MINISTRY OF EDUCATION OF THE REPUBLIC OF AZERBAIJAN

AZERBAIJAN STATE UNIVERSITY OF ECONOMICS

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MASTER DISSERTATION

on the topic

"THE DEVELOPMENT PERSPECTIVES OF KNOWLEDGE ECONOMY IN AZERBAIJAN"

Yagubzada Ilkin Yusif

BAKU – 2022

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Elm andı

Mən, Yaqubzadə İlkin Yusif oğlu and içirəm ki, “The development perspectives of knowledge economy in Azerbaijan” mövzusunda magistr dissertasiyasını elmi əxlaq normalarına və istinad qaydalarına tam riayət etməklə və istifadə etdiyim bütün mənbələri ədəbiyyat siyahısında əks etdirməklə yazmışam.

AZƏRBAYCANDA BİLİK İQTİSADİYYATININ İNKİŞAF PERSPEKTİVLƏRİ

XÜLASƏ

Mövzunun aktuallığı: Müasir postindustrial cəmiyyət elmi, texniki və texnoloji tərəqqinin nailiyyətlərinin uğurla həyata keçirilməsi nəticəsində yaranır. Hazırda biliklərə əsaslanan iqtisadiyyat informasiya-kommunikasiya texnologiyalarının, xidmət sektorunun, insan kapitalının artımına arxalanan ölkələrin yüksək keyfiyyətli inkişafının və rəqabət qabiliyyətinin artırılmasının əsasına çevrilmişdir. Müasir post-sənaye cəmiyyəti innovativ fəallığın artması və əldə edilən nəticələrin yeni texnologiyalarda, məhsullarda və xidmətlərdə təcəssüm olunmuş bazar kommersiyalaşdırılması ilə xarakterizə olunur. Davamlı inkişaf edən cəmiyyətlər istehsal və təhsil innovasiyalarını həyata keçirməyə qadir olan mütəxəssislərin hazırlanmasını tələb edir. İqtisadi inkişafda insan kapitalının mühüm keyfiyyətlərinin artan əhəmiyyəti həyati əhəmiyyət kəsb edir ki, bu da bilik iqtisadiyyatının inkişafı olmadan mümkün deyildir.

Tədqiqatın məqsəd və vəzifələri: Azərbaycanda biliyə əsaslanan iqtisadiyyatın yaradılması və təşəkkülünün başlıca istiqamətləri.

İstifadə olunan tədqiqat metodları: Tədqiqat zamanı məntiqi və tarixi əlaqə, elmi abstraksiya, induksiya, deduksiya, analiz və sintez metodlarından istifadə olunmuşdur. Bundan əlavə, Azərbaycanda bilik iqtisadiyyatının inkişafı üçün müsbət və mənfi amilləri, potensial və təhlükələri təhlil etmək üçün SWOT təhlilindən istifadə edilmişdir.

Tədqiqatın məhdudiyyətləri: Məhdud ikinci dərəcəli məlumatlar və vaxt çərçivəsi tədqiqatın aparılması üçün əsas məhdudiyyət idi.

Tədqiqatın yeniliyi və praktiki nəticələri: Bu tədqiqat bilik iqtisadiyyatının iqtisadi proseslərə müsbət təsirini və elm və texnologiyanın və tətbiqi proqramların inkişafı hesabına daha səmərəli iqtisadi fəaliyyətə nail olmaq imkanlarını nümayiş etdirir.

Nəticələrin elmi-praktik əhəmiyyəti: Tədqiqatın əsas nəticəsi və elmi müddəa, təklif və tövsiyələr biliyə əsaslanan iqtisadiyyatın hansı işdə uğurlu və ya uğursuz olacağını göstərməkdir.

Açar sözlər: Bilik-İqtisadiyyat, inteqrasiya, SWOT, bilik işçiləri, insan kapitalı.

THE DEVELOPMENT PERSPECTIVES OF KNOWLEDGE ECONOMY IN AZERBAIJAN

ABSTRACT

The subject actuality: Modern post-industrial society is formed as a result of the successful implementation of the achievements of scientific, technical and technological progress. At present, the knowledge-based economy has become the basis for high-quality development and increasing the competitiveness of information and communication technologies, the service sector, countries that rely on the growth of human capital. The sustainable developing societies require the training of specialists that are able to implement educational and production innovations. The increasing significance of basic features of human capital in economic progress is vital which is impossible without development of knowledge economy.

The goals and objectives of the research: The main directions of formation and progress of the knowledge-based economy in Azerbaijan.

Used research methods: In the study of the problem, scientific abstraction, historical and logical connection, induction, deduction, analysis, and synthesis methods were collected and generalized. Moreover, the SWOT analysis was employed to analyze the positive and negative factors and potential and threats for knowledge economy development in Azerbaijan.

Restrictions of research: The limited secondary data and time frame were the main restriction for conducting the research.

The novelty and practical results of investigation: This study demonstrates the positive impact of the knowledge economy on economic processes and the possibility of achieving more effective economic activity due to the development of science and technology and application programs.

Scientific-practical significance of results: The main result of the research and the scientific provisions, proposals and recommendations to show in what kind of work the economy based on knowledge will be successful or unsuccessful.

Keywords: Knowledge-Economy, integration, SWOT, knowledge-workers, human capital.

ABBREVIATIONS AND SYMBOLS

AKIS	Agricultural Knowledge and Information Systems
ANAS	Azerbaijan National Academy of Sciences
AIS	Association for Information Systems
DDS	Data Distribution Service
ETS	Emissions Trading System
ETT	Economic Transformation Technologies
EGIS	Engineering Group International Services
GDP	Gross Domestic Product
ICT	Information and Communications Technology
IT	Information Technology
NIS	Network and Information Systems
OECD	Organization for Economic Co-operation and Development
ROI	Return on Investment
TELINT	Telemetry Intelligence
US	United States

CONTENTS

INTRODUCTION

Relevance of the topic: The term "knowledge economy" was applied to the scientific community by Austrian-American expert Fritz Maxlup in one of the branches of the economy. Today, along with this expression, such terms as "Innovation economy", Information and knowledge society", "High-tech civilization", "Information society", "Knowledge society" is extensively used (Som, 2012). The "knowledge economy," from a scientific perspective, is a production technique that encourages the formation of thinking creatures who contribute substantially in the creation, diffusion, application, and generation of new ideas. The knowledge - based economy establishes a framework for the methodical application of all sorts and areas of knowledge. The knowledge economy establishes the fundamentals for the consistent and planned use of all kinds and types of knowledge.

The modern post-industrial society results from the successful implementation of the achievements of scientific, technical, and technological progress. Currently, the knowledge-based economy has become the basis for high-quality growth and increasing the competitiveness of countries that have relied on the development of information and communication technologies, the service sector, and the growth of human capital. The modern post-industrial society is characterized by increased innovative activity and market commercialization of the results obtained, embodied in new technologies, products, and services.

The development of individuals instituting production and academic innovations is required for society's inventive growth. Statistics and specialized research back up the rising relevance of vital human capital attributes including knowledge, capacity to deal with information, and creative technology in economic growth. The universe has seen how evidence is gathered, saved, and transferred since the Internet's inception. Individuals used to go to the postal service to chat to their friends who lived overseas in the 1980s, since there were no mobile phones. Older individuals extensively employed to post offices in order to obtain gifts and

pensions. They headed to record stores with phonograph recordings in hand to compose music. Individuals went to the library to read whatever literature, paper, or journal they wanted. Furthermore, individuals used to have to wait in line to pay their utility costs, but now they could do it all online without leaving their homes. Human jobs have become more reliant on internet technology. It's difficult to envisage a world without the current period.

The extensive application of advancements that are the result of knowledge in the control of socio-economic processes is particularly pertinent. The difficulty of choosing and systematizing large volumes of data is exposed. Furthermore, knowledge is the result of two different techniques of measuring it. The cost of knowledge produced is one, and the economic value of knowledge provided is the other. Based on innovative technologies, chances emerge in the country, region, and enterprises' physical, social, economic, and technical environment. Furthermore, there are socio-economic troubles in the adoption, production, implementation, and application of newly technologies in science.

Statement of the problem and learning level: This study addresses the factors affecting the effectiveness of decision-making in enterprises and the application of modern methods, and research has been conducted. The problem has been studied and researched by foreign scientists and specialists, and monographs have been written. At the same time, many articles have touched upon this issue and made suggestions. Scholars of the country also come across research on certain aspects of this topic, but it is not very large-scale and has not been the main subject of research.

Purposes and objectives of the research: The primary goals of the research is the concept of knowledge, the establishment of the knowledge economy, features of the knowledge economy, the essence and features of the knowledge economy in socio-economic development, the essential features of the knowledge economy, the knowledge economy in the national innovation system consists of studying the place of science and high technology.

Object and subject of research: The main object of research is innovative economic activities in the Republic of Azerbaijan. The study of the mechanisms of recovery and development of the knowledge economy in Azerbaijan, called post-industrial economy or information economy, is the subject of research.

Research methods: is based on a wide range of scientific research methods based on economics. In the study of the problem, scientific abstraction, historical and logical connection, induction, deduction, analysis, and synthesis methods were collected and generalized. Constitutes the scientific considerations and conclusions of many foreign scholars who explain the features and tendencies of modern development.

Research database: During the research, many statistical indicators, annual reports of international journals and journals, scientific researches and articles were included and used in the analysis.

Research limitations: The main limitation of the study is the lack of extensive statistical analysis of the information economy in the Republic of Azerbaijan during the analysis.

Scientific novelty of the research: This study demonstrates the positive impact of the knowledge economy on economic processes and the possibility of achieving more effective economic activity due to the development of science and technology and application programs.

Scientific and practical significance of the results: The main result of the research and the scientific provisions, proposals and recommendations to show in what kind of work the economy based on knowledge will be successful or unsuccessful.

CHAPTER I. THEORETICAL AND METHODOLOGICAL ASPECTS OF THE STUDY OF THE KNOWLEDGE ECONOMY

1.1. Conceptual bases for the formation of the knowledge economy

The knowledge economy is the top phase of the innovation and the industrial economy. The knowledge economy differs from innovation. The term innovation economy is often used as a synonym for the expression knowledge economy by economists. The central infrastructure of the innovative knowledge economy includes (Atkinson and McKay, 2007):

One of the primary areas for establishing functional state institutions with good quality of life is to realize and examine innovation activities. One of the most crucial aspects in the establishment and progress of the knowledge economy is high-quality human asset. As a result, the proportion of better intelligent persons in the economically active population has gradually increased in recent years, and the number of "knowledge workers" whose job it is to gather, organize, and evaluate knowledge is expanding in the new economy. It is true that more than 60% of new occupations produced in recent years have been tied to information alone, and more and more professions and specializations are being associated with working with new revolutionary technology. Every new day, every morning, is now defined by a technology advancement and the appearance of fresh findings. The examination of the economic activity of the world's economic sectors reveals that knowledge and complete human growth have become more important in recent years. This issue is being tackled more forcefully, developing world. The end product is fantastic. Knowledge, science, electronics, and gadgets, all of which are considered science-intensive goods, now account for more than 20% of the Economy of a large country like America. Capital spending on human development and cognitive goods are many times more efficient than capital spending on other traditional sectors, according to the practice of such industrialized countries. A country like China, which is currently one of the world's

economic leaders, is the outcome of accurate science and human intellectual ability assessments. The most valuable and productive asset is knowledge. Japan, which was subjected to a slew of negative effects during WWII, had a nuclear weapon exploded on its territory, and was governed by foreign forces, based its economic success on knowledge and the social component. It has developed to a global scale. This case also demonstrates that if human capital was used effectively on a worldwide basis, there would not be numerous global problems, or these problems would not arrive at the level that would menace human civilization today. On the plus side, it should be highlighted that international organizations have placed a greater emphasis on the knowledge aspect. This is a topic covered in the World Bank's World Development Indicators for 1988/99. The World Bank's World Development Report's 21st issue, titled "Information in the Service of Development," focuses on the critical role of knowledge in advancing social and economic health. The writers of the research argue that economic progress is influenced not only by the creation of wealth and job skills, but also by the correct and timely gathering, analysis, transfer, and training and mastery of knowledge. Humans (especially leaders) and community should comprehend how information is acquired, utilized, and inhibited in order to better the lives of people across the world, particularly the impoverished. Nowadays, in the age of the tech revolution, it is critical to comprehend the interconnections among knowledge and progress, to compensate for them, and to put them into practice. The introduction of new technological advancement, as well as dropping prices for computer parts, has blurred the lines between place and time, with a limited duration. Even a tiny hamlet may get "large" knowledge in a small space of time and for a little price. Furthermore, remote learning has enabled millions of individuals to obtain an education. Everything is fine. It is beneficial to regard knowledge and studies range as a significant aspect in a country's development. Instead, the new possibilities afforded by the digital revolution will not be beneficial and may even be detrimental to the country's economic progress. In a worldwide world, rivalry grows, and developing nations' economic primitiveness is expected to worsen

because their citizens are uninterested in science, information, or literacy. In terms of its influence on economic growth, the World Bank identified two types of information. One is what is known as "lack of knowledge," which is caused by misallocation and development of technical information in different ways. For numerous reasons, it is not used in manufacturing. The "information issue" originates from the late reception of knowledge regarding advances in the second half. The economy and people's living situations are strongly influenced by knowledge. The essential element of this impact, nevertheless, is that it may be seen by experts. As a result, increasing societal and state education is vital to boost the effect of information on the economy as a significant and decisive component. Absence of data has a significant influence on an individual's, family's, business's, or country's economy, and its mechanisms of action are numerous. The "operations" carried out by individuals and structures for survival are the start of this system. The industry can gradually decline if both sides are active in the operation and do not know each other. Here are a few straightforward suggestions that have significant economic implications. A few decades previously, the absence of accurate information regarding Vahidbank and other similar institutions, as well as the population's failure to understand in this field, had a significant detrimental influence on every citizen's and state's economic position. States need to understand the lack of knowledge and information and take action to handle the problem. Nevertheless, in developing countries this issue is rarely appealed.

Therefore, we realize the link between knowledge and business and apply it in practice, especially in business development. Second, government agencies, international organizations, non-governmental agencies and private organizations in developing countries need to work together for the benefit of institutions dealing with information issues.

1.2. The essence and features of the knowledge economy as a new form of socio-economic development

The worldwide effort recognized in world economic development as the Green Revolution is an illustration of the power of knowledge and its socioeconomic advantages. For years, this information-based global effort has been developing new agricultural knowledge and distributing it throughout the world. Several nations, charities, multinational businesses, private companies, institutions, producers, and landless peasants are all involved in the Green Revolution initiative, which has become a paradigm for leveraging information for growth. They all collaborated to build a knowledge output that could be assigned to different regions of agriculture to drive growth. The establishment and growth of a modern economy based on knowledge and information, contemporary technology, and innovations, such as the information economy, is important to the achievement of the information society. The vast majority of the able-bodied activities made in the creation, analysis, preservation, and transmission of knowledge and information, and this activity accounts for the vast majority of the gross national product (GDP).

M.Porat first introduced the term information economy to the scientific community in the mid-1970s. He believed that information technology reflected main points of the new society. He also noted that the essential resources of production and forms of public wealth are knowledge and information (Erdil E., Turkcan B. and Yetkiner I.H., 2009). The characteristics of the information economy are basically as follows (Zanini M., 2009):

- Information and knowledge as a factor of production and the main resource;
- Broad use of information technologies in non-production and production sectors:
- Dematerialization of the established product;
- Variations in the creation and composition of labor;
- The worldwide character of the new economy.

New technologies are critical in the development of a new economy. ICT expansion, in particular, is required for the construction and growth of the digital

age and its associated economy, particularly the creative information economy. The advancement of ICT enables the accessibility of information, new forms of communication, the coordination of manufacturing processes, and the productivity of a wide range of economic operations. By linking to worldwide marketplaces and global industrial networks, networking help to advance economic globalization. ICT is becoming a major driver of economic development. Its influence on economic progress takes place in two directions. First of all, the ICT goods production and storages is very dynamic and innovative areas of the economy and significantly contributes to economic progress. Second, the ICT implementation in the economic and other areas enlarges innovative progress, enhances labor productivity, diminishes costs, establishes new sectors of economic activity, and upgrades living terms (Datta A. and Agarwal S., 2004).

R. Atkinson and A. McKay wrote down the next mechanisms of the influence of the ICT usage on socio-economic progress (Atkinson and McKay, 2007):

- Raise in worker productivity at both local and global scales, as well as investment and more sustainable use of natural resources; - Implicit activation of expansion contributes to the rise of markets and the advancement of management efficiency; - Rise in the amount of jobs and advancement of the financial system; - Enhancing the circumstances for the sale of goods and maintenance and redistribution. The historical phases of economic progress are comprehensively connected with the substitution of technological production ways. In current situations, information technology identifies the technological production ways, where the basic driving powers of progress are knowledge and information. Knowledge and information have usually played a crucial role in the progress of human society. Nevertheless, knowledge and information in the society of information have enhanced so many that they have performed a conclusive role in production. The sources of knowledge and information can potentially substitute traditional parameters of production to some degree, diminishing the requirement for material sources.

A scarcity of resources is constantly felt in Azerbaijan when the economy is experiencing significant structural changes. In today's world and socioeconomic terms, it is hazardous for economic progress to overestimate its oil potential and expect it to address all of its issues. Other nations' experiences have proven that the majority of countries who export gas, oil, and other natural sources in conditions of natural sources do not achieve the desired purposes. The idea is that foreign cash enters into the country from oil exports might cause major economic and social concerns. It occurs when a country turns its oil revenues into foreign-imported natural resources, which are subsequently used for investment spending. It is known that extremely manufactured foodstuff and industrial products imported straight for use meet the present requirement at best and don’t put the foundation for future economic progress. The funds allocated for investment, on the other hand, seem more productive, but finally, the desired result is not achieved. Because the products of the ventures that have been opened up using the investment are usually incapable to bear the ferocious competition in foreign and internal markets. The basic reason is the local market is able to be filled with a broad range of strong quality and even inexpensive food and industrial products at the cost of manufactures from the vending of crude oil. For that reason, it is essential to make an effort to stop the disagreeable situation in Azerbaijan, which is happening in a number of crude oil-exporting countries worldwide. The main point of this inconvenient condition is that the yearly growth in oil incomes causes to a regress in manufacture in the agricultural and industrial areas of the country. Such a condition, as usual, establishes new economic and public resource voltages in the country. Science-oriented aimed at programs ought to be grown up in this sector. To make this, more important issue must be recognized in the non-oil areas of the economy, and aimed programs ought to be grown up for their progress. The focus ought to be on obtaining technologies and equipment that show the final technological and scientific development for the food and light industries as a vital energy center. Once, Marx's opinion that "the great power of economic progress is not machines and equipments, but people" has extremely demonstrated itself

nowadays. The purpose of socio-economic actions in the new ETS and progress strategy is to establish convenient situations for quality economic progress, humanization of work of people for efficient and complete usage of human sources, raising the level of working life, and decreasing working hours. As ETT speeds up, as the technical standards of production enhances, rational environment, favorable production, and economic operation depend extremely on socio-psychological terms and factors. Taking this into consideration, the new tactics covers a lot of crucial features, such as changing the structure of social and individual necessities, deserting overproduction, and encountering the intellectual and cultural necessities of the people more profoundly, which have not been taken into account in most countries. ETT and the innovative tactics of socio-economic progress forecast the application of socio-political actions. The basic problem here is to modify the primary issues in economic policy to upgrade the life quality. New pattern of human source usage demands the appearance of new systems to stimulate labor. The foundation and function of data systems in the administration of the economy are very connected with the progress of information technology - the basic element of AIS. The increasing requirement and data services in the terms of market relationships have conduct to the implementation of the broadest range of technical ways of contemporary data processing technology. Estimating networks and systems are established on their groundwork, not only for construction, keeping, manufacturing but also for making as large as possible the inclusion of final devices in the specialist's workplace. Implementations in man-made intelligence for data assistance of automatized data management devices of economic operation are of curiosity. One of the methods to achieve success in this sector is the formation of specialist systems: that is specific computer systems, which take the crucial part in the assembling, improving, contemplation, and assessment of the knowledge of extremely qualified experts. The specialist system reports knowledge on the subject of a peculiar subject field. The knowledge base combines patterns, rules, and elements that conduct to evaluate and creates settlements to complex issues in the subject field. According to the types of control

processes, automated control systems are divided into Technological process control AIS - this is a human-machine system that controls technological devices, machines, and automated lines. Technological and organizational action administration AIS is a system that has many level that joins the establishment of these technological actions AIS and organization administration AIS. Experts in economics evaluate that 90% of contemporary economic progress in developed countries is attained in new technologies, knowledge, chances gives an explanation in phases (Datta A. and Agarwal S., 2004). During first phase (classical economy), output is totally consumed, therefore trading is conducted by bartering, and the use of tech is restricted. Per the Rostow's ideology, specialization generates surplus production for commerce in the second phase (preconditions for takeoff), with a strong state backing the private industry. The work force shifts from agriculture to industry in the third phase (liftoff), and expansion is focused in certain areas and increasing the skills. The industry diversifies, innovations generate new investment possibilities, and urbanization accelerates in the fourth level (drive to maturity). The stage 5 (relatively high spending) sees an increase in public consumption, a rise in business growth, the service industry taking the lead, and an improvement in social wellbeing. In the terms of a rural (agricultural) society, production was accomplished chiefly by human physical labor. Certainly, in principle, definite knowledge, abilities, information, which is a resource for production, was required (Rostow W.W., 2009). Nevertheless, data as a source for economic was indivisible from the other, more essential for the rural society, from the opposite - the worker, the labor force. The deficit necessary information in a person who was physically healthy was not a barrier when employed. The necessary knowledge for this process was gained in the work environment. Information was transmissed to the future generations and, undoubtedly, taking action as a feature of healthy people. When the subordination on the powers of nature was extremely high, personal knowledge did not define the society well-being. These terms do not permit to pay attention to the knowledge as an independent, vital economic source in the terms of a rural society. The industrial society progress was conducted by a continual

distribution of requirement into an abled worker, that is, with necessary knowledge. The significance of knowledge in the preparation and application of the manufacturing process of products has extended dramatically, but till the middle of the last century, physical sources were importantly behind first and foremost human and natural sources. The supremacy of the material sources over non-material sources is completely simple: in the great part of the XIX and XX centuries, humankind pursued the greatest feasible economic progress. Growth in the gross domestic product (GDP) has been the essential macroeconomic purpose of all industrialized countries. GDP - development meant expanding the demand for physical sources; the subsidiary, subject role of knowledge arrives from the data. Nevertheless, material sources are able to be used just one time. The industrial economy has encountered pretty quickly with the worsening of the alive environment and, consequently, with a sharp growth rate in this issue. Manufacturing production made it feasible to encounter the essential requires of all participants of society but also found out the borderlines of future socio-economic progress at the cost of physical and natural sources. The function of knowledge and data in social manufacturing in terms of reduction has been recognized as a parameter of relative softening, and at the several moments, as a parameter that removes the challenges of limited material sources. Identification that information and knowledge are strong, independent elements in social growth has been a conventional characteristic that splits human progress into manufacturing and post-manufacturing centuries. Absence of the necessary knowledge in the information society is an essential element in stuffing and makes this kind of manufacture impossible. However, it is not a question of elementary literacy, but quality vocational training and human knowledge both in activity and close relations with it must be implemented effectively. Thus, the method of opening the electrocardiogram is for the doctor-therapist - information as a means of labor, that is, a kind of labor tool. For a specialist in computers, the tool can provide information on the diagnostic methods of electronic network components. A characteristic feature of modern economic development is the development of

world trade ahead of world GDP, which is associated with the spread of international knowledge, information products, and technologies. At the end of the 1990s, the growth rate of world trade was about three times the annual growth rate of the world economy. International trade is developing at a higher rate with services, especially financial services. The main role here is played by the development of e-commerce, which is associated with creating global networks, especially the Internet. For the transition to an information society, Azerbaijan must go through two important stages: 1. Achieve stability in socio-economic life. 2. Ensure the development of the industry through the progress of science-intensive and technological industries.

1.3. The main features and characteristics of the knowledge economy

The knowledge - based economy is a functioning economy that is characterized by knowledge-based operations such as innovation, automation, and understanding. The knowledge economy boosts jobs and production proportionally. The key components of this economy are schooling, technical services, entertainment, marketing, and science. The construction and creation of data are regarded important for its effective use throughout the time of society's digitization. The examination of information ignores the principles of change that govern its genesis and application in diverse sectors of human endeavor. It differentiates the content of objects as manufacturing and use items. It is quite diversified, and it is separated into categories that support human activity: scientific, technical, production, managerial, economic, social, and legal. Every sort of data has its own set of treatment processes, purpose, display and reflection formats, accuracy, learner reflecting performance, realities, circumstances, and procedures.

Information technology (IT) must understand the sum of computer equipment and communication systems for the creation, processing, storage, and transfer of information in all spheres of activity. IT ensures that information can be used in the

most convenient way for the consumer and can be changed immediately in a user-friendly way. They reduce the complexity of using information resources in tangible and intangible production, increasing information transmission and reception reliability and efficiency. IT is divided into the following basic technologies: - technologies of microelement components; - technical support technologies; - software technologies; - communication technologies. The main components of IT are microprocessors, local and global computer networks, robotics, specialized automated workstations, programmed controllers. IT improves very quickly, and this is inevitably reflected in management functions and methods. The following trends can be noted in their development: improving the characteristics of goods and information products and services, ensuring the compatibility of components, eliminating the gap between entrepreneur and user, the development of wireless computer technology, globalization of information production, distribution, and consumption. Information management serves the production, distribution, exchange, and consumption processes and the solution to the national economy's organizational and economic management issues. It is a variety of economic, technological, social, legal, demographic, and other information. Information is one of the most important resources in the information process, which is active in management. In processing technology, the first information about production and economic operations, people, output, acquisition, and sale of goods plays the role of the object of labor. The resulting information is used to analyze the role of the product, and this information is used to analyze and make management decisions. Nowadays the crucial extension in the influence of information in the world is for a number of objective truths. ETT has a specific role in their brother. Innovative technological and scientific growth, conducted by concentrated technological and scientific revolutions, establishes essential variations in manufacturing. The technologies, methods, and ways of manufacturing company are being developed fast, the rate of manufacturing is enhancing, production is getting more equipped with machines, and the chemicalization of use is developing. Under these terms, the demands for people,

an abled worker, and an engineer are also increasing. They have to manage workable production with a superior level of strategic organization, manufacture standard products and perform them in whole world countries. The modern economic function of knowledge nowadays is influenced by the modern economic function of professional and common education. It is essential to increase the profession level of the workers. Countries that realized the significance of this issue are raising the number of capital distributed to education. For instance, in the USA education gets over $ 40.0 billion yearly at the present time. For confrontation, this statistic was $ 3.2 billion in 1940 and $ 8.8 billion in 1950. Consequence of such a top level of service for education, the workers quality improves, their labor gets more fruitful, and its outcomes are more fruitful.

According to the research by E. Depison, the famous American economist, in the period after the World War II, 10-32% of economic progress in the USA and Central Asia was achieved by appealing the outcomes of scientific study in different areas of technology and engineering to manufacturing. As well increasing ETT has an affirmative influence on people's knowledge. Recently, experts in economics throughout the world have stressed the critical function of knowledge in economic progress. E. Denison noted that 2-15 percent of the economic growth achieved in the USA and Central Asia was for the increase in the level of education. The emergence and development of new knowledge have become an essential part of the manufacturing process. Modern knowledge is shown in implementation in the modern design of machines and systems, the workers quality, efficient organizational conclusions, realizing of the arrangement, the selection of advantageous patterns of economic progress (Ahmed E.M., Ridzuan R., 2012). The growth of knowledge clears the way economy in power and material sources and the reduction of the energy of the product, stock, material, and labor capability in whole actuality. One of the differentiating characteristics of knowledge sources from manufacturing sources is that, different from equipment and machines, knowledge is able to extend faster to the large areas: the new information revolution establishes the situations for this.

Trademarks, permits, guidance, and know-how are all ways to sell and buy knowledge, such mechanisms and machines. This cycle is continually repeated, and the procedure is restarted. Instead, every state that wishes to build its economy and raise the living conditions of its citizens must continually strengthen the knowledge cycle. In general, the acceleration of the knowledge cycle might proceed in two ways from the perspective of the global economy. The first is concerned with international organizations' and institutions' involvement in this area. International institutions must address issues related to the formation, gathering, transmission, and use of partnerships, which are not very appealing to people. For that reason, the enterprises of worldwide institutions have been more arranged in removing technological lagging behind, ensuring the economy of the world with worldwide social products, and taking the part as a negotiator in the moving of information. There is a necessity to develop governance, for which data in the world establishes an utmost circumstances. The next direction is belonging to the function of government organizations. States have to exactly straight the origins of information in the country they clear the way (information established by the country's strength and information "imported" from overseas) and their connection. Moreover, if the market require for information may drop, then the state has to intrude. Since the state is always able to find chances to remove technical unawareness in the country, the government can improve a system of education that is able to educate the people throughout their lives. The government has to also control information on knowledge and over its quality.

CHAPTER II. FORMATION OF THE KNOWLEDGE ECONOMY IN DEVELOPED COUNTRIES

2.1. Knowledge and investment are critical factors in economic growth (an example of its impact on GDP)

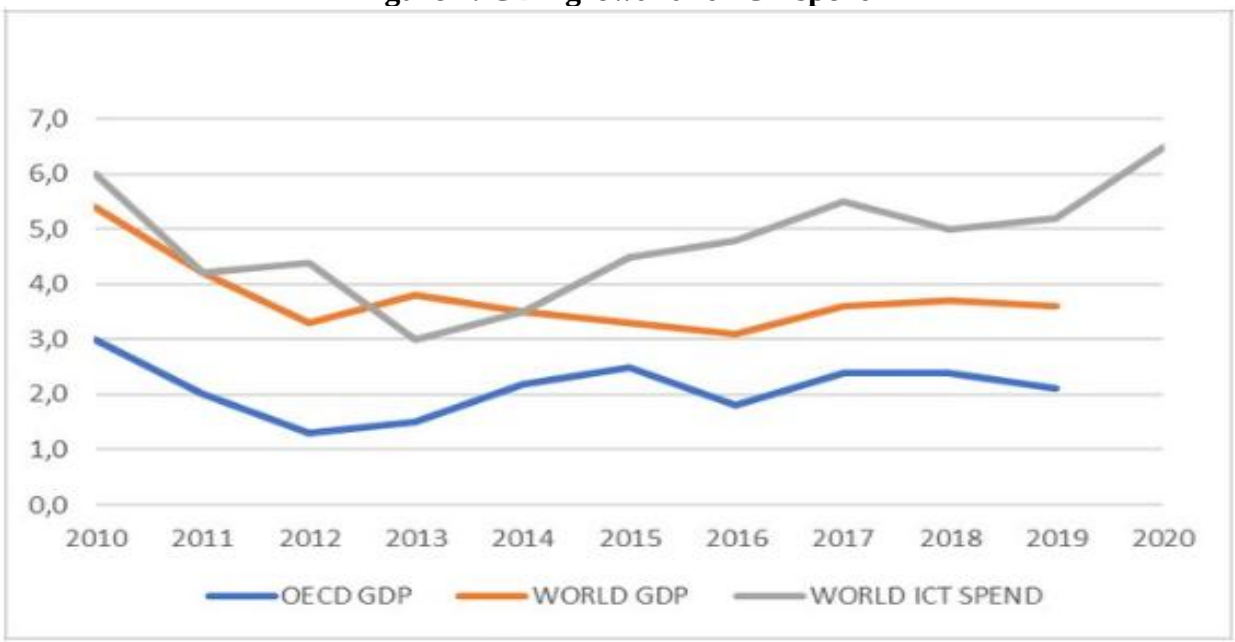
The methodology of calculating GDP shows that it can be used to study the general situation in the country and the world economy. Nevertheless, it is necessary to take into account the price factor. GDP at current prices is called nominal GDP, and when calculated based on the fixed price of any base period (year), it is called real GDP. In order to study the actual situation and avoid wrong results, the world's GDP is calculated in US dollars (at current and constant prices). The improvement (growth) of GDP is characterized by economic development, and the stability of its growth rate characterizes the country's economic strength. However, the indicator of GDP depends on the costs of large or straightforward reproduction (World Bank, 2020). Whether economic growth is intensive or extensive, how the economy's structure has changed, and so on. does not provide any information to the researcher. Therefore, other indicators are used to give a deeper assessment of the world economy and the economic development of its subsystems. One of the important indicators is the indicator of the scientific capacity of the national product. In order to calculate this indicator as a percentage, the costs of science development, the design, and the production of new products are divided by the GDP and multiplied by 100. In recent years, the level of this indicator has been 2.7 in the US, -2.3 in England, and -2 in France. 4, in Japan - 2.8, in Italy - 1.4 percent. For example, in 1996, the United States spent $ 185 billion on scientific development or 47% worldwide. One of the following quality indicators is the stock capacity of production. This indicator is calculated by dividing the value of fixed capital by GDP. World experience shows that this indicator has been at different levels in different periods. The most influential factor in its level is the type of economic growth. In the stages when the extensive type of economic growth prevails, the fund capacity increases (efficiency

decreases), while when the economic growth takes place mainly in an intensive way, the fund capacity decreases (and the efficiency increases). In the field of this indicator, the United States was able to turn around in the mid-20s, and Western Europe and Japan in the 70s, and achieved high results. Experts from the London School of Economics have proposed the following mechanisms for the impact of ICT on economic growth (Feng W. and Xiao Y., 2009): - removal of geographical barriers to interaction between counterparties; - increasing the role of network effects in market conquest; - a creation of new access to products, reduction of consumer transaction costs. Changes in related forms of consumption; - Increased competition due to access to local markets from other regions and countries; - increasing the competitiveness of transnational corporations compared to local corporations. The innovation-based ICT sector is now one of the most significant segments of the global economy. Thus, the ICT sector is highly productive, and its growth has a beneficial effect on the entire economy. According to DigiWorld, a research company in the ICT sector, in 2011, the ICT market accounted for 6.1% of world GDP. According to the McKinsey consulting company, its share in world GDP may reach 9% by 2020 (https://www.ebrd.com/what-we-do/sectors-and-topics/ebrd-knowledge-economy-innovation.html). The growing role of ICT as an economic factor in developed countries is due to structural changes. These changes are characterized by a decrease in the share of those engaged in the industrial sector of the economy and an increase in the share of those working in the sectors related to the creation, processing, and consumption of information. According to the latest data, the share of the ICT sector in GDP in the United States was 6.4%, and in Japan, 6.8%. The spread of ICT in other sectors of the economy, in principle, changes their nature. Information technology increases the utilization of resources. This is reflected in the increase in productivity, including GDP growth. ICT is responsible for collecting, processing, storage, presentation, transmission, and protecting information and knowledge.

ICT has a stronger impact on the real economy through the production and application of ICT in various fields. This is explained by the fact that with the

development of the service sector, the ICT sector has become a critical area at the global level. The ICT manufacturing sector is essential for GDP growth in the real economy, and features such as rapid technological progress, strong and sustainable demand, relatively low prices, improved quality, and increased product range have led to an increase in the sector's share of GDP. In many Southeast Asian countries, including Singapore, Malaysia, Japan, China, and South Korea, the development of the ICT sector has an exceptional advantage. These countries include processors, hard drives, motherboards, personal computers, and laptops, which play an important role in producing and exporting various ICT products. At the same time, it creates additional opportunities and conditions for increasing labor productivity in all areas where ICT is applied, its more efficient use, and the productivity of physical capital. At present, economic growth is ensured through the use of information sources and resources. Information and knowledge create conditions for more efficient use of factors of production. Information and knowledge resources are not independent because they cannot completely replace material, energy, and labor resources. However, information and knowledge are only potentially significant resources and can only manifest themselves as a factor of production when combined with other resources.

Figure 1: GDP growth and ICT spend



Source: Comparative evolution of rates of growth of ICT expenses and GDP. [Source: (IDC, IDC State of the Market 4Q20: IT Spending Review and Outlook, 2020c)]

Based on figure 1, it can be concluded that the amount spent on ICT is in gwoing trend, which shows its positive contribution to the GDP. In modern times, innovations and technologies play an essential role in any country's sustainable economic development and productivity. In the last century by Y. Schumpeter, R. Solow, P. Romer, and others did this. Many well-known American economists have noted in their research (Smits R.E., Kuhlmann S. and Shapira P, 2010). They argued that economic growth was closely linked to scientific and technological progress. The analysis shows that various research methods, including production functions, have been used in scientific research to assess the impact of ICT on economic development. Solow used the production function to assess the impact of scientific and technological progress on economic development in the United States. He concluded that economic growth in the United States depended more on technological change than labor and capital factors. Other economists, A. Datta and S. Aragwal used data from many countries to study the link between telecommunications infrastructure and economic growth. These authors used dynamic data and the regression equation for evaluation (Datta A., Agarwal S 2004). Using the Cobb-Douglas function, a researcher at the University of California conducted a study in 1977-1997 to assess the impact of ICT on overall productivity in Singapore (Luhmann N,1982). Research has shown that investing in ICT has a very high impact on labor productivity. Finnish researcher P. Nuninen studied the impact of investment in computer systems on economic growth in the country using a new growth accounting system and concluded that the ICT sector has a more substantial impact on real growth than other factors of production. In connection with these studies, Stanford University researchers L. Lay and I. Tokutsu assessed the impact of ICT investment on economic growth in the United States during the 1960s and 1990s using the three-factor translogarithmic unit price function, consisting of computer capital, capital, and labor resources (Пидоймо Л.П. and Бутурлакина Е.В, 2010). Research has shown that in the United States, almost half of the increase in GDP was due to investment in the computer industry (Ji Z. and Sun Q., 2009). In general, much research has been conducted in the United States

and other advanced countries to analyze the impact of the ICT sector on overall productivity. Based on their research, American economists M. Boskin and L. Lay concluded that more than 40% of economic growth in developed countries is due to technological progress, primarily the application of information technology (Пидоймо Л.П. and Бутурлакина Е.В, 2010).

D. Pilate and F. Lee studied the impact of the ICT sector on the economy and labor productivity in Australia, Canada, Denmark, New Zealand, Ireland, and Norway. Researchers have concluded that there is a strong link between ICT use in these countries and the growth of the overall productivity factor (Ahmed E.M.and Ridzuan R., 2012).

According to Brenner's calculations, information technology increases labor productivity many times (Ставцева Т.Н., 2010). The impact of the Internet on economic growth is of particular interest to researchers. The Boston Consulting Group found that a 10% increase in Internet penetration contributed to a 1-2% increase in GDP (www.bcg.com). According to a 2011 study by McKinsey in Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, the United States, Brazil, China, India, South Korea, and Sweden (13 countries), between 1995 and 2009, The average 7% increase in GDP in the countries was achieved due to the Internet. In 2012, the Boston Consulting Group studied the impact of the Internet on economic growth in the G20. According to the study, the contribution of the Internet to economic growth is 8.3% of GDP in the UK, 7.3% in South Korea, 5.5% in China, 4.7% in Japan and the United States, 4.1% in India caused an increase. In general, various production functions and statistical approaches are used to analyze and forecast economic processes. Malaysian researchers E.Ahmad and R.Ridzuan used data from 1975-2006 to study the impact of ICT on economic development in several Asian countries, including Malaysia, Thailand, Singapore, Indonesia, the Philippines, Japan, South Korea, and China. Capital (CAP) and labor (LAB - human capital). To assess the impact of ICT on production growth in Asian countries, a new parameter has been added to this function - the telecommunications investment (TELINT) parameter. Using initial data, the

Hausman test and the generalized least squares method (GLS) were used to detect the relationship between the dependent variable of GDP and independent parameters - labor, capital, and telecommunications. Research has shown that ICT plays a vital role in economic growth and sustainable economic development. The existence of a long-term relationship between GDP and factors of production (capital, labor, and telecommunications) is justified by calculations. As a result of introducing a new parameter in the standard production function, such as telecommunications investment, to assess the impact of ICT on GDP, the production function is expressed as follows: GDPit = f (CAPit; LABit; TELINTit).

It should be noted that the ICT industry is mainly concentrated in the United States, Canada, Europe, and Southeast Asia. Africa, Latin America, and most Asian countries do not have ICT production and lack financial and human capital. Therefore, research in these countries to assess the economic impact of investment in ICT, including the Internet and mobile telecommunications, is essential. It allows us to talk about achieving higher benefits through applying high technologies and an innovative economy based on the "knowledge economy" and thus do everything possible to ensure our national economic security. At the same time, the analysis of WFP ratings shows that this will not be possible only due to successful macroeconomic indicators. With the qualitative growth of the modern economy of Azerbaijan, each new step requires more effort, and only a balanced and comprehensive improvement of all factors affecting the overall competitiveness can be the basis for this success (www.weforum.org/WEF/The Global Competitiveness Report 2011-2012). At present, the main objects of capital investment in the Azerbaijani economy are housing, highways, road construction, construction of water supply and sewerage systems, transport, energy, and communications. In this case, the state does not have to fully finance these investments, as there are always alternative sources. This requires only flexible regulation of this market.

A clear example of this is the construction of housing in Azerbaijan, which is funded entirely by private sources. At the same time, in our opinion, the need for public funding for the infrastructure of the country's economy will remain. For

example, in the leading countries of the West, the share of public spending in GDP has increased from 6-12 percent to 45-55 percent over the past 40 years (up to 80 percent during the financial crisis in 2008).

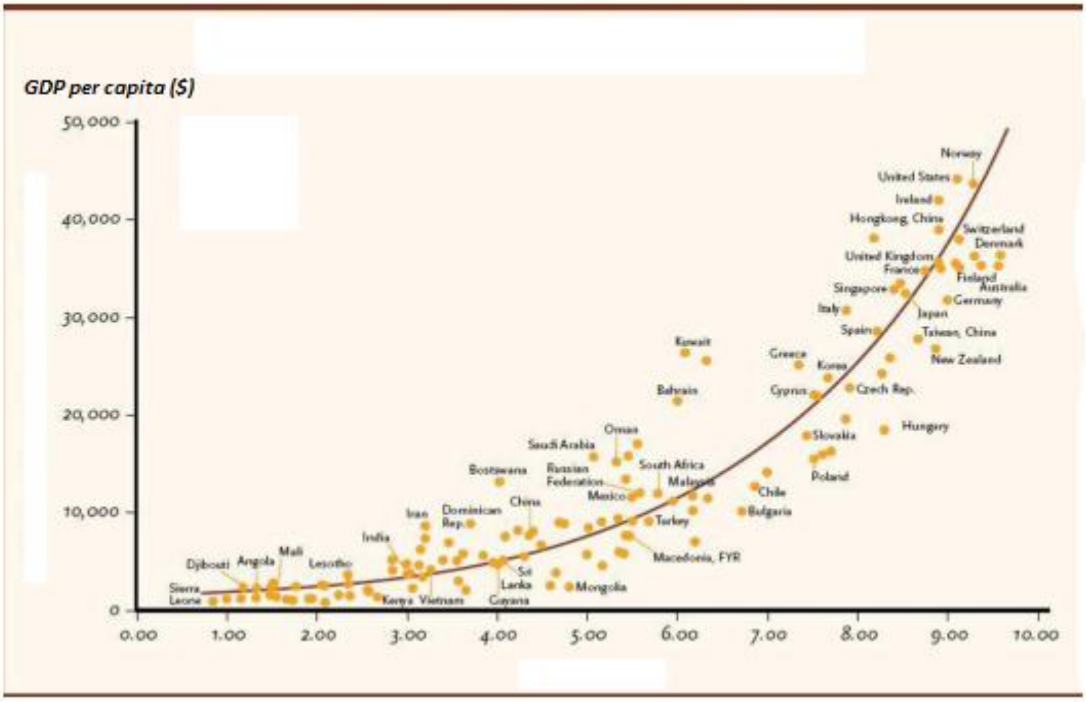
This, in turn, has strengthened the state's regulatory role in the economy, especially in the high-tech sector (www.weforum.org/WEF/The Global Competitiveness Report 2009-2010). More attention should be paid to domestic investors in the Azerbaijani economy. An alternative strategy based on foreign investment as the driving force of economic growth is to build on its capabilities, especially in the early stages of economic modernization. Furthermore, in our opinion, one of the current tasks to improve the security of the Azerbaijani economy is to increase national competitiveness and ensure the creation of world-class infrastructure in the country as a critical component of this. In general, the formation of a successful, world-class infrastructure in Azerbaijan with its modern potential will accelerate the modernization of the country based on the application and development of the XXI century and help increase the national competitiveness of the Azerbaijani economy.

2.2. The national innovation system as the institutional basis of the knowledge economy

It is impossible to imagine the process of modernization without innovative development since modernization in itself involves the application of innovations. The Austrian economist Schumpeter identified five types of innovation: - a new product, - new production method; - a new source of supply; - new markets; - New ways of organizing business. The main focus in the economy is on the first two types of innovation. Based on the role of entrepreneurs, creative destruction, and the business cycle, Schumpeter argued that innovation destroys the economy. Influenced by Schumpeter's school of science, McLaurin identified five steps toward technological innovation: - science; - discovery; - innovation; - finance; - reception (diffusion). Today, some companies around the world create innovations, while others imitate it. Thus, the elements of R&D are the struggle between research (R) and development (D). Calculations based on a dynamic general model show that social welfare only increases when the sustained intensity of innovative initiatives exceeds a critical threshold (Segerstrom P.S., 1991). There are two models of approach to the R&D paradigm: 1. The primary function of R&D is to create a new product; 2. The second function of R&D is to support new products, processes, and services by creating new knowledge. Contrary to the principle of return on investment (ROI), R&D does not serve the purpose of finding a golden mean between profit and innovation. The application of innovations requires the active and organized use of various organizational resources (Klein J.K., Andrew P., 2005). 2. Azerbaijani scientist Eminov suggests that to create and develop the infrastructure to support small business in Azerbaijan, it is possible to develop a model of strategic innovation development and an organizational and economic mechanism for the development of innovative entrepreneurship. This mechanism can be applied as a set of methods, techniques, and tools to stimulate the development of small innovative enterprises in the country as a whole and in its economic regions (Eminov N.O., 2012). Based on the economic miracle of South Korea, the transition from a low-wage export-oriented industrialization course to a

market model based on innovation and entrepreneurship has been crucial (Branscomb L. M. and Choi Y.H., 1996).

Figure 2: Knowledge Economy and Economic Growth



Source: World Bank Institute, Measuring Knowledge in the World's Economies 2021

According to the World Bank research on measuring the knowledge and its impact on the world economy, it can be concluded that there is a positive relationship between the GDP per capita and the amount countries spend on the development of the knowledge economy (see figure 1).

According to Bergek and other scientists, innovation systems have 7 functions: (Bergek A., Jacobsson S., Hekkert M., Smith K., 2010) 1. Development and dissemination of knowledge; 2. Identify impacts and opportunities on the direction of the search; 3. Entrepreneurship testing and risk and uncertainty management; 4. Market formation; 5. Resource mobilization; 6. Legalization; 7. Development of positive side effects. In order to build an agrarian innovation system in Azerbaijan, its mission and functions, as well as key players (agricultural producers, universities, think tanks, entrepreneurs), must be identified, and working mechanisms must be established to create conditions for the development and

application of innovations. Successful innovation systems develop their uniquely competitive scientific, educational, and technological profiles and strengths slowly over decades or even centuries, and change usually manifests itself too late. This feature should be taken into account when creating the Agrarian Knowledge and Innovation System in Azerbaijan. Today, the world's leading innovation systems are based on the high level of interaction between science and technology, industrial institutions, and the political system. Innovation systems define the roles of participants actively involved in the process, enable the formation of a system-specific spectrum of diversity, develop their own areas of discussion, and stabilize interactions expectations (Smits R.E., Kuhlmann S. and Shapira P., 2010). At the same time, innovation systems act as special intermediary forums and bodies that facilitate negotiations between their participants. Innovation is a broad concept. The Organization for Economic Co-operation and Development (OECD) defines innovation as introducing a new or significantly improved product (product or service) or process, a new marketing method, business experience, workplace organization, or a new organizational method in foreign relations. This means that all innovation activities are scientific, technological, organizational, financial, and commercial steps that lead to or envisage the application of innovation. At present, many stakeholders view the relationship between innovation practice, innovation policy, and even innovation theory through the prism of the joint development or acquisition of knowledge. In modern theories, knowledge formation is considered a top-down linear process but complex with many repetitions.

Gibbons (1994) called this the transition of science from Regime 1 to Regime 2. Leidesdorff and others call this the triple spiral approach: According to the approach, the three independent institutional structures (government, business, and science) are more independently managed by their own development and interact with each other from time to time (Leydesdorff L. and Etskowitz H., 2003). A systematic approach to innovation implies that a firm's behavior cannot be understood simply in independent decision-making at the firm level. Innovation, moreover, encompasses two different levels of complex interactions between a firm and its

environment. In his work on business cycles, Schumpeter also linked the gap between innovations with long-term Kondratyev waves. With the mass production of the fourth industrial wave maturing and the development of ICT as the fifth industrial wave (Perez C., 2002), businesses began to decentralize research and development (R&D) funds in the 1980s. Scale effects have developed resilience, which has necessitated the transition from strategic research to consumer-oriented innovation. At the same time, public funding for research and development has increased. As a result, new issues have emerged in innovation management: absorption capacity, commercialization of intermediate institutions, and university research (for example, start-up projects and the availability of risky and venture capital). Innovation management has made it possible for more and more organizations to network across borders. Agreeing with F. Agio's research (Гуриев С., 2010), we can say that successful modernization is achieved through vertically integrated large-scale structures, but a competitive environment and small companies are more important for innovation. Given the challenges to developing a competitive environment not only in Azerbaijan but also in the entire post-Soviet space, we can talk about the need for modernization, innovation, and the participation of large businesses. Achieving the development of a competitive environment for small and medium-sized businesses is a key challenge for modernization. It is necessary to develop an environment that is necessary for successful innovative development, the creation of innovative products. Innovation infrastructure is characterized as a set of public and private structures that provide the evolution and support of all phases of innovation development. During the establishment of the national innovation system, the government forms certain conditions for the development of the innovation sphere, determines the strategy of innovative development of the economy, participates in the development of scientific research. This, in turn, requires the legal regulation of innovation activities, the formation of appropriate infrastructure, the implementation of state measures of economic and financial nature that ensure innovation activity (Əliyev İ., 2007). Strengthening the local innovation system and developing efficient clusters

can add value to unprocessed products and enhance the value chain in horticulture, food production and packaging, food storage and transportation, food security, sales networks, and export potential (Juma C., 2011). The elements of the National Innovation System (NIS) include the following: - state (management function and coordination); - normative-legal base of innovation activity; - Infrastructure of MIS; - Subjects of innovation activity, the market for science-based products In the first stage of independence, increasing the production capacity of the Azerbaijani economy and renewing the infrastructure required deep modernization. Thus, the main strategic directions of economic modernization have been identified. In general, there are active discussions on how to modernize. Innovation is the creation of new technologies (from the point of view of the global economy), and modernization is the introduction of the most modern ones. Innovation is aimed at the export of new technologies and their integration into global processes. In the context of developing a knowledge-based economy, modernization of the agricultural sector necessitates the development of the following infrastructure: 1. Creation and development of innovation transfer centers (tested in Kazakhstan) and business incubators (established in different regions of Russia); 2. Development of agricultural innovation transfer network, national and global integration; 3. Establishment and development of venture funds in the agricultural sector using the US experience; 4. The complex development of upstream and downstream directions for the creation of agrarian-innovative clusters; 5. Formation of the mechanism of state support for agrarian innovations and creation of a single information system; 6. Creation and development of electronic agricultural infrastructure. Today, the global changes associated with the rapid development of innovations, technological processes, and free enterprise have caused several global challenges that the economies of all countries worldwide have faced. As a country with large reserves of many types of natural resources of great geostrategic importance, Azerbaijan also faces these challenges to one degree or another. The more important and far-reaching challenges of reality are determined by interrelated factors that depend on the following changes: -

increasing global competition involving not only traditional commodity, capital, technology and labor markets, but also political governance systems, innovation support, and human development; - the expected new wave of technological changes that strengthen the role of innovations in socio-economic development and reduce the impact of many traditional growth factors on competitiveness; - increasing the role of human capital as a key factor in economic development and the formation of sustainable competitive advantages, a science-based economy requires personnel that is different from those required by a quality labor-intensive and capital-intensive economy; - depletion of export-raw material potential based on the rapid growth of fuel and raw material exports of the economic development model; -complication of the world food crisis; - aggravation of the world energy crisis; -complicating the current demographic and immigration situation, changes in the number and quality structure of the population acting as both a consumer and a labor force; - the expected ecological changes and, as a result, the abandonment of the man-made nature of economic development, the acceleration of its ecologization (www.weforum.org/WEF/The Global Competitiveness Report 2010-2011/). However, we would like to note that the conditions of political stability in Azerbaijan and the successful socio-economic base created in recent years for further reforms, in our opinion, raise the possibility of becoming one of the top fifty most competitive countries. In our opinion, this is a real and, at the same time, the large-scale goal of continuing to improve our national economic security. Many years of international experience show that the continuation of economic modernization and the formation of an innovation system in Azerbaijan will allow our economy to move out of the development zone of superior raw material exports and give a strong impetus to the growth dynamics of processing industries.

2.3. The role of the state in the formation of the knowledge economy

The study showed that the leading role of DDCs in world exports is not only expressed by the high share of their weight. The role of these countries is that they mainly export high-tech products. Such products are either not produced or not produced enough in other countries. This is in favor of DDCs: a country with a high demand for high-tech products becomes dependent on these countries and allows DDCs to make a monopoly profit. However, no one and no state voluntarily gives them this opportunity. DDCs have always had this opportunity in their own countries because they care about science, technology, and the MAN who created them, and they still do. One of the main distinguishing features of DDC foreign economic relations is the creative implementation of state regulation. The study of the problem showed that the state plays a major role in foreign economic activity in all DDCs. The main goal is to ensure socio-economic development in the country. The state uses all means to protect export companies and, if necessary, provides them with financial, technical, organizational, and moral assistance. When necessary, methods of subsidizing and securing export loans are also introduced. Developed Western countries are also very flexible in the process of inflow of foreign capital. If the state thinks that foreign investment is essential, then the state creates a liberal regime. The essence of the liberal regime is that the state uses the method of registration, not prohibition. In this case, the state is not passive. It stimulates the country by creating appropriate infrastructure to attract capital, which is very important. The link between science and industrial production is more beneficial than the link between science and other sectors of the economy. The organic combination of science and entrepreneurship in the industry is carried out in various forms. The fast-growing innovation business is of great importance. At its center are territorial scientific production complexes. In developed countries, such complexes are called "Technopark," "Technopolis", and their main purpose is to increase the production of science-intensive products in the industry. In principle, the latest techniques and technologies are created, tested and organized in small batches for the production of scientific products. There are

more than 100 technopolises in the United States. The United States accounts for about 40% of the world's scientific output. Science-intensive industrial products create conditions for the rapid development of other sectors of the economy. This shows the essence of the leading role of industry in the economy. In the state regulation of developed countries, man, his life, his destiny is always at the forefront. For example, improved government regulation in the United States has led to significant results in two areas: first, steady GDP growth (an average of 2.5-3.0% in recent years), and second, creating a large number of new jobs. (11 million in the early 1990s). Intensive foreign economic activity is observed in all DDCs. Compared to other countries, DDCs have a more creative approach to foreign economic activity and seek optimal options. The objective basis for approaching the issue from this perspective is that foreign economic relations have a strong impact on the country's socio-economic development. As a rule, DDCs try to reduce production costs and increase overall efficiency by developing foreign economic relations. "New norms of foreign economic cooperation" means, first of all, the following. First of all, they want to organize the production of fundamentally new products and services in their countries and sell them on favorable terms to consumer countries. The analysis shows that almost all DDCs use these methods to expand foreign economic relations. This opportunity to expand foreign economic relations is either non-existent or limited in other (developing, transition economies). In the DDCs, the force that creates this opportunity is their economic, technical, technological, scientific, and military forces. Because the economic power of DDCs is always much higher than in other countries, they can invest billions in the consistent development of science, technology. The point is that the strength of any state, including the DDC, in the modern world economic system is determined by its achievements in the field of research and development (ETLTI) and the intensity of its "application to production." It requires much money. The DDCs can cope with this money. The United States can sell computer hardware and software to all countries of the world. Germany and Japan are among the leading countries in the automotive

industry. The supply of resources minimizes dependence on foreign countries. In addition, the large domestic market of the United States, the high technical, organizational, scientific potential of companies, the world's leading exports and imports, socially-oriented economic policy, machine-building with a leading area superior development and progressive structure of man, mastering new types of high technologies, etc. Such aspects are the factors that create the conditions for the intensive development of the economy, the driving force of economic development in the United States. The US government is also creative in creating new jobs through its economic mechanism. The new jobs incorporate the latest advances in science and technology, and serious consideration is given to the wages in such jobs. This long-standing tradition, combined with measures to constantly reduce the product's material, stock and energy capacity, has allowed achieving such a progressive result that the share of labor costs in production costs has reached 70%. This is a very progressive indicator and is the result of the state's consistent social policy. It also proves that the number of people engaged in intellectual labor in America is constantly growing, the number of high-paid people is increasing, and the middle class is developing. The US economy has several distinctive features. The most significant thing for the modern era is that the United States pays more attention to ten new techniques and technologies, produces science-intensive products, and has been a leader in innovation for many years. This is reflected in the balance sheet that characterizes the payments and receipts for the transfer of technology. It should be noted that this balance includes "technology transfer" operations, patent registration, licensing, trademark acquisition, copyright and industrial design of designs, know-how, and management. Reports on payment for services in the field are shown. According to many sources, the US technology balance has had a dynamic balance for many years. Its amount is 7-8 billion dollars a year. A dynamic balance creates new opportunities for the United States, and entrepreneurs who use these opportunities are expanding the production of science-based products. Japan has a well-thought-out governance mechanism that accelerates economic development and technical

progress. All other issues aim to achieve the main goal of this mechanism - to ensure a high level of socio-economic and cultural development of the country. In personnel training, when the issue of ownership is resolved, when science and technology are developed, new residential areas are built, management is improved, and so on. In solving such issues, the country's main goal is taken into account in the first place. Science is being developed in Japan in six integrations into production (especially industrial production). It is no coincidence that up to 70% of ETLTI's costs fall on the industry. The state of Japan is an example for other countries around the world. The US and German governments have not yet been able to form such an effective government. Territorially, Japan, which has a much smaller share of natural resources than the United States and Western Europe, has become a real catalyst for economic, social, and technical development in the world. As a result, as experts call it, a "war corporation" - a union of industrial firms, banks, trade unions, and the state with a very effective mechanism - has emerged. Such corporations can compete and win with all countries of the world.

The probability of internal conflicts in such large corporations is close to zero. Success also comes from here. The high level of harmonization of business efforts with government regulation is also best resolved in Japan. It also creates good conditions for the competent protection of the domestic market.

CHAPTER III. PROBLEMS AND PROSPECTS OF FORMATION OF KNOWLEDGE ECONOMY IN CASE OF AZERBAIJAN REPUBLIC

3.1. General trends and factors of knowledge economy development in Azerbaijan

According to the World Bank's Knowledge Economy Index, Azerbaijan's rapid progress in the knowledge economy in the post-Soviet space in 2000-2012 has affected the quality of the labor force and increased labor productivity. The experience of South Korea shows that investing in education can turn Azerbaijan into a center of the knowledge economy in the future. The experience of Costa Rica shows that when the literacy of the population reaches a certain level, the economy is ready for modernization because innovations can be applied and employed only by a skilled labor force. In Azerbaijan, which has a literacy rate of about 100 percent, special attention is paid to training specialists to form a workforce contributing to modernization. The development concept "Azerbaijan 2020: Vision for the Future" envisages further improvement in the agricultural sector's scientific support and training. Although agriculture provides about 5 percent of GDP in Azerbaijan, it accounts for 38 percent of employment. In turn, this disproportion reflects the situation with labor productivity and human capital development in the agricultural sector. The conceptual directions of staff training were: Identification of general and additional needs for professional staff; linking the future development of professional training systems with scientific and technical progress and production technology; providing a structural forecast for the training of qualified personnel by professions and specialties (Allahverdiyev Q.S., 2012). The process of modernization makes it necessary to increase the intellectual burden of labor. "Intellectualization of labor" means increasing the superiority of mental labor over physical labor. This concept is closely related to the theory of human capital and the paradigm of the knowledge economy. The theory of human capital was introduced to science by Theodore Schultz (Becker G. S, 1994) and

developed by his successor, Gary Becker, to formulate the efficiency of investing in human capital and an economical approach to human behavior. Gary Becker was awarded the Nobel Prize in 1992 for his contribution to science. As the founder of the theory of knowledge economics, Fritz Maxlup showed a radical change in the role of the human factor in the economy and society. The development concept "Azerbaijan 2020: Vision for the Future" states that the foundation for the transition from a traditional economy to a knowledge economy must be laid, and the adequate development of human capital, which is crucial for this, must be brought to the fore. The urban environment provides a reasonable basis for the development of human capital and the knowledge economy. Strengthening the relationship of science with the economy in Azerbaijan is also reflected in the "National Strategy for the Development of Science in the Republic of Azerbaijan for 2009-2015," approved by the decree of the President of the Republic of Azerbaijan dated May 4, 2009. The strategy defines the priorities of scientific research following the development of world science and the solution of critical socio-cultural issues of the country, the formation of a new type of knowledge-based economy, modernization of science management system, scientific infrastructure, research institutions, and science funding mechanisms, training of highly qualified personnel. The main directions of state policy in the field of development of science and technology aimed at protection of scientific schools and ensuring succession in science, integration of science, education and production, improvement of social security of scientists, strengthening of normative legal base and information provision, integration of Azerbaijani science into international scientific space is a set of goals, principles, and approaches of the measures to be implemented. The National Strategy for the Development of Science in the Republic of Azerbaijan for 2009-2015 also states that the strategic goal in improving the network of research institutions should be to ensure the unity of theoretical and applied aspects of research. Here it is necessary to consider the optimal combination of the structural and functional characteristics of research institutions with their structural qualities as a network. Relevant activities are

carried out within the "Electronic Azerbaijan" State Program framework in a number of government agencies related to the agricultural sector - the Ministry of Agriculture, the Committee for Land and Cartography, Amelioration, and Water Resources Open Joint-Stock Company.

For example, in order to implement the “Electronic Azerbaijan” State Program in the Land and Cartography Committee and accelerate the use of electronic signatures, as well as to provide modern and flexible management, increase the range and improve the quality of electronic services provided to the population and government agencies. Order No. 58 was signed. With this order, the training schedule on the application of ICT in management with the staff of the Office and district (city) departments and subordinate institutions included in the Committee structure was approved and began to be held. Connection of district (city) departments of the Committee and regional branches of subordinate bodies to the single Internet network can allow conducting virtual training and organizing video reception of citizens via the Internet. The Ministry of Agriculture of the Republic of Azerbaijan, the Land and Cartography Committee, the Amelioration and Water Resources Open Joint-Stock Company integrate into the e-Government State Information System (EGIS) and offer various interactive services on the e-Services Portal. All three bodies provided unimpeded and free access to the e-service by providing the name of the service provided, the exact list of documents required for this service, and the electronic form of the relevant documents. A particular program ("engine") has been developed to identify the applicants to the e-service unit, receive electronically completed applications and scanned copies of the required documents, and submit a confirmation notice to the sender. Review is provided in the prescribed manner and time. Appropriate billing systems have been established to ensure real-time electronic payment of fees and other charges for the services provided. The implementation of operations through the e-service unit, mainly through EHDIS, allowed to take advantage of the necessary technical security measures applied in the system to ensure the security of personal data. The electronic signature is implemented following the legislation of the Republic of

Azerbaijan. It has legal force in the presence of software and technical means that ensure its identification and observance of the rules of use in the automated information system. The Law on Electronic Commerce defines the legal basis for the organization and implementation of e-commerce in the Republic of Azerbaijan, the rights and obligations of its participants, as well as the responsibility for violation of the legislation on e-commerce. Participants of e-commerce are legal entities and individuals who act as sellers (suppliers), buyers (customers), and electronic document management in the implementation of e-commerce. Institute of Soil Science and Agrochemistry of ANAS (TAI) Reconstruction of local network infrastructure, use of AzScienceNet, ensuring the network's connection to the AzScienceNet node via fiber-optic cable, the creation of Wi-Fi and Eduroam services. The informatization of laboratories and structural units at the Institute of Soil Science and Agrochemistry, extensive use of computer technology, advanced software play an essential role in the development of science, the achievement and application of innovative results. Because the advantages of information technology are widely used in developed countries for high-level research and experiments in agriculture, these technologies are crucial in the modernization of the agricultural sector and the achievement of innovative scientific results. Azerbaijan's Azerspace-1 telecommunications satellite will export $ 10 million worth of resources by the end of 2013. Through two more satellites planned to be launched into orbit, Azerbaijan is strengthening its position in world space markets.

From 2014 to 2017, oil production in Azerbaijan will have a "W-shaped" dynamics and dance around a production volume of about 40 million tons. During this period, reputable think tanks forecast an average of $ 100 per barrel. Thus, Azerbaijan will stabilize oil revenues in the medium term, and from 2019 will compensate for declining oil revenues by expanding natural gas exports from the Shah Deniz 2 phase. Stable oil and gas revenues provide a common basis for the comfortable development of the non-hydrocarbon sector in Azerbaijan. For example, the share of the non-oil sector in GDP will increase from 48.8% in 2011

to 72.4% in 2017. In 2014-2017, the non-oil sector will grow by 40 percent and have an average annual growth rate of 8.6 percent. The non-oil sector will be the fastest-growing sectors - construction, tourism, ICT, food production, and some non-oil industries. The expansion of computerization in the agricultural sector increases the speed and accuracy of information transmission. Being aware of the latest information on product prices, investments, and consumer trends can significantly increase the optimality of the farmer's decisions and positively impact his position in the deals. Such information is a tool for deciding about future plantings and crops and the best time and place to sell products. In many countries, initiatives are being taken to address this issue. Simple websites designed to compare the supply and demand for agricultural products are the beginning of more complex trading systems. These sites evolve from local shopping websites and pricing information systems to systems that offer marketing and sales functions. Typically, price information is collected from key regional markets and stored in a central database. The information is published on the website and delivered to farmers through the information center. In order to reach a wider audience, the information is broadcast on local radios, televisions, or mobile phones, thus creating a single information platform between producers and traders in the region. For example, in Sri Lanka, the Govi Ghana project displays prices on light boards in key markets. Currently, the information and consulting system called "Knowledge Dissemination Cooperative Service" is rapidly developing in the United States as an important direction in the informatization of the agricultural sector. This system covers all areas of agriculture, the main sectors of the food complex, and provides information on agricultural entrepreneurs' socio-economic and environmental situation. It is possible to build appropriate infrastructure for collecting and transmitting agricultural information in Azerbaijan using the capabilities of artificial satellites launched into orbit. In recent years, developed countries have been building their policies to ensure more sustainable development. The main goal of sustainable development, a model of economic progress, is to ensure that available resources are used for human needs while

protecting the environment through modern technologies. In this sense, the modernization of energy production leads to energy efficiency (Diesendorf M., 2007). Sustainable energy policy consists of two main directions. One is policies to increase alternative and renewable energy sources, and the other is policies to increase energy savings and energy efficiency. The damage to the environment caused by the processing of traditional energy resources, the depletion of these resources, and the desire of countries to ensure energy security have led to an increase in research and projects in both areas of sustainable energy policy. Unlike most oil and gas countries, Azerbaijan has paid more attention to these issues in recent years and has taken several measures. The “State Program on the Use of Alternative and Renewable Energy Sources in the Republic of Azerbaijan” approved by the President of the Republic of Azerbaijan Ilham Aliyev on October 21, 2004, and the establishment of the State Agency for Alternative and Renewable Energy Sources in 2009 are the main activities in this direction. The action plan for the implementation of the "National Program for the Use of Alternative Energy Sources" in the Republic of Azerbaijan states that the development of modern technologies for the production and application of bio-substances from industrial, agricultural, and household waste, as well as the design of small biomass power plants must be built. Due to the degradation of the technological structure, those engaged in the national economy have changed accordingly. Throughout the 1990s, not only did the number of unemployed in Azerbaijan increase, but its quality structure increased, and the share of skilled and highly skilled workers increased more rapidly. Thus, in the mid-1990s, the share of the unemployed with higher and secondary special education in Azerbaijan was 39.2% of the total, while the number of those with primary education was already 2%. At that time, it was more intense in the economically developed regions of the country than in the past. In Moscow and St. Petersburg, the share of the unemployed with secondary special education is 55% and 57.2%; respectively, the general average is 34.3% and 32.5%, respectively, only 0.2% and 0.7% without primary education. In the first half of the 1990s, the Azerbaijani economy was represented by two-thirds of the

workforce at the beginning of the twentieth century, while at least a quarter of those employed in the United States. Thus, contrary to world trends, there was a demand for more highly educated workers in the Azerbaijani economy, funds were spent on their training, and socio-economic development was ensured. This global approach is ineffective and illogical from the point of view of the processes in the country's economic and social life in the 1990s. The modern fifth technological structure based on modern microelectronics, informatics, biotechnology, electronic networks is very little represented in Azerbaijan. According to experts, it accounted for only 2% of GDP in the mid-1990s. According to the State Statistics Committee of Azerbaijan, at the beginning of 1996, the share of modern high-speed digital telephone exchanges was only 15.5% of the capacity of automatic telephone exchanges because the stations are not connected. Even in Moscow, the level of implementation of modern digital telephone networks was 12% lower than at the beginning of 1999. At the same time, telephone networks in the SIO are practically digitalized. If we consider that our country has been provided with international communication channels for the next 10 years, the transition of analog systems to digital systems on domestic lines is prolonged. On a large scale, this means that Azerbaijan is trying to integrate into the global information society fully. The provision of computers - more typical of the fifth technological structure - reached 25 to 40 units per capita in Azerbaijan at different prices by 1997. In the United States, this figure was 9 times in 1995, but it was 14 times in reality. The volume of information services in the country is still insignificant, mainly due to the low level of development of computer networks. While the share of satellite communications was 2.5% in the 1990s, it decreased to 2.3% in the early 1996s. According to official data and experts, 65% - 90% of our satellites need a complete replacement, which has used its resources. For comparison, 80% of transatlantic telephone calls are via satellite, which means that Russia has the potential for satellite communications, and the potential of other countries is simply great. Trends in the reduction of this interruption are not yet considered. Modern satellite communications are of paramount strategic importance for the country. The

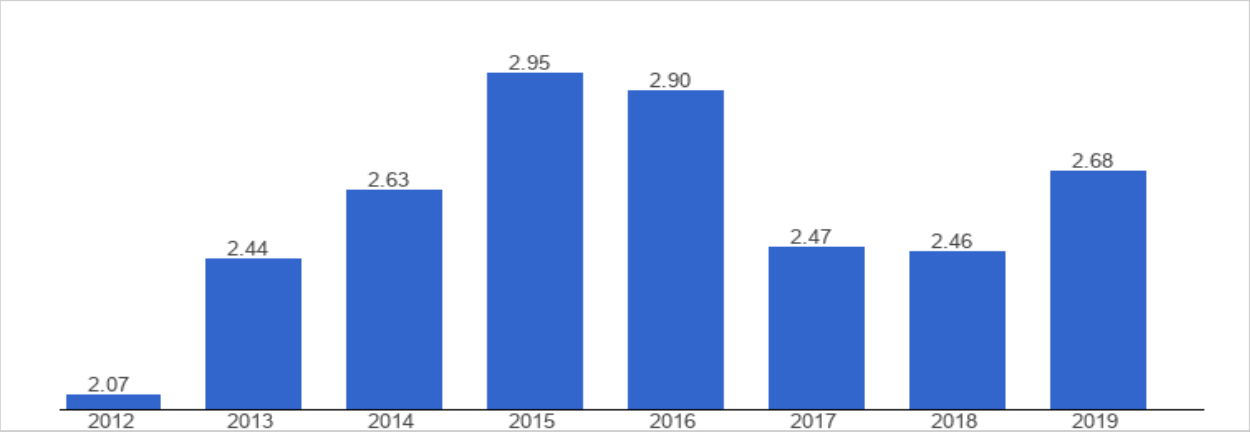
availability of large space infrastructure for electronic and optical intelligence is a global information advantage of the United States. Azerbaijan is gradually losing its orbital satellite grouping, European countries are creating it, and the United States is taking a rare opportunity to receive and process any information from anywhere in the world. In the mid-1990s, more than 70% of homes in the United States were covered by cable television services. In general, Azerbaijan needs mass investment in telecommunications, another area on which virtually the entire national economy depends. In the early 1990s, Azerbaijan's telecommunications sector lagged behind the West by 10 to 15 years. In the 1970s, the national industry carried out the first information revolution. Imports of basic communications and television equipment increased throughout the 1990s, while domestic production declined. The optics used in the country are imported in almost full capacity. However, it should be noted that optical fiber production began in Azerbaijan in 1997-1998, but the finished parts for it are imported. Azerbaijan's telecommunications and information networks are currently controlled by about 80% of foreign companies.

3.2. Science and high technologies in the economy of modern Azerbaijan

Science is the sum of people's knowledge of the objective laws of nature and society. The concept of "science" also includes the practical activities of people who collect and systematize this knowledge. People gather information about the objective laws of nature and society and gradually study them and draw certain scientific conclusions. These conclusions can provide a complete and incomplete knowledge of objective laws. It is challenging to fully understand the objective laws of nature and society and apply them in practice. The progress of science and technology is a continuous process. Its objective basis is the needs of the people and the rapid growth of these needs. The point is that the means of production that society is responsible for in any period can only meet its needs for a certain period. Over time, existing tools and objects of labor are unable to meet the ever-increasing demands. There is a need to create better, more productive means of production to meet society's new superior needs. There is a time when it is impossible to meet the needs of society for this or that product with the help of available means of production. There is a growing need for new technical means to be found, produced, and applied in various fields of industry and the national economy. This also necessitates revolutionary revolutions in technology. This need is solved in principle as a result of the creation of new equipment. This process continues uninterrupted. That is why many scientific and technical revolutions have taken place in the history of mankind, and this process is still going on. In simple terms, technology has come a long and complicated way, from primitive stone tools to computers, which are now widely used in production and have artificial intelligence. There are many examples of technological revolutions. The emergence of stone tools in its time was a revolution. Later, replacing stone tools with tools made of other materials (iron, steel, various solid tools) was also a revolution in technology. The emergence and application of the steam engine in the second half of the 18th century and the emergence of electric and internal combustion engines in the late 19th and early 20th centuries are also technological revolutions. Along with the technology the amount spend for education is the

fundamental factor for creation of knowledge economy, the average value for Azerbaijan during that period was 3.09 percent with a minimum of 2.07 percent in 2012 and a maximum of 6.06 percent in 1992. The latest value from 2019 is 2.68 percent. For comparison, the world average in 2019 based on 101 countries is 4.18 percent (see figure 3). Technological revolutions in modern times have become a complex and multifaceted process.

Figure 3: Azerbaijan: Public spending on education, percent of GDP, 1992 - 2019



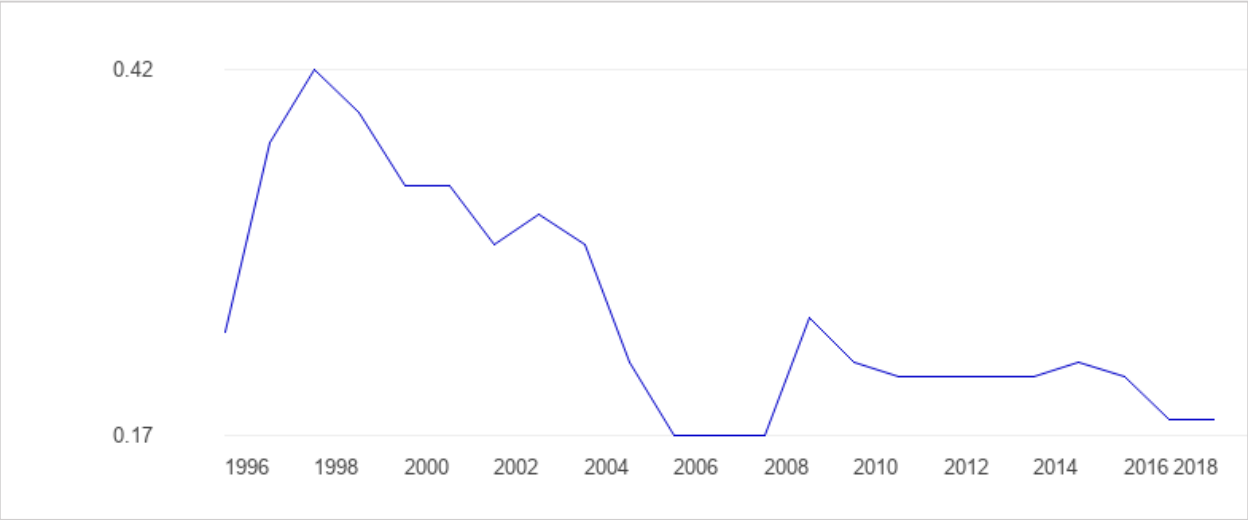
Source: https://www.theglobaleconomy.com/Azerbaijan/Education_spending/

The main feature of this process is the change in the kinematic structure of technology and the creation and development of fundamentally new rings - cybernetically programmed devices, control and control rings. The emergence of such rings has allowed realizing the long-cherished dream of society - the creation of automated production. As a result of such a technical revolution, man is freed from all kinds of monotonous, uncreative work. Science goes through two stages in its development. In the first stage, science develops gradually, slowly studying this or that lawful process of nature and society. However, such a gradual (evolutionary) development covers a specific period. A new basis must be created for further development.

Such a new basic science emerges in the second stage of development - the revolutionary stage. The second revolutionary stage takes place in a shorter period than the first. As a result, scientific knowledge is further enriched. On such an enriched basis, science falls into a new line of development, and again (on this new

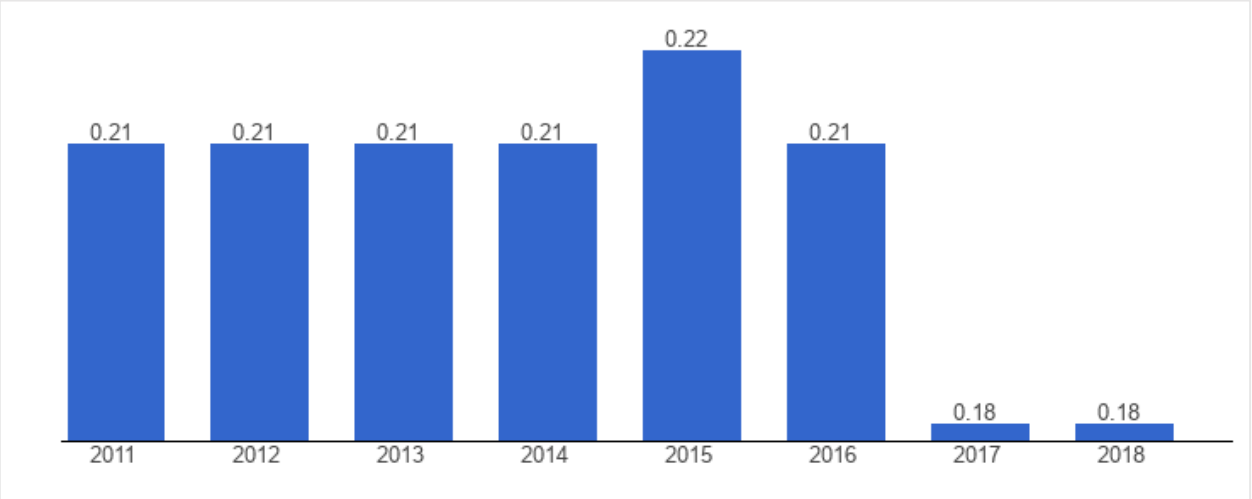
basis), the gradual (evolutionary) development of science begins. So, it can be concluded that the progress of science is the sum of its gradual (evolution) and revolutionary development. At the stage of gradual development of science, the basis for its revolutionary development is being prepared. As the development of science, the development of technology takes two forms - evolution (gradual development) and revolution (qualitative change, explosion, leap). The period of gradual development of technology can be different. The duration of evolutionary changes depends on the development level of society's productive forces and the state of the economic mechanism. If the level of development of productive forces is high and the economic mechanism is perfect, then the evolution of technology can be shortened. Regardless of the period covered, during the evolutionary period, the means of labor are gradually improving: technology becomes more sophisticated, productivity increases, technical parameters improve, and so on. It must be pointed out that, as in science, the development of evolution in technology ends with revolutionary development, but in particular, the progress of the means of labor does not stop. After the revolution in technology, its gradual development begins again on a new basis.

Figure 4: Azerbaijan: Graph of the expenditure of R&D in Azerbaijan



Source: https://www.ceicdata.com/en/azerbaijan/company-statistics/az-firms-that-spend-on-rd--of-firms

Figure 5: Azerbaijan: Research and development expenditure, percent of GDP, 1996 - 2018



Source: https://www.theglobaleconomy.com/Azerbaijan/Research_and_development/

In figure 4. Research and development expenditure, percent of GDP, 1996 – 2018 years in Azerbaijan was shown as an essential parameter for knowledge economy development. The average value of the expenditure for R&D in Azerbaijan during that period was 0.25 percent, with a minimum of 0.17 percent in 2006 and a maximum of 0.42 percent in 1998. The latest value from 2018 is 0.18 percent. For comparison, the world average in 2018 based on 49 countries is 0.89 percent.

So, as in science, gradual development in technology results in revolutionary changes, and then, on an entirely new, progressive basis, gradual development begins again, and new revolutionary changes take place, and this cycle is constantly repeated. The progress of science and technology, as a rule, leads to the progress of production on a global scale. This means that new techniques and technologies are spreading in all directions, all over the planet. When new techniques and technologies spread on a large (global) scale, the issue of their practical use depends on the development of international relations and economic relations between countries. A characteristic feature of modern times is the increasing intensity of scientific and technical revolutions. Science presents itself as a fully productive force and positively impacts the world economy and its semi-systems. Science is a productive force reflected in the creation of new types of

labor objects and tools, the improvement of existing ones, and the active influence on production technology. A unique and crucial aspect of scientific and technological progress is the positive impact on the formation and development of the world economy. This is since modern ETT, which is rich in R&D, allows to increase the volume of any product. Therefore, in foreign economic relations and widely traded goods, modern machinery and equipment with technology, management, knowledge, experience, scientific and technical information, or "embodied" knowledge (experience, science) have a high specific weight. As a result, the world economy is developing. One of the modern features of the modern scientific and technological revolution is the internationalization of the use of scientific and technical activity results. The internationalization of scientific and technical achievements allows accelerating the application of inventions, rationalization proposals, and know-how in production to expand international relations and accelerate the growth of the world economy. The time required to implement innovations in production varies from country to country. For example, the average term in Japan is 2-3.5 years, in the United States 5-7 years, in Germany 8-10 years.

It should be noted that the exchange of scientific and technical experience is carried out in several forms. The United States is a world leader in high technology exports. The United States has a 70% share of licenses sold worldwide. Countries that import licenses also benefit greatly. For example, in the 1950s, Japan was 20-30 years behind the United States regarding technical level. Today, Japan has managed to overcome this backwardness and even maintains world leadership in some areas. Japan continues to obtain a license, eliminating the backlog in a short time. Thus, the rapid development of scientific and technological progress in individual countries, the application of scientific and technical achievements in production on a global scale, and the intensification of "know-how" in this area and parallel, combining license and parent exchange in all areas and all kinds of innovations. The acceleration of another process - the turnover of goods, services, and finance - has led to the formation of a new international division of labor,

creating conditions for the rapid development of the world economy. Scientific and technical progress has a substantial impact on the development of industry and the improvement of its structure. This effect is complex and almost inexhaustible. Scientific and technical progress (ETT) affects the sectoral structure of the industry with its general, specific, and latest directions. ETT leads to the emergence of new types of products. Under the influence of this process, the instrument-making industry, mechanization and automation, the production of electronic and radio equipment, and the chemical industry began to develop rapidly. Mechanization and automation, which are essential areas of ETT, lead to the rapid development of mechanical engineering. Electrification made it necessary in the machine-building industry to produce generators, transformers, and the like, new to those times. The large-scale use of chemical materials and chemical technologies in the production of products highlights the need for superior development of the chemical industry. At the same time, particular fields producing equipment for the chemical industry, fields of organic synthesis producing a wide range of synthetic products, areas carrying out the enrichment of mineral raw materials are emerging and developing.

3.3. Establishment of a national innovation system, the basis, and prospects for the development of the knowledge economy in Azerbaijan

Industrial parks are being created in Azerbaijan to stimulate the process of industrialization. Several industrial parks have been established to develop innovative industries. To this end, following the Development Concept "Azerbaijan 2020: Vision for the Future", along with the development of innovative entrepreneurship in the country, creating a favorable environment for the promotion of new activities and products, measures are being strengthened to transfer and master advanced technologies. Technoparks and innovation zones are being created in Azerbaijan to develop and apply science-based products and technologies. Innovative industry development manifests itself in the production of products that have undergone significant changes or are newly introduced. For example, the processing industry is a leader in this area. In 2012, the volume of products that underwent significant changes in the processing industry or were newly applied amounted to 22.656 million manats, 98.3 percent of the exact figure for the entire industry. In this sense, in particular, the production of beverages, chemical industry, computers and other electronic equipment, machinery and equipment, and installation and repair of machinery and equipment were distinguished. The production of improved products in the processing industry in 2012 amounted to 809.6 thousand manats, which is more than 80% of the relevant figure for the industry. The analysis shows that innovative development in the processing industry is accelerating. In areas where Azerbaijan has a strong competitive position, it is possible to target innovative development based on fundamental research, applied nature, and new activities. It is essential to develop the necessary infrastructure for this. Elimination of technological backwardness facilitates the presentation of innovation because innovative development requires, first of all, a stage of modernization. In the coming years, the elimination of technological backwardness will occur in the context of complex economic processes associated with global transition processes in the economy in the "turbulent decade" (May B., 2010), as defined by V. May. It is precisely these

conditions that can stimulate the leap in modernization when the innovative economy slows down. According to Glaziyeva, technologically backward countries can already benefit from developed countries' innovative and technological experience, which will allow them to optimize the composition of technological chains (Глазев С., 2009). There are two directions of state activity and regulation of the modernization process: direct and indirect. As a method of direct influence, the state finances innovative development (by purpose, subject, and problem areas), lends, provides leasing services, conducts fund operations. Planning and programming of innovative development, as well as direct regulation of entrepreneurial activity of the state, can be included in the arsenal of policy. As for indirect regulation, the state creates fertile macro conditions to accelerate the innovation process and implements stimulus (tax, customs, etc.) policies. In order to increase the efficiency and competitiveness of the agricultural sector in Azerbaijan, it is necessary to develop a knowledge triangle consisting of education, research, and innovation. The integration of the knowledge triangle with entrepreneurship can directly accelerate the process of modernization of agriculture. The Agricultural Knowledge and Innovation System (AKIS) operating in the European Union can be considered an essential experience for developing innovative agriculture in Azerbaijan. The Agrarian Knowledge and Innovation System has become a substantial structure, encompassing education, training, and research. In addition, the Agrarian Knowledge and Innovation System opens up opportunities for the development and application of innovations, covering other links in the food chain (food producers, suppliers of turnover and fixed assets, institutions providing services to agricultural production, etc.). In developed countries, manufacturing is the primary source of financial and knowledge resources for sustainable development. Industrialization then requires the development of the service sector and creates new jobs. According to empirical calculations, industrialization plays an accelerating role in transforming the economic structure of agrarian societies. In fact, this concept of economic development is related to the changes that occur with the enrichment of countries.

On May 3, 2011, President Ilham Aliyev signed a decree on improving governance and developing agricultural science in Azerbaijan. The order aims to accelerate the innovative development of agriculture based on the latest technologies to eliminate retail in the management system.

According to the order, significant work has been started to improve management in the agricultural sector. We can note that the Department of Agrarian Sciences has already been established at ANAS. The Department of Agrarian Sciences has three research institutes with vast scientific potential - the Institute of Soil Science and Agrochemistry of ANAS, the Institute of Genetic Resources of ANAS, and the Azerbaijan Scientific Research Institute of Erosion and Irrigation. Strengthening the coordination of Azerbaijan's agricultural science, consistent use of assistance from international organizations and foreign scientific centers in training, strengthening the material and technical base of research institutes in the agricultural sector, and increasing the average monthly salary of scientists should be included in the long-term plans. In the modern world, agrarian advisory services are entering a new stage with the development of the ICT sector. Resource centers can be established in villages using ICT opportunities, where agricultural producers can diagnose the problem individually or in groups, process data, and test the results (Luhmann N., 1982). Relevant structures have been established in Azerbaijan to establish a link between science and the economy. For example, the State Fund for Information Technology Development under the Ministry of Communications and Information Technologies, established by the President of the Republic of Azerbaijan on March 15, 2012, aims to promote the implementation of state policy in the field of information and communication technologies, support entrepreneurship, innovation, and research. To stimulate projects, stimulate the development of modern infrastructure, provide financial support to small and medium-sized businesses, and attract local and foreign investment in this area. At the same time, the main goal of the Science Development Fund under the President of the Republic of Azerbaijan is to promote the development of science, first of all, the development of the country, society,

and economy. However, as these funds are not directly related to the agricultural sector, we would suggest establishing the State Fund for Commercialization of Agrarian Science as a network of intermediaries for applying research results to improve the structure of the intellectual product market Azerbaijan, based on Kazakhstan's experience. The primary purpose of this Fund should be defined as the achievement of direct application of the results of scientific research in the economy. The Fund can also finance grants for fundamental, applied, and innovative exploratory projects in the agricultural sector. The State Fund for Commercialization of Agrarian Science will allow the structure of agricultural science to meet agriculture's current and future needs. Strengthening the functional partnership of agricultural science and agriculture will increase the role of agricultural science in the development of agriculture, strengthen personnel training, expand basic scientific research, improve the mechanism of funding science, modernize not only the agrarian sector but also scientific and technical infrastructure and information science. Venture financing is a form of lending and financing of scientific and technical research, discoveries, inventions, the implementation of any risky but promising innovations by small and new companies, and an element of the relevant mechanism. Venture funds and companies are commercial organizations that review, select, and implement technological innovations and develop research to finance and complete technical innovations or provide funding and advice to companies and enterprises that have those innovations. Although the financial resources of Azerbaijani universities are not sufficient to invest in venture capital, initial government support for universities (for example, through the establishment of joint ventures) may solve this problem.

By investing in the agricultural sector, Azerbaijani universities will include the latest achievements of science in their curricula, gain the opportunity to effectively organize research activities, strengthen the capacity of scientific personnel, expand interdisciplinary research, obtain a mechanism for direct application of research, contribute to improving the intellectual property market. It

will gain additional opportunities to develop distance education, help students find jobs in the future, and benefit. In 2012, the State Agency for Alternative and Renewable Energy Sources of the Republic of Azerbaijan started work on the project "Agro-Energy Complex," which will be located in the Samukh region for the first time in the world. The project's primary goal is to make the energy supply of agricultural and processing industries, residential, social, and other buildings more sustainable through alternative and renewable energy sources and bioenergy through agricultural and household waste. In the future, it would be expedient to attract venture capital to establish such settlements in other regions. One of the main activities of venture investment funds established in the agricultural sector should be education. The key to successful venture capital investment in rural areas is to reconcile the interests of all parties involved in the process - entrepreneurs and investors and commercial and public interests. The proposed State Fund for Commercialization of Agrarian Science in Azerbaijan can offer direct financial, information, and other assistance to small and medium-sized innovative enterprises in the agricultural sector by implementing government policy and developing new high-tech products. It can assist in implementing projects related to production and support the creation and development of infrastructure for small and medium enterprises. The need for the development of innovative entrepreneurship is due to the following factors: - Intensification of intensive factors of product development allows the application of ETT in all spheres of economic activity; - Science plays a decisive role in increasing the efficiency of development and application of new techniques; - The need to create new equipment, significantly reduce the time of mastering, increase the technical level of production is a factor. It is also necessary to develop the mass creativity of inventors and rationalizers; - The specific nature of the scientific and technical production process manifests itself mainly in the uncertainty of the results, the diversity of research, the presence of risk, and the possibility of obtaining negative results; - the costs of the enterprise increase during the development of new products; - emerges as an objective necessity for the morally rapid application of techniques and technologies.

Small innovative entrepreneurship needs a unique program, and above all, a system that addresses tax and credit incentives, an autonomous system of venture financing, and a developed innovative infrastructure. This program, developed and implemented in the agricultural sector in Azerbaijan, includes the following main directions for supporting innovative entrepreneurship:

1. Develop infrastructure to support small innovative entrepreneurship (technoparks, innovation-technology, and engineering centers, technology transfer centers, venture and leasing companies, and creation of other innovative institutions);

2. Establishment of a preferential regime for the activities of innovative entrepreneurship entities at the initial stage;

3. Simplification of the accounting and reporting system;

4. State financial control over the activities of innovative entrepreneurship support funds (related to the use of budget resources);

5. Development of personnel training system for organization and management of the innovative business, etc. The socio-economic significance of mastering innovation is that the consistent use of innovative activities in agricultural production results in economic and social benefits for the consumer, which creates material conditions for effective management and development of production. The functional significance of mastering innovation is to eliminate differences in scientific and technical knowledge and production practice.

In order to accelerate the modernization of the agricultural sector in Azerbaijan, it is necessary to ensure the integration of science and education into the process on a single platform. Our research shows that the realization of the idea of a university cluster based on the Azerbaijan State Agrarian University can be an additional impetus for training, innovative development, and modernization in the agricultural sector. The ideological basis of the concept of university cluster is reflected in the development concept "Azerbaijan 2020: Vision for the Future". The concept envisages strengthening relations between science and industry to create an innovative economy in the country, creating the necessary mechanisms

for conducting applied research following market needs. State support measures will be implemented. The relevant legislative framework will be created to stimulate the production of competitive products by increasing innovation activity, establishing the necessary mechanisms for implementing innovation activities and ensuring the effective use and development of innovation potential.

Along with the development of innovative entrepreneurship and the creation of a favorable environment for the development of new activities and products, it is planned to strengthen measures for the transfer and adoption of advanced technologies, the creation of technology parks and innovation zones for the development and application of science-based products and technologies. The term university cluster can be found in many countries, especially in almost half of the CIS countries. This concept is currently used in the Russian Federation, Georgia, Belarus, Kyrgyzstan, and others. It has become quite popular in CIS countries. In the experience of developed countries, the University cluster is considered in some cases within the framework of general education strategy and sometimes in the framework of special innovation programs. In this regard, the cluster created based on the Azerbaijan State Agrarian University, in addition to training following the requirements of the labor market, can also organize the writing of conceptual documents (draft law, policy document), as well as business consulting, outsourcing and outstaffing services. For this purpose, the Azerbaijan State Agrarian University has the following advantages:

a) Human resources and material and technical base that can provide these services;

b) to use the resources of the state;

c) International reputation;

d) Positive image in the labor market.

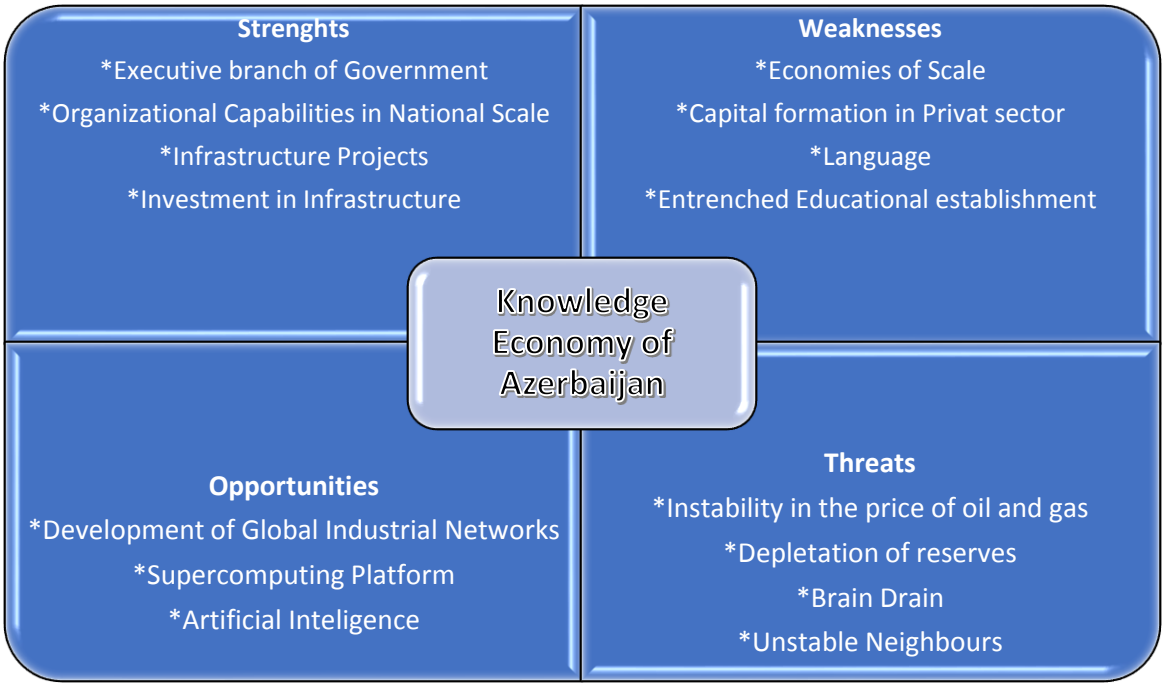
The establishment of agro-technoparks in Azerbaijan can be a step forward in the commercialization of knowledge in the field of agriculture, modernization of the agricultural sector, increasing efficiency, diversification of the economy in general. Agrotechnoparks are located in Singapore, Cameroon, Brunei, Russia

operates effectively. Our research shows that it is possible to establish an agro-technical park in the territory of Azerbaijan in the Nakhchivan Autonomous Republic. The blockade of Nakhchivan necessitates the modernization of agriculture in this area, strengthening food security, obtaining foreign currency, increasing the export of agricultural products, and creating new jobs. The Azerbaijani government has already begun to establish industrial parks to develop competitive industrial production based on high technology. Presidential decrees on the establishment of Sumgayit Chemical Industrial and Balakhani Parks were signed in December 2011. Nakhchivan Agrotechnical Park can use the region's scientific potential (of course, this potential should be further strengthened after the creation of the park). It should be noted that the Nakhchivan branch of ANAS (in particular, Laboratory of Fruits, Vegetables and Grapes at the Institute of Bioresources, Laboratory of Cereals, Legumes and Technical Plants, Laboratory of Biochemical Research, Department of Botany, Plant Systematics and Zoological Research) and Nakhchivan State University (In particular, the departments of chemistry, geography, zoology, botany and veterinary medicine at the Faculty of Natural Sciences and Agriculture) can make a scientific contribution to the formation of the agro-technical park. The agglomeration of scientific and educational institutions in the face of Nakhchivan State University as a department of ANAS in Nakhchivan forms an institutional environment; in this way, intellectual value can be transferred to agriculture, and new forms of innovative entrepreneurship can emerge. Using the Russian experience, it is possible to create an Innovative Center for Agrarian Technologies in the Nakhchivan Agrotechnical Park. The Innovative Center for Agrarian Technologies should aim to achieve broad integration of science, education, and production based on the long-term development prospects of the agrarian sector. The main research areas can be grouped as follows: - To achieve success in the field of genetics, biotechnology, and microbiology to reach a new technical and technological level in agricultural production; - Adaptive-landscape improvement of the area, design of various agro-

technologies; - Use of resource-saving, environmentally friendly and high-productivity technologies.

Based on the analysis, it is possible to make a SWOT analysis of the Knowledge Economy development in Azerbaijan.

Figure 6: SWOT analysis of Knowledge Economy of Azerbaijan



Source: Analyzed by the author on the basis of articles, www.researchgate.net

CONCLUSIONS

In the second half of the new century, professionals in technological innovation, using effective technologies, allow manufacturing companies to increase productivity and guarantee competitiveness. Ultimately, it leads to economic growth and easier and more efficient ways to achieve goals. Enterprises, especially state-owned enterprises, can promote the development of the information and knowledge society and become an integral part of it if they understand the value of the knowledge produced, and at the same time choose the knowledge product needed by their organizations and use it for the benefit of the organization. Using the Cobb-Douglas function, various mathematical methods, and World Bank statistics, it is possible to assess the impact of ICT, human capital, and other resources on the economy. Research shows that the development of the ICT sector has a positive impact on GDP growth; ICT is the driving force of the economy and a key factor in economic development. By improving the Cobb-Douglas function used in the analysis process, the impact of ICT in various areas of the information society can be assessed. This can accelerate the spread of modern technologies in developing countries, playing an important role in building a new society and a competitive economy. A high agrarian orientation index can positively contribute to the sustainable economic development of agriculture in Azerbaijan in the medium and long term. It is important to increase the number of tractors and combine harvesters per thousand hectares in Azerbaijan to the world average in the short term and to the level of industrialized countries in the long run. In order to accelerate the modernization of the agricultural sector in Azerbaijan, it is necessary to ensure the integration of science and education into the process on a single platform. Establishing a university cluster, land grant universities, the Agrarian Science Commercialization Fund, and agro-technical parks would be important. The analysis of the role of national competitiveness in ensuring economic security of the Republic of Azerbaijan in the current stage of development of the world economy leads to the following conclusions: 1. Continuation of modernization of the economy and formation of innovation system

will allow our economy will fully ensure the country's competitiveness in the world community and its equal integration into the world economic space; 2. The conditions of political stability and the successful socio-economic base created in recent years for further reforms have made it possible to enter the top fifty countries that are more competitive with our economy. This is a real and, at the same time, the large-scale goal of continuing to improve our national economic security; 3. Increasing and forming national competitiveness as one of the factors of ensuring the economic and general security of the country is a powerful weapon in the state; 4. One of the tasks of improving the security of the Azerbaijani economy is to increase the national competitiveness and, as a key component, to ensure the creation of infrastructure in the country that meets world standards; 5. Stable economic reforms in the modernization of the Azerbaijani economy, especially technological development, efficient financial institutions, the state's role in the economy is not possible without strong; 6. In the context of globalization, the protection of the country's economic security as a new independent task of the state under the influence of the market system is one of the important issues. In Azerbaijan, government agencies should look at the economic (socio-economic) security system as a tool designed to provide better conditions for the development of society and the state itself within the full range of possibilities; 7. The dynamics of the World Economic Forum (WEF) index indicators in recent years show that it is important for the Azerbaijani economy today to maintain existing competitive advantages and move to higher advantages through the introduction of new technologies, high technologies, and an innovative knowledge-based economy. Thereby doing everything possible to ensure our national economic security; 8. Foreign investment does not automatically solve all the problems of ensuring the economy's competitiveness, and during the financial crisis, national sources are more important than foreign sources. In the post-crisis period, the Azerbaijani economy should pay more attention to domestic investors. As a result of the research, we consider it appropriate to make the following proposals: - To implement the knowledge-based economy, the activities of

enterprises in the country should be electronic. According to the processes, the information should be entered into the information system quickly and accurately. In this study, by proving the visible positive impact of the knowledge economy on economic processes, it is possible to achieve a more effective economic activity due to the development of science and technology and application programs.

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List of figures