay time at natural tests. During the Fourth Industrial Revolution, digital duplicates became part of the “perfect storm” that combined the Internet of Things, robots, artificial intelligence, and automation. But interest in digital duplicates has spread far beyond production. A study by analysts at MarketsAndMarkets indicates that digital counterpart market will grow from $ 3.8 billion in 2019 to $ 35.8 billion by 2025 due to the great interest in this technology from pharmaceutical and defense industries.

Digital duplicate is a virtual copy of a physical product, process, or ecosystem. It is used to create a simulation that can be updated and changed to a greater extent in the real world, and to reflect any actions that occur with physical object. Digital dual device consists of making decisions based on various assumptions. Tests are performed on virtual

analogue without the need to interfere with the work of real, usually expensive, objects.

In today's business environment, the principles of digitalization of business are as follows: interoperability, operational interaction, integration (interoperability), virtualization, decentralization, real-time interaction, service orientation, modularity, training and continuing professional education, synergy and emergencies. So, it is not surprising that the concept of digital duplicates is attributed to Industry 4.0 and digitalization of production, the origins of this concept originated much earlier than the 2010s.

This concept continues CALS and PLM methodologies that emerged in the early 21st century. Product Life Cycle Support or CALS (Continuous Acquisition and Life Cycle Support) involves the continuous integration of CAD, CAE, CAM, MRP, ERP, SCM and CRM systems used in design, manufacture and operation of high-tech products. Product data management systems are responsible for data integration.

The product lifecycle management technology itself fits into the concept of PLM (Product Lifecycle Management) – an organizational and technical system that supports all information about the product and related processes from design and production to decommissioning. One of the goals of CALS/PLM technologies is to create virtual productions, where the development of specifications for software-controlled process equipment is distributed in time and space between several autonomous organizations to accelerate and optimize the development and production of products. In the leading countries of the world for the development of CALS/PLM-technologies standards for electronic data exchange, electronic technical documentation and manuals for process improvement are being developed (*Wikipedia, 2022*[a]).

However, since 2010, when the term Big Data appeared, the popularity of CALS/PLM has been rapidly declining. The concept of virtual production is embodied in the form of a digital double, because it is from the second half of 2010 that computing power allowed to create almost identical copies of real physical objects and processes in real time (*Wikipedia, 2022*[b]). Due to this, as well as the development of Big Data and the Internet of Things (IoT), the ideas of CALS/PLM were continued in Industry 4.0. Interactive data collection from IoT devices allows you to monitor and even control an object or process online. For example, Apache Kafka together with Spark, Storm, Flink or NiFi provide continuous aggregation and online processing of operational data. And the Apache Hadoop ecosystem is responsible for the reliable storage of this information and data from CAD, CAE, CAM, MRP, ERP, SCM, CRM, and even SCADA systems.

In addition, digital duplicates are actively using another trend technology Industry 4.0 – augmented and virtual reality (AR/VR). This allows you to simulate almost any situation and clearly represent the internal structure of complex systems, from living organisms to space satellites. Thus, digitalization of industrial enterprises, which develops digital duplicates of industrial objects and processes, has become a modern embodiment of CALS/PLM-ideas, significantly expanding their original scope. Digital duplicates are created on the basis of a specialized platform. Such platforms are manufactured by both global fans such as Siemens and Dassault Systemes, and small companies such as Xcelgo. The choice of vendor depends, first, on the specific tasks of the digital duplicate. For example, Siemens is targeting its digital dual hardware platform, and Xcelgo's solution is better suited for modeling production systems. In particular, the conditions for checking the operating modes of the platform are formed in the execution of instructions that can be edited.

Having digital duplicate for the created object provides a significant increase in efficiency for all project participants. The developer creates a quality system faster, radically reducing system debugging time. Client receives a thoroughly tested system in all possible modes with increased reliability. In this sense, digital counterpart is a tool to radically reduce the risks of large technical systems projects. The use of digital duplicate changes the application to the knowledge and experience of a specialist in the subject area of the customer's business: these specialists write scenarios to test the future system, form a checklist, which is then irradiated in full finished digital dual system (*Kraus et al., 2022*[b]).

Digital enterprise offers tangible benefits through the operation of digital duplicates, which are a virtual representation of the actual system. They allow you to get an idea of the entire life cycle of equipment and optimize it – both for new and existing plants and projects (*SIEMENS, 2021*). The creation of a digital duplicate takes place at the design stage of a new system (Figure 37). After that, as the object is completely designed, a static model of digital dual device is created on the basis of CAD-models in the CAD system or 3D-models of objects. It essentially describes the architecture of the object, the location of the system equipment in the workspace.

In the next stage, the static model "comes to life" describes the workflows, moving to a dynamic model system. This is not just a visualization of what is happening in the system. Digital dual must reproduce systematic control in the same way as the physical system. In order to write algorithms for controlling digital dual devices, such algorithms are created for the purpose of a real system. If you connect

algorithms on digital duplicates, you can get algorithms that will work exactly on a real system.

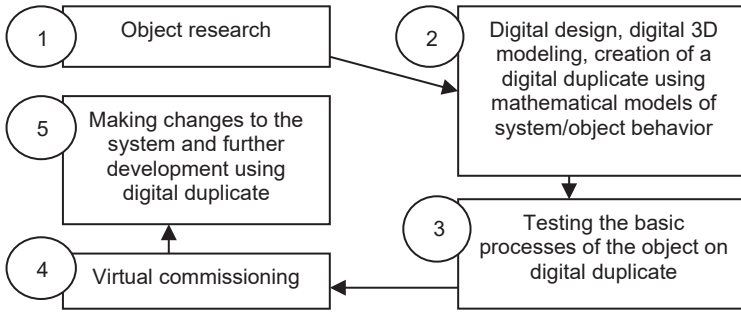


**Figure 37 – The process of creating and using a digital duplicate**

*Source: author's development*

Internet of Things (IoT) technology allows you to control devices remotely. In addition, the new method of digital duplicates can create copies of these devices. Digital duplicates are virtual copies of real objects that can be used to test the performance and efficiency of an item or system. Using digital duplicates, engineers can now quickly and easily test new sensors and products, as well as maintain and monitor their condition in a timely manner. Practitioners suggest that digital twin is a virtual interactive copy of a real physical object or process that helps to effectively manage it by optimizing business operations. For example, digital duplicate of the plant allows you to simulate the location of equipment, employee movements, work processes and emergency situations (*Kraus et al., 2022*[b]).

In essence, digital duplicate is a model of a real-time system that provides a virtual representation of physical assets. It allows you to manage both digital and physical assets as a whole. Digital duplicates have revolutionized the aerospace, manufacturing, engineering and energy sectors by optimizing design, development, production and management of all aspects of a physical product throughout its life cycle (*Logist.fm, 2020*). The integrated concept of digital business duplicates consists of three forms: digital product duplicate, digital production duplicate and digital product and production performance duplicate. With extensive expertise in this field and optimized tool, Siemens is the only company to offer a holistic approach. Value of

digital duplicate lies in the execution of scenarios and forecasting future performance (Table 32).

**Table 32 – Contents of digital duplicates at new and working enterprises**

| Digital duplicates for new businesses | Digital duplicates for working enterprises |
|---|---|
| 1 | 2 |
| Creation of virtual production is carried out at the stage of designing processes and installations. Siemens provides a comprehensive set of tools for the design, modeling and construction of manufacturing enterprises. Using as a basis for collaboration platforms such as | At existing enterprises, technological processes, hardware and software can be used unchanged for decades. However, even in this case, digital duplicate can be very useful for optimizing existing processes and facilities. This digital duplicate allows |
| COMOS, and ensuring full data integration in the stages from design to design and commissioning, the system developers automatically create a digital duplicate installation with process automation, ready for implementation in real production with minimal effort, which allows you to reduce design costs and reduce production time. | you to analyze information on the operation of the plant. In this case, modernization and maintenance measures are based on the documentation in its original form and the relevant data on the operation of the plant. This significantly reduces the search time and the number of errors. |
| In the real world, Siemens' Process Management and Production Operations Management (MOM) systems ensure reliable production operations and help collect the data needed to create digital duplicate. This duplicate, created on the basis of real production systems and enriched with data obtained from Internet of Things, optimizes the production and maintenance of critical facilities. | Thanks to the integrated workflows, created digital duplicate is constantly updated until the end of the service life of the installation – the connection between virtual and real production is carried out in a closed loop. |

*Source: grouped by authors based on (SIEMENS, 2021)*

Digital duplicate technology is one of the fastest growing concepts in Industry 4.0. It is the growth of the IoT industry and cloud technologies that has a significant impact on digital counterpart market. According to Gartner, digital duplicates are used in 13% of organizations implementing IoT projects, while 62% are either already implementing the technology or planning to do so. According to the

latest MarketsandMarkets report, digital counterpart market will grow to $ 35.8 billion by 2025 with an average annual growth rate of 37.8%. Digital duplicate technology is already widely used in industry, but it is no less important for manufacturers. Table 33 presents the advantages of using digital model of duplicates and the factors that should be considered before its implementation.

In logistics industry, the development of digital duplicates for complex infrastructure supply chains, such as ports and large warehouses, is still at an early stage. However, major ports around the world, including Singapore and Rotterdam, are turning to digital counterparts to design, plan and manage their operations. Having digital duplicate, such as a storage room, can significantly increase operational efficiency. Every process that takes place on the site and every piece of equipment will be reflected in a digital mirror, ensuring a constant flow of operational data.

There are many advantages: you can quickly detect the inefficiency of certain areas of handling or identify problems with the maintenance of equipment before they affect the throughput (*Logist.fm, 2020*). In addition, digital duplicate is not limited to collecting data obtained during product development and manufacturing, but continues to collect and analyze information throughout the life cycle of a real object, for example, using Internet of Things (IoT) devices (*Andrusiak et al., 2020*). Factors to consider before implementing digital duplicates in virtual reality are presented in Table 34.

From a practical point of view, it matters for what essence digital duplicate is created. For example, an aircraft engine is a separate object, which would correspond to a very difficult set of complex mathematical descriptions of how it works. This digital duplicate is necessary in order to test on a mathematical model all its capabilities and performance in various situations, including freelance. Another example is the logistics company's sorting center automation system. The sorting system consists of many relatively simple elements (for example, for transporting the conveyor), but for a logistics company it is important not one element, but the entire sorting system, and a digital duplicate is created for the entire production system (*Kraus et al., 2022*[j]).

The benefits that an enterprise receives from digital transformation of business processes depend on the type of tasks performed by employees. The more complex the task, the deeper the level of digital transformation the company needs to increase overall efficiency. According to the level of complexity, the tasks are ranked as follows (from the simplest to the most complex):

- Epetitive tasks;
- Administrative tasks;

**Table 33 – Advantages of using digital duplicates in virtual reality**

| Advantage | Content and characteristics during the application |
|---|---|
| *1* | *2* |
| Operational assessment of risks and production time | With the help of digital duplicate, companies can control the quality of a product before it appears in the real world. Because digital duplicate is a copy of the planned production process, experts may notice any process failures before the product goes into production. Thanks to digital duplicates, you can increase the intensity of testing by 10 times and reduce by 85% the labor resources involved in design process. In general, engineers can restructure the system by generating unexpected scenarios, studying the system's response, and creating mitigation strategies. Thus, new technology allows for better risk assessment, accelerate the development of new products and increase the reliability of production lines. |
| Improving interaction within teams | Process automation and round-the-clock access to system information can increase productivity and efficiency. Yes, in the team, developers can pay more attention to creating new elements, rather than monitoring and checking once again already running. |
| Intelligent service | Because digital duplicate IoT sensors generate big data in real time, businesses will be able to analyze internal statistics and detect any system failures in advance. This allows companies to move to intelligent service, while increasing the efficiency of the production line and reducing operating costs. |
| Improving financial decision-making process | In the virtual model, you can also specify the cost of materials and labor costs. As a result, companies can make faster and more efficient decisions in financial sense: whether the value is calculated correctly, what can affect it, and so on. You can also use digital duplicates to avoid financial losses due to reduced productivity. For example, previously business owners had to stop all workflows to test new warehouse modules. Now it all happens virtually and the effectiveness of the settings is easy to check again. |
| Remote real-time monitoring | When working with a large system, it is simply impossible to check any of its elements at once. However, digital duplicate can be accessed anywhere, allowing users to remotely monitor and control system performance. In practice, engineers have created a warehouse structure with all the necessary technical characteristics. Yes, digital duplicates mimic the operation of a warehouse. Thanks to it is possible to estimate productivity better and to choose the optimum approach at the organization of industrial warehouses in reality. |

*Source: grouped by authors based on (Arnautova, 2020)*

**Table 34 – Factors to consider before implementing digital duplicates in virtual reality**

| Factors | Characteristic features |
|---|---|
| 1 | 2 |
| Update data security protocols | Gartner estimates that by 2023, 75% of digital duplicates for OEM products connected to the IoT will use at least five different types of integration endpoints.<br>The amount of data collected from the many endpoints is huge, and each is potentially vulnerable. Therefore, before implementing digital duplicate technology, companies need to analyze and update their security protocols. It is worth paying special attention to:<br>– data encryption;<br>– access rights, including a clear definition of user roles;<br>– principles of the least privileges;<br>– elimination of known defects of the device;<br>– regular security checks. |
| Team training | Companies need to make sure that their staff have the necessary skills and tools to work with digital duplicate models. |
| Data quality management | Duplicate digital models use data from thousands of remote sensors through unsecured connections. Companies should be able to exclude irrelevant data and manage gaps in data flows. |

*Source: grouped by authors based on (Logist.fm, 2020; Arnautova, 2020)*

- Unit level tasks;
- Tasks of the enterprise level;
- Xpert tasks.

Ultimately, main goal of digital transformation is to ensure that employees perform only expert, ie the most unique tasks that are difficult to copy or accurately replicate. The rest of tasks can be performed with minimal employee participation and with the maximum involvement of powerful digital tools and increase the efficiency of their work. Features of the implementation of projects involving digital duplicates in terms of virtual reality in terms of stages are disclosed in Table 35.

For example, DHL named three main challenges in promoting digital duplicates in logistics: cost, accurate asset representation, and data quality. Next-generation wireless and 5G can solve the last two problems. The exact reproduction of digital duplicates depends on the ability to communicate in real time between the physical asset and its virtual display. Given the complexity of modern warehouses and the growing number of automated logistics tools, the collection, transmission

**Table 35 – Peculiarities of project implementation with the participation of digital duplicates in the conditions of virtual reality**

| Stages of the project | Content and characteristics |
|---|---|
| *1* | *2* |
| Technical | Digital dual platforms are an objectively new phenomenon in the market. In particular, it provides clarity that not all pieces of equipment used in a particular project can be adequately represented by the platform. Then, these or those complex elements either come to create (construct) independently, which is not always a trivial task, or to ask the vendor to work with the platform. However, it should be noted that the vendor platform responds to operational requests at all times if they are interested in ensuring that their product is optimal as required. |
| Financial | If only the company decides to create digital duplicate, then this project will have to defend before the CFO in part the need to purchase licenses on the platform, and obviously a foreign vendor, and therefore the costs will be quite significant.<br>If the production system is created by external contractors, such as an integrator, then the cost of acquiring a license is borne by the company's partner. To do this, it is important that the integrator constantly executes projects using digital duplicate platforms: then the cost of the platform will not become a separate item in the cost item required by the project. Because customers are often not ready to increase project budgets, for the sake of digital duplicates in the design services. |
| Terms of designing with the participation of digital duplicates | The timing of such projects depends on the system. In general, they are equated to the duration of the design phase. The expert conducts an empirical pattern: in the project, which takes 8 months, work on digital double adds to the duration of the first phases of development from 2 to 4 weeks, ie a maximum of 1 month. In the future, work with the digital double is carried out in parallel with the planned work on the system. |
| Improving the quality of design | Improving quality systems using digital duplicate is reflected in the best solutions at an early stage. |

*Source: grouped by authors on the basis of sources (Wikipedia, 2022[a]; Kraus et al., 2022[j])*

and visualization of data into dynamic virtual models have so far been limited by the capabilities of existing wireless networks. Now, thanks to 5G, this problem can be solved. Digital duplicate can be thought of as a virtual prototype of a real object or process that contains all the data about it, including history and information about the current state. The criteria for digital duplicates are given in Table 36. Interactive analysis of this data using Big Data technologies allows you to effectively perform the following important management functions:

- Obtaining accurate information about system performance;
- Forecasting future conditions using ML-models of predictive analytics;
- Remote control of the object in real time.

**Table 36 – Categories of digital duplicates**

| Categories | Characteristic features |
|---|---|
| ***1*** | ***2*** |
| *Duplicate (Digital Twin Instance, DTI)* | data describing the physical object. For example, an annotated three-dimensional model, information about materials and components of the product, information about work processes, test results, records of repairs, operational data from sensors, monitoring parameters, etc. |
| *Prototype (Digital Twin Prototype, DTP)* | virtual analogue of a real physical object. It contains all the data for this product, including information from design and production stages, such as product requirements, three-dimensional model of the object, description of technological processes, disposal conditions, etc. |
| *Aggregate double (Digital Twin Aggregate, DTA)* | a system that integrates all digital duplicates and their real prototypes, allowing data to be collected and exchanged in real time. |

*Source: grouped by authors based on (Kraus et al., 2022[j])*

In terms of data quality, digital duplicates today have to collect data from many sources, both traditional IT systems and many sensors in the physical world. These can be boxes with RFID ort. All this needs to be coordinated and coordinated through a single high-speed wireless network, which DHL suggests will be based on 5G (*Logist.fm, 2020*).

Successful scenarios for the introduction of digital duplicate technology in different sectors of the economy are presented in Table 37. The ultimate goal of digital duplicate in manufacturing industry is to create a closed feedback loop between virtual and real production

**Table 37 – Successful experience in the implementation of digital duplicate technology**

| Field of application | Brief description, content of the work |
|---|---|
| *1* | *2* |
| *Energy sector* | In the energy sector, digital duplicates are used to create virtual wind farms, or as they are sometimes called, "wind farms" based on cloud technology. Each wind farm has its own unique structure, like DNA or a fingerprint. Thanks to digital twin technology, engineers can combine and select different turbine configurations, depending on the conditions of the wind farm. As soon as the turbine is put into operation, its virtual copy begins to collect and analyze environmental data in real time, which leads to the creation of more efficient models. |
| *Sphere of hospitality and service* | Digital duplicates help to create simulations of real events and situations, and this creates a significant impact on the development of the Industry. For example, in the CKE Restaurants Holdings fast food chain, digital duplicates allow restaurants to work more productively. Digitization has affected the halls for visitors and kitchens, so companies are testing different options, thereby reducing staff rotation and creating more favorable conditions for visitors. |
| *Urban environment* | The technology helps city planners better understand and refine factors such as energy consumption. Digital copy of Singapore already exists, and copies of other cities are expected in the future. |
| *Retail* | The technology of digital duplicates has recently entered the field of retail, but could be very useful, especially when it comes to modeling the behavior of shoppers. Analytical firm Pygmalios singles out virtual duplicate technology as part of the Retail 4.0 digital retail transformation process, an approach that collects detailed real data from the physical retail environment and then uses it to better understand visitor behavior and actions. |
| *Healthcare* | Since a virtual image of any real object or environment is created, it is possible to create a "digital patient" – a model of the human body that gives an idea of the state of human health during his life. This is how Philips sees the future of healthcare. The idea of creating a whole digital patient is still far from being realized, but the technology is already being applied to certain parts of the body, which is encouraging. Philips has developed the HeartModel application, which creates a detailed 3D image of the human heart based on ultrasound images. One day, a virtual heart can help save the real thing. |

*Source: compiled by the author based on (Logist.fm, 2020)*

through the use of the right digital infrastructure. Due to this connection, the duplicate characteristics of real production allows you to develop optimization scenarios in virtual production. After successful modeling and implementation of these scenarios, the cycle begins again.

Based on the analysis of literature sources, we concluded that digital transformation of the enterprise is the introduction of modern technologies in its business processes. This understanding involves not only the installation of modern hardware or software, but also fundamental changes in approaches to management, corporate culture, external communications. As a result, the productivity of each employee and the level of customer satisfaction increase, and the company gains a reputation for progressive and modern. The latest digital technologies of the "digitization" process lead to innovative transformations in all spheres of enterprise activity and encourage the creation of new business models.

In conclusion, it is worth noting that new technologies help companies reduce costs, increase productivity and efficiency, as well as optimize maintenance. In particular, it is the technology of digital duplicates in combination with the tools of machine learning and artificial intelligence allows to achieve this without compromising workflows. With this content, digital technology makes it possible not to stop the line to test a new element. Therefore, for manufacturers, the technology of digital duplicates is important not only to improve efficiency, but also to bring the product to market faster.

We remain true to the opinion that it is still important to conduct future research aimed at presenting the effects of digital transformation. Among them, we believe: significant release of working time of employees to focus on more important tasks, reducing the number of specific tasks, improving the coherence of business processes within digital enterprise, accelerating the processing of analytical information for management decisions, etc.

Raising the issue of servation, which has a powerful impact on the results of economic activity of digital entrepreneurship, it is impossible not to mention the new European Regulation on protection of individuals in relation to the processing of their personal data, namely General Data Protection Regulation (GDPR), which is mandatory for the implementation and application of all European Union states in the legislation.

The GDPR principles are as follows:

- Legitimacy, transparency, fairness;
- Goal restrictions;
- Minimization of data;
- Accuracy;

• Limited storage;
• Integrity and confidentiality;
• Accountability.

We are talking about the following data:

• Name, gender, age, race;
• Passport data, identification number;
• Residence and location data;
• Mobile phone number, e-mail;
• IP-address, cookies;
• Payment card data;
• Biometric data;
• Medical information (*Kraus et al., 2020*).

As part of the problem of our study, it is worth noting that personal data is any information relating to an individual by which it can be identified. As for understanding the content of the "individual" category, it is a person who can be identified directly or indirectly, in particular by linking to a specific identifier; e.g. name, identification number, passport data, location data, mobile numbers, payment cards, IP-addresses, e-mail, etc.

Grounds for legitimate processing of personal data are as follows:

• Consent of the data subject to fulfill the contract;
• Public service;
• Legitimate interest;
• Lital interest.

The reasons why Ukrainian digital business should meet the GDPR are as follows:

• Extraterritorial principle of the regulation;
• Targeting of clients from the EU;
• International commitments: association agreement with the EU;
• Adaptation of the NPA to GDPR liability;
• Counterparties from the EU.

In the context of digitalization of entrepreneurial activity, whose companies will be affected by the need to meet the GDPR will be with the following characteristics, namely:

• Process, store, transmit personal data of entities from the EU;
• Perform works, provide services to citizens or residents of European Union countries;
• Have counterparties from the EU (*Marchenko et al., 2020[b]*).

As for the existing experience of "high-profile attacks", they are as follows:

1. TICKETMASTER

• 23.06.2018 – attack on data of 40 000 clients;

• 27.06.2018 – notice, possible fine of 2% or 10 million euros, looking that more.

2. DIXONS CARPHONE

• 06.2018 – attack on these risk for 5 million 900 thousand customers;

• possible fine – 4% turnover, about 423 million pounds.

Violation of the requirements for the protection of personal data in the world:

• FACEBOOK – data transfer to Cambridge Analityca;

• YOUTUBE – collection of information about children without their parents' consent;

• UBER – 20 million people were injured.

Illegal data transmission in Ukraine:

• Banks – sale of customer data;

• Postal services – 18 million customers;

• Carriers – constant transfer of data to third parties;

• Online stores – data transfer to third parties, further blackmail of the client (*Manzhura et al., 2019*[a]).

In order for the enterprise to fully meet modern requirements of quality functioning it must take main steps in terms of the application of a new service, which is aimed at fully digitizing its economic activity, namely:

• Audit of company's activities in terms of the collection of personal data: what data, for what purposes, in what form, including technical audit;

• Work with the staff and its training;

• Development of typical documents: consent, contract, instructions, private policy;

• Development of software for process automation: notification of subjects, logging of incoming queries.

Changing business models in terms of their digitalization provides an increase in customer loyalty through the omnichannel experience; allows employees to provide a popular service; simplifies daily routine work; allows you to manage strategic planning and merchandising; provides integration with supply chain management; unify business processes by different communication channels (websites, directories, mobile applications, contact centers, social media, etc.). Implementation of entrepreneurial activity at an effective level in the conditions of digitalization of the economy is possible only if there is a favorable general social situation, high-quality work of institutes of entrepreneurial environment, market system of relations, as well as personal freedom of entrepreneur, i.e. his "healthy" personal independence, which allows to make such entrepreneurial decisions, which from his point of view will be the most effective, effective and profitable.

Main focus today: optimizing IT for successful digital transformation, cybersecurity, privacy. GDPR: enhanced personal privacy rights, increased duty for protecting data, significant penalties for non-compliance.

Under the influence of new Internet technologies and online platforms, the global economy will gradually "get free" from the numerous barriers that divide it and will be characterized by a special "spatial plasticity" designed for the dynamics of communications and the driving force of innovation. Already today we observe both the economies of different countries inherent clustering, direct connection between economic participants; collective way of responding; hyperminous institutional environment. Digitalization of the economy, which is actively taking place today in Ukraine, to some extent "touched" all spheres of business. Its actors, aimed at long-term success and development, are forced to accept the challenges of the modern economy – only way they can become leaders in business. Digital transformation and servation of economic activity at the micro level can help them.

Cloud services are key to today's its strategies. 1,181 different cloud services are used by enterprises on average. 61% of cloud applications IT isn't aware of. 75% of companies consider SaaS tools essentials to their business. 80% of workers use non-sanctioned cloud apps (*Holoborodko et al., 2019*).

Cloud Access Security Brokers (CASBs) are defined by Gartner as: on-premises, or cloud-based security policy enforcement points, placed between cloud service consumers and cloud service providers to combine and interject enterprise security polices as the cloud-based resources are accessed. CASBs consolidate multiple types of security policy enforcement. Estimated to be the fastest growing security market. Top security project planned in the next 2 years. By 2020 85% of large enterprises will use CASBs.

Elevate the security for all your cloud apps and services. A uniquely integrated CASB: Threat Signal Clustering (Microsoft Intelligent Security Graph), Security Analytics & Guidance (Microsoft Secure Score), Cloud Security Posture Management – IaaS (Azure Security Center), Unified Endpoint Management (Inture), Data Loss Prevention (Azure Information Protection), Identity & Access Management (Azure AD & Conditional Access), Endpoint Detection & Response (Windows Defender ATP).

Shadow its management lifecycle by Safely adopting cloud apps, namely:

1. Discover Shadow IT – Identify which apps are being used in your organization.

2. Identify the risk levels of your apps – Understand the risk associated with discovered apps, based on more than 70 risk factors including, Security factors, industry- and legal regulations.

3. Evaluate compliance – Evaluate whether the discovered apps meet the compliance standards of your organization against factors like GDPR or industry-relevant standards like HIPAA readiness.

4. Analyze usage – Understand the usage patterns and identify high risk volume users.

5. Manage cloud apps – Start managing cloud apps and leverage one of several governance actions such as Sanction, Unsanction, onboarding an app to AAD to leverage SSO, marking them for review or blocking them from your network.

6. Continuous monitoring – Be alerted when new, risky or high-volume apps are discovered in your environment for continuous monitoring and ongoing control over your cloud apps (*Kryvoruchko et al., 2017*).

Discovery process is as follows:

1. Identify cloud apps and services:

• >16,000 cloud apps and services from catalog;

• Custom apps.

2. Understand usage patterns

• Traffic data Top users and IP addresses App categories;

• Machine-based investigation via native integration with Windows Defender ATP.

3. Understand the risk:

• Assessment across >70 risk factors;

• Regulatory certifications, compliance standards (e.g. GDPR), industry standards and best practices;

• Risk score calculation – can be customized based on the priorities of your organization.

4. Take control:

• Sanction or un-sanction apps;

• Onboard apps to Azure Active Directory;

• Block apps natively with Zscaler;

• C-level report & recommendations.

Cloud Discovery with Windows Defender ATP consists in:

• Discovery of cloud apps beyond the corporate network from any Windows 10 machine;

• Single-click enablement;

• Machine-based Discovery;

• Deep dive investigation in Windows Defender ATP.

Protect sensitive files in the cloud occurs as follows:

1. User uploads a sensitive file to a cloud app

2. A classification label is automatically applied to protect the file
3. User tries to share sensitive file with external users
4. External user is not able to access the file due to classification and protection
5. Admin receives event alerts

Contents of work of Unified Data Classification Service consists in: unified labelling with Microsoft Information Protection; 90 built-in, sensitive information types you can choose from; ability to configure custom sensitive information types (supports complex patterns with Regex, keywords and large dictionary).

Azure ad conditional access:

1. Controls: allow access, require MFA, limit access, deny access, force password reset.
2. Conditions: users, devices, location, apps.

Protection against cloud threats is as followed:

1. Malicious Insider. Protect against disgruntled employees before they cause damage.
2. Malware. Detect malware in cloud storage as soon as it's uploaded.
3. Ransomware. Identify ransomware using sophisticated behavioral analytics technology.
4. Rogue Application. Identify rouge applications that access your data.
5. Data exfiltration. Detect unusual flow of data outside of your organization.
6. Compromised Accounts. Combat advanced attackers that leverage compromise user credentials.

Malware Detection happens by: Scan cloud storage apps; Identify potentially risky files Powered by Microsoft Threat; Intelligence.

Automatic detection and revocation of risky 3rd party apps possible in case of: monitor cloud permissions authorized by your users; act on suspicious apps; automatically revoke apps to the entire org or specific users and groups.

### 4.2. Green business in the blue economy with digital content

Ukraine ranked 60th in Global and Digital Competitiveness Rankings IMD-2017 (*Liga, 2019; Portulans, 2018*) of the International Institute for Management Development (IMD). However, in digital competitiveness ranking for the implementation and study of digital technologies that are transformative in government practice, business models and society as a whole, Ukraine is in the last positions alongside Indonesia, Mongolia,

Peru and Venezuela. Innovation has become a major factor in the success of states and businesses today.

Countries and corporations seeking to become world economic leaders are investing heavily in research and development, new manufacturing and quality management. Among the countries that invest the largest share of their GDP in research and development (R&D), South Korea leads by a large margin of 4.3% and Israel of 4.1%. Japan invests 3.6% of GDP, Austria, Germany and Switzerland – about 3%. Whereas, by comparison, Ukraine invests only 0.2% of its already insignificant GDP in scientific development.

In terms of money in R&D investment, in purchasing power parity, the absolute leader is the US – $ 480 billion and China – $ 371 billion a year. For comparison, in Ukraine – $ 2.5 billion. Expenditure on R&D 1000 corporations, the world's largest R&D investor, increased 3.2% in 2017 to $ 702 billion.

In 2017, the Government of Ukraine presented a National Report on "Sustainable Development Goals: Ukraine" (*Sustainable Development Goals, 2017*), which set the benchmarks for achieving them. However, there are now many concepts that are based on utility estimates such as energy, water, waste management, transportation, and complicate long-term smart community planning.

The European Strategy for Intellectual, Sustainable and Inclusive Development by 2020 (*EUROPE 2020, 2019*) has declared the achievement of objectives as a common interest on the basis of three complementary economic policy priorities: Smart growth (economic development based on knowledge and innovation); Sustainable development (promoting a more resource-saving, green and competitive economy); Inclusive growth (stimulating the employment economy, ensuring social and territorial cohesion).

Valuable in the scientific sense of the study of green entrepreneurship are scientific works and practical achievements of such well-known scientists as A. Merts, K. Richter, N. Fontsein, A. Shchulst. The theory concerning the future modern development of the economy, the so-called "blue economy" theory, by a scientist economist, a member of the Roman Club of G. Pauli, deserves due attention.

Economists from Ukraine are also actively involved in research and development in the field of doing business which seeks to combine environmental concerns, fair treatment of employees and economic success and the issues of quality management of environmental business. But at the same time, there are a number of pressing issues of type:

• The particularities of problems and risk management at the various stages of green business in blue economy;

• Previous recommendations regarding the control and quality management of green production at the stage of its growth;

• Ranking of the most promising green business ideas that allow us to join green market and lay the foundations for the development of blue economy in Ukraine remains poorly understood.

Finding out the specificities of problems and risk management in the various stages of green business in blue economy. Substantiation and disclosure of previous recommendations regarding the control and quality management of green production at the stage of its growth.

Green business (Sustainable business) or circular (non-exhaustive) business is an activity that has minimal adverse impact on the global or local environment, society or economy – a business that seeks to combine environmental, equitable treatment and economic success (*Wikipedia, 2019*[a]). Most green companies have progressive environmental principles and policies on human issues. A business is generally considered green if it meets the following four criteria:

• Is guided by the principle of "circulation" in making all its business decisions;

• Supplies environmental goods or services that replace the demand for non-environmental goods or services (*Kyiv International Economic Forum, 2018*);

• "Greener" than typical competitors;

• Has long been committed to environmental standards.

The Brundtland Commission (*Wikipedia, 2019*[b]) emphasized that the understanding of inexhaustibility rests on three pillars: people, the planet and profit. Circular business in its content aims to balance these three factors, using circular production and distribution in order to influence the environment, economic development and society (*Wikipedia, 2019*[c]).

In general, all types of businesses affect circulation in the context of world market and our planet in some sense. The development of a circular principle in business can be significant for the buyer, the investor, and it is also environmentally friendly. The circular business must meet the needs of the buyer and be environmentally friendly.

A scientist economist, a member of the Roman Club G. Pauli put forward his theory about the future of the latest economic development, the so-called "blue economy" theory. Her content was revealed in her research paper entitled "Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs". In her research, the scientist is devoted to the aspects of becoming an innovative economy in the context of the transition of society to sustainable environmentally sound development. G. Pauli argues that economic development and the restoration of environmental balance must be interrelated processes.

G. Pauli's scientific postulate is that "there is nothing superfluous in nature", so the rational use of resources at every stage of humanity's economic activity is necessary condition for humanity's competitiveness. "Blue economy" demonstrates how many environmental and environmental degradation problems can be avoided through the conservation of material resources and the adaptation of production processes to the laws of nature. G. Pauli gives examples of the interrelationship between nature and economy and points to the ways of harmonious environmental and economic development of society.

Based on the existing concept of green business, which is based on the principle of "circulation" and theory, regarding the future modern development of the economy, the so-called "blue economy" theory, it can be stated that their implementation in practice pursues the same goal, namely: a consistent and reasonable combination of economic and environmental development on a circular basis in business with complete satisfaction of the customer's needs.

For these reasons, we consider it appropriate to present the core of VI and VII technological frameworks that lay foundations for green business formation in blue economy, which are presented in Table 38.

Regarding the functions performed by green business, most of them relate to all possible lines of business. For example, setting prices for goods and services sold, conducting research and development work and creating innovative goods, methods and technologies, creating new jobs.

Functions specific only to green business entities include: meeting public needs for environmentally friendly products, protecting the environment, minimizing environmental-destructive environmental impacts, shaping the environmental awareness of society and its environmental culture, and preserving natural capital. It is the fulfilment of these functions that distinguishes green business in blue economy, among other areas of activity.

It should be noted that the functions that are inherent in all areas of activity in the green business are manifested in a more environmentally rational way. For example, efficient use of resources not only minimizes the amount of their use, but also is based on the choice of those resources, the use of which will have the least possible environmental impact (*Wikipedia, 2019*[a]).

Specific features of problems and risk management at the various stages of green business in blue economy are presented in Table 39.

Previous recommendations regarding the control and quality management of green production at the stage of its growth are presented in Table 40. The forms of manifestation of green production today are: eco-company; direct green entrepreneurship; production of environmental goods and services.

**Table 38 – The core of VI and VII technological strucrures that lay for green business in blue economy**

| Direction | Problems solved | Possible implementation options |
|---|---|---|
| 1 | 2 | 3 |
| *Characteristics of VI technological way* | | |
| Non-traditional energy | Reducing the burden on the environment, saving natural resources | Hydrogen energy, synthetic fuel, solar energy converters, closed-loop nuclear power plants, fast reactors, vortex heat generators |
| Information systems | Globalization of the world economy through partnership | Bioenergy, optics, quantum-vacuum computers, artificial intelligence, torsion communication systems |
| Biotechnology | A new level of well-being | Water purification, seafood desalination, modified agro-culture, disease treatment, cloning |
| Transport | Environmental safety, speed, efficiency | Underwater superliners, string transport, electric vehicles, aerospace transport systems |
| Ecology | Sustainable development | Waste-free and closed technological “circuits” |
| Materials | Durability, safety, reliability, efficiency | Nanotechnology, amorphous metals, memory materials, high-temperature superconductivity, torsional materials processing technologies |
| *Characteristics of VII technological way* | | |
| Cognitive and socio-human technologies. The main production factor is creative intelligence | “World vacuum control”. New forms of life on the planet. Constructing a new social reality | Fusion technologies, psi-technologies (advances in modern psychology that include new tools for human management), bioenergy, technologies related to morality and responsibility. This way is realized by means of hyper intelligence, hyper knowledge, hyper information, hyper communication. “Subconscious and mind games”. It is projected that there are 5 cognitive technologies: neuroimaging, cognotropic drugs, cognitive assistants, brain-machine interfaces, artificial sensory organs |

*Source: Krasnoshchekov, 2008; own experience*

**Table 39 – Characteristic features of problems and risk management at different stages of green in blue economy**

| Possible life-cycle options "green business (WB) – innovation market (RI) – new products (NP)" | Preliminary diagnosis for questions major problems and risks of GB |
|---|---|
| *1* | *2* |
| 1. WB growth is the embryonic state of RI – the technical idea of creating an NP | The problem is related to the need for rapid implementation of the technical idea and the emergence of NP in RI. The most significant risk is the mismatch of the expected and actual consumer response to the NP |
| 2. WB growth – crystallization of RI – technical idea of creation of state of emergency | The problem is the same, but time is limited. Main risks are events that can slow down the process of RI production (counterparties, internal inconsistencies) |
| 3. WB Growth – RI growth – technical idea of Creating an NP | The problem is the same, but the time resource is almost exhausted. Main risks are the same |
| 4. WB growth – RI saturation – technical idea of creating a NP | Technical idea was "late" |
| 5. WB growth – RI maturity – technical idea of creating a NP | |
| 6. WB growth – decline of RI – technical idea of creation of state of emergency | |
| 7. ST growth – embryonic state of RI – development of NP | There are no visible problems. There is a good chance for the successful development of the ST in the future. Main risk is the mismatch of the expected and actual consumer response to the NP |
| 8. WB growth – crystallization of RI – development of NP | There are no visible problems. However, the time resource for RI output is limited. Main risk is the same + events that can slow down the output of RI (counterparties, internal discrepancies) |
| 9. WB growth – RI growth – NP development | Main problem is the limited time resource for the NP to enter RI. Main risks are the same |
| 10. WB growth – RI saturation – NP development | Development is "late". It is obvious that there are problems in management: marketing "sleeping", organization of the basic processes "limping". Main risk is the deterioration of financial condition |
| 11. WB growth – RI maturity – NP development | |
| 12. WB growth – decline of RI – development of NP | |

(End of Table 39)

| *1* | *2* |
|---|---|
| 13. ST growth – embryonic state of RI – exit of NP to RI | Has a chance for successful development of the WB in the future. Main risk is the mismatch of the expected and actual consumer response to the NP |
| 14. WB growth – crystallization of RI – output of NP on RI | |
| 15. WB growth – RI growth – NP output to RI | Unbeatable/wonderful! There are no problems. Of paramount importance are the risks of an internal nature: will the company "drive" such rapid/rapid growth? |
| 16. WB growth – RI saturation – NP output at RI | Exit to RI NP "a little late". Underestimation of management. Difficulties with the financial state of the ST are possible |
| 17. WB growth – RI maturity – NP output to RI | The same, but financial problems can be more serious |
| 18. WB growth – decline of RI – exit of NP on RI | The exit of the NP at RI was too late. Obvious problems in management and marketing. Financial losses can be critical to the ST |
| 19. WB growth – crystallization RI – sales growth of innovation | The situation is quite promising for the WB. Main problem is to maintain a position in the emerging market. Main risks are actions by competitors |
| 20. WB growth – RI growth – NP sales growth | Fantastic situation! The problem is to save it. Risks of internal character are most clearly seen: in the part of the analysis of trends of development of RI, as well as the organization of the basic processes of ST |
| 21. WB growth – RI saturation – stable sale of NP | There are no obvious problems. Main risk is the financial loss that can occur if the ST "hangs" on RI with "old" product |
| 22. WB growth – RI maturity – stability of NP sales | The problem is the limited time available for "production upgrades". Most important are marketing risks as well as risks related to reorganization of internal processes |

*Source: Medvedeva, 2011; Wikipedia, 2019[a]*

**Table 40 – Previous recommendations regarding the control and quality management of green production at the stage of its growth**

| Possible options for the life-stage ratio "green production (DR) – innovation market (RI) – new products (NP)" | Previous recommendations |
|---|---|
| *1* | *2* |
| 1. WB growth is the embryonic state of RI – the technical idea of creating an NP | Develop a rigorous timetable of activities to ensure a rapid and efficient transition from a technical idea to a serial issue of an NP. Clearly motivate managers to implement the plan in terms of time and quality |
| 2. WB growth – crystallization of RI – technical idea of creation of state of emergency | |
| 3. WB Growth – RI growth – technical idea of Creating an NP | Mobilize all resources for organizing activities to bring the NP to RI |
| 4. WB growth – RI saturation – technical idea of creating a NP | Use a technical idea for a second product that addresses the needs of a more promising sector of RI (second market niche) |
| 5. WB growth – RI maturity – technical idea of creating a NP | |
| 6. WB growth – decline of RI – technical idea of creation of state of emergency | |
| 7. ST growth – embryonic state of RI – development of NP | Perform continuous analysis of the state of RI. Develop the program for the fastest and most effective product promotion |
| 8. WB growth – crystallization of RI – development of NP | Develop a timetable for activities that provide a quick and effective transition from product development to production. Clearly motivate managers to implement the plan |
| 9. WB growth – RI growth – NP development | Mobilize all resources to accelerate the exit of the NP in RI |
| 10. WB growth – RI saturation – NP development | Use the development for a second NP focused on the needs of a more promising sector of RI (other market niche). Reorganize the main processes |
| 11. WB growth – RI maturity – NP development | |
| 12. WB growth – decline of RI – development of NP | |

(End of Table 40)

| *1* | *2* |
|---|---|
| 13. ST growth – embryonic state of RI – exit of NP to RI | Continuous monitoring of the consumer response to the state of emergency and the state of RI. Develop a program for the fastest and most effective promotion of NP |
| 14. WB growth – crystallization of RI – output of NP on RI | |
| 15. WB growth – RI growth – NP output to RI | Analyse and refine basic processes. Pay more attention to discipline, responsibilities and responsibilities |
| 16. WB growth – RI saturation – NP output at RI | |
| 17. WB growth – RI maturity – NP output to RI | The same NP + modified to more promising sectors RI (other niche market) |
| 18. WB growth – decline of RI – exit of NP on RI | Reorganize the management system and main processes of the EE. Modify NP for a more promising sector of RI (other market niche) |
| 19. WB growth – crystallization RI – sales growth of innovation | To carry out constant analysis of the state of RI, and especially the actions of competitors. Ensure the readiness of the EE (in terms of organizing major processes) for its potential growth |
| 20. WB growth – RI growth – NP sales growth | Constantly analyse the state of RI. Ensure that the VP is ready to move to another product line or to another sector (niche) of RI |
| 21. WB growth – RI saturation – stable sale of NP | Develop a production upgrade program: move to another product line or to other sectors (niches) of RI |
| 22. WB growth – RI maturity – stability of NP sales | Implement the production upgrade program |

*Source: Medvedeva, 2011; Wikipedia, 2019[c]*

The first form of green production is the introduction of environmental management, which is mainly related to the administrative regulation of the enterprises in the country. As a result, the enterprise contributes to the reduction of environmental pollution, but as a rule, not at will, but in accordance with the requirements of laws and regulations or regulations of world organizations.

The peculiarity of the second form of green production is that, in addition to minimizing the harmful environmental externalities from production activities, the enterprise has managers and employees forming an ecological consciousness, which is based on providing environmental needs not only for the modern generation, but also for creating favourable living conditions for the future by minimizing the environmental impact of production over the long term.

The third form of green production is manifested when the company, at its own discretion, switches to energy-efficient, environmentally-friendly technologies for the production of goods and services and promotes environmental improvements through the use in the process of activity of methods and raw materials that minimize the environmental-destructive impact on the environment and lead to improved living conditions (*Lanovenko et al., 2013*).

Green technologies are production processes that are nature-friendly and produce a product that meets high quality standards. For example, the largest vehicle companies have turned their attention to hybrid and electric cars, eco tires and eco gasoline, which are still in high demand today. One should not ignore the fact that in these areas there is an active cooperation between business and science.

Scientists from different universities in the world are opening up new opportunities in the use of solar panels, growing organic crops and creating an “eco-culture” (*Yurinova, 2019*). Rating of the most promising green business ideas that allow you to join the environmental market and a basis for the formation of a blue economy in Ukraine is presented in Table 41.

Key features of the future patterns of development of the blue economy in Ukraine should be:

- Institutional order of cluster structure based on innovative hubs;
- Direct communication between its members;
- A collective way of creating innovation;
- An effectively functioning harmonization institute;
- Structure of production of V and VI technological structures.

The strategic priorities for the development of green production of innovative type in the course of R&D include: development of new technologies of energy transportation, introduction of resource-saving technologies, modernization of power plants and technological updating of the agro-industrial complex, high-tech updating of machine and instrument making, systematic modernization of health care.

**Table 41 – Rating of the most promising green business ideas that allow you to join the green market and lay the foundations for becoming a blue economy in Ukraine**

| Green business idea of green direction | The content and overall characteristics of green business idea that underlies blue economy |
|---|---|
| *1* | *2* |
| Eco-consulting services | Ideal for those who are well versed in green technology. Companies operating in the sector provide environmental expertise for residential buildings, office space, and are developing options for improving eco-equipment, ranging from energy-efficient technologies to waste management programs. In order to gain the trust of potential clients, you need to get a certificate, better international, that allows such activities |
| Bicycle repair | This service is in dire demand in a number of CIS countries. Not only the desire to preserve the environment, but also more rational arguments (high prices for gasoline, endless traffic jams and accidents) make citizens abandon cars. In addition, having ridden a bicycle about ten kilometres away, you do not have to go to the fitness room, so you can save money and burn calories, which will not be unnecessary. For these reasons, there is a need to open bicycle repair centres. |
| Cleaning of ventilation systems | Provides services that improve the energy efficiency of buildings. The fact is that dust and other small particles in any case enter the ventilation systems, but you can get rid of them. This may come in handy for a company that will show you how to save money on gas and electricity. Potential clients can certainly be allergy sufferers: they are always willing to pay a lot of money just to get rid of the allergens |
| Growing vegetables and fruits | This industry clearly demonstrates the desire of many to eat properly, favouring those fruits and vegetables offered not by large companies but by small farms. It is important that there are certificates that confirm that no chemicals were used when growing the crops. You should also be prepared for the approval of such activities to be agreed with the local authorities |
| Release of organic cosmetics | A real hit in today's market. Nowadays, girls and women are striving not only to be beautiful, using a huge amount of products every day, but also to want cosmetics to be safe for the skin. At the same time, most beauties simply do not have the time to prepare their own scrub or balm, so it is much easier to buy the finished product |
| Furniture restoration | A service that is not cheap but is of interest to many. The content of the service is to "revive" old furniture, which may have been inherited from grandparents and which are just so easy to say goodbye to |
| Eco-cleaning of the house | Actual service for people who are constantly employed. Cleaning up with clean, non-chemical cleaners is a difficult job, but it is essential for families with small children or allergic family members |

*Source: compiled by authors based on (Yurinova, 2019)*

### 4.3. Risks of investment activities of digital enterprises

Comprehensive development of a system of actions aimed at intensifying investment activities, effective use of investment potential, attracting investment in the real sector of the economy is an urgent problem for Ukrainian businesses that needs to be addressed. The fundamental importance, the diversity of the problem of identifying and minimizing risks of investment activities of enterprises necessitate the study of classification, assessment processes and features of risk management of investment activities, taking into account all factors of influence.

Investment activity is one of the key forms of economic activity of the enterprise. Opportunities for enterprise development and economic growth are largely determined by investment projects. The investment process is implemented and managed through the investment policy of the enterprise. Investment policy is aimed at the use and formation of investment potential, which, in turn, is the result of investment processes and is based on investment.

Risk is an integral attribute of a market economy. Every company strives to increase profits through optimal solutions and minimize risk. This requires risk assessment and forecasting.

Close attention to the problem of risk regulation of investment activities of the enterprise is due to the fact that the negative trends of its development pose a serious threat to the economic security of the enterprise. Irrational use of available investment potential hinders the dynamic and balanced development of the economy.

All investments involve some degree of risk. Risk is an important component in assessing investment prospects. Investors, making investments, consider less risk more favorable. The lower the investment risk, the more profitable the investment. However, the greater the risk, the better the return.

As investment risks increase, investors seek to increase profits to compensate for such risks. Each savings and investment product has different risks and returns. Differences include: how easily investors can get their money when they need it, how fast their money will grow, and how safe their money will be. Main factors influencing investment risks are shown in Table 42.

The investment policy of the enterprise is a complex set of measures that ensure a profitable investment of own, borrowed and other funds in investments in order to ensure stable financial stability of the enterprise (*Stolbov, 2016*). An integrated approach to risk management considers the relationship between different sources of risk and their impact on the overall business. Key word of modern risk management is the use of

**Table 42 – Factors influencing investment risk**

| Influence factor | Characteristics of the influence of the factor |
|---|---|
| 1 | 2 |
| Wrong decisions | Usually based on erroneous calculations |
| Terms of investment | Long-term investments are more risky than short-term ones because the future is not stable |
| Investment level | The larger the amount of investment, the greater the risk |
| Field of activity | Growing industries are less risky |
| Political, legal factors | Changes in government policy and legal statutes |

*Source: summarized by authors based on (Kolomiiets et al., 2016)*

probabilistic models (*Kolinko, 2019*).

Considering the scientific approaches to understanding the concept of "investment risk", we can conclude that it is associated with possible losses and deviations from the expected financial results of the investment project. Diverse classification of investment risks depending on the stage of investment policy, sources, areas of manifestation and factors of influence simplifies the process of identifying risks of investment policy of the enterprise and facilitates the choice of strategy to prevent, eliminate or minimize them.

Approaches to understanding the essence of "investment risk management" of the enterprise include three components (Figure 38).

For a balanced and sound implementation of risk management of investment activities of the enterprise, you need to go through several main stages:

1. Risk identification is the systematic identification and study of risks that are characteristic of investment activities. Dangers that pose a threat are identified; resources that may be affected; risk factors; loss, which expresses the impact of risk on resources.

2. Risk measurement – determining the degree of its probability and the size of potential damage. Use special methods of risk assessment based on the development of scenarios for its occurrence (*Shyshkin, 2018*).

3. Control is divided into physical and financial. Physical control is the use of methods that reduce the likelihood or extent of damage associated with certain costs. The rule is that the costs of the system of preventive measures to prevent risk and reduce losses should not exceed the possible amount of damage. Financial control of risk is to find sources of compensation for possible losses in cash. In the economic scientific literature there are several key areas of risk management of investment activities of the enterprise (Table 43).

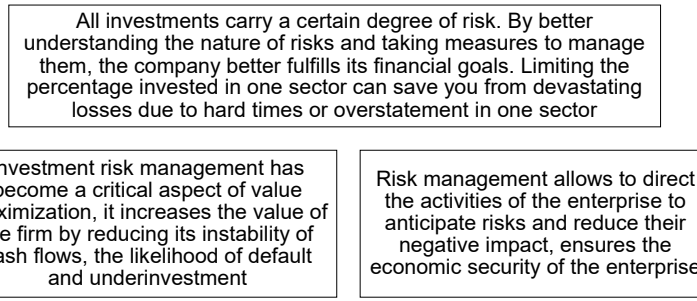


**Figure 38 – Scientific approaches to understanding the essence of "investment risk management"**

*Source: compiled by authors based on (Koroluak, 2019; Nymoshek, 2019; Mostenska, 2015)*

The peculiarity of risk management of investment activities of the enterprise is the relationship of stakeholders, because unexpected events affect shareholders, debt holders, managers, employees, customers. The basis of economic relations between these participants are special principles of risk management of investment activities of the enterprise (Table 44).

Starting the investment activity of the enterprise, in order to minimize the risks at the initial stages, it is necessary to determine the following aspects: planned time of receipt of funds, possible amount of funds for emergencies and debt coverage, security level for the enterprise, action plan in case of unsuccessful investments, acceptable level of investment reduction. To avoid risks or minimize their negative impact on enterprises, a whole system of methods for managing the risks of investment activities can be used (Table 45).

There are five main strategies for managing the investment risk of an enterprise.

*Strategy 1.* Allocation of assets. By including various asset classes (such as stocks, bonds, real estate, and cash) in its portfolio, an enterprise increases the likelihood that some of its investments will return satisfactorily, even if others equalize or lose value. Thus, the risk of large losses, which may be the result of excessive emphasis on one class of assets, is reduced. Asset allocation planning is the first step in managing investment risk. Most investors invest too aggressively when valuations are high and too conservative (out of fear) when deals are available. Calculating the probable maximum loss for the company will help determine what risk to take (*Fedorovych et al., 2018*).

**Table 43 – Areas of risk management of investment activities of the enterprise**

| Direction of risk management | Risk management measures |
|---|---|
| 1 | 2 |
| policies aimed at direct risk reduction | – redistribution or addition of resources;<br>– adjustment of calendar plan;<br>– conducting additional marketing research; |
| policies aimed at minimizing the possible negative consequences of risk | – insurance;<br>– attraction of co-investors. |

*Source: summarized by authors based on (Koroliuk, 2017)*

**Table 44 – Principles of risk management of investment activities of the enterprise**

| Principle | Characteristics of the principle |
|---|---|
| 1 | 2 |
| risk awareness | the company does not seek to avoid any risks in its activities in principle, and works with a level of risk that allows to ensure the expected profitability |
| controllability | availability of projects with managed risks, with the ability to use various tools to neutralize them |
| compatibility | compatibility of the level of accepted risks with the level of profitability |
| comparability | comparison of the level of accepted risks with the financial capabilities of the enterprise |
| accounting | accounting for a temporary factor in risk management; compliance with the company's policy in relation to the level of acceptable risk |
| taking into account the possibility of risk transfer | projects with a level of risk above the standard, but only if the probable financial losses can be shared with contractors |

*Source: summarized by authors based on (Yarovenko, 2015)*

*Strategy 2.* Diversification is the process by which an enterprise distributes money allocated to a particular asset class, such as inventories, to different categories of investments belonging to that asset class. Diversification with an emphasis on diversity allows for the distribution of assets. In a diversified investment portfolio, the yield on securities and stock prices will be different. Diversification reduces

(End of Table 39)

risk by combining investments that reduce the ratio of assets and is attractive to anyone who does not like risk and prefers a certain future rather than an uncertain one.

**Table 45 – Methods of risk management of investment activities of the enterprise**

| Method | Peculiarities of using the method |
|---|---|
| 1 | 2 |
| Risk transfer | the ability to transfer risk from one company to another on a contractual basis |
| Risk retention | availability of reserve funds that can cover the negative effects of risk |
| Risk avoidance | refusal to conduct financial transactions related to risk |

*Source: summarized by authors based on (Koroliuk, 2016)*

*Strategy 3.* Hedging is the purchase of a security to compensate for a potential loss on another investment. The purpose of hedging is to eliminate the uncertainty of future cash flows (both negative and positive), which will give a complete picture of future income and expenses arising in the process of financial or commercial activities (*Garmatii, 2019*). Main task of hedging – the transformation of risk from unpredictable forms to clearly defined. It aims to change the risk of interest rates, commodity and currency risks through derivative instruments.

Hedging aligns the incentives of managers with the interests of shareholders and increases their responsibility and self-awareness. Hedging improves the compensation of executive contracts and the evaluation of efficiency. Hedging helps to reduce the asymmetry of information between managers and shareholders about the source and extent of the risks faced by the company. Employees benefit from the practice of hedging because the security of their work is associated with the risk of bankruptcy (*Kolosivska et al., 2016*).

Individual investments can increase or decrease the price without any correlation with the market. This is a specific risk for an individual investment or a small group of investments. If a company has only one investment, its risk is extremely high. However, if the company has 15-30 investments, it “smoothes” its profits, reducing difference in portfolio returns. Hedging and insurance can provide additional ways to manage risk. In addition, hedging typically involves higher-risk speculative activities, such as short selling or investing in illiquid securities (*Hlushchevskii, 2017*).

*Strategy 4.* Investment evaluation. Even with the right distribution and diversification of assets, the choice of individual investment should be based on evaluation. Time estimates are a form of market timing for the investor. Valuation terms mean that the company has assets that provide a margin of safety. The required margin of safety will determine the probability of success of the enterprise. The greater the required margin of safety, the more likely it is above the average rate of return. Acquisition of investments without any, or even negative stocks, increases the probability of loss of investment capital. High-quality assets can be risky, and low-quality assets can be safe. It's just a question of the price they paid for them. Businesses should not try to stay ahead of the market and instead focus on buying assets at prices that will greatly increase the chances of a positive outcome for the company (*Boiko, 2017*).

*Strategy 5.* Investment restrictions. Investment limits can help a company ensure sufficient diversification of its investment portfolio and maintain an acceptable level of risk. Having a credit rating is an important condition of an open financial market and is used internationally: for regulatory purposes; when negotiating with the investor and raising funds and to improve the risk management systems of the investment environment. In determining its policy, the company may either accept the limits set by law or choose more restrictive limits. The recommended approach is to set one set of limits for all broad asset categories and then a separate set of limits for financial instruments (*Chuorina, 2014*).

Investment risks directly depend on changes in the investment climate, ie a set of economic, legal, financial, political and social factors. The investment climate is a complex market tool for optimizing the flow of investment. In order to determine the probability and amount of losses that characterize the magnitude (or degree) of risk, a risk assessment is performed. It is largely subjective and depends on the manager's ability to assess the situation and make decisions.

A step-by-step assessment of investment risks is determined for each stage of investment separately, and then they are summarized. The emphasis of risk assessment of investment activities of the enterprise is on the analysis of risk factors and uncertainty in development process (Table 46).

When assessing the effectiveness of investments, the calculation of the realized return on the portfolio and comparing the result with the selected baseline in this case is quantitative description of the behavior of the selected set of securities or any of the known stock bond indices (Standard & Poo's 500), published by leading consulting companies.

Global bond market indices include the Merrill Lynch Global Bond Index, Barclays Capital Aggregate Bond Index, and WorldBIG (*Holiubov, 2016*). Calculations require the conversion of future flows to the current

**Table 46 – Advantages and disadvantages of methods for assessing the risks of investment activities of the enterprise**

| Risk assessment method | Advantages of the method | Disadvantages of the method |
|---|---|---|
| *1* | *2* | *3* |
| Expert evaluation | Possible with a lack of information | The views of expert analysts may differ from those of practitioners |
| SWOT analysis | Simplicity, determination of influencing factors | Lack of dynamics in time, analytical assessment |
| Method of analogies | Used to assess the risk of re-investment | Difficulties in finding such an investment project |
| Adjusting the discount rate | Easy to calculate | Do not take into account the probability of deviation from the result |

*Source: authors' development*

period of time, but the calculations do not take into account the probability of deviation from the result, ie the degree of risk (Table 47).

**Table 47 – Scientific approaches to risk assessment of investment activities of the enterprise**

| Approach | Qualitative | Quantitative |
|---|---|---|
| *1* | *2* | *3* |
| Methods | • building an event tree<br>• construction of a fault tree<br>• identification of hazard indicators<br>• evaluation of points-factors | • decision tree<br>• sensitivity analysis<br>• script-based method<br>• method of statistical approach<br>• Monte Carlo method |
| Advantage | leads to a quantitative assessment, where the risk is assessed in value terms | simplicity of mathematical calculations |
| Drawback | complex processes of information processing and analysis | need for a large number of observations |

*Source: summarized by authors based on (Zaplitna, 2016)*

The qualitative approach begins with identifying risks at the planning stage and is based on the need for preliminary research to

gather information before analyzing the actual risks. The essence of a qualitative approach is to study the possible causes of risk and various criteria that contribute to the dynamics of risk. After assessing the expected damage at the last stage of the analysis, measures are prepared to combat the identified risks. A quality approach uses subjective values and is closely linked to investment conditions.

Quantitative approach is a numerical measurement of the impact of changes in factors. Investment risk analysis is based on the application of mathematical statistics, probability theory and other mathematical tools. Quantitative assessment is characterized by the use of unbiased conclusions, requires the proper use of mathematical analytical tools and is based on statistical samples and time series (Table 48).

**Table 48 – Quantitative methods for calculating the probability of risks of investment activities of the enterprise**

| Risk assessment method | Advantages of the method | Disadvantages of the method |
|---|---|---|
| *1* | *2* | *3* |
| Sensitivity analysis | • quick assessment<br>• modeling of different ways of project development: from negative to positive | • insufficient consideration of the correlation coefficient<br>• only possible scenario<br>• analysis of changes in parameters independently of each other |
| Script-based method | • accounting for the correlation coefficient<br>• study of possible project implementation options<br>• taking into account the relati-onships between parameters | • inability to predict all possible options and parameters of the external environment<br>• the need to select and process information for multiple forecasts<br>• limited number of variables |
| Statistical approach | • accurate for a long period | • inaccurate for a long period |
| Monte Carlo method | • high accuracy, analysis of socially significant projects | • simulation requires software |

*Source: summarized by authors based on (Tymoshyk, 2019)*

Risk assessment of investment activities of the enterprise is an important element of investment policy, regardless of the field of operation, effective implementation of which increases the profitability of

organization and its investment attractiveness and helps to successfully adapt to changes in the environment without significant losses. Telecommunications sector is particularly exposed to risks (Table 49).

**Table 49 – Risks of the telecommunications industry of Ukraine**

| Risk | Impact |
|---|---|
| ***1*** | ***2*** |
| Uneven distribution of radio frequency resource between operators | Limiting opportunities for competition in the market |
| High tax burden | Reduction of net profit of companies |
| Restriction of subscribers' freedom | The complexity of changing the operator |
| High levels of concentration and market barriers | Abuse of dominant operators by their own market power |

*Source: authors' development*

Today, market of communications and mobile communications in Ukraine is one of the most competitive and dynamic. By investing in the development of this industry, you can significantly expand not only their capabilities, but also increase the competitiveness of national economy.

The introduction of the 5G service in Ukraine is impossible without investment, so it is necessary to clearly assess the risks of investment activities (Table 50).

The introduction of 5G may require the purchase of a large number of frequencies, the cost of which, due to the low risk of testing mobile capabilities or investments, can pay off in decades. In order for the new technology to successfully focus on the path to consumers, it is necessary to create conditions for improving the country's economy, reducing the tax burden on the industry and its adaptation to European regulatory practices. For this purpose, several areas of investment by telecommunications companies are appropriate:

*1. Crown Castle International.* In order for all connected devices to work harmoniously, you need to create an infrastructure. Crown Castle International is a REIT that owns, operates and leases cellular towers and other wireless infrastructure. Tower and fiber network operators will be among the first beneficiaries of 5G, as telecommunications operators will improve network coverage and bandwidth. Crown Castle has a 3.5% dividend yield and is traded 22.3 times according to the FFO.

*2. Amdocs Limited (DOX).* Amdocs is a provider of customer experience solutions for customers in the telecommunications industry. Amdocs won the most innovative 5G strategy at Lighting Leading Lights

**Table 50 – Risks of investment activity of the enterprises of telecommunication sphere**

| Risk | Examples |
|---|---|
| ***1*** | ***2*** |
| Economic and legal | – Bureaucratic obstacles in the development of 5G networks<br>– Prohibition to transfer spectrum for use to third parties<br>– Changes in the approach to the definition and regulation of universal services, which include broadband access<br>– Unpredictable changes in the economy and legislation<br>– Suspension of investments from abroad |
| Socio-political | – Changes in the bill "On electronic communications"<br>– No license to implement 5G mobile communications<br>– Complaints of the population about the quality of services provided |
| Technological | – Lack of frequencies for the introduction of 5G technology<br>– Lack of technological and technical neutrality<br>– Lack of geographic surveys of networks and data updates once a year<br>– Lack of interaction between business and citizens with the regulator in electronic form |
| Financial | – Long payback period<br>– Consequences of inflation and stock fluctuations<br>– Occurrence of undesirable events in operational, administrative procedures<br>– Tax increases<br>– Market liquidity risk |

*Source: authors' development*

2019, and the company recently acquired TTS Wireless to further expand its 5G capabilities. Amdocs has zero debt and ROE is about 14%. The share has a 5.4% return on shareholders (dividends + share repurchase) and is traded with 18 times the free cash flow.

*3. Xilinx, Inc. (XLNX).* Xilinx is a leader in programmable chips that position the company well in key growth areas such as artificial intelligence, cloud computing, autonomous driving and the Internet of Things. In recent years, the company has increased R&D spending to position itself as a stable player in 5G communications. The stock fell more than 30% from its highest time in the spring. Management has issued conservative guidelines for next year, which have lowered expectations and created a better entry point for new investors. Operating margin fluctuates around 30%, and stock trading with 22 times free cash flow with a 5.6% return on shareholders.

*4. Qualcomm (QCOM).* Qualcomm manufactures digital wireless equipment and is the market leader in wireless chips. Qualcomm should benefit from a richer set of 5G phones and pricing, while most connected devices should lead to increased license sales. In early 2020, the company signed a multi-year agreement to supply chipsets with Apple, confirming Qualcomm's leadership in 5G modems. Qualcomm is highly profitable with an operating margin of 35% and a ROIC of 40%. Shares are traded at 16 times the free cash flow with a 5.0% return on shareholders.

*5. Verizon Communications (VZ).* Verizon is an integrated telecommunications company that now relies heavily on radio communications (70% of revenue). Verizon is focused primarily on 5G to ensure further growth. Multilevel pricing settings should increase the average revenue per user. Moreover, the potential for wireless connectivity for businesses from the development of industrial use is one of Verizon's greatest 5G capabilities.

Investment risks influence the choice of risk management strategy in order to achieve effective investment activities. The era of 5G is just beginning, so now is a great time to invest in 5G with the least risk and high return, without waiting for further development. Despite the fact that Ukraine does not yet have full coverage, the transition to 5G is inevitable. Even if operators delay 5G investments, they will need to increase infrastructure costs to cope with rising traffic.

Perhaps that is why Ukraine's telecom industry leaders are behaving much more frugally during this first phase of 5G deployment than in 4G. The BIS Research industry intelligence report "Global 5G Infrastructure Market – Analysis and Forecast 2019–2025" (*BISresearch, 2020*) shows that global 5G infrastructure market will grow by more than $ 42 billion by 2025. The market, which is projected to be estimated at $ 2.55 billion in 2020, is expected to grow at a CAGR of 75.09% over the period. Ukraine risks lagging behind other countries in the deployment of 5G mobile services due to strict regulation and weak investment.

Many elements of 5G technology are built in 4G networks, ie mobile operators can use an evolutionary approach to infrastructure investment. Yes, operators can start by upgrading the capacity of an existing 4G macro network by re-equipping part of their 2G and 3G spectrum or purchasing additional spectrum when they exist.

Thus, they can delay investment in 5G by evolving to LTE and LTE-Pro features. Although each technology cycle brings greater opportunities to mobile operators, it also requires greater investment in infrastructure. To get the most out of 5G, they need to understand how the network infrastructure and associated cost base will evolve over the next few years to develop an investment strategy that best meets their unique needs.

In the long run, 5G will be one of key technologies already known as the “Fourth Industrial Revolution”. By 2035, the IHS Markit study shows full global economic impact of 5G: goods and services worth about $ 12.3 trillion, will create about 22 million jobs. The network will add a staggering $ 3 trillion to global GDP. So, as a long-term investment, 5G technology is one of the safest bets you can make.

Investing in new technologies is an opportunity to become a market leader and realize significant benefits. The choice of investment project is a compromise between trying to make a profit and taking into account its risks in conditions of economic uncertainty. Unjustified risk can lead to loss of capital and market position, and in the worst case to bankruptcy.

The investment activity of telecommunication enterprises is focused on the introduction of technological innovations and the development of ICT, which is provided on the basis of continuous research activities. Financial support of investment activities is due to the accumulation of depreciation and net profit, the implementation of capital accumulation policy and the expansion of the reproduction of the resource base for future economic benefits (*Mashlii, 2017*). We propose to consider the risks of investment activities at two levels (Table 51).

**Table 51 – Characteristics of risk levels of investment activity**

| Telecommunication level | Local level |
|---|---|
| ***1*** | ***2*** |
| price dumping by main share of participants in the telecommunications market of Ukraine until 2018 | the need to simultaneously make significant investments both in increasing capacity and in developing the technical level of the communication network |
| divergent actions of the authorities in legal field of telecommunications of Ukraine | lack of a clear investment policy for capital investment |
| impossibility of business planning, due to strong variability of macroeconomic indicators, instability of the hryvnia | the dominance of self-financing policy with small amounts of own sources of financial support for investment activities |

*Source: authors' development*

Depending on the investment risk, you should choose the appropriate management strategy:

1. Risk transfer – assigning responsibility for risk to a third party, such as an insurance company (risk insurance).

2. Risk conservation – the risk still needs to be controlled, but no mitigation measures are in place.

3. Risk reduction – control of risk through actions that reduce the likelihood of risk or minimize its impact before it occurs.

4. Cessation of risk – changes in processes to completely eliminate the risk.

One of the basic problems of investment activity of telecommunication enterprises is the limited financial resources for investment, which is due to low income from service users, main reason for which is low effective demand in Ukraine and fierce price competition, where the tool of survival for a long time was lower prices.

These problems negatively affect the rate of penetration and spread of new generations of ICT in Ukraine compared to developed countries. Ukrainian telecommunications companies are unable to provide sufficient and timely investment. This creates the preconditions for reducing the efficiency of investment activities due to the “failure” effect in the implementation of previously technologically advanced solutions.

The experience of Ukrainian telecommunications companies shows that insufficient investment in the development of operating activities leads to the formation of the so-called technological lag, which threatens very existence of such enterprises in the market. In order to avoid such a scenario, the implementation of investment activities requires the main emphasis on the choice of investment areas.

The directions of investments accepted for realization should be able to provide not only modernization of a telecommunication network, but also to create a basis of its further perspective development taking into account rapidly growing needs in information transfer. It is important to study the international experience of operating and investment activities of telecommunications companies.

Investment projects should not be aimed at supporting their own current activities and solvency, but at large-scale modernization of the communication network and the development of ICT in general. The formation of financial support for investment activities at their own expense provides the least risk. However, such a policy slows down the pace of business development, as the real potential to raise funds in financial market is not used. This limits the broadening of the basis for future economic benefits.

At the same time, raising funds requires timeliness, because in the event of a technological lag, it will be difficult to provide financing for investment activities at the appropriate level, even with active raising funds, because the pace of technological cycles in telecommunications is constantly growing.

The introduction of the latest technologies by Ukrainian telecommunications companies is somewhat delayed compared to foreign ones. The world experience of telecommunication companies in the implementation of innovative technologies (*Verkholiak, 2018*) is the basis that will determine the further directions of development of operational activities and, accordingly, the directions and objects of their investment activities:

1. Development of the network in the direction of formation of technical and technological base for further differentiation of services provided by telecommunications companies and Internet of Things by combining different network standards.

2. Introduction of business models that provide targeted investment in network development to create opportunities for the implementation of range scenarios to meet customer demand, which is constantly changing under the influence of ICT development and expanding geographical presence of the telecommunications company.

The formulated directions will be implemented in the strategies of telecommunication enterprises, the segmentation of which depends on digital maturity of the enterprise. Main components of the strategy of telecommunications companies are the geographical scale, the level of digital ambitions and the contrast of growth priorities, maneuverability, organizational transformations to improve interaction with customers, the formation and regulation of their needs, product simplification.

As the telecommunications sector becomes more complex, it is necessary to balance investment directions. On the one hand, selective business models will allow you to implement targeted strategies and support targeted investments. On the other hand, the preparation of range scenarios in demand with certain levels of service and personalization will be crucial, as customer needs have a strong influence in the digital world.

One of the areas related to solving the problems of efficiency of investment management is the use of new tools for the formation of financial security, which have the availability and ability to determine the economic value of both individual investment decisions and the telecommunications company as a whole.

In addition, there is an urgent need to improve the practice of investment management, which is impossible without further development of the methodological basis for the formation of information and analytical support, organization, analysis, planning and implementation of investment activities, assessing the economic value of investment activities and monitoring.

General structure of investment risk management of telecommunications enterprises should be based on the life cycle of investment projects. Each stage of which is characterized by clear

results, their analysis and decision-making for the next stage. The progress of the investment project requires specific methods of work and adequate principles under a systematic approach.

In order to reduce uncertainty and minimize investment risks, it is necessary to exercise control during the implementation of each stage of the project with the possibility of correlation of management decisions after each stage. At each stage of the investment project implementation, it is necessary to implement such processes as initialization, planning, execution and closure, with the condition of control after each process.

Awareness of risks and an open culture for managing them will strengthen discipline and control, explain the difference between risk avoidance and acceptance, improve risk quantification tools, increase risk management responsibilities and facilitate timely detection of changes in the investment risk profile. Investment risk management can be improved by implementing the following proposals:

*1. Focus on the goals and participants of the investment project.* Investment risk management as a way to manage the expectations of investment project participants requires the company's management to change attention from assessing the actual results (plan, budget, etc.) to more active management of expectations of all investment project participants. Careful analysis of which should be the first step in the process of investment risk management. The main purpose of all investment risk management measures is to promote the implementation of organizational goals. Investment projects should reflect management's choice of the specific value they want to create for all participants in the investment project. The assessment of investment risks should be aimed at assessing the probability and extent of achieving the objectives.

*2. Comprehensive risk assessment.* The assessment of investment risks of the enterprise should not be one-sided. The analysis should include issues that may help achieve business goals (opportunities) and those that potentially hinder the achievement of goals (risks). The company's top management must coordinate risk management (events that may occur) and incident management (events that have occurred). Management must be convinced of the need for a proactive, comprehensive approach to both risks and incidents to ensure that business controls are in place.

*3. Focus on opportunities.* Analysis of investment risks of the enterprise should provide a balanced view of the future. Senior managers should prevent support functions from considering risk mitigation as a critical strategy. It is necessary to move to preventive control and better ways to overcome the risks than just strengthening control. Reviews of investment projects and their plans should be organized to establish the reliability of the existing control system to achieve these goals. Managers

should be encouraged to take advantage of risk management experts and internal auditors. The introduction of new business opportunities should be supported by a discussion of the risks associated with predicting often-promised results.

*4. Generalization of risks.* The management of a telecommunications company should require a single integrated report, thus expecting that many functions that provide this information will work together. The aim should be to form a common idea of how much the goals of investment activity have been achieved in the previous period and how much they are expected in the next period. Management should insist that those who provide information use modern tools and methods to analyze available business data. They should monitor the effectiveness of the control system and use continuous monitoring to identify irregularities and negative trends in a timely manner and to develop sound measures to minimize investment risks.

*5. Detailing of risk management processes.* Organizational leaders of the enterprise must insist on the existence of clear rules for the implementation of investment policy, which can actually be implemented in practice. The level of detail of these rules depends on such factors as management philosophy, maturity of business processes, industry practice, legal requirements. The activities of employees at each stage of the investment project must be complementary and clearly coordinated. If the company's management wants the rules to be taken seriously, it must be demonstrated that the violations must be appropriate.

The implementation of these changes will provide a strategic approach to investment risk management of the enterprise by expanding its application to all valuable sources, not just physical and financial. This approach provides effective reduction of investment risk and response to it, emphasizing the reduction of income volatility and minimizing the risk of uncertainty. In compliance with these recommendations, investment activity will be of strategic importance not only for the development of its own economic activity, but also for the development of ICT in Ukraine, its entry into the global information space.

Practical application of these proposals will help raise the management of investment risks of the enterprise to a higher level and will improve the ability to manage them in a business environment and the existing uncertainty. Continuous improvements in investment risk management will enable companies to accelerate their response to investment risks, reduce operating losses, provide integrated responses to interrelated risks, identify risks at their inception stage and improve capital utilization. Moreover, effective investment risk management, consistent with the pace of market changes, protects the reputation and image of enterprises and promotes confidence in the future.