

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**  
**UKRAINIAN-AMERICAN CONCORDIA UNIVERSITY**

School of Management and Business

*Department of International Economic Relations, Business & Management*

Bachelor's Qualification Work

**Artificial Intelligence and growth of future economies and business sectors**

(based on COMPANY OF ASSETS MANAGEMENT AND  
ADMINISTRATION OF PENSION FUNDS "AKTIV PLUS") case)

Bachelor's student of the 4<sup>th</sup> year study

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Ph.D. in Economics (or Doctor of  
Economic Sciences )

## **Annotation**

The work is devoted to the study of the role of artificial intelligence in personnel management on the example of a Ukrainian company in the insurance market. We have determined that it was artificial intelligence technologies that made a colossal breakthrough in personnel management, because today you can manage an entire corporation while sitting at your computer at home. We have studied the activities of the company and analyzed the level of use of innovative technologies in the implementation of various projects related to the activities of the company. As a result, we proposed a personnel management system based on artificial intelligence technologies, and its effectiveness was determined in detail.

**Keywords:** artificial intelligence, personnel management, insurance, innovative technologies, financial result, SAP

## **Анотація**

Робота присвячена дослідженню ролі штучного інтелекту в управлінні персоналом на прикладі української компанії на ринку страхування. Нами визначено, що саме технології штучного інтелекту зробили колосальний прорив в управлінні персоналом, адже на сьогодні можна упавляти цілою корпорацією сидічи вдома біля компютера. Нами була дослідженна діяльність компанії та проаналізований рівень використання інноваційних технологій при здійсненні різних проєктів пов'язаних з діяльністю компанії. В підсумку нами була запропонована ситсема управління персоналом, яка базується на ехнологіях штучного інтелекту, та детально визначена її результативність.

**Ключові слова:** штучний інтелект, управління персоналом, страхування, інноваційні технології, фінансовий результат, SAP

**PHEE-institute «Ukrainian-American Concordia University»  
School of Management and Business  
Department of International Economic Relations, Business and Management**

Educational level: **bachelor degree**  
Specialty: **292 “International Economic Relations”**  
Educational Program **“International Business”**

**APPROVED**

**Head of Department Prof. Liubov Zharova**



**TASK  
FOR BACHELOR’S QUALIFICATION WORK  
Mark Samarin**

Topic of the work: **Artificial Intelligence and growth of future economies and business sectors (based on company of assets management and administration of pension funds “Aktiv Plus” case)**

1. Supervisor of the work *Lesya Leshchii, Ph.D. in Economics.*

(surname, name, degree, academic rank)

Which approved by Order of University from “22” September 2022 № 22-09/2022-2c

2. Deadline for bachelor’s qualification work submission “23” April 2023

3. Data-out to the bachelor’s qualification work\_

*The information obtained from open sources, Internet resources, scientific articles, etc., as well as the actual data of the company obtained during the internship and its financial statements and other documents*

4. Contents of the explanatory note (list of issues to be developed).

***The following tasks had to be solved in the work:***

1. Define the essence of the concept of artificial intelligence and analyze the legal regulation of it at the international level
2. Determine the main trends in the development of the nanotechnology market as prerequisites for the development of artificial intelligence
3. Conduct business and financial studies at CAM & APF “AKTIV PLUS, LTD, explore the use of technology and innovation activities in this company
4. Develop a roadmap for building technology development in CAM & APF “AKTIV PLUS, LTD.
5. Determine the economic efficiency of key management activities in international level

5. List of graphic material (with exact indication of any mandatory drawings)

*The work presents and analyzes graphs and tables for the analysis of economic and statistical information about the company and its development, evaluation of the company's activities*

## 6. Consultants for parts of the work

Part of the project	Surname, name, position	Signature	
		Given	Accepted
1	<i>Lesya Leshchii, Ph.D. in Economics</i>	+	+
2	<i>Lesya Leshchii, Ph.D. in Economics</i>	+	+
3	<i>Lesya Leshchii, Ph.D. in Economics</i>	+	+

## 7. Date of issue of the assignment

## Time Schedule

№	The title of the parts of the bachelor's qualification work	Deadlines	Notes
1.	I chapter	<i>31.12.2022</i>	<i>In time</i>
2.	II chapter	<i>20.02.2023</i>	<i>In time</i>
3.	III chapter	<i>11.04.2023</i>	<i>In time</i>
4.	Introduction, conclusions, summary	<i>23.04.2023</i>	<i>In time</i>
5.	Pre-defense	<i>26.04.2023</i>	<i>In time</i>

Student \_\_\_\_\_ Mark Samarin \_\_\_\_\_



Supervisor \_\_\_\_\_


**Conclusions:**

*The work is devoted to the study of the role of artificial intelligence in personnel management on the example of a Ukrainian company in the insurance market. In the work it is studied the activities of the company and analyzed the level of use of innovative technologies in the implementation of various projects related to the activities of the company. It is proposed a personnel management system based on artificial intelligence technologies. In general, the work is sufficiently structured and reveals the topic, contains all necessary structural subdivisions. The international aspect of the development of Artificial Intelligence is not sufficiently emphasized in the work, but to some extent, this issue is investigated. In general, the work can be recommended for defense with a positive assessment.*

Supervisor \_\_\_\_\_



(signature)

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## Introduction

Artificial intelligence is a complex of related systems and technologies that are developing qualitatively and rapidly penetrating into various areas of human activity: stock markets, marketing and data mining, financial and credit risk management, industry, robotics, human resource management, recruiting, military affairs, medicine, music, publishing, etc. Earlier, we also noted that the creation and implementation of artificial intelligence systems and technologies is one of the main trends in the global economy. Today, they have proven to be an important part of the modern world, being able to integrate into many areas of our life and business. Promising companies are already using AI-driven recommendations and insights to drive business value and capture market share across multiple sectors and industries.

Even 20-30 years ago, only large companies could work on AI. They had access to powerful devices and technological infrastructure, to fast connections. A simple developer did not have access to colossal arrays of data in the public domain. And the lack of computing power greatly hampered research in the field of AI. Today, the most favorable conditions have been created for the development and spread of AI: modern infrastructure and the ecosystem have made it possible for artificial intelligence to start “thinking”, which is facilitated by huge amounts of memory, large data processing capabilities, cloud computing, high-speed fiber optic communication, the ubiquity of Wi-Fi and IoT.

The purpose of the thesis is to analyze the main trends in the artificial intelligence market and study the use of technology using the example of CAM & APF “AKTIV PLUS, LTD” in Ukraine.

According to this goal, the following tasks are set in the work:

1. Define the essence of the concept of artificial intelligence: concept, meaning, classification
2. Analyze the legal regulation of artificial intelligence at the international level

3. Determine the main trends in the development of the nanotechnology market as prerequisites for the development of artificial intelligence
4. Conduct business and financial studies at CAM & APF “AKTIV PLUS, LTD.
5. Explore the use of technology in CAM&APF “AKTIV PLUS, LTD.
6. Conduct an analysis of innovation activities in CAM&APF “AKTIV PLUS, LTD.
7. Develop a roadmap for building technology development in CAM & APF “AKTIV PLUS, LTD.
8. Determine the economic efficiency of key management activities

The object of the study is the conditions affecting the development of artificial intelligence and the activities of CAM & APF “AKTIV PLUS, LTD.

The subject of the study is to identify the main trends in the artificial intelligence market in modern conditions and to determine the prospects for the development of CAM & APF AKTIV PLUS, LTD in the pension market of Ukraine in the context of digitalization.

The work uses methods of scientific research: systemic, statistical, historical, comparative, scientific abstractions, induction, deduction, forecasting, analysis and synthesis.

The methodological and theoretical basis of the work is the development of Ukrainian and foreign scientists on the development of the artificial intelligence market, legislative and regulatory acts of the Verkhovna Rada of Ukraine, national statistics, financial data CAM & APF “AKTIV PLUS, LTD.

The information basis of the work is the data of the official website of the State Statistics Committee of Ukraine and the financial reports of CAM & APF “AKTIV PLUS, LTD. The work used the data of monographic and periodicals, materials of scientific and practical conferences.

## **Chapter 1. Theoretical foundations of the role of artificial intelligence in the global economy and trends in its development**

### **1.1. Artificial intelligence: concept, meaning, classification**

Recently, an important stage in the development of artificial intelligence has been the emergence of electronic systems. Such electronic systems are used in many industries, in particular in law, medicine, geology and, more recently, especially in the field of industrial production. All this emphasizes the spread and rapid development of artificial intelligence. But before defining this term, it is necessary to define the concept of “intelligence”. Intelligence can be called the ability of the brain to solve problems, including intellectual ones, by acquiring information from the external environment, checking it for reliability and interpreting it as knowledge, streamlining, accumulating and purposefully transforming the latter in the learning process, based on experience and adapting the brain to all kinds of circumstances. Based on this, the team of authors 1 also highlights the features inherent in artificial intelligence [1]. These features include the ability of the intellect to learn, generalize, accumulate experience (knowledge and skills) and adapt to changing conditions in the process of solving a specific problem. Therefore, the brain endowed with intellect is a universal tool for solving a wide range of problems (including non-formalized ones) for which there are no standard, previously known methods of solving. In general, there is no criterion for assessing the level of intelligence, if we talk about replacing human intelligence with artificial intelligence, so the level of intelligence is determined, for example, by assessing the level of intelligence by experts or by solving tests.

In order to solve any problem, it is necessary to draw up a sequential algorithm, that is, a certain scheme of actions for illuminating information, from already known (problem conditions) to conclusions (unknown).

Thus, it is possible to define artificial intelligence as a set of automatic methods and means of purposeful processing of information (knowledge) in



accordance with the experience acquired in the process of learning and adaptation in solving various intellectual problems [2].

There is another definition of artificial intelligence - this is the direction of computer science, the purpose of which is the development of hardware and software tools that allow a non-programmer user to set and solve their traditionally considered intellectual tasks by communicating with an electronic computer.

As you can see, the above concepts have differences, but they are the only ones in terms of the fact that the end result of such an activity is the solution of intellectual problems and self-improvement as a result.

Based on this, the existence of such a concept as artificial intelligence systems is obvious, which is a field of science and technology in which information, software, algorithmic and hardware complexes are researched, studied, designed and created, the results of which are similar to the results of the action of thinking mechanisms and communication processes. of a person, and they cannot be distinguished from the decisions made by human professionals, and natural communication of specialists in a given subject area is also carried out. That is, an artificial intelligence system is a certain system that imitates the process of human thinking on a computer. To create such a system, it is necessary to study the very process of human thinking, as well as highlight the main stages of this process and develop software tools that reproduce them on a computer.

They will identify four main areas of research in the field of artificial intelligence [3];

- Modeling on electronic computers of separate functions of creative processes (game problems, automatic proving of theorems, automatic synthesis of programs and algorithms, etc.);

- External intellectualization, that is, specialists have the ability to: a) search databases for the necessary documentary and factual information from their workplace with access to database networks; b) solve design, planning and management tasks for their formulation; c) using the knowledge about the subject area accumulated in electronic computers, to recognize and diagnose processes in

complex systems, make decisions, formulate action plans, put forward and test hypotheses, identify patterns in the results of observations, and draw a logical conclusion;

- Internal intellectualization of electronic computers associated with solving the problem of building new generations of electronic computers;
- The creation of intelligent robots, as in systems with artificial intelligence, intellectual work is focused on knowledge generated on the basis of information flows about the external environment and entering the on-board electronic computers (for example, mobile robots).

In the construction of artificial intelligence, two fundamentally different approaches are used, which are conditionally called algorithmic and self-education. In the first case, all the rules by which intelligence operates must be written manually, and in the second, an algorithm must be created that will learn on its own from some large amount of data and select these rules on its own. The advantage of working with "algorithmic" intelligence is that it will never do something it has not been programmed to do.

It should be noted that among researchers of artificial intelligence it is customary to distinguish between two types of it - weak and strong. The first assumes the possibility of performing only a narrow list of tasks. Examples of such systems are mobile applications for voice control Google Assistant, Alice and Siri, which allow you to give voice commands to the operating system and receive a clear answer, that is, these applications perform a certain list of functions. In contrast, strong artificial intelligence is capable of performing any human task, however, such an artificial intelligence system has not yet been created, but developments are being made in this direction.

In order to determine the ability of a machine to exhibit intelligent behavior equivalent to or indistinguishable from similar human behavior, Alan Turing, back in the 1950s a special test was developed. The essence of the test is whether the judge, based on the results of a conversation with one computer and with one person,

can correctly determine in which case the conversation took place with a computer, and in which case with a person [4].

So, artificial intelligence is an integral part of computer science, in which scientific and technical prerequisites are created for solving tasks using information processing systems that were previously associated mainly with human abilities. Thus, the idea of artificial intelligence is to ensure the ability of automatic systems to simulate high-level mental processes inherent in humans, such as thinking, judgment, language, pattern recognition, learning, emotions, creativity, etc.; as well as in the ability of artificial intelligence, analyzing the influence of what comes from outside and taking into account previous experience, highlight the most logical and correct solutions.

As a result of the recognition of artificial intelligence as a special field of science, it has been divided into two areas: neurocybernetics and "black box" cybernetics. The main idea of neurocybernetics is that the only object capable of thinking is the human brain, so any thinking device must somehow reproduce its structure. That is, the object of research is the structure and mechanisms of the human brain and, thus, neurocybernetics is focused on hardware-software modeling of structures similar to the structure of the brain. That is, the main task of neurocybernetics is the creation of elements similar to neurons, as well as their integration into functioning systems - neural networks [5].

As for the cybernetics of the "black box" and artificial intelligence, it does not matter here how exactly the "thinking" device is arranged - the main thing is that it reacts to given input interventions in the same way as the human brain. This area of artificial intelligence was focused on finding algorithms for solving intellectual problems on existing computer models. The purpose of work in this direction is manifested in the creation of algorithmic and software for computers, which allows solving intellectual problems no worse than a person [6].

However, today it is relevant to highlight the third approach, which involves the development of mixed intelligent systems, the interaction of artificial and natural intelligence. At the same time, it is important to reasonably distribute functions

between artificial and natural intelligence, as well as synergy between a machine and a person [7].

Thus, it can be stated that the history of the development of artificial intelligence began to emerge in ancient times and over the centuries the system of artificial intelligence has evolved from the syllogisms of Aristotle to automatic machines endowed with artificial intelligence that we see today.

## **1.2. Legal regulation of artificial intelligence at the international level**

The need for a supranational settlement of general issues related to the development and use of artificial intelligence, in order to avoid the adverse consequences of this, has been discussed for a number of years by both scientists and some developers, representatives of authorities of various states.

In January 2017, The Asilomar Conference on Beneficial AI was held in Asilomar (California, USA), organized by the Future of Life Institute (Boston), a research institute working to reduce the existential risks that humanity faces, including risks from the development of artificial intelligence. More than 100 well-known researchers in the field of economics, law, ethics and philosophy were participants in this conference, which resulted in the formulation of principles for research in the field of artificial intelligence (Asilomar AI Principles) [8]. Subsequently, several thousand more scientists, developers, entrepreneurs signed these principles and experts, including Stephen Hawking, Elon Musk, representatives of Google, Apple, Facebook, IBM, Microsoft, etc.

The process of coordinating positions continues. Under UNESCO (a specialized agency of the United Nations Educational, Scientific and Cultural Organization), an expert group was created to develop recommendations on the creation of ethical principles for the development and use of artificial intelligence. The group was formed following the results of the General Conference of UNESCO in 2019, the result of the work of the group was the approval at the next General Conference by the Member States of UNESCO (about 200 states) of

recommendations on the ethical aspects of artificial intelligence [9], this happened in November 2021. In this first global The Framework Agreement on the Ethics of Artificial Intelligence recognizes that artificial intelligence technologies can be of great service to humanity, all countries can benefit from them, but these technologies also raise fundamental ethical problems.

So, at the UNESCO level in 2021, the first global standard regarding artificial intelligence was adopted. The UNESCO Guidelines on the Ethical Aspects of Artificial Intelligence consider artificial intelligence as a technological system capable of processing data and information in a manner resembling intelligent behavior, typically including aspects such as reasoning, learning, recognition, prediction, planning and control.

So far, there are no multilateral international treaties - conventions adopted at the level of the United Nations, which would fix universally binding provisions regarding the regulation of artificial intelligence on a global scale. The creation of norms of international law of a universal nature, the effect of which would extend to all states of the world, is still ahead. Only separate documents have been adopted that contribute to the formation of the foundations of international legal regulation in the field of artificial intelligence and are advisory in nature, that is, there is a legal regulation in the form of "soft law", but the number of such documents is increasing, among them:

1. The Okinawa Charter on Global Information Society dated July 22, 2000, which was signed by representatives of the eight leading world powers - the G8.

2. Recommendations on artificial intelligence of the Organization for Economic Cooperation and Development - OECD (OECD Council Recommendation on Artificial Intelligence) dated May 22, 2019 [10] as the first intergovernmental standard on artificial intelligence.

This document includes five principles and five recommendations for national governments. About 40 states are members of the Organization for Economic Cooperation and Development, including the countries of the European Union, the USA, Canada, Australia, Japan, Turkey, etc.

### OECD Principles on Artificial Intelligence:

- Artificial intelligence should benefit people and the planet, stimulating sustainable development and increasing prosperity;
- Artificial intelligence systems should be designed in such a way as to respect the rule of law, human rights, democratic values and diversity, they should include appropriate guarantees, for example, the possibility of human intervention, if necessary, to ensure a fair social order;
- There should be transparency and responsible disclosure of information about artificial intelligence systems so that people understand and challenge decisions based on artificial intelligence;
- Artificial intelligence systems must function reliably and safely throughout their entire life cycle, there must always be an assessment and management of potential risks;
- Legal entities and individuals developing, implementing or operating artificial intelligence systems should be responsible for their proper functioning in accordance with the above principles.

The document contains general recommendations for national governments on the development of artificial intelligence:

- Promote public and private investment in research and development to stimulate innovation in robust artificial intelligence;
- Promote the accessibility of artificial intelligence ecosystems through digital infrastructure, technologies and mechanisms for data and knowledge sharing;
- Provide a policy environment that will pave the way for the deployment of robust artificial intelligence systems;
- Provide people with the opportunity to acquire skills in the field of artificial intelligence and support workers for a fair transition to work in a new environment;
- Collaborate across national borders and economic sectors to progress in the responsible management of trustworthy artificial intelligence.

In 2020, the OECD launched the AI Policy Observatory [11] platform, which provides information on the regulation of artificial intelligence in various countries around the world.

Statement of the G20 Ministerial Statement on Trade and Digital Economy of June 9, 2019 [12], in which, on behalf of the member states of the so-called G20, the principles for the development of artificial intelligence, taken from of the previous document - Recommendations on Artificial Intelligence of the Organization for Economic Cooperation and Development (as an annex to the statement) Among the countries participating in the G20: USA, China, Germany, France, Italy, Great Britain, Australia, Canada, Japan, etc.

The text of this document contains, among other things, points about:

- Working together to create a sustainable and innovative global society (point 6);

- Designing and implementing digital policies capable of maximizing the benefits and minimizing the challenges associated with the development of the digital economy, with particular attention to developing countries and vulnerable groups (point 7);

- The need to build a digital society based on trust between all stakeholders, including governments, civil society, international organizations, scientists and business, through the exchange of common values and principles, including equality, fairness, transparency and accountability, taking into account the global economy (point 11);

- Recognition of the need for anthropocentrism in the development of artificial intelligence and taking into account the risks of new social problems, including changes in the labor market (point 19);

- The need to continue to promote the protection of confidentiality, personal data, while recognizing the need to promote the capacity building of artificial intelligence (point 20);

- Recognizing that governance in the digital age must be not only conducive to innovation, but also innovative, without losing legal certainty. Compatible

standards, structures and regulatory cooperation can help in this regard. International policy, as well as participatory national policy formulation, play an important role in addressing a wide range of societal issues and facilitating discussions on how best to include technology in the pool of policy instruments (point 23);

- Supporting the exchange of best practices among the G20 countries and the work of relevant international organizations in order to familiarize themselves with the best approaches and directions for technological innovation (point 24).

If 2019 was the year when countries signed up to the internationally agreed AI Ethical Principles included in the OECD and G20 AI papers, then 2020 was the year the international community began to move towards solving how to make ethical AI a reality by evaluating risks of artificial intelligence in terms of impact on human rights, in order to set standards and regulate the design, development and use of artificial intelligence systems depending on the risk.

With the help of the above documents, by 2021, global goals and objectives for the development of artificial intelligence technologies were formulated. In the coming years, the construction of international legal regulation will be activated at the expense of international organizations: the range of platforms on which an international position on artificial intelligence is formed is expanding.

The process of creating norms of international law in this area is being hampered, because the major players in the global market are not only states, but also transnational corporations. It is in the interests of large development companies not to rush to create a "hard law" that will restrict them. According to a number of legal scholars, such as Professor of Law at the College of Europe, Adviser to the European Commission and member of the Commission on Data Ethics of the Government of Germany Paul Nemitz, there is a clear conflict of interest between corporations and society [13].

Nevertheless, at international discussion platforms where possible options for regulation are discussed, there will be a gradual transition from agreeing on basic ethical principles to agreeing on a common regulation model, after which it will be



possible to talk about the formation of a full-fledged international legal regulation on the issue of artificial intelligence.

### **1.3. Trends in the development of the nanotechnology market as prerequisites for the development of artificial intelligence**

Nanotechnologies continue to influence almost all sectors of the world economy [14], primarily electronics, energy production and storage, computers, telecommunications and information technologies, medicine and healthcare, chemical and biological technologies. Power engineering (PEI), that is, companies engaged in the production of machinery and equipment for the production, transmission and storage of electrical energy, oil and gas and mining equipment, can stimulate additional and differentiated demand for nanotechnology and nanotechnology products.

We propose to consider the total cost of the nanotechnology market and assess its scale (Fig. 1.3).

As can be seen from Figure 1.3, the global nanotechnology market is growing in positive dynamics and at a rapid pace, since it is modern technologies that are one of the global drivers for the development of world technology, which have been integrated into all industries, simplifying their processes.

World market leaders are USA, Europe and Asia-Pacific. The US leads both in terms of commercial market size and the number of publications (about 25,000) and patents in the field of nanotechnology (45% of patents).

The distribution of spheres of influence in the field of nanotechnology, according to the US NanoBusiness Alliance, is already underway and will be completed by 2030 (see Fig. 1.4).

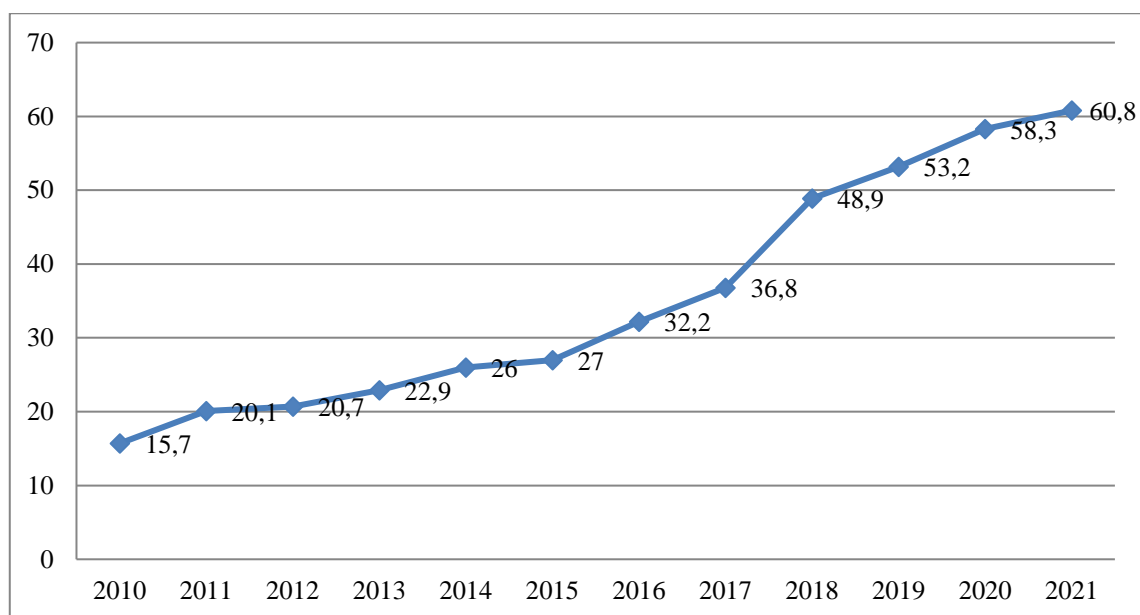


Figure 1.3 - Dynamics of the value of the nanotechnology market for the period 2010-2021, billion dollars USA

Source: [15]

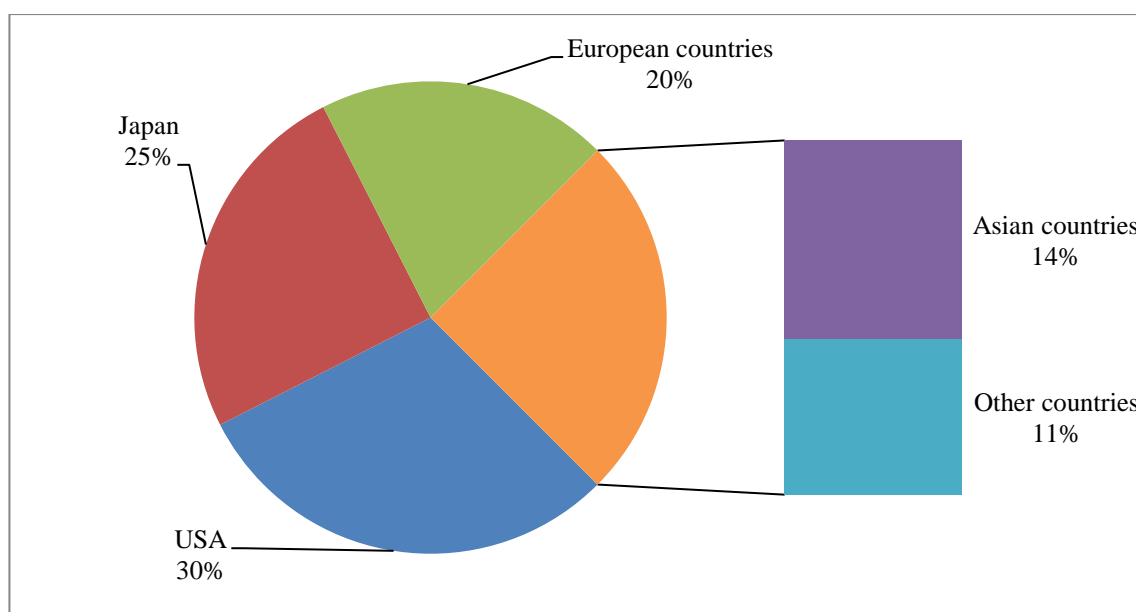


Figure 1.4 - The structure of the nanotechnology market by country as of 2021, %

Source: [16]

As for the areas of nanotechnology, the leader in this sector is the production of nanomaterial's, which are used in the automotive industry and construction. In second place is electronics and third is healthcare (see Figure 1.5).

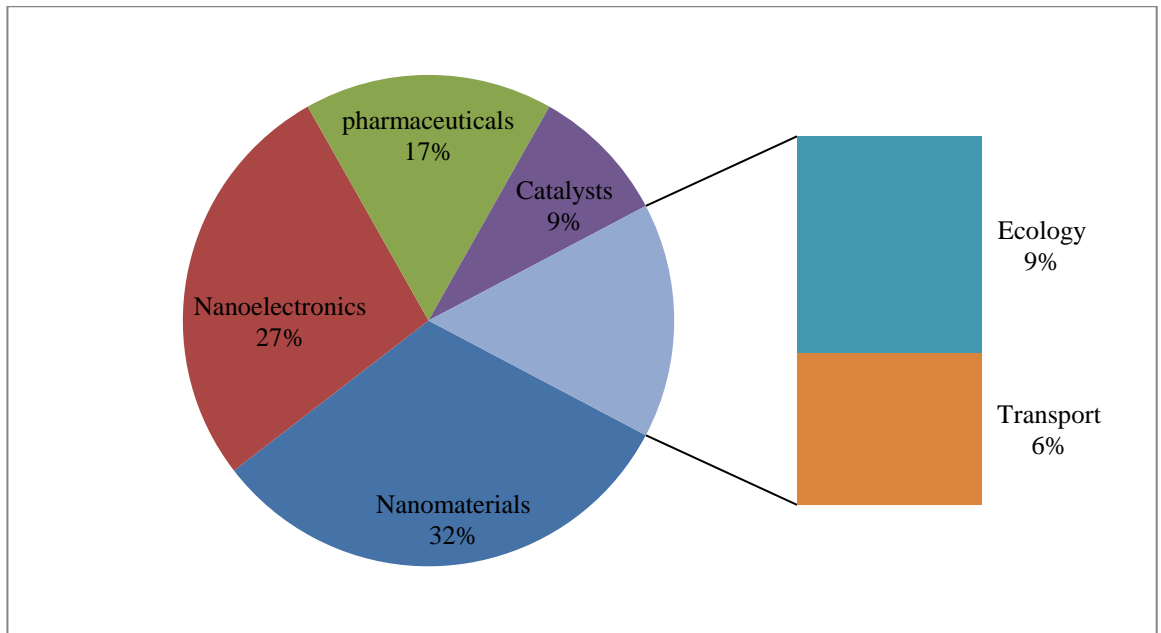


Figure 1.5 - The structure of the nanotechnology market by industry as of 2021, %

Source: [16]

There is a growth trend for companies in the nanotechnology sector, which is on average 30-40% higher than the dynamics of the global market as a whole.

The demand for nanotechnologies in all industries of the world is evidenced by the constantly growing volume of investments made both by private investors (corporations and funds) and at the expense of state budgets. The United States remains the world leader in public investment in nanotechnology through the end of 2018. The cumulative investment of the National Nanotechnology Initiative (NNI) since fiscal year 2001, including the request for 2018, exceeds US\$25 billion. In addition, since 2004, more than \$1.1 billion has been invested in support of small businesses related to nanotechnology. USA within the framework of specialized programs of authorized federal bodies. The President's 2019 budget includes approximately \$1.4 billion for NNI implementation to ensure continued investment in basic research, early applied research, and technology transfer.

More detailed dynamics of investments in the development of world technologies is shown in Figure 1.7.

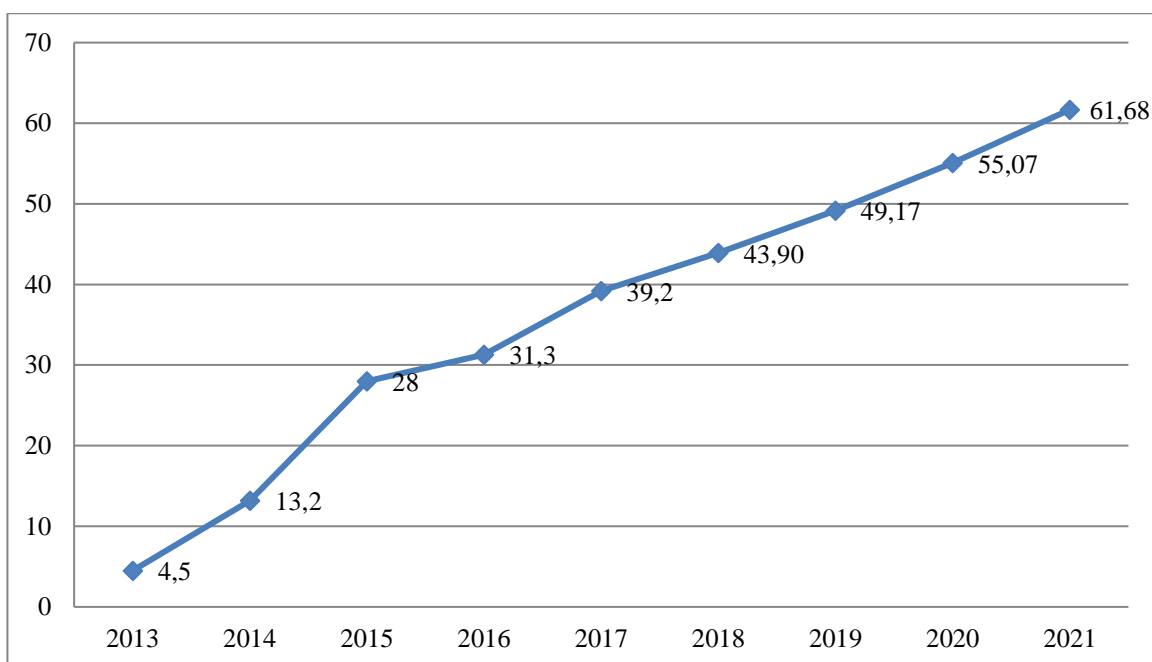


Figure 1.7 - Dynamics of investments in the development of nanotechnologies for the period 2013-2021, billion dollars USA

Source: [15]

The result of the active development of applied research in the field of nanotechnology is the continued growth in the number of patents: in 2019, the number of international patents for nanoobjects, nanotechnologies and nanoproducts reached 189,000, which are 31,000 more than in 2018. The largest national players in this market are China (more than 88,000 nanotechnology patents), the USA (86,000 patents), Japan (25,000 patents) and South Korea (22,000 patents). Over the past 20 years, more than 620,000 patent applications have been filed in the field of nanotechnology [16]. The ranking of the leading countries in terms of the number of nanotechnology patents registered with the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO) at the beginning of 2021 can be seen from Table 1.1 below [17].

Table 1.1

## Highest Patent Activity by the EPO and the USPTO in Nanotechnology by Country, 2020

European Patent Office			United States Patent and Trademark Office		
Country	Quantity	Rank	Country	Quantity	Rank
USA	856	1	USA	4343	1
Germany	355	2	South Korea	887	2
Japan	318	3	Japan	640	3
France	288	4	China	520	4
South Korea	251	5	Taiwan	427	5
Great Britain	114	6	Germany	309	6
Switzerland	103	7	France	236	7
China	90	8	Saudi Arabia	162	8
World	2,908		CBIT	World	

Source: [16]

The most common nanomaterials on the world are graphene, fullerenes and other carbon nanostructures, materials with nanolayer and cluster-fractal structure, metal oxide nanoparticles, nanocomposite coatings, and some others. In table Table 1.2 shows the characteristics of modern world patent activity in relation to individual nanomaterials (including those mentioned above), which are widely used by power engineering companies.

Table 1.2

### US Patent and Trademark Office Nanotechnology Patent Activity for Selected Nanomaterials as of 2020

Nanomaterial	Nanotechnology patents in USPTO		Nanotechnology Publishes Patent Applications in the USPTO	
	Quantity	Rank	Quantity	Rank
Nanotubes	1306	2	1541	3
Graphene	1099	3	1594	2
Nanocomposite	516	5	692	6

Continue table 1.2

Quantum dot	505	6	763	5
Nanoporous materials	254	11	330	9
Fullerene	188	12	213	13

Source: [16]

The large-scale opportunities for the industrial application of nanotechnologies determine the prospects for growth in market share. According to a new research report by Industry ARC, the global nanotechnology market size was \$60.8 billion as of 2021, and the market demand will grow at a compound annual growth rate (CAGR) of 13% during the forecast period from 2011 to 2021 [16].

The global nanotechnology market is expected to exceed US\$125 billion by 2024. In terms of components, nanomaterials occupy the largest share of the global nanotechnology market, with nanoparticles accounting for 85% of the global nanomaterials market. Nanotools account for the second largest share of the global nanotechnology market, with nanodevices accounting for the smallest market share. The top three areas of application of nanotechnology are electronics, energy and biomedicine, which account for more than 70% of the global nanotechnology market.

Thus, the stable and rapid growth of the nanotechnology market, the expansion of the use of nanomaterials and cost reduction, along with the increase in global energy consumption, are the key factors that encourage nanotechnology companies to carry out technological upgrades aimed at achieving increased production efficiency.

However, the factors hindering technological re-equipment in the energy sector include the following: lack of funds, lagging behind in the processes of standardization, metrology and certification in terms of the pace of development of nanotechnologies, insufficient interest of companies against the backdrop of a decrease in the production of machinery and equipment for the energy sector in some countries, including the United States

**CHAPTER 2. Analysis of CAM & APF “AKTIV PLUS, LTD economic performance and evaluation of implamatation of its artificial intelligence**

## 2.1. Study of economic activity and financial state at CAM & APF “AKTIV PLUS, LTD

As part of the pension reform, starting from January 1, 2018, for the appointment of a pension at the age of 60 years, an insurance period with current accumulation is required.

These changes took place after the entry into force of the 2019 reform, in accordance with Art. 1 part 26 of the Law of Ukraine "On Compulsory State Insurance" dated January 1, 2019, the right to a pension (Table 2.1).

Table 2.1

### Insurance experience required for retirement by age

Retirement period	Age		
	60 years	63 years	65 years
From January 01, 2019 to December 31, 2019	At least 26 years old	16 to 26 years old	From 15 to 16 years
From 01.01.2020 to 31.12.2020	At least 27 years old	17 to 27 years old	From 15 to 17
From 01.01.2021 to 31.12.2021	At least 28 years old	18 to 28 years old	From 15 to 18
From 01.01.2022 to 31.12.2022	At least 29 years old	19 to 29 years old	From 15 to 19
From 01.01.2023 to 31.12.2023	At least 30 years old	20 to 30 years old	Between 15 and 20
From 01.01.2024 to 31.12.2024	At least 31 years old	21 to 31 years old	From 15 to 21
From 01.01.2025 to 31.12.2025	At least 32 years old	22 to 32 years old	From 15 to 22
From 01.01.2026 to 31.12.2026	At least 33 years old	23 to 33 years old	From 15 to 23
From 01.01.2027 to 31.12.2027	At least 34 years old	24 to 34 years old	From 15 to 24
Starting from 01/01/2028	At least 35 years old	25 to 35 years old	Between 15 and 25

Made by the author using source data [17, 18]

It should be noted that thanks to the funded system, citizens will be more dependent on personal labor and financial contributions, but will not depend on the demographic situation in the country, wages and the subsistence level, which, of



course, is a positive result.

Thus, the main strategic directions for improving the pension reform are the introduction of changes in the demographic composition of the population; the percentage of SDRs when accrued for each entrepreneur separately (for a group of individual entrepreneurs by type of activity); open your deposit account on the accumulative system in the public domain; give pensioners the opportunity to work (improve their knowledge in practice, give them the opportunity to work with modern equipment, programs); determine the timing of the introduction of the second level and the age category of participants; establish and activate the work of the pension organization; show the population confidence in the reforms of the Pension Fund.

Thus, the need for a gradual transformation, modernization and reform of the pension system with an increase in the role of the funded system led to the creation of CAM & APF “AKTIV PLUS, LTD

CAM & APF “AKTIV PLUS, LTD.” is a private pension fund located in Kyiv [19].

CAM & APF “AKTIV PLUS, LTD was established in 2004, and the company began its main activities in December 2005 with the opening of the first office in Kyiv, and subsequently developed dynamically.

It should also be noted that CAM&APF “AKTIV PLUS, LTD” operates on a common taxation system, as the company is engaged in the resale of goods with a small margin (less than 15%). This taxation system has a number of advantages, first of all, taxes are paid not from income, but from profit, calculated as the income of the entrepreneur minus the expenses incurred to obtain these incomes.

The organizational structure of CAM&APF “AKTIV PLUS, LTD” is shown in Figure 2.1.

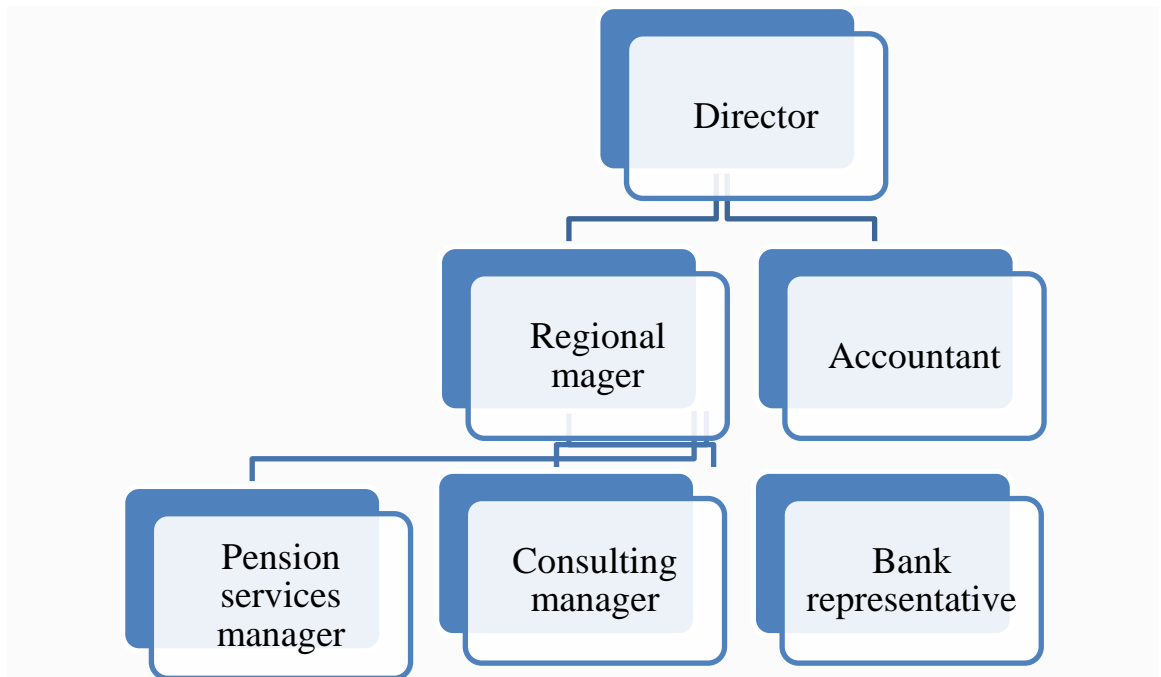


Figure 2.1 Organizational structure of CAM & APF “AKTIV PLUS, LTD  
Source: [19]

Thus, we can see that the organizational structure of the fund is a linear management structure.

It should also be noted that this organizational structure has a number of significant advantages, namely: a clear system of unity of command - one leader concentrates in his hands the management of the entire set of processes that have a common goal; a clear system of mutual relations between the functions of departments; clearly defined responsibilities; quick response of executive departments to direct instructions from management, etc.

CAM & APF “AKTIV PLUS, LTD has an independent balance sheet, settlement and other bank accounts, a round seal, a stamp, letterheads with its name, trademark and brand name, emblem and other attributes. The company uses modern computer technology and uses software to automate accounting, analytical and control work, such as: 1C: Accounting 8.2, M.E.Dok, Microsoft Office 2010, etc.

For the economic properties of the company under study, it is advisable to calculate the main characteristics of the economic activity of CAM & APF “AKTIV PLUS, LTD.

Financial analysis allows you to assess the current state and prospects of the financial situation in the enterprise, the dynamics of its development and choose a strategy for sustainable development in the future.

The financial results of CAM&APF “AKTIV PLUS, LTD for 2020-2022 are shown in Table. 2.2.

Table 2.2

## Financial results of CAM&amp;APF “AKTIV PLUS, LTD” for 2019-2021

Indicator	Year			Change, +/-		Change, %	
	2019	2020	2021	2020/ 2019	2021/ 2020	2020/ 2019	2021/ 2020
Net income from the sale of services, thousand UAH	96124	109005	131750	12881	22745	113,4	120,9
Cost of goods sold, thousand UAH	59314	70540	86176	11226	15636	118,9	122,2
Gross profit, thousand UAH	36810	38485	45574	1675	7089	104,6	118,4
Other operating income, thousand UAH	265	1733	1394	1468	-339	654,0	80,4
Administrative expenses, thousand UAH	6202	7462	8766	1260	1304	120,3	117,5
Sales expenses, thousand UAH	25253	27860	34177	2607	6317	110,3	122,7
Other operating expenses, thousand UAH	1805	2897	3330	1092	433	160,5	114,9
Financial result from operating activities, thousand UAH	3815	1979	695	-1836	-1284	51,9	35,1
Other financial income, thousand UAH	41	39	474	-2	435	95,1	1215,4
Other income, thousand UAH	9	2	23	-7	21	22,2	1150,0
Financial expenses, thousand UAH	964	639	893	-325	254	66,3	139,7
Other expenses, thousand UAH	7	21	0	14	-21	300,0	0,0
Financial result before taxation, thousand UAH	2894	1360	299	-1534	-1061	47,0	22,0
Income tax, thousand UAH	-521	-245	-54	276	191	47,0	22,0
Net financial result, thousand UAH	2373	1115	245	-1258	-870	47,0	22,0

\* Made by the author according to the source [19]

An analysis of the financial results of CAM & APF “AKTIV PLUS, LTD” for 2019-2021 showed that the reduction in profits is too strongly influenced by distribution costs, which spend almost all of the income received.

The business should review these costs and adjust them so that the business does not incur losses.

In general, the financial condition of LLC CAM & APF “AKTIV PLUS, LTD today is stable, as evidenced by a number of financial indicators today. We will analyze financial indicators in more detail in table. 2.3

Table 2.3

Analysis of the financial condition of LLC CAM & APF “AKTIV PLUS, LTD for the period 2019-2021

Main indicators	Years			Relative deviation, %	
	2019	2020	2021	2021/ 2019	2021/ 2020
1	2	3	4	5	6
<b>1. Analysis of the property status of the enterprise</b>					
1.1. Fixed assets depreciation rate	0,3	0,32	0,38	0,08	127,86
1.2. Fixed asset usability ratio	1,36	1,47	1,61	0,26	119,11
<b>2. Analysis of the financial stability of the enterprise</b>					
2.1. Financial autonomy ratio	0,31	0,24	0,3	-0,01	96,53
2.2. Dependency ratio	3,2	4,15	3,31	0,11	103,6
2.3. Equity capital flexibility ratio	1	0,68	0,72	-0,28	72,1
2.4. Debt concentration ratio	0,67	0,75	0,68	0,01	101,89
2.5. Financial stability ratio	1,16	1,13	1,19	0,03	102,32
2.6. Financial stability ratio	0,31	0,24	0,3	-0,01	96,53
<b>3. Analysis of liquidity</b>					
3.1. Total (current) liquidity ratio	1,16	1,13	1,19	0,03	2,32
3.2. Absolute liquidity ratio	0,54	0,26	0,36	-0,18	-33,16
3.3. Quick ratio	1,15	1,13	1,16	0,01	0,95
<b>4. Analysis of the profitability of the enterprise</b>					
4.1. Return on total equity	0,67	0,5	0,55	-0,12	81,97
4.2. Return on equity	0,11	0,1	0,03	-0,08	24,13
4.3. Gross profitability of products sold, services rendered	0,04	0,04	0,01	-0,03	20,42
<b>5. Analysis of business activity</b>					
5.1. Asset turnover ratio	0,03	0,03	0,01	-0,03	23,3
Continue table 1.3					
5.2. return on assets ratio	6,44	7,62	10,06	3,62	156,14
5.3. Working capital turnover ratio	1,05	0,77	1,15	0,1	109,41

5.4. Working capital turnover period	342,61	466,86	313,15	-29,46	91,4
5.5. Inventory turnover ratio	61,09	68,86	23,07	-38,02	37,76
5.6. Period of one inventory turnover (days)	5,89	5,23	15,6	9,71	264,83
5.7. Accounts receivable turnover ratio	3,56	1,92	3,23	-0,33	90,79
5.8. Duration of repayment of receivables.	101,07	187,54	111,32	10,25	110,14

\* Made by the author according to the source [19]

Analyzing the above table, we can say that the depreciation rate of fixed assets increased in 2021, which led to an increase in the shelf life ratio.

Coverage ratio (current liquidity ratio) during 2019-2021 It was more than 1 and was within the minimum standard value. However, there is a positive upward trend, so, in 2020, the value of the indicator was 1.19. The obtained values indicate a positive state of solvency, because there are enough circulating assets to meet current liabilities. As a result, for LLC CAM & APF “AKTIV PLUS, LTD this leads to increased confidence in the company on the part of credit institutions, suppliers, investors and partners.

The total profitability of CAM & APF “AKTIV PLUS, LTD services in 2021 compared to 2019 decreased by 18% and amounted to 55% of the company's net profit. Considering the data on the calculations, we can conclude that an unjustifiably high level of administrative costs, an increase in production costs of production significantly affect the level of profitability, making the enterprise less attractive to investors.

Thus, economic and operational performance shall be certified by a steady growth and development of CAM & APF “AKTIV PLUS, LTD and make it a success, not only in Kyiv, but in Ukraine.

## **2.2. Investigation of the using technologies in CAM & APF “AKTIV PLUS, LTD**

The legal basis for the introduction and development of public electronic services in Ukraine The concept of development of the system of electronic services in Ukraine for 2016-2020 [20]. This document lays down the foundations of state policy in this area and provides for an appropriate set of measures for their implementation.

The digitalization of the activities of CAM & APF “AKTIV PLUS, LTD” is expressed in the provision of electronic services to citizens in the field of pensions and keeping records of persons subject to compulsory state social insurance. CAM & APF "AKTIV PLUS, LTD" on the site has its own portal of electronic services provided to them by categories of recipients: pensioners, insured persons and policyholders.

A prerequisite for accessing and receiving state electronic services in CAM & APF AKTIV PLUS, LTD is the use of electronic identification tools for individuals and legal entities. Availability and reliability are important for electronic identification tools. Among Ukrainian citizens, mobile identification services are the most common, it is the simplest means of electronic identification, in addition, all implemented state electronic services already by default contain the ability to enter government websites using MobileID or BankID.

In the absence of an electronic signature for registration on the portal, you must contact the territorial body CAM & APF "AKTIV PLUS, LTD" and fill out an application for registration (the application can also be printed from the website, filled out and brought to the territorial body of the Pension Fund), having a passport and identification code

If you have an electronic digital signature, you do not need to visit CAM & APF “AKTIV PLUS, LTD”, registration is carried out through the portal. The CAM & APF "AKTIV PLUS, LTD" electronic services portal provides that in the future it will be possible to log into your personal account not only using an electronic digital signature, but also using an electronic pension certificate. The system unites all providers of electronic identification services: electronic signature, BankID, MobileID.

By order of CAM & APF “AKTIV PLUS, LTD”, a survey was conducted among Ukrainian citizens on the introduction of electronic services of the Fund. The survey data was published on February 14, 2020 on the website of the Pension Fund of Ukraine. The results of the study show that about 60% of Ukrainian citizens are aware of the services implemented by CAM & APF “AKTIV PLUS, LTD” over the past years.

Analyzing the services of CAM & APF “AKTIV PLUS, LTD” available online, at first glance, it seems that there is no need to visit the territorial offices of CAM & APF “AKTIV PLUS, LTD on your own, wasting time in queues, since you can order and receive the service online. However, in order to receive the service in an online format: firstly, you must have computer and Internet skills; secondly, to obtain an electronic digital signature, since without this a number of services on the web portal are not available. You can order the service, however, according to the result of the service, you will have to go to CAM & APF “AKTIV PLUS, LTD; thirdly, in the absence of an electronic digital signature, you must contact the fund department to obtain a login and password from the web portal for initial registration as a service user.

To improve the state of implementation and functioning of electronic services of the Pension Fund of Ukraine, it is necessary:

- conduct a study of the use of CAM & APF “AKTIV PLUS, LTD” electronic services among citizens in order to identify the most popular services and problems that citizens face in the process of using the web portal;
- to develop a program and introduce training courses for the population in order to improve the computer literacy of citizens on the use of electronic services CAM & APF “AKTIV PLUS, LTD.

Quarantine has given impetus to the development of electronic services. It forced even the principle supporters of the traditional way of filing documents to turn to online and stimulated all authorities without exception to pay even more attention to online services.

Electronic services and open data help overcome the human factor, queues, and corruption. In this direction, CAM & APF “AKTIV PLUS, LTD has made significant progress in recent years - it has launched many important services of its own web portal for all categories of people served by the Fund.

The process of implementing information technologies in CAM & APF “AKTIV PLUS is characterized by a number of problems, primarily related to the low level of funding for e-government projects from the state, insufficient knowledge in the use of digital technologies and their capabilities by older citizens, the habit of paper documents, disinterest civil servants in the transparency of their activities and their corruption schemes. To eliminate this number of problems, it is necessary not only to stimulate the use of new information and communication technologies in public administration, but also to change the system itself (Table 2.4).

Table 2.4

SWOT analysis of the use of digital technologies in CAM & APF “AKTIV PLUS” in the provision of pension services to the population

<i>Strengths</i>	<i>Weaknesses</i>
<p>democratization of the pension sector on the openness and transparency of the activities of public administration entities and increasing the level of confidence of citizens and society in the bodies and institutions of public administration</p> <p>reduction of corruption among civil servants and officials of public administration bodies</p> <p>reducing the number of errors that employees can make in the course of their activities, through the automation of certain management processes</p> <p>great savings in resources such as time, money and personnel</p>	<p>use of information not for the intended purpose of especially personal data located in information and communication systems</p> <p>cybercrime, which can lead to blocking the work of public authorities</p> <p>possible disclosure of confidential information</p> <p>insufficient number of educated personnel and there should not be proper state provision of office equipment in representative offices</p> <p>dependence on one server, since in the event of a breakdown, the entire established database may disappear</p>



<i>Opportunities</i>	<i>Threats</i>
<p>reducing the level of corruption in government bodies</p> <p>improving the image of our state in the field of information and technological development</p> <p>improving computer literacy and culture of our citizens, employees and officials</p> <p>creation of a unified information and communication system that unites all the main public management services.</p> <p>growth in the level of education, scientific, technical and cultural development of citizens and the state as a whole</p>	<p>high price and complexity of implementing individual transactional services and regulations</p> <p>there is no full-fledged legal basis for the smooth operation of state institutions with information in electronic form, which would provide a legislative basis for the practical elimination of the problem of media gap</p> <p>insufficient number of highly qualified civil servants in state institutions;</p> <p>low level of salaries of civil servants, which does not motivate knowledge to perfect mastery of computer technologies</p> <p>possible information wars and information espionage</p>

Source: created by the author

The main prospects for the development of digital technologies in CAM & APF “AKTIV PLUS” in the provision of pension services to the population of our state are:

- Reducing the level of corruption in government bodies, the transition to electronic work will allow auditors to trace all corruption schemes of civil servants, since paper can be recycled, but an electronic document that is in the public domain is almost impossible.

- Improving the image of our state in the field of information and technological development. Ukraine will be able to reach the level of economically developed states and be known in the world not only "as one of the most corrupt countries in Europe", but also as one of the technologically savvy.

- Increasing computer literacy and culture of our citizens, employees and officials. Since more than half of the population is not computer savvy, the transition to digital control will be one of the key pushes to acquire these skills.

- Creation of a unified information and communication system that unites all the main public management services will simplify not only the work of CAM & APF “AKTIV PLUS” employees, but also the life of citizens.

- Growth in the level of education, scientific, technical and cultural development of people and the country as a whole.

The web portal CAM & APF “AKTIV PLUS, LTD” is a unique opportunity for every Ukrainian to control their salary and pension without looking up from a personal computer monitor. After all, the user has access to the full list of policyholders who submitted information about him to the personalized accounting system, information on the amounts of earnings from which insurance premiums were paid, the number of days for the length of service for each month starting from 2000.

So, the technical progress today has reached an amazing level, and this does not require arguments. Computer technologies, artificial intelligence, nanotechnologies, the development of virtual reality are gradually and constantly changing the realities of life of every ordinary Ukrainian, although not visible to everyone, especially the elderly. However, the vast majorities of them skillfully use mobile phones and master smartphones, are actively involved in social networks and pay utility bills at bank terminals.

### **2.3. Analysis innovation activities in CAM & APF “AKTIV PLUS, LTD**

The innovative activity of CAM & APF "AKTIV PLUS, LTD" is a complex process of creating, using and disseminating innovations in order to gain competitive advantages and increase the profitability of their production. In a market economy, the innovative activity of enterprises is one of the most important factors that allow an enterprise to occupy a stable market position and gain an advantage over competitors in the area that is the area of commercial interests of CAM & APF “AKTIV PLUS, LTD”.

That is why the next study that we will conduct will be an analysis of the dynamics of indicators of innovation and investment activity of CAM & APF “AKTIV PLUS, LTD” (see Table 2.5).

Table 2.5

Dynamics of indicators of innovation and investment activity of CAM & APF "AKTIV PLUS, LTD"

№	Indicators	Optimal value	2019	2020	2021	Change +/-	
						2021/ 2020	2020/ 2019
1	Investment activity ratio	Increase	0,004	0,011	-	-	0,007
2	Share of innovative products	Increase	-	-	-	-	-
3	The share of new technology in the total cost of machinery and equipment	Increase	20%	22%	31%	9%	2%
4	ROI Index	>1	-	-	-	-	-

Source: created by the author

From the data in Table. 2.5, the following conclusions can be drawn: the investment activity ratio in 2020 increased by 0.007 compared to 2019. This indicates an increase in investment in the total share of the company's assets. However, in 2021 the situation changed dramatically: there were no investments in this period, which is negative.

The share of new equipment in the total cost of machinery and equipment has a positive growth trend from year to year, so in 2021 this indicator increased by 2% compared to the previous one.

As a result, we propose to give a description of the based innovative technologies (Table 2.6)

Table 2.6

Characteristics of implemented CAM & APF "AKTIV PLUS, LTD" in 2020-2021 the latest information technologies and services

Technologies, services	Characteristics	
Servicing citizens on the principle of a single window in the "front offices", processing documentation in the "back offices".	Servicing citizens at the level of territorial communities and agency points.	Provides automation of processes from applying to the appointment and payment of a pension, the rejection of paper archives, the prevention of overpayments and duplication of payments, servicing citizens regardless of their place of residence and registration.
Electronic circulation of pension documentation	A single environment for interaction of all information systems CAM & APF "AKTIV PLUS, LTD" has been created	The ability to receive data from the personalized accounting system when recalculating pensions online, conduct analytical processing of data on pensioners and insured persons, forecast income and expenses of CAM & APF "AKTIV PLUS, LTD", etc.
Modernized Register of Insured Persons	The card of the insured person has been introduced, which significantly expands its information and functionality capabilities CAM & APF "AKTIV PLUS, LTD"	Formation in a single card of information on the condition and status of the insured person, simplification of the system for the provision of social insurance services, coordination of social information.
Centralized system for assigning and paying pensions based on an electronic pension file	Implementation of uniform standards of service for citizens, regardless of place of residence	Ensuring full automation of CAM & APF "AKTIV PLUS, LTD" functional processes, improving the quality of service to citizens, reducing service time.
Electronic pension certificate	Introduction of a single personalized card for receiving pension payments and personal identification.	Increasing the level of control and protection of personal data, increasing control over the payment of pensions.
Modernized WEB portal of CAM & APF services "AKTIV PLUS, LTD"	Expanding the functionality of the web portal of electronic services CAM & APF "AKTIV PLUS, LTD"	Providing an opportunity for pensioners and insured persons, using an electronic digital signature, to remotely view information on the payment of contributions to CAM & APF "AKTIV PLUS, LTD" through the web portal of their electronic pension file.

Source: created by the author

To introduce new information technologies, the CAM & APF "AKTIV PLUS, LTD" computer equipment park was updated by 10%, and the software update made it possible to create electronic pension files containing pensioner's documents in electronic form, which are the basis for determining the right to a pension and its size : work book, certificates of the special nature of the work, wages and other documents.

The long-term tasks envisaged by the Modernization and Development Strategy of CAM & APF "AKTIV PLUS, LTD" include: the introduction of innovative technologies by integrating the information resources of the Fund and the creation of a centralized system of analytics and financial management, the introduction of technology for individual mass electronic informing of citizens, the transition to electronic document management.

According to our research at CAM & APF "AKTIV PLUS, LTD", innovation is an exceptional phenomenon rather than a planned one. The introduction of innovations in the enterprise is the responsibility of the director and other employees (who wish to) who wish to contribute to the development of CAM & APF "AKTIV PLUS, LTD".

## **CHAPTER 3. Strategic ways to improve development of artificial intelligence in CAM & APF “AKTIV PLUS, LTD**

### **3.1 Roadmap to build technologies development in CAM & APF “AKTIV PLUS, LTD**

To date, information technology has completely taken over our lives and more than half of the population of Ukraine simply stopped going to physical stores and sells online. That is why, as for building the technological development of CAM & APF “AKTIV PLUS, LTD”, it is proposed to switch to online trading in pension services. To do this, it is necessary to analyze the e-commerce market and introduce an SMM manager to the staff of CAM & APF “AKTIV PLUS, LTD”, who will sell pension services through social networks and online.

Ukraine occupies not the last position in the speed of penetration of Internet technologies and, based on the statistics of the Internet Association of Ukraine, in our country more than 21.6 million users use the Internet, which is more than half of the inhabitants of our country [21].

Let's start with the development of the e-commerce market in Ukraine. According to the Experts of the Internet Association of Ukraine in 2020, the growth of the online commerce market continued at a frantic pace, mainly due to the Coronavirus epidemic, which gave impetus to the freezing of digital elements for many companies and people in particular. In 2021, further growth of the e-commerce market in Ukraine is predicted; this is due to the positive dynamics of the increase in Internet consumption by companies and the population of Ukraine. The Coronavirus epidemic pushed Ukrainian consumers to purchases via the Internet and, accordingly, increased the popularity of online trading among the inhabitants of our state

According to the official statistics of Ukrainian sites, about 67% of Ukrainian Internet users visit sites related specifically to the field of e-commerce. E-commerce has become the most dynamic in the last two years, when physical stores have been

replaced by online ones, the main advantage of which has been low price and home delivery (Fig. 3.1).

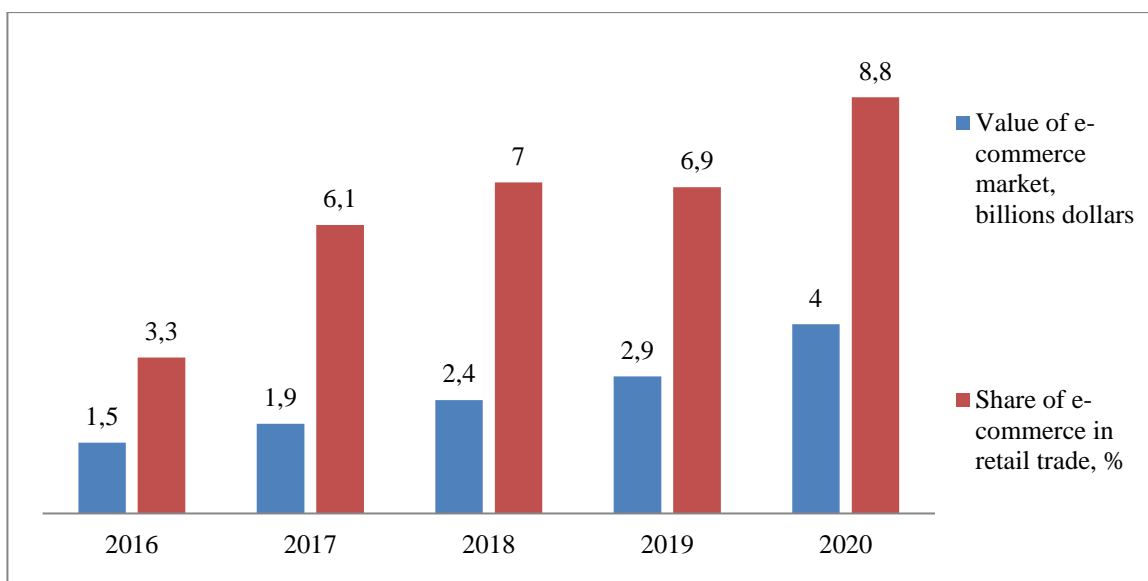


Figure 3.1 - Dynamics of e-commerce and its share in retail trade in Ukraine for the period 2016-2020

Source: [22]

Next, we will analyze the main marketplaces of Ukraine, the most visited by Ukrainians (Fig.3.2)

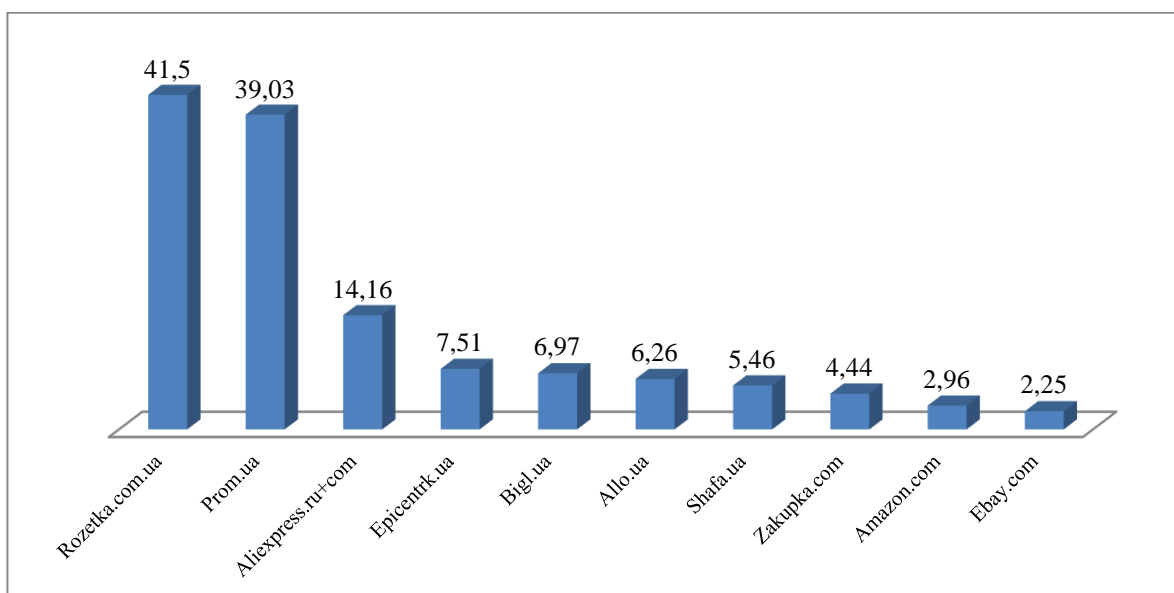


Figure 3.2 - Number of visits to marketplaces by Ukrainian buyers as of July 2020, million people

Source: [23]

As we can see from Figure 3.2, the most visited marketplace among Ukrainians is the Rozetka online store, the next in the ranking is the Prom website and closes the top three among AliExpress marketplaces.

According to the study, we can safely say that the development of marketplaces in Ukraine is quite powerful. It is also worth noting that the market is surprisingly young and with an underdeveloped level of competition that exists in other markets. Therefore, we can conclude that there are more than enough prospects for business development, and in order to effectively master this niche, a marketing strategy should be implemented, the so-called special plan for entering the marketplace.

Based on the analysis of the main trends in the development of e-commerce and marketplaces in Ukraine, we can determine the following long-term prospects for the subjects of this business:

- 1) The constant increase in users on the Internet greatly expands the possibilities for attracting consumers of goods and services;
- 2) The consciousness of consumers is changing every day towards a commitment to the introduction of information technology in all spheres of life, and in particular the implementation of transactions via the Internet;
- 3) The subject of the marketplace constantly has the potential to expand by covering new market segments and attracting other segments of the population;
- 4) Management of an enterprise providing services is not limited by time or space.

If we are talking about the short-term prospects for the development of the marketplace in our country, then this, of course, is the improvement of the legislative and regulatory framework and taking the experience of foreign trading platforms and adapting them to the conditions of electronic commerce within Ukraine.

The second event with the improvement of the level of technology in CAM & APF "AKTIV PLUS, LTD" is the creation of the specialty of an SMM manager, that is, to hire a person who will work with Internet communities and his main task will be to attract people's attention to the brand that he promotes and convert them at



clients.

At the initial stages, we suggest starting with advertising from social networks, which today are one of the most effective marketing tools. As you know, the visitors of this hotel are suchansi people who spend almost all their free time on social networks.

SMM refers to a set of measures aimed at using social media as channels for promoting and solving other business problems [24], in other words, it is the process of attracting traffic or attention to a brand or product through social platforms.

Today, a very small percentage of Ukrainian hotels have this tool in their arsenal of marketing tools [25,26].

Many of our Internet users have already experienced the effectiveness of this method of promotion. After all, SMM is actively used by advertisers from countries both near and far abroad.

One of the main advantages of SMM is that when using it, it becomes possible to influence the target audience with the most appropriate means of communication, choose platforms and services where the required contingent is represented to the greatest extent. At the same time, users who are not interested in certain advertising are minimally affected.

It should be noted that SMM is used not only in relation to goods and services, but is also actively used by the media. Mass media create accounts on social networks, post their content and collect subscribers (readers of their product).

SMM provides for a large number of different methods of activity, among which the most popular are:

- building brand communities in different social media;
- work with blogs;
- personal branding;
- reputation management.

Another advantage of SMM is the relatively low financial costs, with the exception of advertising in the most social media, which is necessary in most cases only at the initial stages of development. Since in the future promotion will occur

due to a large number of subscribers (loyal customers who follow the company through social media).

The main work that an SMM manager performs in order for the CAM & APF “AKTIV PLUS, LTD” brand to be known in social networks:

1. Regularly fill brand pages with content - that is, daily add new posts to Facebook and Instagram pages with interesting articles and photos that will be involved in the activities of CAM & APF “AKTIV PLUS, LTD, for example, photos of updated services, argue that we We are constantly improving our services and the company has a large number of visitors, which indicates its good work.

2. Demonstrate the benefits of the product - that is, the benefits of the service that a person can receive, it is possible to demonstrate the advantages of a private pension fund compared to a public one and highlight its key advantages. Today, having your own website is especially relevant and such a marketing move will help CAM & APF “AKTIV PLUS, LTD” win new customers.

3. Find the target audience - as you know, CAM&APF "AKTIV PLUS, LTD" is engaged in the sale of pension services to the population and the main task of the SMM manager in this direction is to find key clients who will become clients of the Fund in the future.

4. Promote the brand - constantly focusing on the benefits of working with CAM & APF "AKTIV PLUS, LTD" and the benefits that registration in the pension fund will bring, for example, a post about the Fund's existing projects with customer feedback on the quality work of the CAM & APF "AKTIV" team PLUS LTD.

5. Communicate with users and make them your customers - the SMM manager must know everything about the companies and be able to convince potential customers to come and order pensions from CAM & APF “AKTIV PLUS, LTD”, providing a full consultation on the process of applying for a pension and paying contributions.

6. Manage the reputation of the brand - "AKTIV PLUS", the SMM manager needs to take care of the company's reputation by creating publications about its social responsibility (for example, on Saturday, the company's employees decided

to clean up the park in the city and, accordingly, make a short post about it on social networks).

The main cost of implementing an SMM manager in CAM & APF “AKTIV PLUS, LTD” is his salary, which on average in the labor market ranges from UAH 10,000 to 12,000. The work of an SMM manager at the enterprise under study is shown in detail in Fig. 3.3

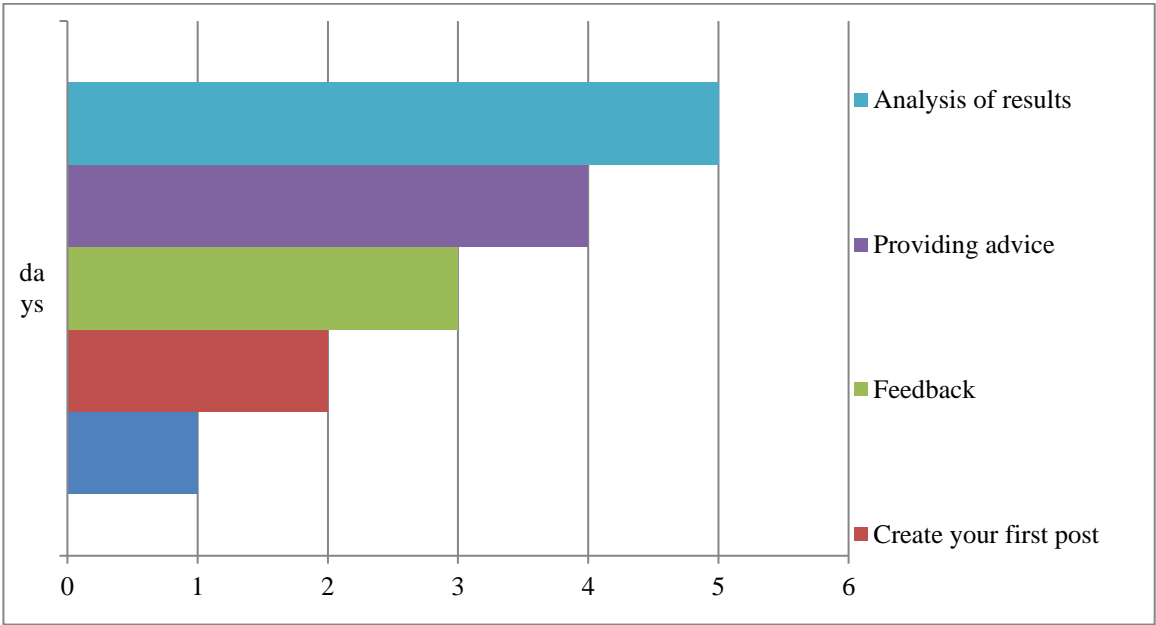


Figure 3.3 Analysis of the weekly work plan of the SMM manager in CAM & APF “AKTIV PLUS, LTD

Source: created by the author

The specialty of an SMM manager is necessary for CAM & APF "AKTIV PLUS, LTD" in terms of building its reputation in Kiev and promoting it through social networks, which are extremely popular today, which in turn will affect the growth of the image of CAM & APF "AKTIV PLUS, LTD and its recognition in the market.

Creating a position of SMM-manager in CAM & APF “AKTIV PLUS, LTD” has the following advantages:

- 1. Increasing the number of sales through effective communication with customers through social networks.

2. Popularization of the CAM & APF “AKTIV PLUS, LTD” brand, since today many people learn information through the Internet and social networks.

3. Increase the number of subscribers and, accordingly, persons who can advertise CAM & APF “AKTIV PLUS, LTD and its services free of charge among their friends and acquaintances.

4. Increase income, by creating posts on social networks and the number of subscribers, sales can also increase, directly proportionally affecting the income of CAM & APF “AKTIV PLUS, LTD.

We also propose to analyze artificial intelligence technologies that should be implemented in the activities of CAM & APF “AKTIV PLUS, LTD” [27, 28].

To determine the possibility of using innovative technologies in personnel management, the head of CAM & APF “AKTIV PLUS, LTD” must diagnose the work of a modern organization, identify advantages and disadvantages, and establish directions for introducing innovations.

Innovations can be introduced into the personnel management system of CAM & APF “AKTIV PLUS, LTD” in the following forms: with the gradual improvement of the individual qualities of employees (at present); as a constructive, stepwise improvement of the entire personnel management system as a whole (breakthrough) [29].

Innovative technologies in the personnel management system can be implemented in the following areas (Fig. 3.3).

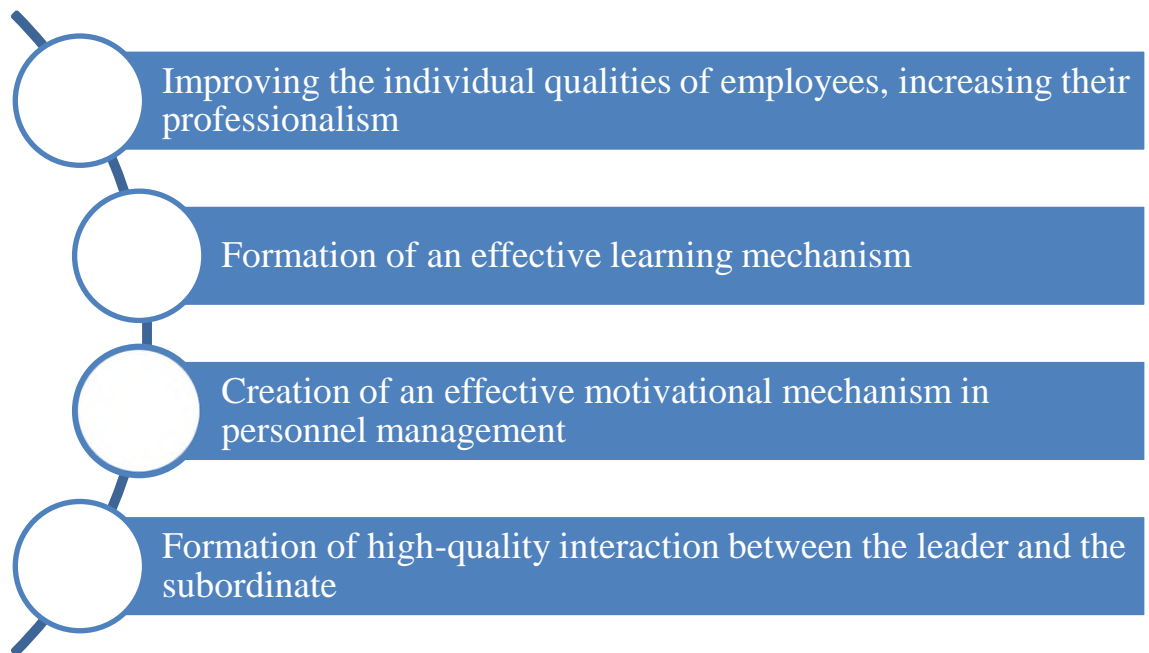


Figure 3.3 - The main areas of application of innovative technologies in the personnel management system CAM & APF “AKTIV PLUS, LTD

Source: created by the author

One of the most important innovative approaches to personnel management in CAM & APF “AKTIV PLUS, LTD” is the employee selection system, since work in an innovative organization puts forward additional requirements for a potential employee. In addition to traditional qualities (skills, experience, diligence, theoretical knowledge), they must have creative potential, flexibility and mobility of thinking, the ability to adapt to rapidly changing conditions, their character and learning and retraining [30].

When selecting personnel, CAM & APF “AKTIV PLUS, LTD” uses traditional forms of interviews, psychological tests aimed at determining the psychotype of an employee. The primary task of the manager today is to form the staff of employees in such a way that they are interested in growth, professional development and their own self-education [31].

Consequently, modern personnel management technologies are designed to increase the efficiency of CAM&APF "AKTIV PLUS, LTD" by increasing the personnel potential and professionalism of employees. These issues are regulated

through the formation of effective mechanisms for recruitment, motivation and professional development. At the stage of selecting employees for his team, the manager must apply not only traditional forms of interviews, but also innovative mechanisms for assessing the individual qualities of employee development. It is necessary to correctly think over the motivational mechanisms of personnel management, to establish the relationship between training and professional development of employees[32].

To simplify the work of a recruiter in CAM & APF “AKTIV PLUS, LTD and make the right decisions, programs based on artificial intelligence are used. With their help, you can analyze employees working within companies - using infographics, summary tables of candidates, sorting resumes, identify highly effective employees, which allows you to reduce the time to view a large number of resumes by 50% [33]

There are also many programs through which you can analyze the correspondence of employees and determine their level of job satisfaction. Currently, there are programs that allow you to identify employees who intend to leave the company in the near future. We believe that this information is very valuable for the senior management of CAM & APF “AKTIV PLUS, LTD, because, based on it, it is possible to make adjustments to the employee’s work, making the right decisions that will increase labor productivity [34]

The development of programs with elements of artificial intelligence is carried out by both large software developers (SAP, Microsoft, IBM, Veriato, Entelo, BluVision) and small ones, such as Workday. The programs presented by the company allow defining and implementing various personnel management strategies, providing information and services to participants in the personnel management process and other departments of the company.

To simplify the processes of personnel management and increase productivity, the German software manufacturer SAP offers a number of solutions for companies, namely: training and advanced training programs; selection and adaptation of personnel; basics of management; planning and analysis processes.

So, let's define the main pros and cons of using SAP for CAM & APF “AKTIV PLUS, LTD”, shown in Table 3.1.

Table 3.1

Advantages and disadvantages of using SAP in CAM & APF “AKTIV PLUS, LTD

Advantages	disadvantages
Easy to set up. It is very easy to adjust for convenience not only simple parameters - such as language, currency, measurement system and more complex ones. You can shape cultural characteristics, etc.	To switch to another vendor, you will need to wait until the contract with the previous vendor that you entered into at the time of purchase and installation expires. And if you terminate the contract ahead of schedule, the company suffers financial damage.
Virtually no software updates are required, which means it won't interrupt your work at the most inopportune times.	
Works with data in real time.	Can't adapt. Since there is nothing universal in the world, SAP can slightly differ from what the company does. You can further customize the application for yourself through official manufacturers, but you will have to pay an additional amount for additional settings.
Helps staff meet their responsibilities and improve their productivity and performance.	
Reduces the number of errors in accounting work to a minimum, because a lot is automated.	The program is not cheap, and given that you will also have to spend money on staff training, this can greatly discourage the director of the company from purchasing such software.
Easily combines with other applications installed on a work computer in the office.	
The scope of work that can be performed using the program is very large, which can be useful for companies with different fields of activity.	Much in working with the program depends on the accountant - even the most modern developments cannot correct figures that were first entered incorrectly or forecasts were incorrectly made. Therefore, it will not be possible to simply buy a program and hire amateur accountants without a good education.
You can customize the interface completely for yourself, this simplifies the work and understanding of programs at the initial level of education.	
It always remains relevant, because sometimes manufacturers update the program in order to make it as modern and effective as possible in today's conditions.	

Source: [35, 36, 37, 38]

Based on Table 3.1, it can be seen that the program has much fewer disadvantages, but for some they may be more significant than the pros. It is also

worth saying that most of the shortcomings and inconveniences of the program depend on the human factor.

Entelo Inc. offers an interesting solution that searches for potential employees not only among the resumes sent, but also among those who are currently online. Thus, the program analyzes a large number of resumes, choosing among them the appropriate option. In this case, companies do not wait for the necessary candidates to appear, since the program independently selects them.

Veriato software is capable of analyzing the computer activity of an employee. That is, check the frequency of opening documents, visiting web pages, e-mail, etc. This is done by generating screenshots of screen pages transmitted to a special server. This data is processed by an artificial mind. Thanks to this program, the specifics of the employee's activity are revealed. Thus, activities can be identified that reduce the productivity of his work.

For example, if an employee often visits personal pages, browses websites of an entertaining nature, the program signals this to the company's management. Based on the information received, a decision is made on which of the data can be considered suspicious. The criteria for review and its frequency are subject to change by management. As a rule, new employees are checked more often than those with experience and a positive reputation.

Also, the Veriato system can evaluate the emotional state of employees. Software solutions based on the latest technologies are able to monitor and analyze their behavior[39].

And BluVision offers its customers the use of RFID badges, which can be used to track the movement of employees.

There are also programs containing technologies that determine the desire of an employee to leave the company. Such solutions are presented by such companies as IBM, Microsoft, Entelo, Workday.

Thanks to the use of proposals from Workday, it becomes possible to analyze labor risks [40]. At the same time, simple settings are made that are adapted to the needs and specifics of a particular company. Thus, taking into account many



parameters, for example, position, salary, the possible risk is calculated for each employee.

The Skillzaz service offers more innovative solutions. By automating routine processes, the aforementioned platform provides an opportunity to record a video interview for a candidate for an employee at any time convenient for him. This reduces the need for personal meetings with the applicant, since the candidates necessary for the company are selected by a robot that evaluates them using machine learning algorithms [41, 42].

In addition to optimizing personnel management processes and tracking the behavior of CAM & APF “AKTIV PLUS, LTD” employees, artificial intelligence technologies also make it possible to identify potential fraudsters and reduce staff turnover [43, 44, 45, 46].

It should be noted that the practice of using artificial intelligence in the field of personnel management has positive results. Here we can highlight the reduction of costs of a different nature, the emergence of the possibility of processing information in short periods of time. This will contribute to the emergence of new development prospects and the improvement of the activities of CAM & APF “AKTIV PLUS, LTD. Artificial intelligence facilitates the work process by carrying out tasks based on embedded algorithms, it contributes to a more efficient use of employees' time, which can be directed to solving global issues that only a person can handle.

So, the measures proposed by us to improve the use of CAM & APF technologies by “AKTIV PLUS, LTD” should have a positive result on its activities, which we propose to analyze in the next chapter.

### **3.2 Cost-effectiveness of the key management measures**

To calculate the economic efficiency of measures, it is necessary to consider the economic effect of their implementation and how this will affect the increase in sales of CAM & APF “AKTIV PLUS, LTD

Next, we propose to evaluate in detail the impact of the position of an SMM manager on his financial activities by calculating the economic efficiency of this position.

So, we propose to analyze the effectiveness of the production of the position of an SMM manager in CAM & APF “AKTIV PLUS, LTD”, the data on the impact of which on sales will be given in Table. 3.2

Table 3.2

Cost-effectiveness from the implementation of an SMM manager in CAM & APF “AKTIV PLUS, LTD

Indicator	March 2023	April 2023	May 2023	June 2023	July 2023	August 2023	Sept. 2023	Oct. 2023	Now. 2023	Dec. 2023
Labor costs of an SMM manager, dollars	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500
Number of visitors	1	3	5	7	8	11	13	16	17	21
People who bought the product	0	0	1	2	3	4	4	5	6	7
Average purchase amount per person dollars	15250	15250	15250	15250	15250	15250	15250	15250	15250	15250
Sales Amount	0	0	15250	30500	45750	61000	61000	76250	91500	106750
Profitability	- 12500	- 12500	2750	18000	33250	48500	48500	63750	79000	94250

Source: created by the author

Next, we propose to visualize the profitability of CAM & APF “AKTIV PLUS, LTD from the implementation of the SMM manager and display the analysis data in Figure 3.5

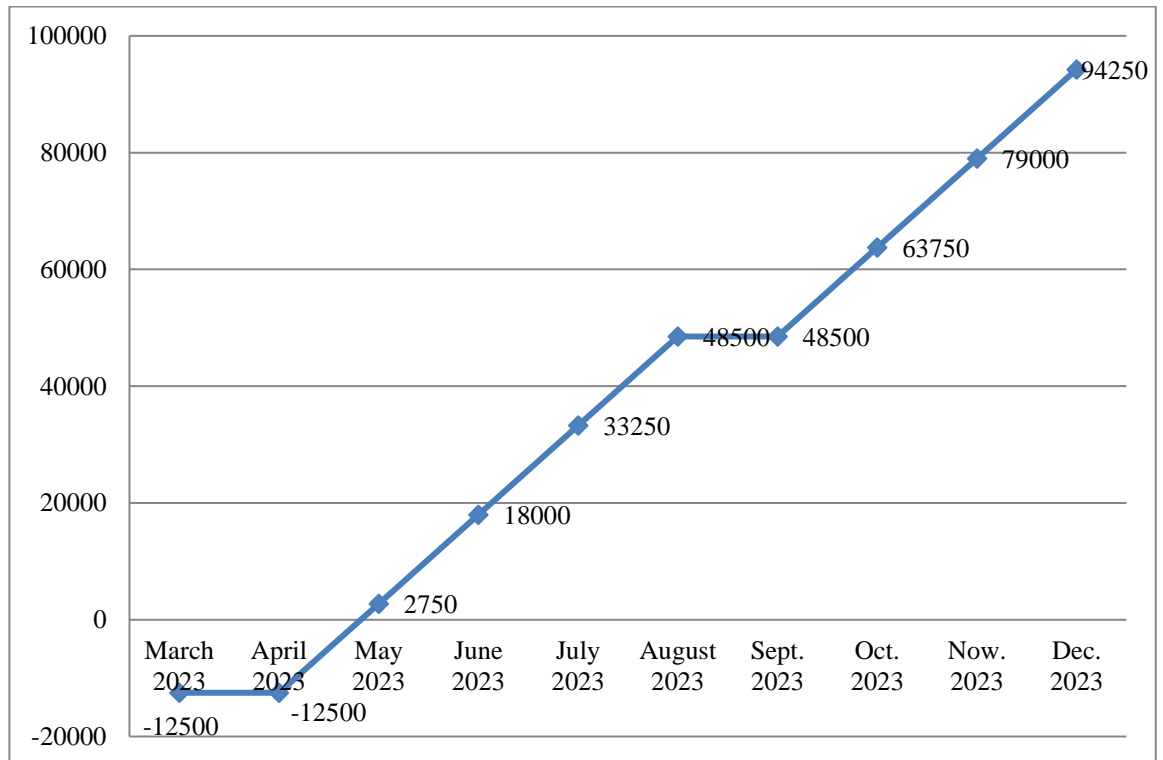


Figure 3.5. Analysis of the dynamics of profitability (loss) of CAM & APF “AKTIV PLUS, LTD from the position of SMM manager from March 2023 to March 2023, UAH

Source: created by the author

So, analyzing the performance obtained by CAM & APF "AKTIV PLUS, LTD" from the SMM manager, we see that he will start earning for himself in May 2023, adding 2750 UAH to the company's income, and by the end of December 2023, CAM & APF will have profits “AKTIV PLUS, LTD from the work of an SMM manager will increase by 800% and he paid off his salary expenses and brought the company an income of UAH 362,000. Thus, the introduction of an SMM manager in CAM & APF “AKTIV PLUS, LTD” was a profitable idea that not only improved its image, but also increased income.

It is this analysis that clearly shows the impact of innovative technologies in the field of sales on the financial results of the company. It is through the use of

various marketing elements that the company receives a stable income, regular customers and will increase its marketing potential. Innovative technologies are one of the main catalysts for profit and increase its profitability. Since the small salary costs of an SMM manager at CAM & APF “AKTIV PLUS, LTD” brought him income that is eight times higher than the cost of this position.

CAM & APF “AKTIV PLUS, LTD has great potential in the Ukrainian pension market not only in Kiev, but also in Ukraine and can use the proposed measures to increase the efficiency of its activities and improve its financial performance.

## Conclusion

In this thesis work, we have studied the impact of artificial intelligence technologies on the control prowess using the example of CAM & APF “AKTIV PLUS, LTD.

The development of artificial intelligence can not only to modify business, but also to modify the format of competition in the world market, to promote further differentiation of the countries of the world according to the levels of economic and technological development, which we have already noted earlier in our studies.

In a broad sense, AI contributes to a change in the perception of machines on the part of a person, and in a narrower sense, it simplifies the interaction between producers and consumers in the market, improving the functional aspects of doing business, including international ones.

Thus, the stable and rapid growth of the nanotechnology market, the expansion of the use of nanomaterials and cost reduction, along with the increase in global energy consumption, are the key factors that encourage nanotechnology companies to carry out technological upgrades aimed at achieving increased production efficiency.

However, the factors hindering technological re-equipment in the energy sector include the following: lack of funds, lagging behind in the processes of standardization, metrology and certification in terms of the pace of development of nanotechnologies, insufficient interest of companies against the backdrop of a decrease in the production of machinery and equipment for the energy sector in some countries, including the United States

CAM & APF “AKTIV PLUS, LTD.” is a private pension fund located in Kyiv. CAM & APF “AKTIV PLUS, LTD was established in 2004, and the company began its main activities in December 2005 with the opening of the first office in Kyiv, and subsequently developed dynamically. Thus, economic and operational performance shall be certified by a steady growth and development of CAM & APF “AKTIV PLUS, LTD and make it a success, not only in Kyiv, but in Ukraine.

So, the technical progress today has reached an amazing level, and this does not require arguments. Computer technologies, artificial intelligence, nanotechnologies, the development of virtual reality are gradually and constantly changing the realities of life of every ordinary Ukrainian, although not visible to everyone, especially the elderly. However, the vast majorities of them skillfully use mobile phones and master smartphones, are actively involved in social networks and pay utility bills at bank terminals.

According to our research at CAM & APF “AKTIV PLUS, LTD”, innovation is an exceptional phenomenon rather than a planned one. The introduction of innovations in the enterprise is the responsibility of the director and other employees (who wish to) who wish to contribute to the development of CAM & APF "AKTIV PLUS, LTD".

To date, information technology has completely taken over our lives and more than half of the population of Ukraine simply stopped going to physical stores and sells online. That is why, as for building the technological development of CAM & APF “AKTIV PLUS, LTD”, it is proposed to switch to online trading in pension services. To do this, it is necessary to analyze the e-commerce market and introduce an SMM manager to the staff of CAM & APF “AKTIV PLUS, LTD”, who will sell pension services through social networks and online.

It should be noted that the practice of using artificial intelligence in the field of personnel management has positive results. Here we can highlight the reduction of costs of a different nature, the emergence of the possibility of processing information in short periods of time. This will contribute to the emergence of new development prospects and the improvement of the activities of CAM & APF “AKTIV PLUS, LTD. Artificial intelligence facilitates the work process by carrying out tasks based on embedded algorithms, it contributes to a more efficient use of employees' time, which can be directed to solving global issues that only a person can handle.

CAM & APF “AKTIV PLUS, LTD has great potential in the Ukrainian pension market not only in Kiev, but also in Ukraine and can use the proposed

measures to increase the efficiency of its activities and improve its financial performance.

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