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CONTEMPORARY ISSUES RELATED TO YOUTH EMPLOYMENT: ARMENIA'S CASE

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Key words: youth employment, unemployment, skilled labor, labor market, "brain drain", economic security

Introduction. Our major goal is to reveal the obstacles for the youth employment in Armenia and develop feasible recommendations to the policy makers to improve the possibilities and conditions for young people to utilize their competitive advantages. In accordance with the main terms for productive work and in order to support young entrepreneurs in Armenia number of experts conducted research to study current social and economic conditions where Armenian young people are struggling to find themselves in various branches of economy and business. These factors, in turn, compel to look at existing risks and opportunities, human and other resources and to analyze some success stories in countries with similar or closer levels of economic development and institutional progress. The outcome of our study might be useful for those government structures and decision makers who deal with youth isuues in Armenia. It may also be considered for some international organizations concentrating on projects related to youth employment and the “brain drain” problems in developing countries.

Scientific novelty. Our study leads to a number of conclusions serving theoretical foundation for practical and efficient solutions of existing problems. Particularly, the linkage between the non-financial and financial services is established and justified. Practical recommendations are worked out aimed to the following: how to improve the linkage between the financial and non-financial services providers. We believe that the government need to encourage not only the cooperation, but also set up a chain of structures(private and public), and each of them will carry their part of responsibility for the final outcome -- more favorable conditions to conduct micro and small business in Armenia. We suggest a set of criteria to choose competitive advantages for each community and set a priority list of competitive advantages for each community where investments are most welcome;

Methodology. Conducted study is based on preliminary research related to the youth employment. We have arranged series of meetings for exchanging ideas on possible solutions, logistics, coordination of activities and methods of work, planned, participated and organized group discussions, made subject - related presentations during the collection and analysis of relevant data. We attempted to use methods of collecting empirical data, as well as the data published and provided by the national

service of statistics. Among the various methods used in this study we preferred those tools that are frequently used by the academic circles examining the youth problems, including youth unemployment causes and consequences. Methods of comparative analysis is used particularly to compare different levels of unemployment and other economic indicators related to economic growth, competitiveness, as well as other methods used in economic analysis. Finally we visited all ten marzes of Armenia to study the conditions facilitating or creating obstacles for your employment and entrepreneurship.

Literature review. *Y*outh employment issues are not new. They are of major practical and academic concern for nearly all governments and progressive minded people, as well as academic circles. While some experts concentrate on youth education and its role in achieving sustainable development [Al-Braizat, 2016, 356–367], on youth and the economic cycle [Bell et al., 2011, 241–267], demographic and education effects on unemployment [Biagi et al., 2008, 1076–1101], others pay more attention on transition of youth from education to the labour market [Braziene et al., 2012, 112, 214–244], promoting young people's full participation in education, employment and society [European Commission, 2007], youth unemployment in the OECD: demographic shifts, labour market institutions, and macroeconomic shocks [Jimeno et al., 2002, 155], as well as on investment in education and US economic growth [Jorgenson et al., 1992, 94, 51–70]. We believe all mentioned issues deserve keen attention, however, to better comprehend the youth problems, we need to take into consideration also such patterns of youth unemployment as peculiarities and commonalities of youth employment in developing and developed nations, the short, medium and long-term effects of youth unemployment, rural youth networks, educational policies and youth unemployment, the school-to-work transition, education and investment in human capital and many others.

Analysis. On phase one preliminary research and analysis were conducted based on personal observations and interviews. On phase two several main findings where gathered from a series of group discussions. Finally, new data was collected and analyzed from personal observations made during the field trips to Aragatsotn, Ararat, Armavir, Gegharkunik, Syunik, Vayots Dzor, Tavush, Kotayk, Lori and Shirak marzes. Our main focus includes the target groups, external factors, supporting government priorities, the role of the education, PR and outreach, the quality of non-financial sector, as well as issues related to the legislation and others.

Target group. What age group shall be considered as a target group for providing qualified financial and non-financial services and productive youth employment:

Participants agreed on 18-30 years old (some suggested up to 35 considering population aging trend in Armenia)

- Who and how had succeeded in business (with or without loans, other financial, non-financial services, other assistance): conduct a survey;

External factors

- How to categorize the customers of financial and non-financial services: unemployed, employed, self-employed;

- Does the quality of financial and non-financial services depend on any external factor?

- Favorable investment environment, banking system, interest rates (some participants suggest that the interest does not matter as much as other terms of the loan, such as grace period for principle payment or duration of the loan based on the type of loan);

Supporting government priorities. How to support the priorities set by the government through the linkage between financial and non-financial service providers: For example, propose tax advantages to those young women/young family businesses who will invest in such priority industries indicated in government program as pharmaceutical, wine / brandy, machinery, particularly in rural and small urban areas in Lori and Shirak marzes; Government need to encourage fruitful cooperation between private, public sectors and civil society to strengthen the linkage between financial and non-financial service providers;

Role of education system. What is the role of education system in supporting productive youth employment through non-financial services:

- Job fairs need to be organized systematically in universities, involving private and public sectors
- On job trainings are extremely useful to prepare young professionals for future work
- For certain professions allow teachers to teach courses only those who are successful in business
- Arrangement of field practices for 2-4 weeks during high school/university studies
- Establish departments sponsored by companies of particular industries to educate young professionals (e.g. Synopsis – Armenia chair in YSU)
- Strengthen the network of technical colleges to educate middle level specialists to run new technologies;

PR, Outreach. How to learn about success stories of existing linkages between financial and non-financial service providers, particularly, initiated by SME DNC and others: more PR and advertising best practices and benchmarks; aside from SME DNC, UCOs, there is also MFI sector in Armenia which is one of the most advanced in the world, regulated by the CBA, complying not only with the regulatory requirements of our country but also operating very much in tune with world best practices, serving over

100,000 clients, over 50% in rural areas, over 50% female clients, over 50% with non-collateralized loans with an outstanding portfolio of several billions of drams.

Quality of non-financial services. How to improve the quality of non-financial services: provide licenses to those individuals and companies who meet professional requirements; examine and spread the best practices models of linkages between the non-financial and financial services in other regions of Armenia;

Coordination. To map the programs already implemented (or still in the progress) by the State, local and international organizations in the field of women and SME development; to use data (especially statistics) how many women work and where; not to lean only on the statistics provided by the Statistics Service and international organizations; to request data from Marzpetarans (Marz centers); that data reflects a real/better picture in the marz, according to the participants;

Strategy. To design the project in a strategic way to change the mentality of people, their stereotypical attitude towards the entrepreneurship; to encourage young people to turn from service-based jobs to pro-active entrepreneurial activities;

Quotas. To help developing quotas for young people from the regions to study at different educational institutions (in the capital and other big cities) with the purpose to return and fill in the labor gap in their marzes;

Health. To create a mechanism (special medical insurance??) for those young women working in the toxic conditions (in particular in the areas of chemical industry) to secure their reproductive health;

Vulnerable communities. To target the poorest regions of the country instead of going to the marzes where donors and investors are already present: the participants highlighted the priority to go the poorest regions with high rate of poverty and migration to help people building opportunities from zero;

Agglomerations. To select small towns surrounded by a number villages, to create connections between the town and villages through entrepreneurial co-assistance projects;

Traditions and customs. To explore what existed in the marz before: to revive the artisan culture which used to take place decades ago; to promote folk culture in the work of the entrepreneur-to-be young people for better marketing;

Localize. To analyze the needs of the marz; to initiate community needs based project; to develop those fields of industry, agriculture or service in the marz, which could become self-sustainable in the future;

Incentives. To give an impetus to those business projects which would be beneficial not only to the individuals starting the business, but also to the whole community living around those projects.

Our final step concludes the activities in rural communities and suggests:

- Establishing a business, especially in the manufacturing sector, can be very risky (particularly in Shirak)
- Most of the new businesses emerge in the trade and service sector
- It is important to explore and recognize what the competitive advantages are for every particular target locality
  - o For instance, for Shirak it may clearly be the agricultural sector. Some other industries, such as production of construction materials or shoe manufacturing may also be worth of close consideration
- Free economic zones have been advocated for by the local business people (in Shirak, in particular)
- The lack of appropriate young labor force is wide recognized (both in Lori and Shirak). For instance, in Shirak, the same peers of young graduates who have established new businesses in the region complain about the new graduates not returning to hometowns and staying in Yerevan. In the same Shirak region, some of discussants mentioned about the situation with the labor force further aggravating (just a year ago, it was perhaps easier to recruit new young staff).
- Technopark in Gyumri may somewhat claim a best practice, due to primarily its record of support in the inception and maintenance of new businesses. In particular, it extends office space and provides necessary training to proactive and idea-resourceful young entrepreneurs. Another good practice by Technopark is their commitment to recognize the best of the best in their field through the award system and special support provision to winners of business idea contests.
- The conventional sequence of flow of young and talented human resource from small town to a regional center, and only then to the capital city of Yerevan is distorted in the case of Shirak. In particular, young people from Artik and Maralik detour Gyumri and migrate to Yerevan straightforward.
- The competitiveness of locally produced, especially high-tech, items remains an issue. There is the good example of a young and growing company (and a Technopark spin-off) producing ceiling hangers for LCDs. While the quality of the product may even be exceeding that of some of Chinese equivalents, the price discrimination may be quite an oppressing factor for the local producer.
  - o Technopark may further explore opportunities to assist with market entries for their existing and potential spin-off, as well as marketing technologies and sales, for newcomers to relevant industries in particular.

Gender aspect has been downgraded by most of the discussants, while also recognized that there is no special discrimination associated with gender (although for waged labor force the level of salaries of women is often lower than that of men).

Conclusion. Thus, there is major lack of trust in the local economic settings and societies at large in both regions. For instance, it has been pointed out by several

discussants in Gyumri that many established and successful Shirak-born entrepreneurs residing outside of Armenia are very reluctant in making investments in the region (despite their willingness to maintain positive ties with their homeland). There is profound lack of appropriate counseling to new businesses, especially in Lori (as opposed to the practices by Technopark in the IT field). Family businesses do exist (and tend to emerge in greater numbers), however, perhaps in Lori at a more profound scale, than in Shirak. Is there a justified need for the existence of SME DNC, particularly at a regional level (since there is no a clearly proven record of success)? Perhaps, no need to complicate the system with an unnecessary layer of bureaucracy, instead new businesses need to have direct access to private non-financial institutions for the provision of training. Some of the good-will initiatives by enterprises, such as introductory tours to business sites by schoolchildren, may be well organized and coordinated by the SME DNC. Some of the young entrepreneurs advocated for looser relationship with public institutions and thus greater freedom and chances for success. At the same time though, in Lori entrepreneurs admitted that the municipality has the potential and has even served at times as an intermediary between the employers and potential workers. The industrial capacity is often unevenly distributed across the smaller urban areas in the regions. For instance, the 90% of the gross regional product in Lori is contributed by the town of Alaverdi. It has been widely admitted by many entrepreneurs, especially in Lori, that creating a full manufacturing/marketing cycle, from semi-finished to a final product may be an exceptional opportunity for enterprise development and employment provision. SME DNC appears not to have special programs for youth, although high need for that exists in regions in particular. Entrepreneurship has been viewed by many young people too as a risky enterprise and thus is preferred less than the stability and security (albeit at an expense of financial attractiveness) associated with jobs in the public (or social) sector. Preferential treatment (especially tax breaks) is a must for youth-led businesses

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Tatul MANASERYAN

Contemporary issues related to youth employment: Armenia's case

Key words: youth employment, unemployment, skilled labor, labor market, "brain drain", economic security

Certain issues are related to youth unemployment and entrepreneurship. In particular, we pay special attention to an adequate, beneficiary-friendly environment for youth as a key target: develop a “testing playground” for would-be young entrepreneurs to experiment with their business ideas and “learn by doing;” establish effective linkages between the “concepts” put forward and social (real-life) experiences of individual target beneficiaries; encourage and support institutional arrangements for young people to start applying and realizing their new business ideas; encourage proactive knowledge sharing and exchange of thoughts/views by and for youth. Positive proclivity of youth to develop entrepreneurial activity includes the following: raise the level of effective awareness on best practices in the field of youth entrepreneurship through real-life contacts and knowledge sharing; provide as many responses as possible (in the most detailed way) on the question of “how to act” and “what to do” (vs. “what to escape” and “how”) while engaging in entrepreneurial activity; closely collaborate with the SME DNC, especially in the area of benchmark activities in the country; encourage, organize, and technically support news exchange and knowledge dissemination from practicing and successful entrepreneurs to youth who undertake the first steps in their business endeavors.

THE IMPACT OF ARMENIA'S EDUCATIONAL SYSTEM ON INFORMATION AND COMMUNICATION TECHNOLOGIES

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Key words: ICT, startup, educational sector

Introduction. The educational sector plays a key role in the development of Armenian information and communication technologies (ICT) sector and startup ecosystem. Its main role is to provide the sector and the ecosystem with the qualified specialists, but it also a place to train the future entrepreneurs who may generate innovative ideas and create startups based on those ideas. So, it is important to understand if Armenian educational sector efficiently provides qualified specialists to the ICT sector and startup ecosystem.

Scientific novelty. We examine the number of graduates with bachelor's degree and master's degree in ICT specializations and compare those numbers with the number of ICT employees in order to try to find out if Armenian educational sector provides the necessary quantity of specialists in the ICT sector. Besides we also review the quality side of the sector to find out if the educational sector provides for their students with the necessary skills and knowledge to enter the ICT sector right after graduation. We emphasize the reasons why Armenian educational sector does not provide those skills and identify the gap between the traditional educational system and ICT sector.

Methodology. We use data provided by Statistical Committee of the Republic of Armenia to compare the number of graduates with bachelor's degree and master's degree in ICT specializations with the number of ICT employees from 2016 to 2020. This allows us to identify the quantitative shortage of employees in ICT sector. Furthermore, we discuss the reasons of qualitative shortage of specialists in ICT sector using the data provided by "Enterprise Incubator" foundation.

Literature review. In our study we take into consideration "Social Situation of RA in 2020" [1], "Social Situation of RA in 2019" [2], "Social Situation of RA in 2018" [3], "Social Situation of RA in 2017" [4] and "Social Situation of RA in 2016" [5] reports conducted by Statistical Committee of the Republic of Armenia to identify the number of graduates with bachelor's degree and master's degree in ICT specializations and their respective shares among all the graduates for each year. Besides, we gathered the information on ICT employees by a request to Statistical Committee of the Republic of Armenia to compare it to the number of graduates. At last, we take into consideration

"Armenian ICT sector 2018" research conducted by "Enterprise Incubator" foundation to find out the qualitative issues faced in Armenian ICT sector [2].

Analysis. The educational sector, which is one of the important factors influencing the development of Armenia's ICT sector and startup ecosystem, plays the role of training specialists in the market and nourishing them in the ecosystem. In Armenia, there is a gap between the practical skills of the graduates of the higher education institution and the skills necessary for the ecosystem. The point is that graduates of the first level of higher education bachelor, and in some cases the second level master's degree program are often not ready to start working in Armenian ICT enterprises or startups immediately after graduation. For that, they often pass trainings organized by various public and private organizations to be able to get a job in their profession and meet the demands of the ecosystem. That is why, especially in recent years, there has been a significant increase in training courses organized by the state or the private sector, which are more adapted to the training of professionals who meet the requirements of the labor market, eliminating the gap between higher education institutions and the labor market. The private sector, in turn, as there is a great demand for qualified specialists, which is growing year by year, takes on a part of the mission of higher education institutions and is interested in organizing such training courses in order to fill the shortage of qualified specialists. Similar courses, focused more on the development of programming and technical skills and knowledge, are conducted by the Armenian Code Academy, established in 2015. It mainly provides programming training courses for both beginners who want to become programmers, starting their education from scratch, and programming training courses for more experienced professionals who want to expand their knowledge in the world of programming and adapt it to new market requirements. Armenian Code Academy already has more than 5,000 graduates by the end of 2021, who have successfully completed at least one course organized by them [1]: Higher education institutions, of course, lag behind and are aware of such a gap with the market, so they offer compulsory or non-compulsory courses aimed at providing students with more practical knowledge, but there, the processes are slow compared to market developments, which is why very often higher education institutions do not have time to adapt their curricula to such rapidly evolving and changing market demands. This is largely due to the fact that the salaries of the teaching staff working in higher education institutions are low, which hinders the opportunity to attract good market professionals who can provide quality and up-to-date teaching and share their rich experience with students [2, p. 32]. In addition, the share of students in ICT education programs is quite low, despite the fact that the demand for specialists in this field is constantly high and growing year by year. In particular, the number of graduates with bachelor's degrees in ICT specializations in 2020 is 918, and their share among all students who graduated in 2020 is only 5.9%. [3, p. 212]: In 2019, they were

respectively 902 and 5.7% [4, p. 217], in 2018 they were respectively 1,039 and 6.7% [5, p. 220], in 2017 they were respectively 649 and 3.6% [6, p. 215] and in 2016 they were respectively 898 and 4.7% [7, p. 214]: Analyzing these figures, we can state that the number of students graduating from the faculties with ICT specializations had little fluctuations, except in 2017, when the number of graduates was much lower. The same is true for the share of students graduating from ICT faculties among the total number of graduates, which suggests that the education sector is unable to respond adequately to the growing demand for ICT professionals.

The number of graduates with master's degrees of the faculties with specializations in the field of ICT and their share among the total number of graduates were also low. In 2020 they were respectively 192 and 4.2% [3, p. 238]. In 2019 they were respectively 204 and 4.2% [4, p. 252], in 2018 they were respectively 276 and 5% [5, p. 247], in 2017 they were respectively 110 and 2.4% [6, էջ 242] and in 2016 they were respectively 204 and 3.1% [7, p. 241]: By analyzing these indicators we can state that the number of students graduating with master's degrees from the faculties with specializations in the field of ICT also had little fluctuations, except for 2017, when the number of graduates was much lower. As for the share of students graduating with master's degree from ICT faculties among the total number of graduates, it generally ranged from 2% to 4%, which is also a low figure. This shows that the higher education institutions of Armenia do not prepare sufficient preconditions and incentives for the involvement of students in the faculties with specializations in this field, so that their number and the share of the total number of graduates becomes more significant. In addition, many individuals are self-taught to enter and work in the field of ICT through the Internet or various training courses. This also justifies the fact that the higher education institutions of Armenia are not the best at training such specialists in the field of ICT, who will be able to immediately start working in the ICT enterprises of Armenia after completing the relevant educational program.

These figures in the field of education can be compared with the number of employees in the field of ICT, which is presented below.

Table 1 [8]. Number of ICT employees from 2016 to 2021

Year	Number of ICT employees	Growth rate
2016	14,118	-
2017	15,095	6.92%
2018	16,170	7.12%
2019	17,493	8.18%
2020	19,827	13.34%

As we see every year the number of ICT employees is increasing by at least 1,000 since 2016 however the number of students graduating with bachelor's degree from ICT

faculties is barely reaching to 1,000. The number of ICT employees increased by more than 2,000 in 2020 and the number of students graduating with bachelor's degree from ICT faculties was 918 in 2020, so there is yet a shortage of specialists in the field within in terms of quantity as well.

Conclusion. The link between educational and ICT sector is weak, resulting in a shortage of skilled professionals in the field, which ICT enterprises and startups are trying to fill. This shortage is seen both in quantitative and qualitative aspects which causes many ICT enterprises and startups to conduct training courses in order to fill that shortage.

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The impact of Armenia's educational system on information and communication technologies

Key words: ICT, startup, educational sector

Armenian ICT sector and startup ecosystem are growing and the demand for qualified specialists is rising year by year. Specifically, since 2016 it increases by at least 1,000 for each year and in 2020 the increase level became more than 2,000. However, the educational sector provides no more than 1,000 graduates with bachelor's degree in ICT specializations for each year since 2016. This is a quantitative issue the ICT enterprises and startups face in Armenia. Besides, the educational sector in Armenia does not provide the necessary skills and knowledge to their students so that they can start working in ICT enterprises and startups right after their graduation. This is a qualitative issue the ICT enterprises and startups face in Armenia. For this reason, many ICT enterprises and startups organize training courses in order to fill the gap that educational system does not.

THE PROJECT OF INTRODUCING A NEW TRANSPORT LOGISTICS SYSTEM IN "ARARAT WINE FACTORY" LLC

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Key words: transport logistics system, international cargo transportation, logistics operator, cash flow, dynamic calculation of project implementation.

Introduction. The production of alcoholic beverages is one of the leading branches of the agri-food system, particularly in the food industry. In the conditions of free economic relations, the market demand is directed towards the production of higher quality alcoholic beverages, the fulfillment of which requires the use of the latest technologies, devices, equipment, modern skills in order to meet the quality standards.

Based on "Ararat Wine Factory" LLC as a leader in the region in terms of procurement, production and sales, has been an object of research.

The purpose of the article is to study the activities of "Ararat Wine Factory" LLC and the technologies used in it, the export volumes and the process, to develop a new project for the introduction of the transport logistics system and to offer the latest ways of its improvement.

The Ararat plant currently produces more than 20 brandies, and plans to expand its range in the next two years. The company controls the whole process of brandy production, from the purchase of the grape to the bottling. At present, the LLC has resumed wine production, for which it has upgraded a number of subdivisions.

Methodology. In the conditions of expansion, deepening of international economic ties, as well as development of production, there is an increase in transport logistics costs [Christopher, 1999]. In this case, the efficient operation of the transport logistics system is required, which should be conditioned by the optimal mode of transport, the choice of the carrier, the conclusion of contracts with logistics partners, the construction of delivery routes, the integration of the transport and storage process, by optimizing the parameters of the turnover process (reducing costs, increasing the speed of transportation) [Pustynnikova, 2016, 316].

Ararat Wine Factory sells most of its products (68-80%) in Russia, some in other CIS countries (19-31%), the remaining 1-4% in Armenia, which is explained by the low level of product recognition. "Ararat Wine Factory" LLC also exports to Ukraine and other CIS countries like Kazakhstan and Belarus.

Ararat factory exported around 3100 tons of alcoholic beverages to Russia in 2018, in 2019 – 1800 and in 2020 - 2600 tons. To other CIS countries and Europe in 2018, 1400 tons of alcoholic beverages were exported, in 2019 - 700 and in 2020 - 600 tons. Sales volumes in Armenia increased by 3% in 2019 compared to 2018, which is due to the fact that the borders were closed in the conditions of the epidemic (COVID-19).

Literature review. There are a lot of studies related to the development of the logistics system. Some researchers point out that understanding logistics innovations is a prerequisite for effectively studying future freight flows and developing transport policies. In particular, Tavasszy, in his article reviewing these innovations, identified the needs for research on freight modeling and focused on the three main dimensions of model improvement: the structural elements of the simulated system, the functional relationships between those elements, and the dynamic properties of the models [Tavasszy, 2020]. Other researchers point out that there is currently no universal method of measuring the efficiency of a logistics system. They claim that there are five main indicators of logistics system efficiency, such as the aggregate logistical costs, the quality level of the logistics service, the overall performance of the business system, the total duration of the logistic processes in the system and the quality of logistics operations [Arshinina, Kiseleva, 2020].

Analysis. "Ararat Wine Factory" LLC exports alcoholic beverages by 12 trucks to the Russian Federation, the CIS and several European countries. Of the mentioned trucks (according to 2020 data), only six are the property of the company, and the rest are used by the company on a lease basis during the export period. Customers use their vehicles to transport alcoholic beverages to almost all regions of the Russian Federation. Customers in the other countries deliver alcoholic beverages at their own expense (freight costs).

In the process of cargo transportation, the vehicles carrying out the cargo are supervised by the company for a period of 2-4 weeks (the period of being on the route). At the same time, goods transported by trucks are insured, which reduces the risk factor of both product failure and stable partnerships.

At present, the production capacities of "Ararat Wine Factory" LLC have 2 bottling lines, each of them has a productivity of 3000 bottles per hour. The volume of the company's output, according to 2020 data, was 3,005,880 liters for brandy and 340,130 liters for vodka, which is approximately 6011.7 and 680.3 thousand bottle, taking into account that an average capacity of a bottle is 0.5 liters. Taking into account the number of work shifts during the year and the duration of one shift, the factory has 10.7 million annual possibility of bottling. Based on the company's output in 2020, it

becomes clear that only 62.2% of the output capacity was used. In our estimation, the LLC has an opportunity to raise the level of utilization of production capacities, as there are all preconditions for that. The company's fixed assets are currently supplemented by innovative cisterns, which will enable the plant to increase production volumes in the future.

Table 1. Production capacities of "Ararat Wine Factory" LLC in 2020

Indicators	**Unit of measurement**	**Brandy**	**Vodka**
Output volume	thousand bottle	6011,7	680,3
Hourly productivity of bottling machines (2 pieces 3000 bottles per hour)	thousand bottle / hour	6,0	
Shift line	hour	8,0	
Shift capacity	thousand bottle	48,0	
Number of shifts worked per year	turn	224,0	
Production capacity	thousand bottle	10752,0	
Production capacity utilization level	%	62,2	

As the only transport route connecting the Republic of Armenia to Russia, Europe, Central Asia and other CIS countries is the Lars checkpoint, which is overcrowded, in this case there occur many obstacles both for Ararat wine for the normal economic activity of the factory and for the drivers carrying out cargo transportation. The average freight driver delivers the goods to the customer within 12-14 days and returns to the starting point. However, due to the regular traffic jams and accumulations, truck drivers have to stay at the border for extra 5-7 days, which has a negative impact on the partnership between the company and the customers.

It should be noted that the plant procures all the necessary items (bottles, corks, barrels, sugar, etc.) exclusively from the Russian Federation to organize the technological process, and their replacement is carried out by unloaded vehicles, which reduces the logistic costs of the return. For this purpose, the company also carries out transportation for other customers.

In order to keep the brand of its own alcoholic beverages high, the company sets the price of the sold product based on the prices of high-quality vodka and brandy available in the particular country's alcoholic beverages market. It is known that there is an excise tax in Armenia to ensure the process of selling alcoholic beverages. The excise costs for the export of the product range of "Ararat Wine Factory" LLC are borne by the ordering partners. Excise taxes are valid for a certain period of time, which once again emphasizes the need to improve the transport logistics system. One of the main problems of export is the unstable and abrupt changes in the currency, which cause serious economic problems for the normal operation of the company. In particular, most of the

factory's products are sold in Russia and payments are made in rubles, which is known to be as one of the most volatile currencies.

Ararat Wine Factory has signed trade agreements with several large trade organizations of the Russian Federation, which are located in almost all regions of the country. The most famous of these is Magnet, one of the leading food retailers in Russia, the leader in the number of shops and the geography of their location.

The implementation of the project of the new transport logistics system aims to improve the export in "Ararat Wine Factory" LLC, to ensure the optimal mode of vehicle management, to promote uninterrupted, reliable, round-the-clock control of the company's export process, reducing the costs of the turnover process, increasing the speed of transportation.

Given the fact that the plant is expanding its own production year by year, focusing mainly on sales in the CIS and European markets, there is a need to establish the latest level of a logistics system armed with disciplines in accordance with international standards which will provide a clear control over the delivery of manufactured products to the consumer. In this case, the project of the new transport logistics system proposed by us includes a system of several functions:

- upgrading of vehicles (number 5),
- availability of logistics operators (number 3),
- introduction of CRM customer relationship management system,
- use of GPS satellite tracking system to track the movement of cargo at any time along the route and installation of cameras in trucks,
- additional cargo insurance to protect high-value and high-capacity transportation from risks.

The proposed project will require significant capital investment, but at the same time will allow the company to maximize its position in the foreign market, which will increase the awareness of the company's alcoholic beverages among foreign customers and consumers.

In order to implement the project of introducing a new transport logistics system, the Ararat Wine Factory first needs to shape the life cycle of the project. Due to the peculiarity of the proposed project, the company needs to divide the implementation of the project into phases and deadlines. Based on the standard structure of the project life cycle, the initiative phase must first be distinguished.

At the initiative stage, the project manager will be the Executive Director of "Ararat Wine Factory" LLC, as the latter is in charge of the activities of each subdivision of the company, who will identify the needs arising in the whole process of project

implementation and will be able to make some decisions to satisfy that particular needs. After the election of the head, at the initiative stage, the concept of the project will be formulated (the need for the project, the main starting points, the budget needed for the project implementation, the project participants).

The budget needed to implement the design of the new transport logistics system should include the market value of the purchase of 5 new trucks (16 meters, with a capacity of 22 tons). The latter is recommended to be purchased from the VOLVO brand, as the trucks of the mentioned company are tested for cargo transportation on the roads of the Republic of Armenia and the Russian Federation and are more durable (at least 10 years). Because one truck at VOLVO costs approximately $ 80,000 or about 37 million Armenian drams, a total of 185 million drams will be required from the company's budget for the purchase of five trucks of 2020 production.

To transport the five new purchased vehicles, the company will need to hire seven experienced drivers (with at least 5 years of work experience). During the freight shift, the workforce of these two extra drivers will be used to relocate the exclusive ordered goods as soon as possible in 24/7 system. As the salary of the company's current drivers is negotiable and it is paid according to the number of orders placed, each driver will be paid approximately 500-700 thousand drams. As a result, from the company's budget, about 4.2 million AMD will be given monthly to the new drivers.

In order to track the logistical flow of alcoholic beverages, the company will also need to hire three experienced logistics operators who will be in constant contact with drivers, develop optimal roadmaps, be responsible for fuel depreciation costs, and be accountable to the company's executive director. Fixed monthly salary will be set for the operators and each of them will be paid around 400-500 thousand AMD. So, the total month salary for these 3 logistics operators will be about 1.4 million Armenian drams.

As the Ararat Wine Factory expands its geographical customer base year by year, it is imperative for the company to create a customer-friendly CRM (Customer Relationship Management) system and equip all the vehicles available to the company (about 20) with GPS (Global Positioning System) and cameras. This innovation will allow customers to track the location of their product and be aware of the exact delivery time. It will also allow the company to follow the movement of its product [Mirotin, 2002]. In order to implement this project, the Ararat Wine Factory will have to completely overhaul the company's website, which should be implemented by the relevant knowledgeable and skilled programmers, which in turn will ensure that customers to follow the location and movement of their orders at any time. The implementation of new technologies will require about 3 million AMD from the

company. In order to equip the company's trucks, about 2 million drams should be allocated apart from the implementation of CRM & GPS costs.

In the final stage of the project, the Ararat Wine Factory will have to insure the trucks transporting cargo and the alcoholic beverages transported through them, which is due to the fact that the climatic conditions of the Caucasus, especially in the winter months, have a very dangerous impact on the cargo process, which increases the probability of crash and damage to the transported goods. Therefore, an annual insurance of the cargo and vehicles should be included in the company's project in order to avoid risks. Despite the fact that the mentioned project will require quite large investments, they will ensure the uninterrupted cargo transportation of the company until it is delivered to the customer. Examining the insurance market, we found that it would cost the company $ 2,000 a month, or about 1 million AMD, to insure a single freight truck. Therefore, it will require from the company to pay about 220 million AMD for the total annual insurance of the trucks.

At the planning stage, the company must set clear deadlines for the project, which are presented in Graph 1 by days. It can be seen from the diagram that the company will need 20 full days to fully implement and test the design of the new transport logistics system. In addition, the CEO must obtain all the necessary documents for insurance at the specified time, sign contracts with VOLVO, new drivers and operators. From the analysis of the production-economic indicators of "Ararat Wine Factory" LLC for 2018-2020, it becomes clear that the capital expenditures required for the implementation of the project of the proposed new transport logistics system will make about 430 million AMD.

Table 2. The life cycle of the new transport logistics system (initiation and planning)

Days	1	2	3	4	5	6	7	8
Start								
Initiation and planning								
Compilation of the project concept	2 days							
Signing purchase agreements with VOLVO company			1 day					
Signing employment contracts with new drivers				2 days				
Signing employment contracts with new operators				2 days				
Agreement with the developers and technical team					2 days			
Sign contracts with insurance companies						3 days		

Based on the cash flow discount methodology (NPV-Net Present Value), through the efficiency of the investment project was calculated and substantiated the effect-tiveness of the introduction of a new transport logistics project in "Ararat Wine Factory" LLC. As a result of the project implementation, the cash flow was estimated to calculate the net present value. The capital value was determined, that is the discount rate at which the Ararat Winery can attract financial resources. To justify the introduction of a new

transport logistics project, we have made a dynamic calculation, which shows the period in which the company will reimburse the costs required for the project. The forecast is calculated for the next ten years, which shows the corresponding increase in the expected profit and revenue of the Ararat Winery.

Table 3. The life cycle of new transport logistics system (implementation & monitoring, end)

Days	9	10	11	12	13	14	15	16	17	18	19	20
Implementation and monitoring												
Parking of the acquired trucks	1 day											
Room cleaning & provision for drivers and logistics operators	2 days											
Upgrading the company's website with CRM system	4 days											
Equipping trucks with GPS & cameras	2 days											
Technical inspection of trucks		2 days										
End												
Testing after project implementation					8 days							
Final report					3 days							

Based on the industry indicators of the Ararat Wine Factory, that is, as of 2020, the company's net profit amounted to more than 1 billion AMD [Annual financial reports of "Ararat Wine Factory" LLC for 2020], it can be stated that for the required about 430 million AMD for the implementation of the project the company has the opportunity to allocate the expenses from its own resources.

Table 4. Dynamic calculation of the implementation project

Discount interest rate	2.5 %	**AV**	4.3 Billion AMD	Equity –100%	Borrowed capital - 0%
Years	T0		T1	T10	T11
In revenue	0		5.72 Billion AMD	8.84 Billion AMD	9.19 Billion AMD
Out investment	-4.3 Bln AMD		-	-	-
production costs	-		3.23 Billion AMD	5.55 Billion AMD	5.81 Billion AMD
fixed costs	-		840 million AMD	1.09 Billion AMD	1.09 Billion AMD
Cash flow 1	-4.3Bln AMD		1.64 Billion AMD	2.19 Billion AMD	2.28 Billion AMD
discount rate	1		0.95	0.76	0.74
discounted CF 1	-4.3 Bln AMD		1.56 Billion AMD	1.67 Billion AMD	1.69 Billion AMD
NPV	**16 Billion AMD**				
Accumulated funds	-		1.21 Billion AMD	17.7 Billion AMD	20 Billion AMD
Redemption Period	**0 years (1-3 months)**				

For the dynamic calculation of the implementation of the new transport logistics project in the first year (T_1) we took as a basis the company's income and expenses for

2020. It should be noted that the project implemented in the calculation has been implemented since the second year (T_2).

According to the dynamic calculation of the investment project (Table 4), more than 6 million produced bottles of vodka and brandy will reach about 10 million in the next ten years in "Ararat Wine Factory" LLC based on the production capacity of the factory. At the same time, according to forecasts, in 2030 the company will record about 9.2 billion AMD revenue due to a significant expansion of production volumes, instead of the previous 5.7 billion and more than 2.2 billion AMD cash flows of, instead of former 1.65 billion money.

Scientific novelty. Thus, studying the transport logistics system of "Ararat Wine Factory" LLC, the article proposes ways to improve the latter as a scientific novelty. In particular, it is proposed to establish a logistics system in the company, which will be equipped with experienced drivers, logistics operators and modern trucks. It is recommended to equip all the vehicles available at the factory with GPS, CRM systems and insure them monthly, including the freight inside.

Conclusions. It is clear from the indicators in Table 4 that after the introduction of the project in the company, the fixed costs will be changed only in the 2nd year (+230 million AMD), and in the next 9 years these costs will remain the same. The reason for the latter is clear, as the company, by introducing the project, has to allocate certain funds for the operation of 5 new trucks (fuel, lubricants, de-cooling, maintenance, etc.) every year. In addition, "Ararat Wine Factory" LLC should include the annual depreciation costs of trucks, the annual staff costs of new drivers and operators. Fixed costs for fuel will be AMD 87,716,000 for the 5 new trucks per year. It was taken into account that a 16-meter-long truck consumes an average of 35-40 liters of fuel (diesel) to cover a distance of 100 km. According to the project, trucks will transport cargo (about 4000 km) twice a month, so one truck will cover 96,000 km per year. Based on the mentioned road section as a norm for all trucks, we will get that more than 17 million AMD fuel and lubricating oils will be spent for the operation of each truck in a year (96000x420 AMD).

As the project offers the company to purchase 2020 VOLVO trucks, it is expected to be operational for at least 15 years, after which it will be sold for 10 million in drams as a worn-out vehicle for the purpose of buying new goods. The depreciation cost of trucks was estimated at 1,133,000 drams per year for a single truck (37 million-10 million)/15, and per 5 trucks - 5,650,000 drams. The total fixed annual expenses of the company (230 million AMD) will include the salaries of new drivers and operators, respectively 50,400,000 and 16,800,000 AMD.

The mentioned indicators prove that the investment of the proposed new transport logistics project is fully justified (NPV, net present value> 0), as the net profit of "Ararat Wine Factory" LLC by 2030 will make about 2.2 billion AMD, instead of the previous 1.6 billion drams. At the same time, the company will dynamically repay the investment of 430 million AMD in the same year, as in 2020 alone the company provided more than 1 billion AMD net profit.

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The project of introducing a new transport logistics system in "Ararat Wine Factory" LLC

Key words: *transport logistics system, international cargo transportation, logistics operator, cash flow, dynamic calculation of project implementation.*

The growth of the production of alcoholic beverages is conditioned by the close cooperation with foreign markets and the introduction of the latest technologies in the domestic production. This is a signal for the exporters of alcoholic beverages of the Republic of Armenia to discover new markets to conquer, to improve their own logistics system, to improve and to strengthen the competitive position in the foreign market.

The article examines the activities of "Ararat Wine Factory" LLC and the technologies used in it, the export volumes and the process, based on the latter's analysis a new project for the introduction of a transport logistics system and has been developed the latest ways of suggested improvement. In particular, the new investment project is a set of actions through which the winery will be able to increase the volume of production export of its products, thus contributing to the increase of the company's funds and the discovery of new opportunities.

INNOVATIVE TECHNOLOGIES OF POWER TRANSMISSION LINES USED IN AGRICULTURE IN ARMENIA

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Key words: electricity, power transmission line, innovation, technological progress, electricity, technology

Introduction. The power transmission line (here in after referred to as the transmission line) is one of the main components of the electrical network. These objects are a system of power equipment, the purpose of which is to transfer electrical energy using electric current. As part of this system, there is an electric line that goes beyond the conversion of a power plant or substation. Cable and overhead power lines differ. It is also worth noting that gas-insulated lines (GIL) are becoming increasingly popular today.

In addition to electricity, information is also transmitted through power transmission lines (via high-frequency signals). This option is used for dispatching control, the transmission of telemetry data, as well relay protection signals, and maintenance of emergency automation. Separately, it is worth noting overhead power lines (overhead lines). This device is used for transmission and distribution of electricity through wires located outdoors and attached using traverses, insulators, and fittings to supports and other structures [Myasoedov, Korzhova, 2019, 24-34].

Methodology. We use theoretical and empirical research methods. As a result of the work, we made references to scientific materials of such authors as Myasoedov Yu.V., Korzhova O.N., Gavryushina N.T., Gavryushin S.S., Arbuzov E.V., Burnysheva T.V., Kozhevnikov A.N., and others. Each of these papers examines in more detail one of the issues related to the topic of this study. Thus, in the literature used, such issues were disclosed as melting ice on power lines: methods, innovations, operation; power supply of an alarm system from a high-voltage power line; a capacitive power source for devices measuring parameters of an overhead power line and others.

Literature review. One of the priority directions of socio-economic development in rural areas of Mordovia is the development of energy infrastructure. The level of development of the energy economy, and the provision of rural settlements with electricity is a kind of indicator of the quality of life in rural areas. Electrification of agricultural consumers is of great importance because it contributes to the development of agri-

culture on an industrial basis and is the solution to many social issues of rural residents. The provision of rural settlements with electricity is a kind of indicator of the quality of life in rural areas. Electrification of agricultural consumers is of great importance because it contributes to the development of agriculture on an industrial basis and is the solution to many social issues of rural residents [Gavryushina, et al., 2018, 110-121].

In agriculture, aluminum, steel aluminum (that is, aluminum with a steel conductor bearing the main mechanical load), and steel both multi-wire and single-wire are used. For the designation of wires, letters are used denoting the material from which the wire is made, and numbers indicating what is the cross-sectional area of the wire. For example, PSO-5 means a steel wire, single-wire, with a diameter of 5 mm; A-16 – aluminum, multi-wire, having a cross-sectional area of 16 mm2; AC - 16 - the same, but steel-aluminum, etc. For rural overhead lines, wooden, wooden with reinforced concrete prefixes, and reinforced concrete supports are used. According to the value of the support, it is divided into intermediate, anchor, corner, end, branch, and cross. By design, the supports are single-line, with struts, braces, and U-shaped.

Analysis. When creating a new generation of power lines, an important role is assigned to wires, the nomenclature of which has already reached several dozen names and will only expand in the future. Different cross-sections of both traditional (steel-aluminum) and innovative conductors determine the carrying capacity of the wire, its weight per unit length, structural strength, metal consumption, the amount of capital investment, and subsequent costs.

The technical and economic feasibility of using modern wires has been repeatedly proven, which can significantly increase the capacity of lines, reduce power losses, and have improved physical and technical characteristics, which as a result will affect the efficiency of the functioning of energy and capacity markets and the quality of regime management. The use of new generation wires makes it possible to solve the main tasks of the power grid complex related to increasing reliability, uninterrupted power supply, reducing losses, and increasing throughput. The use of new generation wires can reduce the losses of power transmission lines by up to 30% and increase their throughput from 1.5 to 2 times. Replacing existing wires with new generation wires allows you to achieve savings by reducing losses to 98 thousand rubles per 1 km of line per year and at the expense of an additional transmitted capacity of 150 - 250 million rubles. per line per year [Korzhova, 2021, 43-56]. One example of a new generation of wires is high-performance wires with a composite core ACCC (Aluminum Composite Core Conductor - aluminum wire with a composite core) are a novelty for the Russian electric power market. This technology of the American company STS uses in its development of composite materials made of carbon fiber – carbon filaments, which are significantly light and durable relative to steel. It should be noted that the implementation of full-scale

innovative projects, for example, Smart Grid, is impossible without the introduction of a new generation of wires, which are an innovative solution based on new technologies and materials, high-quality raw materials.

Due to the obvious increase in the cost of energy resources, losses that were previously almost ignored have now become too expensive. The high level of losses in Russian power grids (about 5% for FGC and 8-11% for IDGC) is determined not only by the high level of deterioration of power grid equipment and the difficult conditions of the Russian climate. During the implementation of pilot projects with new generation wires, it turned out that despite all the obvious advantages and economic effects, there are administrative barriers to the introduction of innovative wires.

Another direction of innovative development of power transmission lines is digitalization and intellectualization of objects. It is through information technologies that high efficiency and rationality of the use of enterprise resources are achieved and ensured today, as well as innovative solutions, are being developed in the professional sphere of human activity. One of the most relevant and innovative areas in the field of information technology development is the Internet of Things (IoT). The concept of the Internet of Things is based on a data transmission network, through which people get the opportunity to communicate with technical devices, and technical devices with people [Zaidullina, Potapchuk, 2018, 97-106].

IoT technology allows you to organize two-way communication through power lines. In other words, data exchange becomes possible even where there is no cellular network coverage, and satellite and terrestrial wired communications are unavailable. The development is based on the technology of broadband data transmission through power lines (BPL, Broadband over Power Lines). For the organization of communication, special SSL modems connected to electrical lines are used. The equipment operates on a power line with a voltage from 0.4 to 35 kV. It is important to note that the system is suitable for exchanging various traffic. This can be telemetry data, voice information, video signal, and so on. With the help of the Internet of Things, devices are combined into a single computer network, through which it is possible to collect, analyze, process, and transfer data between objects through specialized software or another technical device. Smart devices function autonomously, while a person can configure them and provide access to data. Internet of Things technologies work in real-time, and they often include networks of smart devices and a cloud platform to which they are connected via Bluetooth, WiFi, or other types of communication. Internet of Things technologies can significantly rationalize and improve the efficiency of modern electric power systems [Uzbekov, Nematzhonov, 2019, 11-18].

Fluctuations in power flow and an exponential increase in network complexity require more flexible assets with broader capabilities that go far beyond existing

monitoring, control, and automation systems. For a digital and decentralized network, high-voltage transmission devices at substations, such as transformers, switchgear, and circuit breakers, must be connected by default. The operational data of intellectual assets can be analyzed in real-time, and recommendations for improving performance can be implemented. This type of integration and operation creates the Internet of Energy (IoE) for the networks of the future (Fig. 1). IoE is a new generation of digital products, systems, and solutions for modern power lines. It can be independent or integrated either into a corporate network or interact with the cloud.

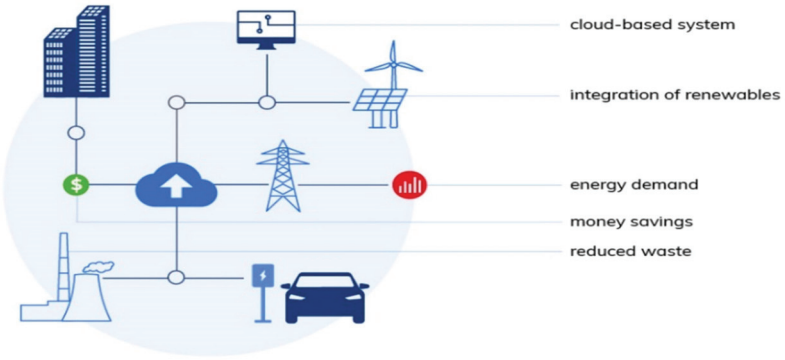

Figure 1. The architecture of the Internet of Energy

It is also necessary to note the innovative technologies in power lines associated with the ability to self-rebuild. DLR is a technology of intelligent power transmission lines that allows you to determine the "rating" of a power line conductor based on its temperature in real-time. Currently, conductors are usually assigned a conservative static rating based on almost the worst weather conditions [Tuichiev, Ismoilov, Tursunov, Baynazarov, 2019, 67-78], [Bagautdinov, Kuvshinov, 2016, 4-11].

Conclusion. These products combine the strengths of local and high-performance data processing directly on the local system with the advantages offered by the cloud: application-based data analysis, data processing, and storage concepts, application updating and versioning, as well as appropriate device management. The data does not leave your local substation network, which gives additional flexibility in making informed and timely decisions.

Thus, the main purpose of this article was modern technologies and innovations in power lines. As a result of the work, the main trends and innovations in the aspect of the development of modern power transmission lines were studied. In conclusion, it should be noted that the technical modernization of modern power lines is a rather complex and multifaceted process, which is based on the coordination and integrated use of innovative technologies with traditional solutions. It is this approach, taking into account

the current state of the operating conditions of electric power complexes, that can achieve significant technical and economic results [Burnysheva, Kozhevnikov, 2021, 113-121].

As a result of the work, we obtained unique conclusions representing scientific novelty in the field of rural power lines. The scientific significance of the work lies in the possibility of using the presented materials in further research on this topic and the development of promising solutions that require the study of the subject area.

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Innovative technologies of power transmission lines used in agriculture in Armenia
Key words: electricity, power transmission line, innovation, technological progress, electricity, technology

We make a unique study of the use of modern power lines and the identification of the main disadvantages. In addition, we also suggest possible solutions. As a result of the work, the technical and economic feasibility of using modern wires has been proven, which can significantly increase the capacity of lines, as well as reduce electricity losses, and have improved physical and technical characteristics, which as a result will affect the efficiency of the functioning of energy and power markets and the quality of regime management. Also, for the first time, we comprehensively analyzed the issue of intellectualization of rural power lines and applied the definition of the Internet of Energy in this direction.

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SUPPLY HEADROOM ISSUE IN MULTI-LEVEL REFERENCE VOLTAGE GENERATORS AND PROPOSED SOLUTIONS

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Key words: reference voltage, multi-level generator, voltage headroom

Introduction. Integrated circuits often use multi-level reference generators for a number of reasons. One of the reasons is that the results obtained during the modeling phase may have small discrepancies with the silicon produced in the production. The multi-level generator controlled by digital signals allows to bring the circuit to the most optimal working condition through digital settings. Defects are also possible in the technical specification requirements of the generator-powered circuit, in which case it is possible to find the one that best meets the actual requirements of the powered circuit from the many available voltages. In addition to post-production settings, multistage reference voltage generators are widely used in systems where different voltage levels are required to perform different functions. Such systems are, for example, energy-independent memories, which, with the exception of NVMe memories connected to the PCIe bus (Christian Watto, 2015), can perform only one function at a time: either write/delete, or read. Each of these operations requires voltage levels (Saed Abed, 2020) to be generated by a multistage reference voltage generator. Compared to the function of reading stored information, much higher voltage levels and high power are required to change the state of the memory element.

Economic significance. Modern integrated circuits such as non-volatile memories use multilevel supply voltages. In order to increase the efficiency of energy consumption different parts of the circuit can be supplied different voltages according to their requirement, which makes it possible to minimize the power consumption in each operating mode. The proposed solution allows using one wide range of supply voltage to provide multiple accurate reference voltages. Decreasing energy dissipation lowers the costs associated with providing charge, as well as for mobile applications battery life and aging of the circuit itself.

Literature overview. The supply headroom is the minimum supply voltage level required to ensure the correct operation of the circuit. Both short-term and long-term voltage level drops are possible in the supply rails that feed the integrated circuits. The failures may be due to overload of the supply battery, abrupt shifts in the load of the

feeding rails, transition to a state of low energy consumption as a result of discharge, etc. Figure 1 shows a simple multi-level reference voltage generator.

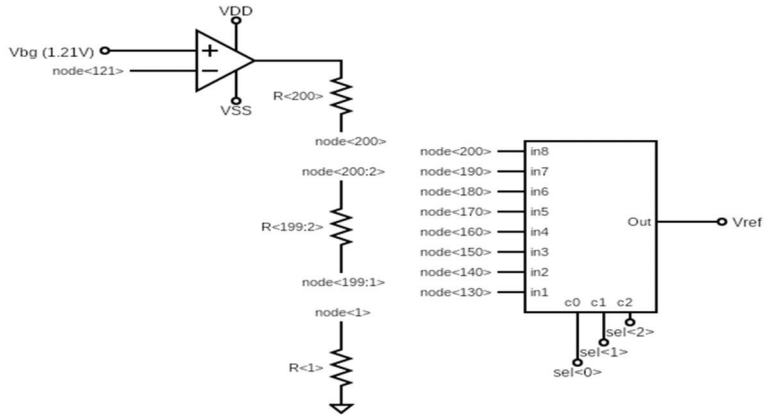

Figure 1. Simple multilevel reference generator

The diagram shown contains a differential amplifier, a series of resistors and three-order multiplexer. A series of two hundred resistors is connected at one end to the output of the operational amplifier and at the other to ground. A positive input voltage of 1.21 volts is given to the positive input of the operating amplifier, which is received from a voltage source based on the semiconductor band gap [Feng, Wang, et al., 2013].

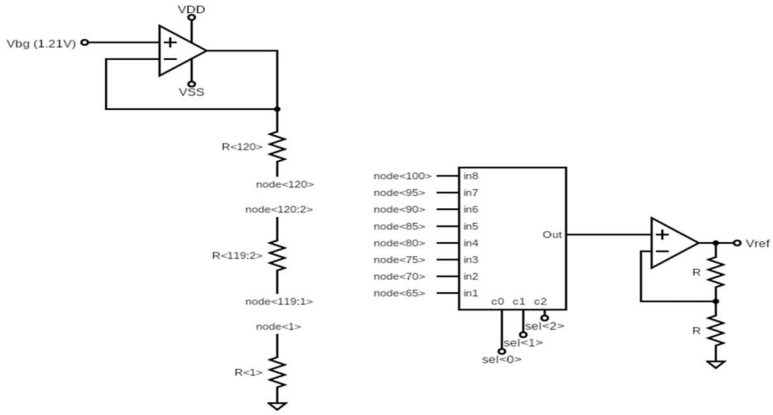

Figure 2. Multilevel reference generator with an output buffer

The point connecting the 120 and 121 resistors is connected to negative input of amplifier, which will be regulated at the value equal to the positive input due to the negative feedback, therefore the voltage drop across each resistor will be 1.21 Volt ÷ 121 = 10 millivolts. The inputs of the multiplexer are connected to different points in the series of resistors, and the output is selected by the input selected by the digital control code. The circuit is designed with 90 nm technological process input/output elements

used in nodes with a nominal supply voltage of 2.5 volts [Melikyan, 2009]. In this multi-level voltage generator architecture, two problems with power supply headroom are obvious.

• A drop in supply voltage level below 2 volts will deviate all reference levels

• Installing a current load at the output will increase the voltage drop from the series of resistors from the selected wire to the output, creating a potential problem with the supply voltage headroom.

To avoid the possibility of these problems, the solution shown in Figure 2 was given. This solution uses a simple multi-level voltage generator, from which it receives half of the required levels, ie a maximum of 1 Volt, and the multiplier added to the output multiplies these levels by two. In this structure, the problem with the power load is completely eliminated, and the reference levels do not deviate as the power drops. Only the output multiplier is limited by supply drops. Figure 3 shows the operation of the two circuits in the event of a normal operation and supply voltage brown-out.

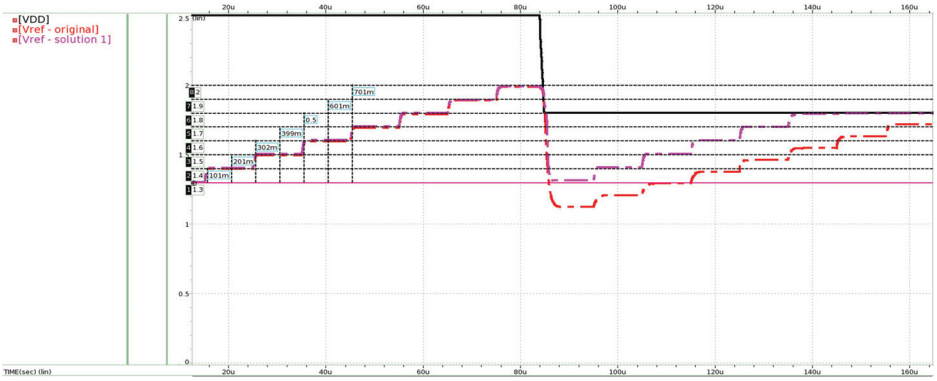

Figure 3. Output levels of two circuits during normal supply level and power brown-out

As expected, all levels of the first circuit deviate when the supply voltage level is less than the generator maximum level. In the case of the second circuit, all the levels below the supply have asserted the intended values.

Proposed solution. Although the above method closes the gaps in the problem of the power supply headroom, it creates a new problem of increasing the area, as the number of differential operational amplifiers used in the design doubles. To avoid this problem, the design shown in Figure 4 is suggested. The proposed design differs from a simple multi-level generator only in that the output level selected by the multiplexer is connected to the output of a differential opera-tional amplifier. This virtually disconnects the resistors above the selected level from the circuit of the resistor divider, which allows to obtain a reference level below any supply voltage. Figure 5 shows a simplified version of the operation of the two circuits. As can be seen in Figure 5, in the proposed

circuit, the output level selected at that point is short-circuited to the output of the operating amplifier; it becomes the highest point of the voltage divider; Figure 6 shows the operation of the proposed scheme under unstable supply conditions. As can be seen, the proposed design provides a solution to the problem of the power supply headroom without the use of an output multiplier.

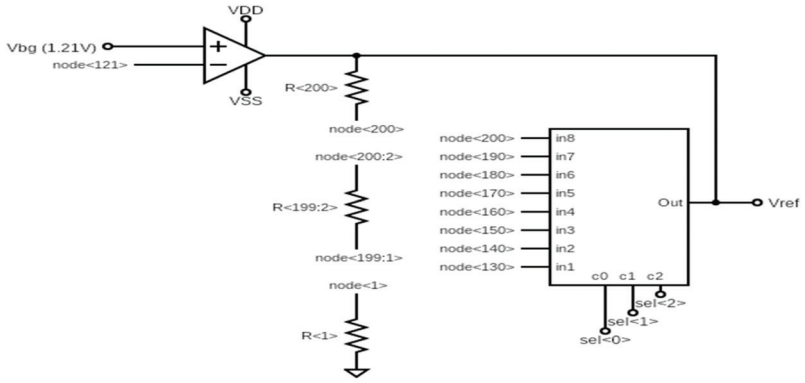

Figure 4. Proposed multilevel reference generator

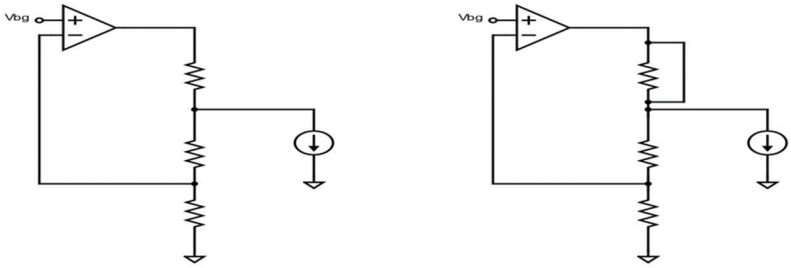

Figure 5. Simplified circuits of existing(right) and proposed(left) circuits

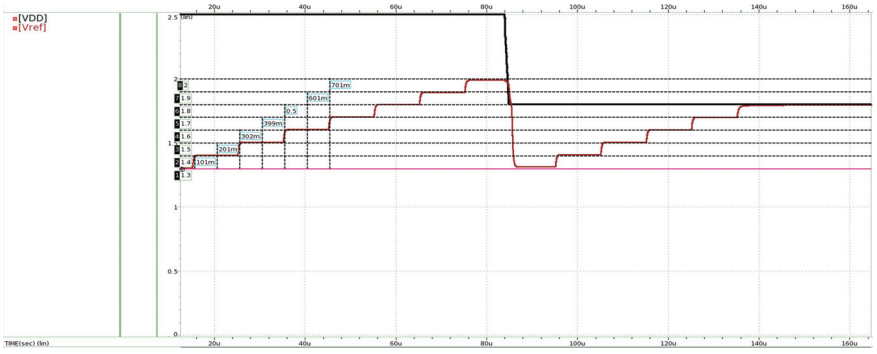

Figure 6. Operation of the proposed design under unstable supply conditions

Conclusion. The main disadvantage of the proposed design is the complication of the design and testing stages. Depending on the control digital input signals, the operating amplifier feedback multiplier also changes, so it becomes necessary to check the amplitude-frequency and phase-frequency characteristics for all output levels (Everett Rogers, 2005).

Designed for the SAED 90 nanometer technological process, multi-level support voltage generators with three different structures were studied. The problem of the power supply headroom in multi-level generators has been studied, its consequences and the solution of these problems in the structure of the output multiplier. A new solution to the problem of the power supply headroom has been proposed, which is not inferior to the simple structure in terms of both size and energy consumption, at the same time repeating the functionality of the structure with output multiplier.

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Supply headroom issue in multi-level reference voltage generators and proposed solutions

Key words: reference voltage, multi-level generator, voltage headroom

In this research paper, SAED 90 nanometer technological process was used to design and simulate three different multi-level reference voltage generator architectures. The study examines supply headroom issue in multi-level voltage generators, it’s consequences and solution through an output multiplier architecture. A new method is proposed, that eliminates supply headroom related issues just as well as output multiplier design, whilst maintaining the layout area and energy consumption of the simple architecture.

PROBLEMS OF BUILDING A DATABASE IN THE CONTEXT OF HUMAN IDENTIFICATION AND VALIDATION

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Key words: identification, validation, database, features of the face

Introduction. Owing to the development of innovative technologies, miracles disappear from our lives one by one, becoming a daily routine, which in fact is not so bad, because in return we get the opportunity to benefit from these great achievements. And this also applies to face recognition programs.

Face recognition is still a new and little studied field, but already now face recognition programs are in great demand in almost all parts of everyday life. The aim of this work is to study the basic methods of holding and recognizing faces.

Economic importance. In modern organizations, it is very important to ensure the security of the organization's premises, which is why it is often necessary to hire a large number of security personnel. Replacing them with cameras ակսն identification system will avoid human error in the long run, making it possible to minimize security-related losses. The speed of the system is also important in identifying the unwanted person, because in case of slow identification the intruder will have time to harm the organization. This article addresses these issues by offering a database structure that can quickly compare an intruder 's face data with the facial features of authorized people stored in the database and determine if a person entering the site is eligible to be in the area.

Methodology. This is about an online program that can separate a person's face from the whole image or video, which allows you to recognize the person to whom the person belongs. Of course, the program can also recognize other objects in the image or video, but in this work we are talking about a specific human face. Modern facial recognition software programs are able to identify details such as:

- The sex of the person
- Approximate age
- Current state of mind

The face recognition process is done in these three main steps:

1. *The face detection process* is an important step as it detects and places a person's face in pictures and videos.

2. *The process of face fixation* transforms analog information (face image) into a series of digital information (data) based on a person's facial features.

3. *The face matching process* checks to see if two faces belong to the same person.

Today, this type of process is considered the most natural of all biometric measurements. And for good reason, we recognize ourselves not when we look at our fingerprints or irises, but when we see our face. [pandasecurity, 2021]. Before we go any further, let's quickly define two keywords: "identification" and "validation".

Image 1. The process of face recogniotion

Literature review. Biometrics is used to identify and validate a person, using a set of data specific to that person to be verified.

• Identification answers the question "Who are you?"

• Ratification answers the question "Are you really that person?"

Here are some examples: in case of face biometry, the 2D or 3D sensor "catches" the face. The face image is then converted to digital data using an algorithm before being compared to the images stored in the database.

Automated scanning systems can be used to identify or verify a person's identity in just a few seconds, based on their facial features, cheekbones, nose size, lips, ears, muzzle and other features.

Yes, the process can even take place in a crowd, in a dynamic, volatile environment. Many cell phone owners are already familiar with face recognition software, as it allows them to be identified and validated by the phone.

Of course, there are other means of recognition through the human body: fingerprints, iris examination, voice recognition, digitization of veins in the palm, etc. [thalesgroup, 2021].

What are the features of recognition? When it comes to pattern recognition, the face recognition system has to store hundreds of thousands of feature vectors. The number of vectors depends on the number of users. When identifying a person, the system not only recognizes the presence of a face in the circle, but also identifies the face of the circle and finds the user.

For example, when it comes to face recognition, the system measures features such as eye distance, eye diameter, muzzle sharpness, and many other nuances. There are a total of 128 such features.

The reason for such sweaty measurements is that just face-to-face comparisons are not enough. Because depending on the light, haircut or level of shaving, the face can be identified by different shapes, and such details can affect accuracy.

The main purpose of this work is to identify the best solution for storing all these properties, because the more users there are in the system, the more properties vectors need to be stored.

In addition, it is desirable to note that these features can be applied not only to the face, but also to objects and even sounds. At the same time, the storage methods do not depend on the properties in question [Rattani, Roli, Granger, 2015, 1-8].

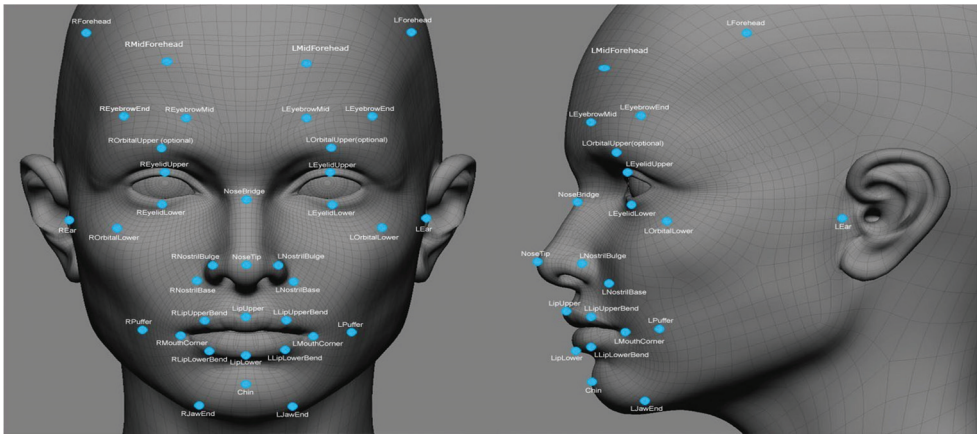
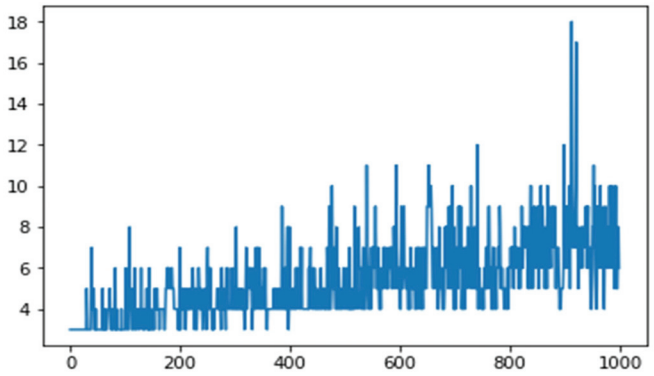


Image 2. Face features

Analysis: What is the complexity of storing feature vectors in recognition systems? The problem with this issue is that the system stores several vectors of each user's features for more accurate recognition. Therefore, our task is to design a database that can store millions of feature vectors. The problem is that no vector of properties will ever be equal to another, that is, complete validation is impossible. In this case, the principle of validation "as close as possible" is used. That is, the input vector has the least deviation from the base vector. This is calculated by the least squares method, ie the sum of the squares of the distances between the vector elements must be minimal.

Thus, there are two problems. The first is the large amount of data, which leads to lengthy information processing. The second problem is the lack of a search algorithm [Fernandez-Saavedra, Sánchez-Reillo, Liu-Jimenez, Miguel-Hurtado, 2015, 240-254].

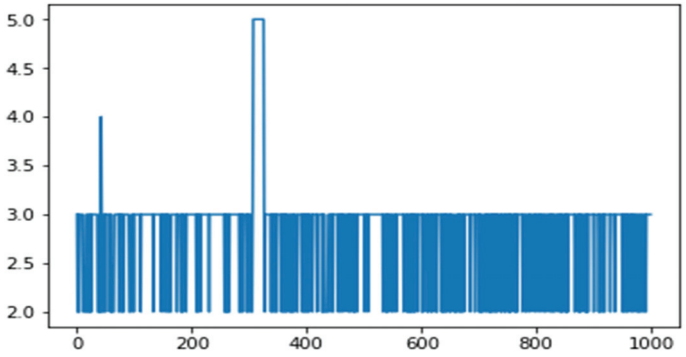
Method 1: In the first method, all the features are serialized in a single text column. Features are contained in one column, and there is a text field that contains an array of 128 features. In the first option, you need to select all the values in the properties column, which takes more time to complete the table.



Graph 1. Distribution of queries by response time (OX – number of requests, OY - seconds):

As we can see in graph 1, as the number of recordings increases, so does the response time, and the average return time is about 5.3 seconds.

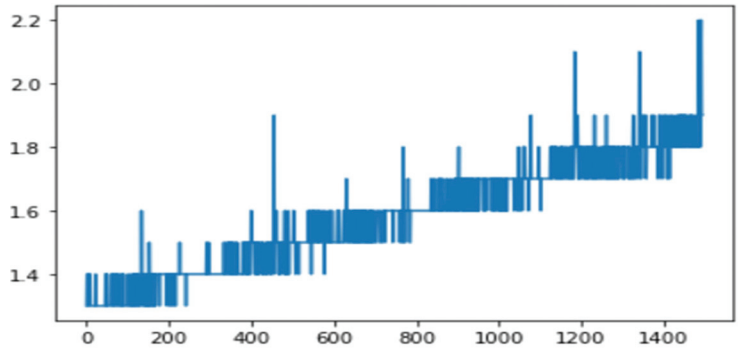
Method 2: In the second method, the properties are stored in 128 columns (f1, f2, f3,… f128)



Graph 2. Distribution of queries by response time (OX number of requests, OY seconds)

As in column 2, regardless of the number of registrations, the waiting time remains almost unchanged and the response time averages 2.7 seconds.

Method 3: Vectors are stored in multiple tables in a one-to-many relationship. Only vectors (without attributes) are stored in the first table, and all properties of all vectors (one line for each property) are stored in the rest of the table. As you can see in the third graph, the third method is much faster than the first. However, the speed of query responses is increasing. Which, of course, is not a good sign.



Graph 3. Distribution of queries by response time
(OX – number of requests, OУ - seconds):

The third method proved to be the most convenient. And although the second method will become faster and more optimized when processing large amounts of data over time, the simplicity and convenience of further use of the database can not be underestimated, which can only be achieved by using the third method.

The Construction of the Database: Thus, the database will be built according to the third method, which is the most convenient for the given work. Figure 3 shows a simplified scheme of the database, where 128 numeric values of facial features will be stored, such as eye size, color, nose size, ear size, lip curvature, muzzle sharpness, etc.

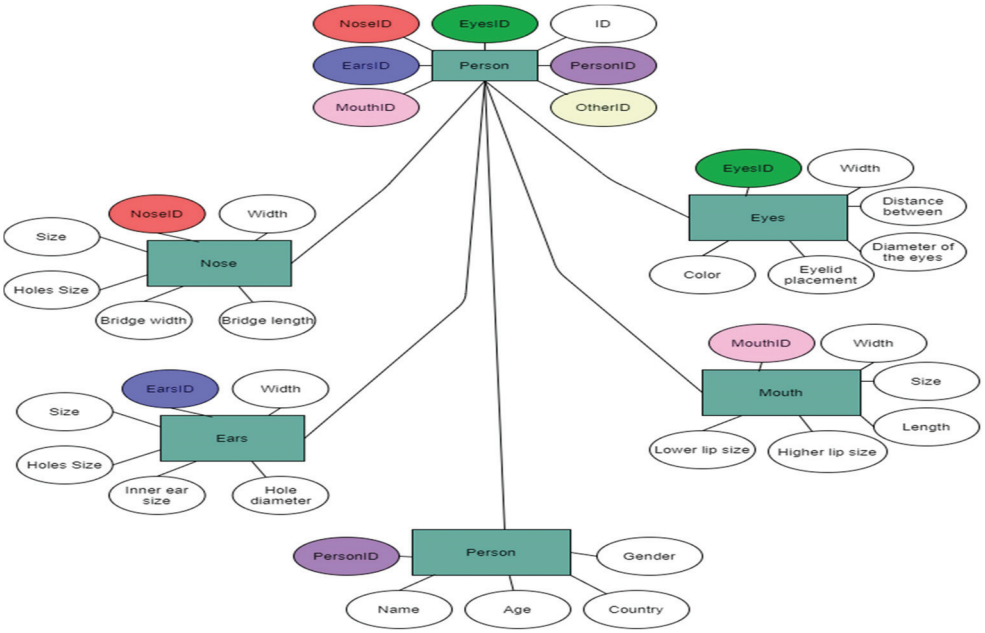


Image 3. Simplified database scheme

The database will also contain general information about the person: age, name, country of residence. Information can be increased or expanded as needed. It is not possible to get a completely accurate value in the face recognition process, so the face to be validated will always be obtained with some deviation from all the values in the database. That is why the principle of "as close as possible" is used in the validation process. That is, the input vector has the least deviation from the base vector. This is calculated by the least squares method, i.e. the sum of the squares of the distances between the vector elements must be minimal. Short information about the person to be returned after recognizing the face: name, gender, age, etc.

Conclusion: Thus, in the course of the work, 3 main approaches to storage in the face database were studied.

The third method was chosen for this task, which requires more time-resources than working with a large amount of data, but instead makes it easier and simpler to work with the database.

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Problems of building a database in the context of human identification and validation

Key words: identification, validation, database, features of the face

In this paper, methods are studied for storing information in a database for the purpose of identification and validation, which, in the presence of a large amount of data, will not lose its speed, but at the same time will not suffer from a complex structure and not enough flexibility. It also describes the general appearance of the database tables, which will contain the necessary facial features. Automation of people's identification and validation systems in organizations can lead to long-term profits, as the need to have a large number of security personnel will be lost. The speed of the system is also important in identifying the unwanted person, because in case of slow identification the intruder will have time to harm the organization. This article addresses these issues by offering a database structure that can quickly compare the intruder's face data with the features of the authorized people stored in the database and determine whether the person entering the area has the right to be in the area or not.

PROSPECTS FOR FURTHER IMPROVEMENT OF MACHINE LEARNING SYSTEMS

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Key words: machine learning, machine learning systems algorithms, data, collectives.

Introduction. The rapid development and widespread use of machine learning methods in the last decade is caused by:

a) The growth of computing power.
b) The amount of accumulated information.
c) Development of the mathematical base used in these algorithms.

Machine learning enables computers or robots to make data-driven decisions. These programs or algorithms are designed to learn and improve over time as new data is introduced. Machine learning models are classified into the following categories:

1. Supervised learning
2. Unsupervised Learning
3. Reinforcement Learning Use Cases

i. Product recommendation on a shopping site.
ii. Spam email filter.
iii. Chat-bots.

Machine learning is the most important branch of artificial intelligence. Without the assistance of training, it is highly unlikely that a human would be able to create any kind of intelligent system capable of any of the abilities we associate with intelligence, such as language or vision. These responsibilities would be impossible to carry out otherwise. Furthermore, because learning is the foundation of intelligence, we would not consider a system truly intelligent if it was incapable of learning. Automated procedures are heavily emphasized in machine learning. In other words, the goal is to develop learning algorithms that can learn on their own without the assistance of humans. Machine learning is often referred to as "programming by example." We frequently have a specific goal in mind, such as checking for spam. Rather than directly programming a computer to solve a problem, machine learning looks for methods to allow the computer to generate its own program based on provided examples.

Economic significance. Machine learning is practically everywhere today, from a pilot car on the road to Siri talking to us and Coursera offering us courses, all thanks to machine learning. It is possible to reach ideas that were proposed two or three years ago,

and which change the reality that surrounds us today, using machine learning. It is possible to apply machine learning knowledge in virtually any field, including economics, where we can, for example, predict the client's solvency or spending for the next month. And this is critical knowledge; machine learning will largely determine the development of humanity for at least a few years, and it is critical for us to know, understand, and be able to work with these tools without fear.

Methodology. The primary goal of machine learning research is to develop universal algorithms that are applicable in real situations. This type of algorithm must be efficient. We are interested in the efficient use of time and space as computer scientists. However, in the context of learning, we are also concerned with another valuable resource: the amount of data that the learning algorithm necessitates. Learning algorithms should be as versatile as possible. We are looking for algorithms that can be used to solve a wide range of learning problems, including those mentioned above. There are numerous machine learning applications to consider. The majority of this article is about classification problems, in which the goal is to categorize things into a predefined set of categories. Below are a few examples:

- Optical Character Recognition: Sorts photos of handwritten characters into categories based on the letters they represent.
- Face detection is the process of identifying people in photographs (or indicating if a face is present)
- Filtering: Determine if an email message is spam.
- Topic Definition: Classifies news into categories: politics, sports, entertainment.
- Determine the meaning of what the speaker is saying in the context of a limited area, to the extent that it can be placed in one of a fixed set of categories.
- The term "medical diagnosis" refers to the process of determining the cause of a patient's illness.
- Predict which customers will respond to a particular promotion, for example, using customer segmentation.
- Fraud detection (i.e., identifying potentially fraudulent credit card transactions).
- Forecasting the weather, whether it will rain tomorrow.

There will be a lot of discussion about classification problems in the long run, but there will also be other important learning issues. In a classification, we want to group items into fixed categories. Regression, on the other hand, attempts to predict a real number. For instance, we might want to forecast how much rain will fall tomorrow. Alternatively, we can make an educated guess as to how much the house will sell for.

Literature review. In [5], one can find data on the applicability of various methods for detecting attacks, which based on various machine learning methods (Bayes classi-

fier, k nearest neighbors, neural networks, random forest, support vector machine, decision trees and ensemble methods) made it possible to achieve a classification accuracy of more than 95%. The work [6] notes the applicability of fuzzy systems for traffic analysis, which allows not only classifying, but also trying to interpret the factors that led to the result, trying to explain it. We may conclude that machine learning and deep learning methods have a high potential for solving cybersecurity problems. Learning methods such as decision trees, SVMs, and KNNs are the most common and are being studied to increase their effectiveness in solving cybersecurity problems. Also, one of the main opportunities for machine learning in 2022 is secure multilateral computing (BMC) - one of the most important areas for the development of modern cryptography. Recall the statement of the BMW problem [1]. Consider a multilateral cryptographic protocol in which each participant has their own individual secret. It is necessary to calculate the given function, the arguments of which are these secrets, so that the result of the calculations is known to all members of the group, but the secrets themselves are not disclosed by the protocol participants to each other or to any third party. A special case of BMW can be considered the problem of confidential machine learning (CML). The purpose of the KMO is to ensure the confidentiality of the data of each of the participants in the machine learning system in conditions when the persons providing the training sample at the stage of training the model (training) or queries to the model at the stage of its operation (inference) and waiting for answers to their requests (clients) remotely interact with provider capable of performing calculations with the model (server)[2].

Scientific novelty. Initially, the field of machine learning appeared to be a work of science fiction. However, machine learning is now being used in real-world industries. In 2022, the most recent advancements in this field have enabled many problems to be solved more efficiently and accurately than ever before. The combination of machine learning methods and algorithms allows for the detection of hidden dependencies, predictive analysis of information, real-time responses, and the implementation of artificial intelligence algorithms. In fact, the methods of collaboration with machine learning technologies (such as the use of neural networks) are based on graph embedding. This technology enables us to conduct a thorough, in-depth, and intelligent analysis of data.

Analysis. Based on literature review, at present, theoretical and applied research in the field of development and implementation of CMO systems is carried out by at least 10 research teams dispersed around the world. Due to the high rate of scientific research in the field of CMO systems, only systems created in the last three years (2019-2021) were considered. The following is a brief summary of the work of each group.

1. Team of the international research division of Microsoft Corporation. The efforts of the team are focused on creating two-level architecture KMO systems, in which client components allow interpreting descriptions of machine learning models performed using the TensorFlow library tools into an internal representation, and server

components automatically execute BMW protocols that implement calculations using modules with a set of universal two-way and tripartite secure computing protocols [3].

The main work of the team:

- SecureNN system (2019) [8];
- EzPC system (2019) [4];
- CrypTFlow system (2020) [2];
- CrypTFlow2 system (inference, 2020) [6].

2. Research group of the Darmstadt University of Technology (Germany). The main area of work of the team in the field of CMO systems is the implementation of universal means for executing bilateral protocols for secure computing based on a combination of representation of calculated functions in the form of arithmetic, Boolean and distorted circuits (garbled circuits), which can be used as a ready-made kernel when creating individual applications, including federated training, processing of medical images using machine learning methods, etc.

The main work of the team:

- module ABY (2015) [7];
- MP2ML system (2020) [8];
- ABY 2.0 module (2020);
- FLGuard system (2021).

3. Research group of the University of California at Berkeley (UC Berkeley, US). The team is working on the creation of CMO systems for obtaining responses to requests containing confidential information to already trained models based on two-way secure computing protocols with enhanced properties, including the most "strong" intruder model - the malicious client model. The main work of the team:

- Delphi system (2018);
- experimental systems and prototypes of Visor, Bost, Cerebro (2019-2021);
- Muse system (2021).

4. Research group of the Indian Institute of Sciences in Bangalore. The activity of the scientific group is focused on the creation of CMO systems mainly for deep neural networks based on 4-way secure computing with the possibility of implementing some systems on three-way protocols. The main work of the team:

- Trident (2020).
- FLASH (2020);
- Blaze (2020);
- SWIFT (2021);
- Tetrad (2021).

Together with the University of Darmstadt, members of the research team participated in the development of the ABY 2.0 module [9].

5. A team of Facebook and Visa Research researchers. The team members' activities are focused on developing a universal module for trilateral secure computing protocols based on a combination of arithmetic, Boolean, and distorted schemes, as well as applying it to CMO systems. Currently, the emphasis is on secure clustering protocols and systems. The main work of the team:

- SecureML (2017).
- ABY3 (Anthmetic-Bmary-Yao) framework (2018);
- K-means clustering (2020).

5. A research group at Princeton University (USA) is developing CMO systems based on tripartite secure computing protocols with increasingly stringent adversary models. The main work of the team:

- SecureNN (2019, with Microsoft);
- FALCON (2021);
- Ponytail (2012-2021);

6. International research group of the National Institute of Industrial Science and Technology of Japan, NTT Corporation and the University of St. Gallen (Switzerland). There is information about one development of this team - the Adam CMO system for deep neural networks, which supports extended functionality in comparison with the known ones when training and applying neural networks [4]. The system is based on tripartite secure computing protocols.

7. Research Group of the Massachusetts Institute of Technology (USA). There is information about one development of this group - the Gazelle system (2018) based on bilateral protocols. Currently, some of the ideas of this development are used in newer KMO systems, and the Gazelle system itself is of historical interest.

8. Aalto University Research Group (Finland). There is information about one development of this group - the MiniONN system (2017) [26], which is only of historical interest, since it is inferior to newer KMO systems in all main indicators.

9. Research group of the University of Paris (France). There is information about one development of this group - the AriaNN system, which is also of only historical interest, since it is inferior to newer KMO systems in all major indicators.

Conclusions. An analysis of the work of research teams allows us to identify several criteria that are essential for evaluating the developed and implemented CMO systems based on BMW protocols. Below we describe them in more detail:

1. Number of parties in BMW protocols implementing functionality of CMO:

1.1. Bilateral:

1.2. Tripartite:

1.3. Quadripartite.

Some CMO systems allow functionality to be implemented through protocols with varying numbers of participants. At the same time, systems with more than four participants in the calculations were not found in the course of this study.

2. Cryptographic primitives used to implement the system.
3. The model of the intruder, under the assumption of which the CMO system was developed and in which its cryptographic strength is ensured.
4. Support for machine learning lifecycle stages.
5. Suitability for use in various communication architectures.
6. Neural network architectures for which KMO systems have been tested:

During the course of the work, an exploratory study was conducted, as well as a review of existing CMO systems, which were mostly implemented in the form of prototypes and laboratory samples.

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Prospects for further improvement of machine learning systems

Key words: Machine learning, machine learning systems, algorithms, data, collectives.

Machine learning is a catalyst for productivity growth. Its methods are the main tools of artificial intelligence, the use of which allows to automate the processing and analysis of big data, identify hidden or non-obvious patterns on this basis, and extract new knowledge. Those methods have many practical implementations in such tasks as processing graphic and speech information, organizing the safe movement of unmanned vehicles, predicting the development of a disease, forming financial strategies, medicine abuse detection, useful and fascinating advertisement prediction, etc. This article is devoted to the analysis of the possibilities of machine learning, after general information about the formulation of problems of secure multilateral computing and confidential machine learning, an overview of the existing systems of confidential machine learning and the prospect for their development is given. An analysis of the work of leading foreign research teams worldwide allows us to identify several criteria that are essential for evaluating confidential machine learning systems based on multilateral secure computing protocols.

FINANCIAL ACCOUNT AS A TOOL FOR MACROECONOMIC ANALYSIS (ON THE EXAMPLE OF THE REPUBLIC OF ARMENIA)

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Key words: System of National Accounts, capital account, financial account, transactions, net lending, net borrowing

Introduction. The financial account and balance sheets of financial assets and liabilities are part of the System National Accounts of the Republic of Armenia. On May 5th, 2022, Armstat first published annual financial accounts and balance sheets of financial assets and liabilities for 2019[1]. The financial accounts are an important source of data for analyzing the activities of institutional sectors of the economy for which detailed information is not available (for example, for non-financial organizations and household sectors), including for studying the financial investments of these sectors in conjunction with real economic variables.

Literature review. After the end of World War II, a new epoch began in the development of the statistical model of the economy. It was connected with the harmonization of macroeconomic indicators, national systems, and international comparisons. This process was based upon the elaboration of the principles of national accounts. The origins of the System of National Accounts (SNA) trace back to the 1947 Report of the Sub-Committee on National Income Statistics of the League of Nations Committee of Statistical Experts under the leadership of Richard Stone [1]. The SNA standard of the United Nations was first developed in 1953 and the second one was issued in 1968. This methodological book also reflected the macroeconomic indicators of assets, liabilities and sectoral interactions. The UN elaborated a new SNA standard in 1993. As a result of the globalization impact, the UN adopted a new methodology for SNA in 2008.

Scientific novelty. The paper touches upon the first published indicators of the financial account of the System of National Accounts of the Republic of Armenia. Within the framework of national accounts, the analysis work presents financial accounts and balance sheets of financial assets and liabilities in the context of institutional sectors and financial instruments, as well as factors influencing the net lending or net borrowing of the financial account by institutional sectors.

[1] Sources: The financial account and the balance sheets of financial assets and liabilities of the Republic of Armenia for 2019: https://www.armstat.am/en/?nid=157&id=843

Methodology. The financial account is the final account in the full sequence of accounts that records transactions between institutional units. The financial account records transactions that involve financial assets and liabilities and that take place between resident institutional units and between resident institutional units and the rest of the world. The balance sheets show the values of the stocks of assets and liabilities held by institutional units or sectors at the beginning and end of an accounting period. The balancing item of the financial account, the net acquisitions of financial assets less net incurrence of liabilities, is net lending (+) or net borrowing (-) (B.9F)[1].

Analysis. The compilation of the financial account according to SNA 2008 in the Republic of Armenia has made it possible to complete the system of national accounts, to present accounts by institutional sectors. In other words, the financial account provided an opportunity to link the production of goods and services, the generation, distribution, redistribution, and use of income as well as the results of economic activities related to foreign economic activity, with financial results.

As a rule, international statistical standards use the accumulation accounts (capital account and financial account) as a tool for macroeconomic analysis to study financial flows. The capital account records acquisitions and disposals of non-financial assets as a result of transactions with other units, internal bookkeeping transactions linked to production (such as changes in inventories and consumption of fixed capital) and the redistribution of wealth by means of capital transfers [UN, IMF, etc., 2009, 39]. The financial account records acquisitions and disposals of financial assets and liabilities, also through transactions [IMF, 2017, 279]. The above accounts are theoretically balanced by net lending or net borrowing in the System of National Accounts. We can calculate net lending/ net borrowing of capital account by the following [UN, IMF, etc., 2009, 27]

NL/NB=S+CTR-CTP- GFCF-CI-ADVNA, *where:*

NL/NB - net lending/ net borrowing; S-Saving; CTR-Capital transfers, receivable; CTP-Capital transfers, payable; GFCF-Gross fixed capital formation; CFC-Consumption of fixed capital; CI-Changes in inventories; ADVNA-Acquisitions less disposals of valuables and non-produced assets.

In the financial account, it is calculated as the difference between the net acquisitions of financial assets less net incurrence of financial liabilities, is net lending (+) or net borrowing (-) [EC, 2013, 257]:

NL/NB=FAA- FIL *where:* FAA - net acquisitions of financial assets; FIL - net incurrence of financial liabilities

[1] The financial account indicates how deficit, or net borrowing, sectors obtain the necessary financial resources by incurring liabilities or reducing assets and how the net lending sectors allocate their surpluses by acquiring financial assets or reducing liabilities. See: System of National Accounts. United Nations, IMF, World Bank, OECD and EC, New York, 2009, p.219

Figure 1. presents the comparison of the net lending or net borrowing of the financial account with the capital account of RA for 2019. mln drams

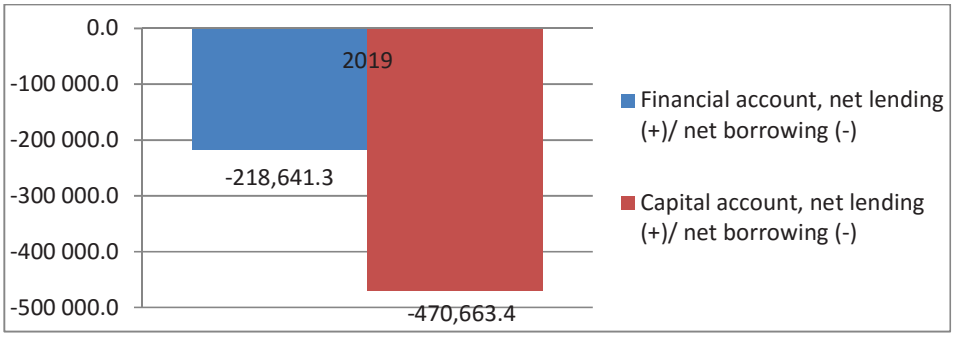

Figure 1. Net lending (+)/net borrowing (+) of financial and capital accounts of the Republic of Armenia for 2019 [4]

Theoretically, net lending/net borrowing of the capital account should be equal to net lending or net borrowing of the financial account, but in practice, the experience from other countries shows, that the above indicators differ both for the economy as a whole and for individual institutional sectors. In practice, accomplishing this identity is one of the most difficult tasks in compiling national accounts.

The differences in question are mainly due to data from various sources, incomplete data (in particular, incomplete data on households' equity shares of RA), features of estimates, data availability, institutional features, etc. Note that the above numerical differences are also present in the comparisons of net lending or net borrowing of the capital account with the financial account of France and a number of other countries (Fig.2).

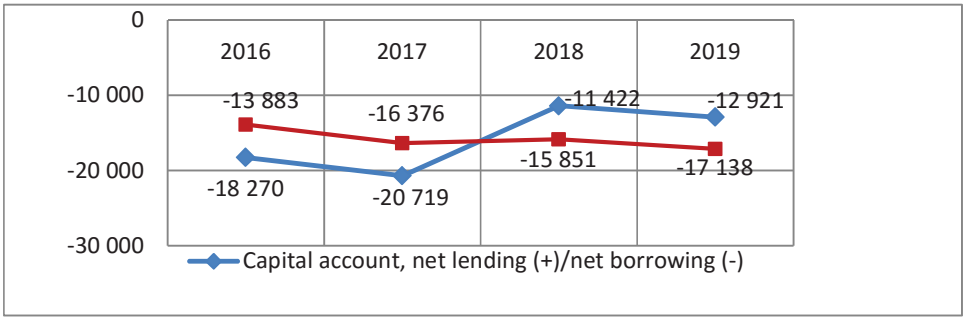

Figure 2. Net lending (+)/net borrowing (+) of financial and capital accounts of France mln. euros [5]

Among the factors affecting the net borrowing or net lending of financial account, we can single out equity, investment funds, purchase and sale of debt securities, currency, credit-loan agreements, the volume of deposits, etc. Armstat has compiled the preliminary tables of the financial accounts and financial balance sheets of the System of Na-

tional Accounts in collaboration with the international experts, as well as in cooperation with the specialists of the Central Bank and the Ministry of Finance of the Republic of Armenia. Financial Account for 2019 and the balance sheets have been compiled on the basis of spreadsheets based on the "From whom-to-whom" (FWTW) approach [4]. In 2019, the only "borrowing sector" of the Armenian economy was non-financial organizations, amounting to -442 923.7 million drams. The above can be conditioned by significant credit obligations of non-financial organizations (see Figure 3). According to data published by Armstat, the lending sectors were financial organizations, general government, households and non-profit institutions serving households (NPISHs), which amounted to 30 780.3, 4 671.9 and 188 830.2 million drams, respectively.The lending sec-tor of the households and NPISHs is due to the significant increase in equity. The growth of accumulated loans of financial organizations, as well as the growth of debt securities, led to the excess of assets over liabilities in the financial organizations' sector.

The general government sector has formed the lending sector too. This can be substantiated by the effective economic policy and the high growth of tax revenues of the Republic of Armenia in 2019. Thus, the tax revenues of the consolidated budget increased in 2019 compared with 2018 (1 384.5 billion drams) to 1 614.9 billion drams. However, it must be stated that the domestic economy was recognized as a borrowing country with 218.6 billion drams in 2019 [4]. It should be noted that Armenia has been a borrowing country for many years, that is, more funds have been "attracted" than "taken out". At the same time, according to the results of the 2019 financial account at the level of the domestic economy, this circumstance can be mainly explained by the increase of credit debts in the institutional sector of non-financial organizations.

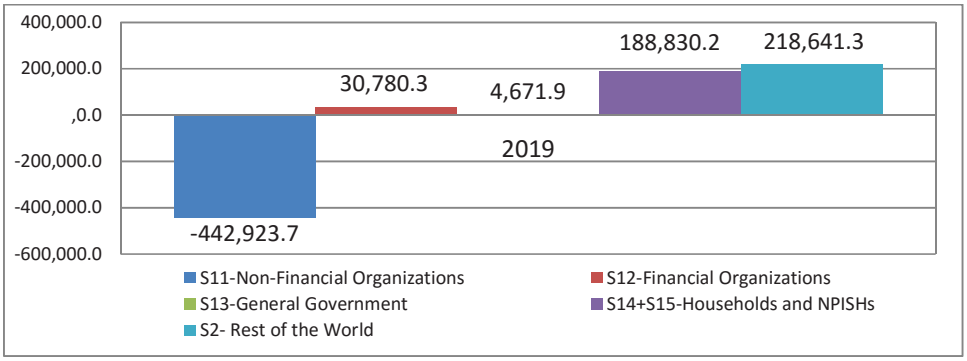

Figure 3. Financial account. Net lending (+)/net borrowing (+) by sectors of the economy, mln drams [4]

In order to comprehensively describe the indicators of the financial account of RA, it is necessary to analyze them by institutional sectors of the economy and financial instruments. According to the results of the survey of non-financial organizations published

by ARMSTAT, the total financial assets at the end of 2018-2019 amounted to 1 836.0 and 2 010.3 billion drams, respectively, and the total liabilities were 6 288.3 and 6 783.9 billion drams, respectively. At the end of 2018-2019, the largest share of the structure of financial assets in non-financial organizations were "currency and deposits" (34.2% and 35.2%, respectively), "equity and investment fund shares" (34.5% and 36.3%, respectively) financial instruments (see Figure 4). The structure of liabilities in this sector was dominated by loans, equity and investment fund shares.

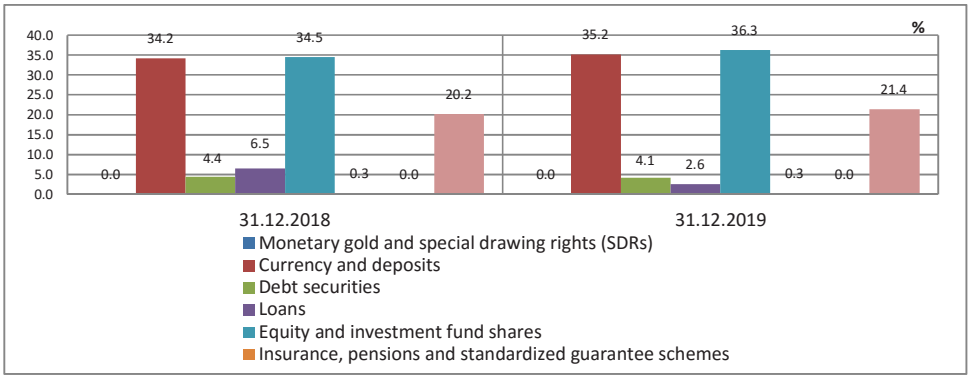

Figure 4. Non-financial organizations sector's assets by financial instruments, %[1]

The assets of the financial institution's sector at the end of 2018–2019 amounted to 5 431.0 and 6 502.5 billion drams, and liabilities were 6 010.8 and 7 076.6 billion drams, respectively. According to the data provided by the Central Bank of Armenia, in the financial sector at the end of 2018–2019, most of the assets were loans, accounting for 62.8% and 61.9%, and debt securities were 23.8% and 22.7%, respectively (see Figure 5). With regard to liabilities, at the end of the same period, 60.4% and 62.5% had been allocated to "currency and deposits" (F2).

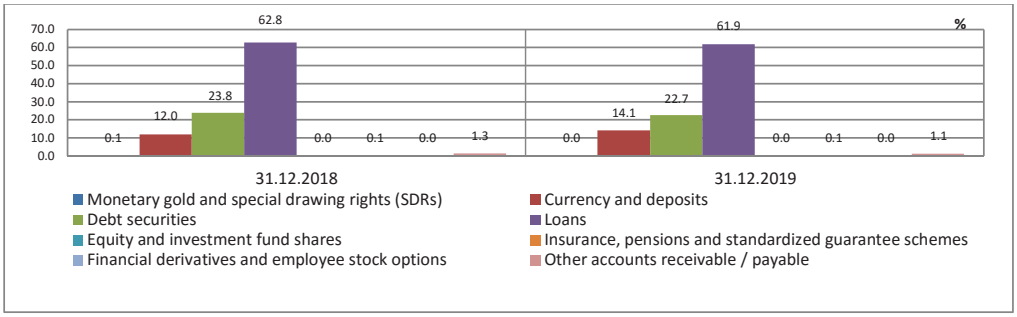

Figure 5. Financial organizations sector's assets by financial instruments, % [4]

[1] All figures are compiled by the author.

According to the data of the Ministry of Finance of RA, in the general government sector of the financial account, at the end of 2018-2019 the assets amounted to 1 049.1 and 1 249.4 billion drams, respectively. At the end of 2018-2019, according to the data of the general government sector of the financial account, the assets amounted to 1 049.1 and 1 249.4 million dreams, respectively. In the general government sector, 40.8% and 34.4% of assets were loans; 18.1% and 26.7% were "currency and deposits"; 21.5% and 19.7% were other receivables. At the end of the above period, liabilities amounted to 3 218.9 and 3 408.5 billion drams, respectively. 62.9 and 61.3% of the structure of liabilities were formed from loans.

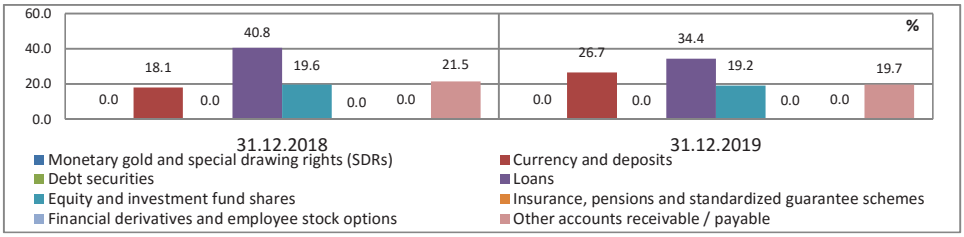

Figure 6. General government sector's assets by financial instruments, %

ARMSTAT has collected data on households and NPISHs from various institutional sectors as a "residual sector". The financial account for the households and NPISH sector has been chiefly estimated on the basis of information declared by other sectors. Thus, at the end of 2018–2019, the total assets of households and NPISHs amounted to 4 238.0 and 4 817.7 billion drams, respectively, and the liabilities were 1 576.2 and 1 975.2 billion drams, respectively. Households (including NPISHs) assets were mainly formed from "currency and deposits" (60.3% and 57.8%) and "equity and investment fund shares" (25.1% and 27.7%) (see Figure 7). In the structure of liabilities, loans accounted for 93.5% and 94.6% [4].

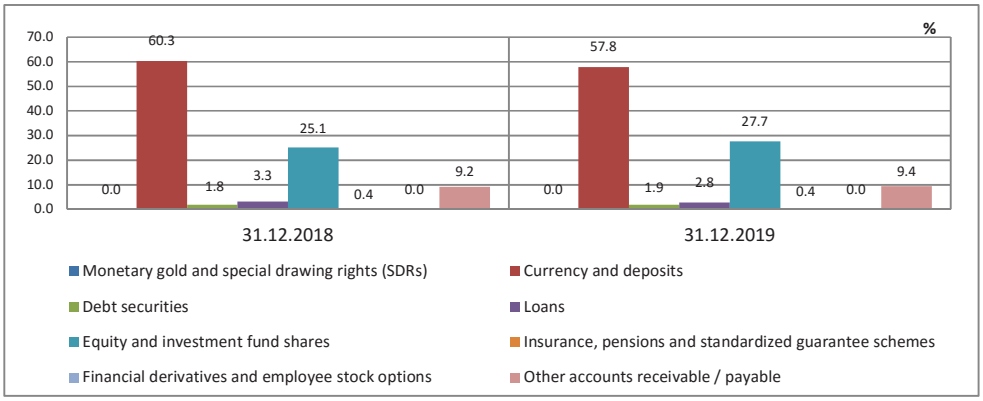

Figure 7. Households and NPISHs sector's assets by financial instruments, %

According to the data formed by the Balance of Payments, the assets of the external sector as of the end of this period were 7 093.6 and 7 670.5 billion drams, and the liabilities were 2 553.4 and 3 006.3 billion drams, respectively [4].

As for the share of financial instruments in the rest of the world, more than half of assets (53.5 and 52.4%) were accounted for by loans, and investment funds accounted for 25.6 and 22.6%, respectively (see Figure 8).

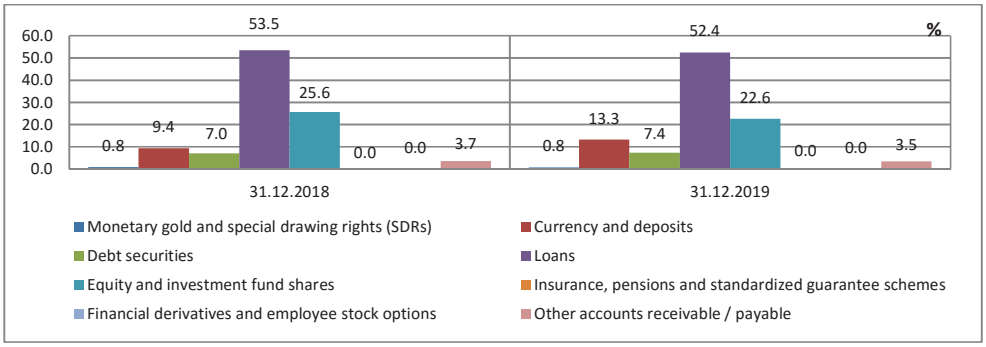

Figure 8. Rest of the World sector's assets by financial instruments, %

Conclusions. The compilation of the financial account according to SNA 2008 in the Republic of Armenia has made it possible to complete the system of national accounts and to present accounts by institutional sectors.

Armenia has been a borrowing country for many years, that is, more funds have been "attracted" than "taken out". According to the results of the 2019 financial account at the level of the domestic economy, this circumstance can be mainly explained by the increase of credit debts in the institutional sector of non-financial organizations. Financial organizations, general government, households, and NPISHs have created "additional resources" that can become the main sources of production, construction, acquisition of fixed assets, financing, and domestic investments in both this sector and other sectors.

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Financial account as a tool for macroeconomic analysis (on the example of the Republic of Armenia)

Key words: System of National Accounts, capital account, financial account, transaction, net lending, net borrowing

The financial account and balance sheets of financial assets and liabilities are part of the System of National Accounts of the Republic of Armenia. Financial account and balance sheets of financial assets and liabilities, being an important information basis for conducting an in-depth study of financial flows in the economy and structural analysis within the framework of macroeconomic analysis, allow not only to evaluate the structure of financial assets and liabilities of economic agents, but also to timely identify emerging risks and the imbalances in various sectors of the economy. The paper touches upon the calculation of balancing items of capital and financial accounts, compilation features and methodological aspects. The article analyzes the volumes, structure, and dynamics of financial instruments, both in the context of the economy as a whole and its separate institutional sectors. It also presents factors affecting the net lending or net borrowing of the financial account by institutional sectors.

ANALYSIS OF PRODUCTION AND ECONOMIC INDICATORS OF BEER MANUFACTURE IN ARMENIA

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Key words: beer, production, beverage, import, export

Introduction. Beer is one of the oldest and most consumed alcoholic drinks and is considered to be the third widespread beverage after water and tea. Beer is produced from cereals, via starch fermentation. Mainly barley malt is used, nevertheless, wheat, maize and rice are also widely applied throughout its production. Beer is mostly flavored with hop, which adds bitterness and serves as a natural conservant, though other supplements like herbal plants and fruits can be also used. Brewing is a global business, which consists of some dominant international companies and thousands of small manufacturers. The alcohol content per its volume makes 4-6% but in some cases it can fluctuate within 0.5-20%, while some factories produce beer with 40% and even more strength.

Methodology. For the processing and application of information retrieved throughout the research work, as well as for the study of production and economic indices of beer manufacturing companies of the RA, dialectic, economic and statistical, scientific research, as well as analytical and comparative methods have been used. The economic and production indicators of the RA beer producing companies have been considered in the scope of mutual relationships.

Literature review. Beer manufacturing industry in Armenia started still from ancient times. The first brewery in Armenia was opened in 1892 in Yerevan. It was known as "Zanga" beer production factory and was situated at the Hrazdan riverbank. The factory used to produce beer under "Bock" brand. It was closed in 1920. It is also known that for high quality beer production the beer raw stuff (barley) was imported from Kars region, while hop was brought from Poland; above all these, fresh water of the most famous Yerevan spring called "Krbulagh" was used. Contemporaries attest that the beer of "Zanga" brewery was endowed with amazing taste properties. The product of the mentioned factory was considered as the best one not only within the borders of South Caucasus but it was also in great demand in the Russian cities and even in Europe, where during the expos organized in Rome and Naples, in 1910, the Yerevan beer won the highest prizes. Barley is the raw material for beer production, from which malt is produced. Hop and hop flowers also serve as ancillary materials. The high properties of

barley malt are related to the soil and climatic conditions. In the Shirak, Lori, Gegharkunik and Syunik regions of Armenia barley endowed with high biochemical and physiological properties is grown. There are some technological requirements for barley cultivation which consists namely in that its moisture content shouldn't exceed 15 %, the protein content shouldn't surpass 9-11 %; it should have high extraction properties, while the starch content should be low. The low extraction properties increase the raw material costs per a product unit causing extra expenses [Matevosyan, 2000, 109/-110]. Malt is produced in the Gyumri Beer-Malt Factory CJSC (10 thousand tons annually). It is also imported from Germany, Hungary, Belgium and UK. There is a need to increase the production sizes of local barley, and consequently malt production sizes as well. It is also necessary to regulate the production and economic contractual relations between the raw material producing and processing organizations [Mamikonyan, 2013, 282-284].

One of the main objectives of processing economic entities is not only to increase the capacity of raw material base but also to ensure its efficient use in the production process. The rational use of raw material reduces its demand at economic level and increases the overall efficiency. The efficiency of raw material application is evaluated via generalizing and partially analytical indices. The generalizing indicators describe the total amount of the product manufactured per a raw material unit and the material requirement for the product. Whereas, the norm of raw material spent per the unit of a specific product is already the analytical index [Mamikonyan, et al., 2004, 54].

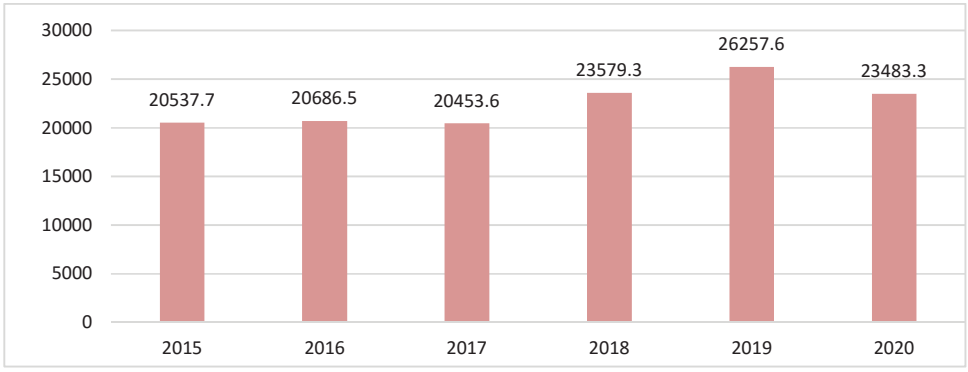


Figure 1. Beer production in the RA for 2015-2020 years, by volume, thousand liters

According to the results of the RA national statistical data, 2021, 11 enterprises were actively engaged in the entrepreneurial activities of the beer manufacturing sector among which Yerevan, Gyumri, Kotayk, Sevan breweries, Hayasy Group, as well as Ginevan and Dilijan breweries are distinguished. Their overall production capacities averagely make 150 000 liters of beer annually, while the staff number of industrial and production personnel makes about 994 employees. Each economic system is based on

the equilibrium of economic and social efficiency. Market social trend implies meeting the growing and changing needs of people, human resource development and coexistence of different ownership forms. Beer manufacturing is the steady cornerstone of beverage industry in Armenia. Figure 1 presents the beer products sizes manufactured by the breweries of Armenia in physical terms (by volume). In 2015-2017, the companies recorded a sustainable production growth with slight deviation observed in 2018, when compared to 2017, it exceeded by 13.3% and in 2019 – by 22.1%. Nevertheless, in 2020, the beer production sector has also demonstrated downturn in the economic indicators. Compared to 2019 year, in 2020 the beer production sizes in the Republic of Armenia were reduced by 11.8 % related to the pandemic and war conditions.

Scientific novelty. The conducted investigations and analyses have entailed to the results among which the comprehensive study and analysis of the beer manufacturing sector of the Republic of Armenia and the comparative analysis of the dynamics in production and economic indicators, such as beer production sizes, export and import indices can be considered as the scientific novelty of the current work.

Analysis. Beer, like other alcoholic drinks, is a product taxable through the excise taxes. Excise tax is an indirect tax type which is calculated and paid for the import of goods as regulated by law or for their alienation by the manufacturers in the territory of Armenia. Excise tax is a state tax paid to the state budget for transactions (operations) related to the objects of excise tax, in the manner, amount and within the time limits determined by the relevant Code rule. It is determined through the excise taxation base per the products quantity (volume) expressed in natural units, using excise tariffs. The excise duty rate on beer product (product code is 2203 according to FEACN) for 2020 made 130 drams per liter, in 2021 it was 133.9 drams, in 2022 – 137.8 drams, while in 2023 it is 141. 7 drams [RA Law on Excise Tax, 2020]. Throughout the analysis of the activities of the RA beer manufacturing companies the entrepreneurial risks of economic entities engaged in this sector should be particularly emphasized. The beer manufacturers are faced with all types of entrepreneurial risks. The latter have problems in the procedures of barley importation, which is the raw material base for beer production and in the development of reserves. Some reasons for the entrepreneurial risks of the RA beer producing companies are the unfavorable fluctuations between the products' demand and supply, increase in the wholesale prices, as well as growth in the prices of food and non-food products, utility services, force majeure circumstances (pandemic, war in the Republic of Armenia and its consequences, the political and economic situation in the region), variations in the ruble exchange rate, etc. [Hayrapetyan, 2015, 36-39]. According to national statistics, in 2015-2019 the industrial production sizes of the beverage products in Armenia increased, while in 2020, compared to 2019, production decline by 11.6 % was recorded. Different beverages, including beer, manufactured in Armenia

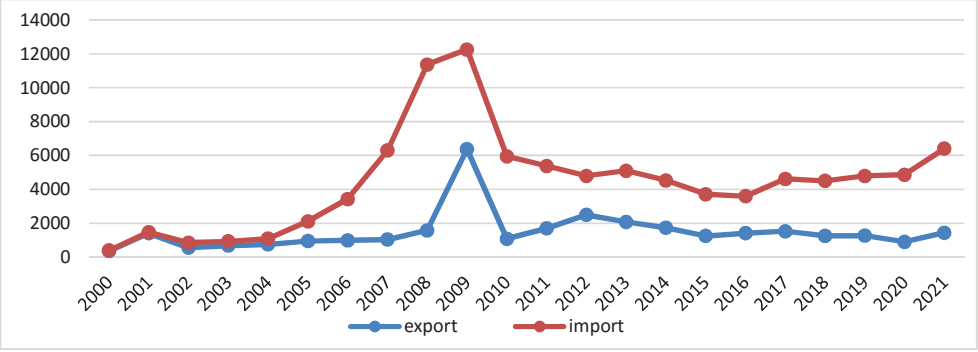
have been exported for sale in EAEU countries since 2018. In 2019, the industrial production of the beverages manufactured in the RA made 184.6 bln drams in the current prices, 10.5 bln of which (5.7 %) accounted for the share of beer production. In 2020, the output production costs of the drinks in the RA was equal to 163.1 bln drams in the current prices, 9.2 billion of which (5.6 %) were allocated for beer production.

Table 1. Economic indices of the beverage and beer production in the RA for 2015-2020

	2015	2016	2017	2018	2019	2020
The industrial production size of beverages in the RA in the current prices, billion drams	110,9	102,7	149,2	152,6	184,6	163,1
The sale of output products of beverages in current year prices (billion drams), including	110,6	103	150,9	156,5	186,3	162,3
In CIS countries	53,6	43,4	80,9	78,5	92,9	86,8
EAEU countries	-	-	-	70,8	92,8	80,2
Other countries	13,1	9,9	14,1	15,1	21,3	21,6
The industrial production size of the RA beer products in current prices, billion drams	7,4	8	8,1	9,3	10,5	9,2
The sale of beer output products in the current year prices (billion drams), including	7,3	7,9	7,7	9,4	10,7	9,4
In CIS countries	0,77	0,68	0,85	0,79	0,86	0,75
EAEU countries	-	-	-	0,77	0,85	0,76
Other countries	0,16	0,19	0,17	0,18	0,22	0,23

The economic indices introduced in Table 1 show that beer production has its steady share in the RA beverage manufacturing sector [The key indicators, 2016, 2017, 14-15, 2018, 2019, 18-19, 2020, 2021, 16-18]. Throughout 2000-2009 the export and import of Armenian beer products increased in arithmetic progression. Anyhow, in 2009 - 2010 the volumes sharply decreased related to the world economic crisis; the men-tioned indices recorded for 2020-2021 years demonstrated relative stability.

Figure 2. The import and export for the Armenian beer in 2000-2021, thousand USD



To reduce the import sizes of food products, the problems related to the increase of competitiveness and quality of the products manufactured in the processing branches, as well as those related to the improvement of product appearance and implementation of wholesale market program, should be handled.

Table 2. The self-sufficiency level of the Armenian beer in 2017-2020 and the share of local product in the sale system, %

Indicator	2017	2018	2019	2020
Self-sufficiency level of beer product	88.9	88.6	88.7	88.6
Share of local product in the sale system	80.5	83.2	83.7	81.2

In view of the world practice, the analysis of the population's self-sufficiency level in respect with food and non-food products is one of the prior measures to address the safety issue of the country. The data research indicates that the self-sufficiency level of Armenian beer products throughout 2017-2020 years makes 88.7 % on the average, while in the sale system the share of local product makes 82.2 % [Food Safety, 2017].

Conclusion. Thus, beer production holds an important position in the RA food and processing industry. Up to date no comprehensive research work concerning the entrepreneurial activities of the RA beer manufacturing companies has been implemented and the current issues of the mentioned branch haven't been identified properly yet; hence, the relevance and urgency of the current article and the selected topic is justified.

Beer is a low-alcohol beverage with 5000 years' history. It passes through Babylon and ancient Egypt coming up to Europe. Nevertheless, previously beer used to have sweet taste, since no hop was applied then. The modern beer aficionado has the opportunity to choose and enjoy dozens of beer types. It is remarkable that even millennia ago, mankind was already familiar with several types of beer [Petrochenkov A., 2003]. It would be definitely interesting to study sound and specific historical data about brewing. For the first time, in 1585, Thaddeus Hagecius described beer production procedure in his book " An Ancient Technical Essay on Brewing" [Gabikh G., 2012, 352 p.]. Armenia is also one of the ancient countries engaged in beer production. The activities in this sector root back to the 4th century B.C., when the leader of Greek mercenaries Xenophon, passing through our territory, enjoyed the "strange beverage" produced from barley and mentioned about it in his proceedings. The contemporary world is full of different beer varieties.

The data of the RA national statistical committee evidence that during 2000-2020 years more than dozens of beer manufacturing Armenian and foreign companies were actively engaged in the entrepreneurial activities in beer production sector. Beverage production sector, beer production, in particular, possesses a non-fluctuated share in the whole industrial structure of the RA. Beer production is one of the sustainably developing branch in the RA processing industry. This specific beverage produced from barley has been manufactured and consumed for thousands of years in Armenia.

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Analysis of Production and Economic Indicators of Beer Manufacture in the RA
Keywords: beer, production, beverage, import, export

Among the factors justifying the research relevance and urgency, the RA beer market, extreme imbalance of the resources, raw material and varieties for their complementation, the millennial history and traditional technologies of brewing, development trends of beer import and export sizes and other key factors have been investigated. The relevance of the topic is underpinned by the steady-state share of industrial beer product volume in the total industrial beverage product range of the RA (in 2018 - 6.1 %, in 2019 - 5.7 %, in 2020 - 5.6%). The entrepreneurial activities of beer producing organizations are not only of economic but also of social significance for the country, since multiple jobs have been created and the unemployment has been reduced to a certain extent. Beer manufacturing methodology and the historical survey of the first Armenian brewery, as well as some of beer producing companies in the RA per the data of 2021 have been introduced. Studies related to the beverage, particularly beer production sizes and its comparative analysis have been conducted. The share of beverage production in the overall industrial output of the RA has been indicated and the specific weight of beer manufacture in the structure of beverage production has been estimated. Besides, the RA beer export and import processes, its self-sufficiency level and share of domestic product in the sales system have been studied.

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EXPANDING THE USE OF DIFFERENTIAL TARIFFS AND SERVICE FEES AS A FACTOR IN THE DEVELOPMENT OF ENERGY SECTOR

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Key words: electricity market, state regulation, differentiated tariff, service fee, tariff margin, generating stations

Introduction. Selecting the model of the national energy market is a rather complicated and step-by-step process, although there are a number of models of reforms in the world market, which have had a positive impact on the development of the economy and energy. Nevertheless, the need to develop and effectively implement ways to improve the regulation of Armenia's energy sector has become imperative over time.

The regulation of the energy sector of the Republic of Armenia is one of the key issues of the economy of the Republic of Armenia, which aims to balance the interests of consumers and entities with activity licenses upon the establishment and control of the activity rules, regulatory tariffs and licence conditions in the electricity, heat energy and natural gas markets, to create equal activity conditions for the persons with activity license and to promote formation and development of competitive market. Thus, the efficiency evaluation of the operation of electricity generation, supply and distribution system and the study of justification of current tariffs and the application of the differentiated tariffs and service fees are of utmost significance.

There are significant challenges in the energy system in terms of ensuring adequate energy supply, and pursuing affordable and sustainable tariff policies for consumers.

Methodology. The following research methods served as the basis for scientific research: empirical research methods: observation, comparison, measurement,methods used both at the empirical and theoretical stage of research`abstract, analysis,econometric, statistical, factorial, system analysis, as well as grouping methods, tabular and economic-mathematical methods.

Literature review. The theoretical and methodological basis for solving the study tasks are the main provisions of classical and modern theories of economics, the works of domestic and foreign researchers, legislative regulation of the sphere and by-laws.

Scientific novelty. As a result of the study, will be presented recommendations for improving the tariff methodology of electricity power: the observation is differentiated by the possibility of tariffs and the separation of service fees. The main goalfor the energy system and organizations generating solar electricity is to justify the introduction of a fee. One of the important results of this study is also the determination of the service fee and its comprehensive justification. Of course, there is a need to establish differentiated tariffs for electricity and its assessment of the complex impact both within the entire framework of the energy system and within the framework of economic entities and resident subscribers.

Analysis. The regulation of the activity of the constituent objects for the power system in Armenia is carried out through laws, by-laws and decisions. Particularly:

- The Law of the RA on Energy was adopted on March 7, 2001.
- The Law of the RA on Public Service was adopted on March 23, 2018.
- RA PSRC 18.08.2018. The concept of the new structure of the RA electricity wholesale market approved by the decision N 289L - the concept of electricity trade, the concept of ensuring the energy security of the RA.
- RA Public Services Regulatory Commission N 125-N 16.09.2005 decision on approving the methodology for calculating electricity tariffs (capacity) supplied by electricity generating companies
- Public Services Regulatory Commission of RA N 541-N 13.12.2017. Decision on approving the methodology for calculating tariffs for electricity and distribution services sold to consumers by "ELECTRIC NETWORK OF ARMENIA" CJSC
- Methodology for calculating the required income and Tariff Margin of the Licensee, Annex N1 Conditions of the license N0092 for distribution of electricity (capacity).

The quality of energy sector regulation, as well as the efficiency of public administration activities, directly affect the running costs of existing companies and the organization of production processes. An efficiently regulated system promotes efficiency increase and innovations, while inert administrative processes or late regulatory technical decisions can jeopardize productivity growth and competition[1].The main guarantee of effective activity in the market is to ensure a level playing field of competition among all market participants, which is the main task of the regulator. When operating in such conditions, the companies themselves are interested in improving their own efficiency,

[1] "European competitivences report 2004"; Ch. 2, Sec. 2,2,1 " Justification for public intervention in R&D and instruments", Commission staff working document SEC (2004); ISBN 92-894-8227-3

which leads to an increase in production volumes, and consequently to the reduction in prices. One of the goals of our research is to identify the real development level of Armenian market via analysis of the legislation regulating the energy market of the RA and revealing the current shortcomings and to present the directions of its perspective improvement, which we believe will lead to effective development of the RA energy sector.

Let's present the main provisions of the tariff policy in the RA electricity system. The basis for the development of the methodology for calculating electricity tariffs is the decision N 125-N of 16.09.2005 of the Public Services Regulatory Commission of the RA on approving the method of calculating the tariffs for electricity (capacity) supplied by electricity generating companies. Based on the latter, the principles of calculating the producer's tariffs and the provision of electricity transmission service by an entity with a license for electricity transmission activity are defined. The principles include: providing the necessary revenue, cost analysis and tariff setting. The key to tariff calculation is the principle of providing the necessary revenue, assuming a certain amount of revenue, which will allow the Licensee to have all the operating costs necessary for reliable, safe, continuous operation, as well as an acceptable (reasonable) return on invested capital. The components for calculating the required revenue are the eligible annual expenses, depreciation of fixed assets and allowable profit. Eligible costs include current expenses incurred during the year of calculation of tariffs, which will contribute to the uninterrupted and regular activity of the organization, including operating, maintenance, and fuel costs. Depreciation in this case is calculated by the linear method. The two main directions of defining the allowable profit are as follows:

1) method of net assets profit rate; that is the product of profit calculation base (PB) and allowable profit rate (PR),
2) Method of reimbursement of necessary financial costs.

Thus, the basis for calculating the tariff margin is the principle of ensuring the necessary revenue of the licensee; according to the latter the rquired revenue of the account year (for 12-month period) is calculated via the price of purchased electricity, operational and maintenance costs for the licensed activity, depreciation of fixed assets involved in the implementation of licensed activities and depreciation of intangible assets, the amount of allowable profit for the net assets involved in carrying out the licensed activity, the amount of allowable profit for the net assets involved in carrying out the licensed activity, the difference between the cost of electricity purchased and the required revenue of the licensee, the amount to be reimbursed as a result of the deviation from the calculated and actual values, the difference of the amount of unsecured receivables and proceeds from the provision of electricity distribution service to legal entities by a licensee. According to the decision/decree of RA Public Services Regulatory Commission N 541-N 13.12.2017 on approving the methodology of calculating the

tariffs for the sold electricity and distribution service rendered by the "Electric Network of Armenia" CJSC for cost analysis and their distribution among consumer groups, all costs of the distributor are classified into three groups:

1) electricity (capacity) purchase costs (including Compensation amount),
2) electricity distribution costs,
3) consumer service costs.

Electricity distribution costs are fixed costs, which include the costs of operating and maintaining the distribution network (repair, material, labor costs, etc.), depreciation costs of fixed assets, and amortization of intangible assets, except for the customer service costs referred to in paragraph 8 of the mentioned methodology. The eligible return on the fixed assets raised from investments and on the net value of intangible assets is considered as an expense and included in the electricity distribution costs. Consumer service costs include those for recording data on electricity metering systems, billing, collection of money from customers for electricity sold, bad debts, and other customer service costs. The formation of consumer groups is carried out based on the principles of having the same consumption characteristics of each consumer group, creating an equal price load for the electricity system. Electricity consumers are classified into:

1) 110 kW power consumers,
2) 35 kW power consumers,
3) 6(10) kW power consumers,
4) 0.38 and 0.22 kW power consumers.

The distribution of costs among consumer groups is carried out through the following stages:

1) distribution of electricity (capacity) purchase costs,
2) distribution of electricity distribution costs,
3) distribution of consumer service costs.

The costs of purchasing electricity (capacity) are distributed among the consumer groups according to the following formula: Consumer service costs are distributed among consumer groups (also Distribution Network Technologies) as follows:

1) the costs of collecting money from customers for the sale of electricity are entirely attributed to the consumer group of 0.38 and 0.22 kW,
2) other consumer service costs are distributed according to the proportion of the number of customers in the consumer groups.

The calculation of electricity sales tariffs for consumer groups is the following. Tariffs for electricity sales for consumer groups are set in a single rate tariff system. The service to be paid in the single-rate tariff system is electricity consumption, the unit of measurement of which is AMD / kWh. In the case of differentiated tariffs (day and night) at different hours of the day, the electricity sales tariffs (SE) calculated for the

consumer groups are average weighted quantities. Tariffs for the distribution service are set in the single rate tariff system; they are differentiated according to the consumer groups determined according to the above-mentioned methodology, taking into account the requirements of the Trade Rules. These are electricity tariffs in 1997-2022:

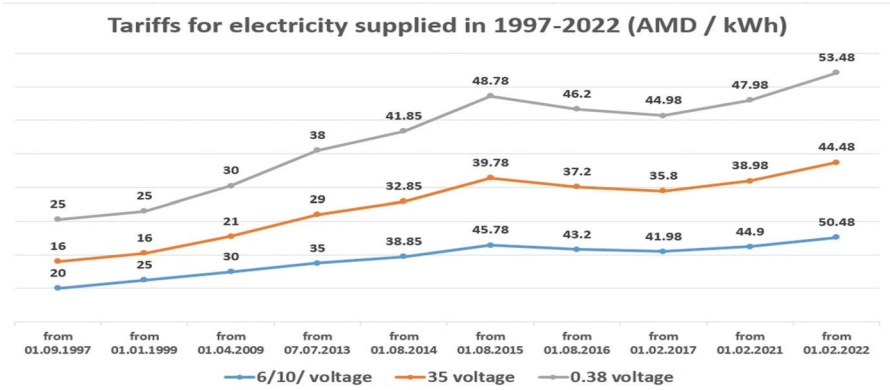

Figure 1. Tariffs for electricity supplied in 1997-2022.

During 1997-2022, the electricity tariff for Armenian consumers has been changed 10 times. The longest period, when the electricity tariff remained the same, was 1999-2009. It is noteworthy that in those years, in conditions of stability in electricity tariffs, the Armenian economy recorded mainly double-digit growth. Electricity tariffs in Armenia have increased dynamically since 1997, with the exception of 2016, when the new government was formed by K. Karapetyan, negotiating with the Tashir Group, reduced the electricity tariff. However, in following years, due to objective and subjective factors, the tariff increased again. The increase in electricity tariffs for businesses in 2021-2022 is of particular concern, which, of course, had an impact on the level of inflation and business competitiveness. In 2021, ENA supplied 6.2 billion kWh of electricity, out of which 33% was consumed by the population, 24% - by industry, 3% - by budget organizations, 3% - by the irrigation system, 2% - by the transport system, and 1% - by the water supply and drainage systems, while 34% - other consumers. It should be emphasized that the largest identified group of consumers after the population is industry. Therefore, the idea of having differentiated tariffs is primarily relevant in case of industrial organizations. Setting differentiated electricity tariffs, particularly in the case of industrial organizations in the processing sector can significantly increase the competitiveness of this sector not only in domestic but also in foreign markets. Let's present the productive supply of 20 high-cost electricity customers by 2021. It amounted to 1 billion 388 million kWh. In order to study the distribution of productive supply for 20 customers, we have separated the administrative-territorial units of the Republic of Armenia. Particularly, 3 out of the above stated 20 customers operate in Syunik marz, however, the volume of productive supply is 614.2 million kWh, which is 44.25% of the overall pro-

ductive supply of 20 customers. In Yerevan, 7 organizations out of the mentioned 20 customers are operating but the volume of productive supply makes 206.3 mln kWh, which is 14.86 % of the 20 customers' productive supply.

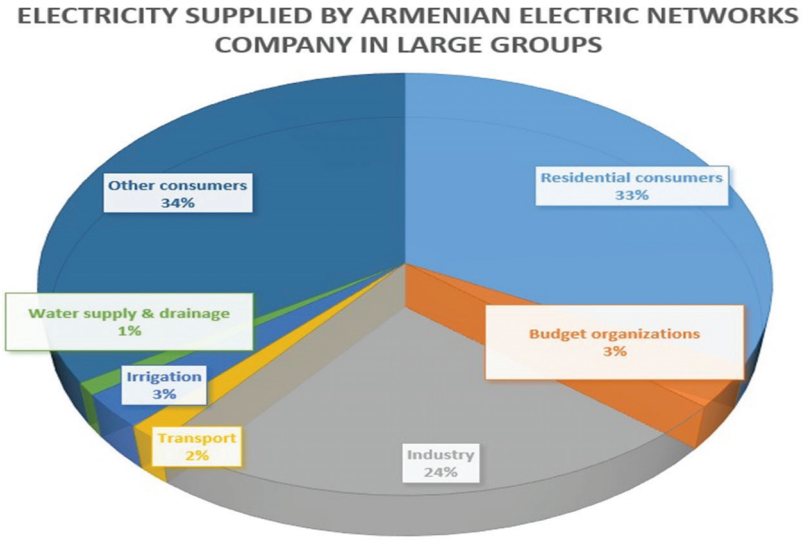

Figure 2. Electricity supplied by ENA per enlarged groups

The other 9 organizations operate in the regions/marzes of Ararat, Lori and Kotayk, whose productive supply volume makes 191.8 mln kWh, 190.9 mln kWh and 171.2 mln kWh, respectively. In the Armavir region only 1 organization out of 20 customers takes activities, whose productive supply volume makes 13.7 mln kWh.

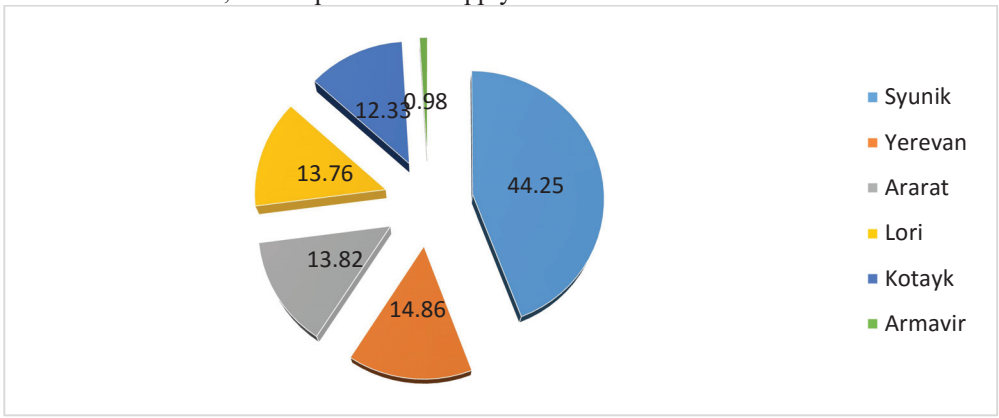

Figure 3. Percentage distribution of productive supply in 20 high-cost electricity customers throughout 2021.

In the result of studying the distribution of productive supply of 20 high-cost electricity customers during 2021 per the activity areas, it has been disclosed, that mining companies consume 91.6%, while those engaged in production activities and service providers – 4% and 4.4%, respectively.

Figure 4. Percentage distribution of productive supply in 20 high-cost electricity customers throughout 2021 per the activity areas.

Armenia has favorable conditions for the development and use of non-traditional energy sources. In the joint context of ensuring stability of the RA economy, improving the social welfare of the country's population and raising its living standards, the change in the direction of the national energy policy has become urgent. According to the US Energy Information Administration/Agency, the volume of electricity used in 2006-2030 will increase by 44%. Analysts predict that by 2050, global energy demand will increase 1.2 times. In addition, by then the world population is projected to grow by 1.7 billion, which will also lead to high energy demand. As a result, it is predicted that prices in energy resources will also rise. According to the RA strategy and strategic plans, the RA energy industry has 4 pillars:

1. safe and reliable power supply,
2. development of production capacities,
3. maximum use of internal renewable resources,
4. regional integration or energy system diversification.

During the recent 20 years, the tariffs for electricity supplied to only population have almost doubled in our country, which should remind Armenia, being not rich in fuel and energy resources, to develop the energy sector, infrastructures, generated capacities and the market, reducing dependence on imported energy resources. These resources are called renewable or alternative resources. Solar energy is considered to be one of the cleanest energy sources. Solar energy has become quite attractive and profitable in Armenia. According to forecasts, in 2028 solar energy will become so cheap and widespread that it will be able to meet all human energy needs. According to the measurements, in Armenia on the average about 1700 kWh electric energy on 1 square meter

area can be annually generated, which is twice as much as the European average indices, where this number is close to 1000 kWh. Since 2015, it has been established, that the electricity generated in the automatic solar stations and supplied to the grids is not taxed. It has been also stated that in order to meet their needs the citizens can install up to 150 kWh, while economic entities – up to 500 kWh automatic solar stations which will enable to generate and consume electricity in sunshine hours, whereas to send the unused electricity to the grids, meanwhile in sunless or slightly sunny weather the sent electricity can be retrieved from the grids. The fact that neither individuals nor economic entities pay maintenance fees while using the existing infrastructure, is left out of that process and their number is gradually growing.

In total, there are 10.5 million jobs/working positions related to the renewable energy industry according to the calculations for 2020, while the solar photovoltaic plants are the largest employers. Renewable energy systems are rapidly becoming more efficient and cheaper. The data show that the cheapest tariff sold to ENA is 10.844 drams[1] and their share in the total energy consumption is increasing. As of 2019, more than 2/3 of the newly installed electricity plant capacity worldwide was renewable. As of 2020, in most countries, photovoltaic solar energy and land wind are the cheapest way to build new power plants. The cheapest tariff sold to ENA is 10.844 drams.

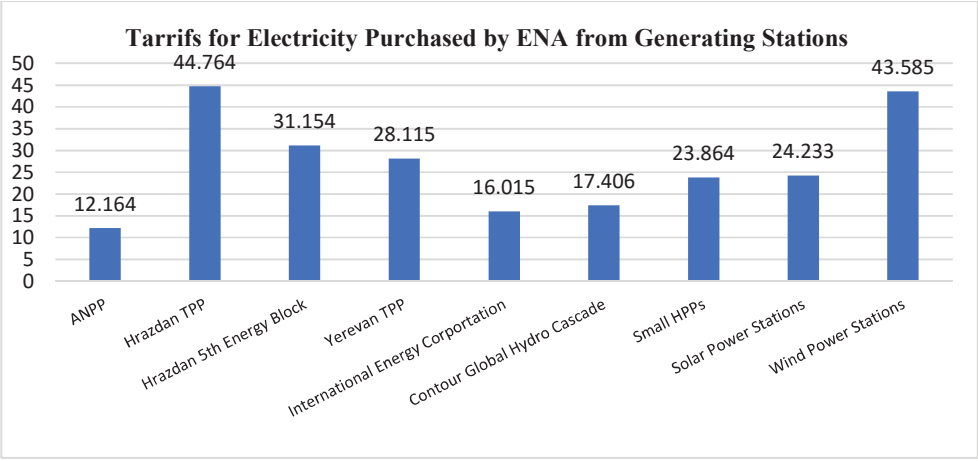

Figure 5. Tariffs of Electricity purchased by ENA from generating stations in 2020.

As of January 1, 2021, 4144 automatic generating solar stations with a capacity of 76,844 kW were connected to ENA, and 234 ones with a total capacity of 8536.01 kW were in process. Throughout 2020, the amount of electricity supplied by the autonomous power generators to the distribution network was 35,225,201 kWh.

[1] https://www.arlis.am/DocumentView.aspx?DocID=131066

Physical and legal entities can install autonomous solar stations with a capacity of up to 150 kW and 500 kW for their own needs. As of April 1, 2021, 4599 autonomous energy generators with a capacity of about 89959.11 kW were connected to ENA and 366 ones with a total capacity of about 9978.395 MW are in process.

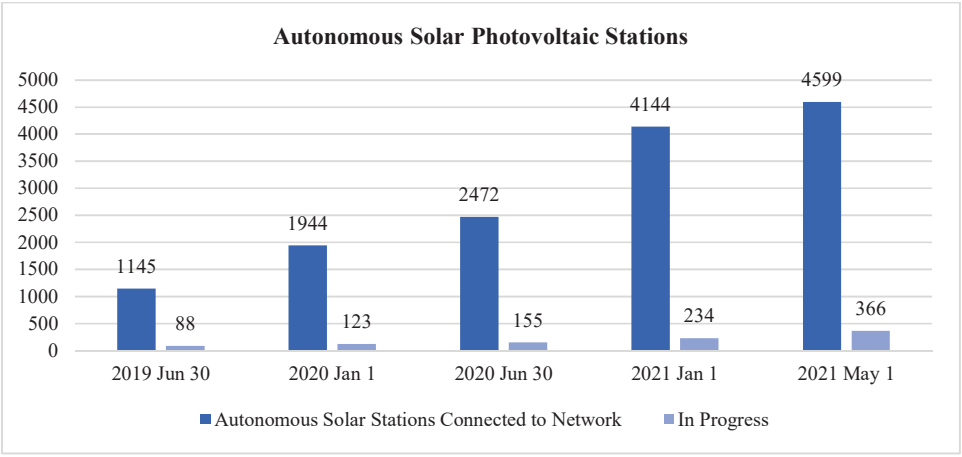

Figure 6. Quantitative changes of autonomous solar photovoltaic stations throughout 2020-2021

Considering the quantitative changes of autonomous solar photovoltaic stations during 2020-2021, we can conclude that the largest increase in their installation was registered in the period from June 30, 2020 to January 1, 2021 (see Figure 6). It is worthy to look at the differentiated electricity tariffs in some countries. In Russia electricity tariffs vary widely, depending on the group of consumers (urban population, rural population, commercial consumers, etc.), specific area and time zone. The separation of the tariff for urban population is also related to heating method: when using gas stove the tariff is different from the one when electric heating devices are used. Electricity tariffs for commercial consumers are not regulated. It is formed by the price received as a result of bargaining in the wholesale electricity market, the cost of electricity transmission through electricity networks, the cost of electricity supply services, and the sum of other surcharges. It is noteworthy that in the case of legal entities, the electricity tariff depends on the volume of its consumption, the method of electricity metering (single, night/day, daylight peak/daylight half-peak/night), the ability of the consumer to predict the amount of electricity consumption and other factors. Electricity tariff distinction per the time zones is implemented in the following way:

1. Tariff according to two time zones:

a. daylight (peak) zone, which covers the period between. 07:00-23:00.

b. night-time zone, which covers the period between 23:00-07:00,

2. Tariff per three time zones:

a. overloaded (peak) zone, which includes the periods of 08:00-11:00 p.m. and 20:00-22:00.

b. half-load (semi-peak) zone, which includes the periods between 07:00-08:00 p.m., 11:00-20:00 and 22:00-23:00,

c. night time zone, which includes the period of 23:00-07:00.

For example, in the city of Moscow, starting from July 1, 2021, according to the two time zones, in case of tariff application, the night-time tariff for the urban population is almost 64% cheaper than the day-time tariff, and according to the three time zones, the tariff for the half-load (semi-peak) zone is about 17 % cheaper than the tariff of the overloaded (peak) zone and is almost 60% more expensive than the tariff of the night-time zone. In Belarus, for both the population and commercial consumers, a differentiated electricity tariff is applied according to two time zones and three time zones. For instance, in case of differentiated three times zones (06:00-15:00, 15:00-23:00, 23:00-06:00) for the commercial consumers (in case of connection with 750 kWh capacity) the tariff for the period within 06:00-15:00 is the most expensive, moreover, the difference between the tariffs operating in the mentioned periods can reach about 48%.

Electricity tariffs in Kyrgyz Republic are differentiated according to the volume of consumption (up to 700 KWh and more), according to the location of consumers' residence (mountain zone, etc.), consumer's groups (industrial, agricultural, etc.), industrial branches depending on the energy capacity, e.g., the tariff for 1 kWh for mining or gold mining enterprises is multiplied by 2 factors, and for enterprises for the cement production, the tariff for 1 kWh is multiplied by 1.3 factor. In Ukraine, the tariff for electricity is differentiated for both two and three time zones, while in Georgia and Moldova the tariff is differentiated depending on the group of consumers, consumption volumes, etc.

Conclusion. Thus, it can be inferred that the largest distinguished consumer group after population is the industrial sector. Therefore, the idea of having differentiated tariffs is primarily relevant to consider in case of industrial organizations. Differentiated electricity tariff setting particularly for the industrial organizations in processing sector could considerably boost the competitiveness of the mentioned branch not only in the domestic but also in foreign markets. It is worthwhile mentioning, that the solar energy sector is full of rather promising perspectives for the RA economy and for the energy sector on the whole.

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Expanding the Use of Differential Tariffs and Service Fees as a Factor in the Development of Energy Sector

Keywords: electricity market, state regulation, differentiated tariff, service fee, tariff margin, generating stations

The article analyzes the current state of the RA electricity market and presents the legislative regulation of the sector, as well as the main provisions of the tariff policy in the RA electricity system. In particular, the methodology of calculating electricity tariffs (capacity) supplied by electricity generating companies, the methods of calculating electricity tariffs for electricity sold to the consumers by "Electric Networks of Armenia" CJSC, distribution service fee, the necessary income of a licensee and the method of calculating the tariff margin has been viewed. The dynamics of electricity tariffs for 1997-2022 is analyzed, the factors influencing the latter are identified, the electricity supplied by "ENA" CJSC is presented in enlarged groups, and the percentage distribution of productive supply of 20 high-cost consumers of electricity by 2021 per activity areas have been introduced. Tariffs for the sale of electricity supplied from electricity generating stations by using renewable energy resources in the territory of the Republic of Armenia have been analyzed, the impact of differentiated tariffs, relevancy and impact of setting differential tariffs and service fees on the electricity market participants has been considered. The world practice of applying differentiated electricity tariffs has been studied.

PROBLEMS OF ASSESSING THE IMPACT OF HIGH-TECH SECTOR LENDING IN THE REPUBLIC OF ARMENIA

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Key words: high-tech sector, bank, loan, gross output, innovation, competitiveness, econometric model

Introduction. The guarantee of sustainable economic growth and competitiveness is the provision of advanced rates of development of the innovative sphere. To solve this problem, each country chooses an economic policy that meets the structure of its economy and resources. In some countries, the emphasis is on fiscal policy to achieve this goal, while in others, monetary policy tools are used. A number of countries have used both monetary and fiscal policy instruments. It is quite difficult to say which of these models is more effective, as, nevertheless, there is a great activity of technological changes in all groups of countries.

In any case, the assertion that the development of technologically advanced industries is largely due to the level of concentration of both financial and quality human resources is confirmed. From this point of view, in this research, special attention was paid to the issues of output volumes due to the impact of financing in the sectors considered to be high , medium-high-tech sectors of the Republic of Armenia . The study of the level of the latter will allow to understand what is happening in the high-tech spheres of the Republic of Armenia, how different tools of fiscal-monetary policy can influence the dynamics of the output volumes of the high-tech spheres. In this regard, high, medium high, medium low and low technological spheres were singled out within the framework of the research . One of the strengths of the analysis is the crediting of the high-tech spheres of the Republic of Armenia. It is clear that it is necessary to offer lending conditions that will allow thousands of companies operating in these areas to ensure the development of high technology through effective investment of credit. In monetary policy, the availability or containment of credit resources is extended to all sectors, but one of the objectives of this study is to show that the greater the availability of credit resources, the higher the output of high-tech sectors.

Methodology. Within the framework of the research, the high-tech spheres of the Republic of Armenia were singled out according to the classification criteria of the European Union[1]. In particular, in terms of high-tech spheres, the spheres of the production of pharmaceutical products, computers, electronic-optical equipment of the

[1] https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf

Republic of Armenia were considered. Medium-high-tech spheres include the spheres of production of chemicals and electrical equipment of the Republic of Armenia. The movement of production volumes in the above-mentioned sectors was observed on the basis of a quarterly database of official statistics. On the other hand, the movement of lending to high-tech sectors was observed on the basis of quarterly statistics of the Central Bank of Armenia. It should be noted that only the volumes of lending to the fields of electro-optical equipment and electrical equipment production are given in general, in enlarged groups. The study looked at quarterly data covering the third quarter of 2011 to the fourth quarter of 2021. During the research, the presented dynamics was analyzed observation of possible cycles. After analyzing the dynamics of high-medium-tech sectors, the issues of production-credit interrelationships were addressed. Correlation analysis was performed. Based on the results of the latter, econometric models with autoregression-labeled variables were considered. Prior to evaluating the models, the stationary nature of the series and the effect of seasonality were considered.

Literature review. There are many works, analyzes, researches dedicated to the peculiarities of the implementation of monetary and fiscal policy in the field of high technologies. First of all, let us single out CB researcher R. Mnatsakanyan's analysis, which refers to the assessment of the impact of technological changes on the structural shifts of the economy for a small open economy. One of the conclusions of this work is that during the period under review in the agricultural and industrial sectors, the rate of absorption of external and internal technologies was particularly low, which is due to the slow processes of structural reforms in these sectors [Mnatsakanyan R.,2017, 48]. Such a conclusion proves that the slow pace of investment in the innovation sector requires a new policy; large financial resources are needed, which will increase, in particular, the production of high-tech sector. In this respect, I. Dovbi's view, according to which the loan should be considered as an independent financial-economic category, which is a set of economic relations between the state, financial institutions, development institutes and active financial entities [Dovbiy I, 2011, 30]. 0. Khrustalevna notes that the transition to the innovative stage of operation of the credit system is considered a necessary condition for ensuring a new level of economic relations. The latter envisages the development of a resource base for the activation of innovative processes, the improvement of innovative financial policies, the establishment of innovative credit institutions, the promotion of innovative investments [Khrustaleva O., 2011, 67].

Creating sources of long-term credit resources in the economy is extremely important for financing the innovation sector. From this point of view, Academician A. Aghanbekyan notes that the important thing that has not been done in Russia for decades is the formation of "long money" market funds, which would ensure the stability of banks and organizations [Aganbegyan A., 2009, 285]. I. Dovbin concludes that the state

policy of lending to innovation activities should be in line with the concept of industrial policy and ensure the formation of a hierarchy of values and interests of the subjects of thelending system of innovation activities [Dovbiy I., 2010, 18].

Scientific novelty. One of the most important tasks of this research is to make visible the high-tech spheres of the Republic of Armenia. To study the dynamics of their output volumes in the longest possible time. On the other hand, high-tech industries have been lending for years, which is a very important financial resource in terms of supporting innovative processes. In this regard, the dynamics of foreign currency loans provided by the banking system in the high-tech sector of the Republic of Armenia was considered. The third important goal of the analysis is not only to study in detail the dynamics of output and lending volumes in high technology areas, but also to identify the interdependencies between them. As a result of econometric modeling, it became clear that there are specific dependencies and effects in a specific direction between the output and lending voulumes of high-tech sectors.

Analysis. There is still not much research on the issues of the innovation lending system. However, this issue is compounded by the fact that the introduction of a proper and effective system through the use of various monetary policy mechanisms will ensure the creation of new technologies or its absorption in various sectors of the Armenian economy, which will greatly contribute to more competitive exports of relevant sectors. Therefore, first of all, it is necessary to understand the dynamics of production volumes in the high-tech spheres of the Republic of Armenia, the volumes of crediting in those spheres, the mutual relations between the two. All this will allow us to understand the efficiency of the credit system for innovative activities, first of all, in terms of ensuring results in high-tech sectors. The diagram below shows the dynamics of the volume of production of chemicals, which is considered a "medium-high" technological field, in the field of foreign currency lending.

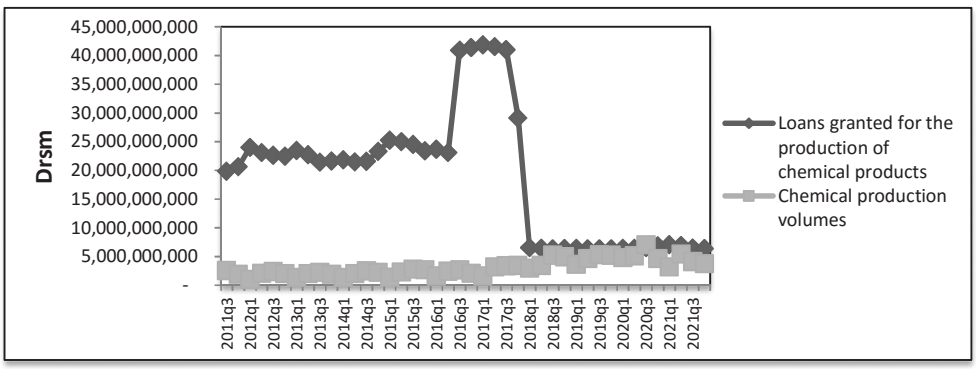

Figure 1. Dynamics of lending to the chemical industry and the sector output from the third quarter of 2011 to the fourth quarter of 2021 [www.armstat.am]

According to statistics, the volume of chemical production in Armenia in the 4th quarter of 2021 amounted to 3.8 billion drams, and the volume of foreign currency lending - 6.4 billion drams. The share of chemical production in the manufacturing industry in the 4th quarter of 2021 was only 0.7%. In the 4th quarter of 2022, as compared to the same quarter of 2021, foreign currency lending in the field of chemical production decreased by 6%, and compared to the previous quarter, by 1%. On the other hand, the production of chemicals in the 4th quarter of 2022 decreased by 19% compared to the same quarter of 2021, and by 9% compared to the previous quarter. Looking at the chart, we notice that by the first quarter of 2018, the volume of foreign currency loans exceeded the volume of chemical production. Then there is the approach of foreign currency lending to production levels. The mechanism of delayed influence may work here. That is, the loans are taken for some time, and the results are observed with a considerable delay. It should be noted that a significant increase in lending to production volumes may also be the cause of crises in the sector. The resulting loans were not used to create new value in the sector, but were used to meet current financial needs and pay off debts. Consider the manufacturing sector of pharmaceutical products in the chart below.

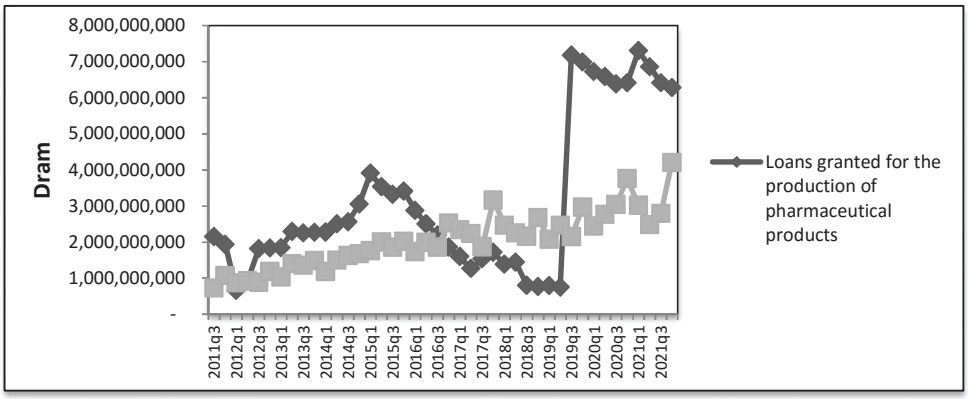

Figure 2. Dynamics of chemical production and lending in the sector from the third quarter of 2011 to the 4th quarter of 2021 [www.cba.am]

In the 4th quarter of 2021, the volumes of production of pharmaceutical products made 4.2 billion AMD, and the volumes of crediting in foreign currency - 6.3 billion AMD. The field of production of pharmaceutical products is considered high-tech. The share of the latter in the processing industry in the 4th quarter of 2021 was only 0.8%. In the 4th quarter of 2022, compared to the same quarter of the previous 2021, the previous quarter, the volume of foreign currency lending in the field of pharmaceutical production decreased by 2.1%. On the other hand, the production of pharmaceutical products in the 4th quarter of 2022 increased by 12% compared to the same quarter of 2021, and by 51% compared to the previous quarter. Looking at the chart, we notice that since the

third quarter of 2019, the volume of foreign currency lending to the sector has increased sharply, and production volumes are quite low. Let 's refer to the spheres of production of computers, electronic-optical equipment , electrical equipment.

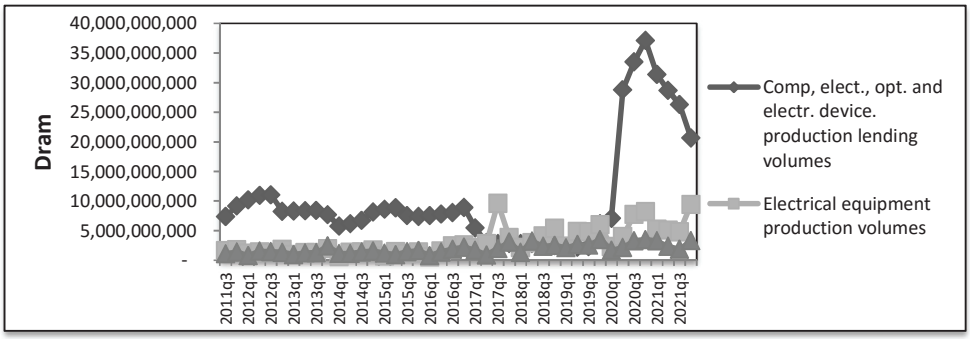

Figure 3. Comp., electricity., opt. and electr. device production and sector lending volumes from the 3rd quarter, 2011 to 4th quarter, 2021 [www.armstat.am www.cba.am]

In the 4th quarter of 2021, the volumes of computers, electro-optical equipment made 3.4 billion AMD, and the volumes of production of electrical equipment - 9.4 billion AMD. The volume of foreign currency lending in the two spheres considered above amounted to 20.6 billion drams. The field of computers, electro-optical equipment is considered to be high-tech, and the field of production of electrical equipment is considered to be medium-high-tech. In the 4th quarter of 2021, the share of the production of computers, electro-optical equipment in the manufacturing industry was only 0.6%, and the production of electrical equipment - 1.8%. In the 4th quarter of 2022, compared to the same quarter of 2021, the volume of foreign currency lending in the above sectors decreased by 44%, and compared to the previous quarter by 22%. Looking at the chart, we notice that since the third quarter of 2019, the volume of foreign currency lending to the sector has increased sharply, and production volumes are quite low.

Modeling. The dynamics of the indicators described above, with quarterly data, shows that the volume of lending has an impact on the production volumes of high-high-medium sectors. In order to understand these effects, a correlation analysis was first performed [Eliseeva I., 2021,36-38], as a result of which it was found that there are strong links between the production of pharmaceutical products, the volume of foreign currency lending, as well as the production of chemicals, the volume of foreign currency lending.Autoregressive models were used to identify these dependencies[Magnus J.,2004, 264-305], which can be represented as follows:

$$Y_t^i = \beta^i{}_0 + \sum_{q=0}^{n} \beta^i{}_{q+1} X_{t-q}^i + \sum_{q=1}^{n} \delta_q^i Y_{t-q}^i + \varepsilon_t^i, i = \overline{1.2} (1)$$

where:

Y_t^i −production volumes in the i−th sector−in the t−th quarter,

X_{t-q}^i −foreign currency lending volumes (expressed in armenian drams) of the i−th sector in the t−q−th quarter,

Y_{t-q}^i −production volumes in the i-th sector-in the t-q-th quarter,

$\beta^i{}_0, \beta^i{}_{q+1}, \delta^i_q$ −unknown parameters of model i,

ε_t^i − random error of the i − th model in the t − th quarter,

t −index of the quarter, $t = \overline{2011:3-2021:4}$,

q −lag index,

i −is the industry index. Moreover, if $i = 1$it is the sphere of production of chemicals, if it is the sphere of production $i = 2$ of pharmaceutical products.

In order to evaluate the above models, first of all, the stationarity check [Magnus, 2004, 276-285] of all considered variables was performed. The results of the latter proved that all series are non-stationary and become stationary with the help of first or second order differences. Subjecting these variables, the econometric models of the corresponding variables were evaluated as PCE. Several evaluations were performed, removing the insignificant lag variables in turn. There was heteroskedasticity in the models [Marno, 2008, 146-148], which was taken into account during the evaluation. The problem of seasonality [Babeshko, 2006, 246-249] was considered, for observation the variables q1, q2, q3, and q4 were introduced in the model, which respectively represent the first, second, third and fourth quarters. As a result, the models were selected whose quality features are as acceptable as possible. After evaluating the two models described above, the following results were obtained.

Table 1 . (1) Model evaluation results

	Y 1:	Prob:	Y 2:	Prob:
c1:	570 000 000:	0.0000:	-	-
c2:	-	-	-517 000 000:	0.0019:
q1:	-1 490 000 000:	0.0000:	-	-
q3:	-806 000 000:	0.0000:	1 250 000 000:	0.0036:
q2	-	-	1 290 000 000	0.0003
X1(-8)	0.15	0.0003	-	-
X1(-1)	0.07	0,0050	-	-
X2(-12)	-	-	0.06	0.0087
X2(-9)	-	-	0.04	0,0023
X2(-10)	-	-	-0.05	0.0001
Y2(-1)	-	-	-0.39:	0.0141:
Rsqr:	0.64:		0.66:	

The obtained results show high coefficients of determination, and all the coefficients are significant. In the first model, which describes the effect of foreign currency lending on the volume of pharmaceutical production, the variables of lending volumes with a delay of 8 lag were significant. These results mean that in the long run, the increase in the volume of foreign currency injected by the sector at the moment by 1 dram, ceteris paribus, leads to an average increase of 0.22 drams in the production of pharmaceutical products after 8 quarters or two years. In other words, if the volume of lending in the sector increases by 1 million drams in the given quarter, the production volumes of pharmaceutical products will increase by 220,000 drams on average.The impact of foreign currency loans on the production volumes of the chemical industry was observed in the 9th, 10th and 12th quarters. In particular, the 1 dram increase in foreign currency loans in the given quarter after 12 quarters will lead to an increase in the production of chemical substances by 0.05 drams. With larger numbers, it turns out that the increase of loans by 1 million drams in the field of chemical production in the given quarter leads to an average of 50,000 drams in production volumes.

Conclusions. The Armenian government continues to prioritize the high-tech sector with all the resulting assistance programs. At the same time, there is a need to provide access to credit for these sectors. The latter is possible through the application of appropriate monetary policy tools in specific high-tech sectors, as a result of which it will be possible to form an existing lending system for innovative activities.

As a result of the analysis of the crediting trend of the RA high-tech sector, it became clear that crediting affects the production volumes with a significant delay. The results of the correlation analysis showed a strong correlation between the production of chemicals, pharmaceuticals, and foreign exchange lending in the respective sectors. Implementing the corresponding stages of econometric modeling, the following results were obtained:

- In the long run, the increase of foreign currency loans in the given quarter by 1 dram, ceteris paribus, leads to an average increase of 0.22 drams in the production volumes of pharmaceutical products after 8 quarters or two years. In other words, if the volume of lending in the sector increases by 1 million drams in the given quarter, the production volumes of pharmaceutical products will increase by 220,000 drams on average.
- The impact of foreign currency loans on the production volumes of the chemical industry was observed in the 9th, 10th and 12th quarters. In particular, the 1 dram increase in foreign currency loans in the given quarter after 12 quarters will lead to an increase in the production of chemical substances by 0.05 drams. With larger numbers, it turns out that the increase of loans by 1 million drams in the field of chemical production in the given quarter leads to an average of 50,000 drams in production volumes.

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Problems of assessing the impact of high-tech sector lending in the RA
Key words: high-tech sector, bank, loan, gross output, innovation, competitiveness, model

Ensuring the rapid pace of development of the innovative sector is one of the priority issues facing the current economies. Without these rates, it is impossible to ensure sustainable economic growth and be competitive in international markets. Countries that have already achieved high, sustainable levels of growth in the high-tech sector have been able to move significantly closer to building an innovative economy with a solid foundation. Growing in high-tech industries requires huge financial resources, which must be attracted from various sources. This study addresses the resource of the banking system for raising money in high-tech sectors. It is no secret that banks provide loans to almost all sectors of the economy, in particular, the high-tech sector of the economy. This work explores the rich international experience and possible applications. The study examines in detail the dynamics of loans provided by banks to the high-tech sectors of the Republic of Armenia. At the same time, the dynamics of gross output in the high-tech sector is studied. The use of modern econometric models considers the correlation between the gross output of the high-tech sector and lending volumes. As a result of the analysis, the authors came to a number of conclusions that reveal the potential of the banking system to support innovative sectors in the economy.

BASIC THEORETICAL PROVISIONS ON ECONOMIC CRISIS

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Key words: economic crisis, theoretical provisions, endogenous theories, exogenous theories, eclectic (synthesized) theories

Introduction. Currently the world economy is constantly evolving and declining. The world economy, which has not yet overcome the consequences of the economic crisis caused by the coronavirus, is in a new crisis situation, at least due to the political factor, in particular, the negative impact of the Russian-Ukrainian war. In addition, the national economies of different countries, in turn, are simultaneously affected by other factors. For example, along with the coronavirus, the Armenian economy was exposed to the effects of the 44-day Nagorno Karabakhakh's war and its consequences have not yet been overcome. As we can see, there are several reasons for the emergence of modern crises, and these factors affect at the same time, which makes policy makers face serious difficulties, as it is quite difficult to assess the impact of each factor and the level of nationality of several factors even more difficult. This, in turn, poses serious challenges to the effectiveness of anti-crisis policy.

Research methodology and literature review. The theoretical and methodological basis of the research is the studies of domestic and foreign authors on the economic crises and their causes and the works of representatives of various economic theories. The approaches put forward by economists at different times have different interpretations of the economic crisis. It is difficult to find another problem in economics on which economists have such a diversity of conflicting opinions. The question is what economic or non-economic factors cause cyclical fluctuations and crisis situation, what are the mechanisms of their propagation, are these processes determined or stochastic, and so on? To this date, exhaustive answers to these and many other similar questions have not been found. Data collection and grouping methods were used for the study, using information summarized in specific source differences.

Scientific novelty. Economic crisis theories show that there are many factors contributing to crises, and the presented view on the difficulties of assessing their impact can be the basis for new problems and opportunities in the study of economic theory.

Analysis. Theories on economic crises can be conventionally divided into:

1. *Endogenous theories*
2. *Exogenous theories*
3. *Eclectic (synthesized) theories.*

Proponents of endogenous theories try to explain the causes of economic crises through the internal factors inherent in the economic system, from which can be identified issues of consumption, savings, investment, money supply, supply and demand, depreciation of fixed capital and its renewal. The causes of economic crises by internal factors was made by the Swiss economist J. Sismondi in the first half of the 19th century. He was one of the first to reveal the contradictions between production and consumption, as a result of which, according to him, economic crises are inevitable. According to Sismondi, the cause of economic fluctuations and crises is the poverty of the population, low purchasing power, which leads to malnutrition.

A similar approach was suggested by the British economist T. Malthus. T. Malthus attributes the economic crisis to overpopulation. He notes that the growth of excessive savings can also be a cause of crisis, as the reproduction process is disrupted. Increasing savings in the market leads to a decrease in demand for the means of production. According to him, the main reason for the over-saving of the population is the unequal distribution of national income throughout the society. Most of the savings go to those with high incomes. The theory of modern over-savings was referred to by A. Hawks, M . Katching, J. Hosts and others who point out that the existence of over-savings is due to the fact that most of the income received by the society is saved and a small part is consumed. Proponents of these two approaches argue that if it were possible to raise wages and distribute national income more evenly at the same time, the economy would not face the issue of malnutrition or overspending. Proponents of these theories attach importance to the stability of consumer goods market, because, they think, if supply and demand in the consumer goods market are balanced, then the economy is not in crisis. In contrast to the theories of malnutrition and over-saving, the next proponents of the theory of over-accumulation (T. Baranowski, A. Spitgoff, A. Aftalyon, etc.) believe that economic crises have a greater impact on industries that produce goods of industrial significance. They believe this situation directly affects the emergence of disparities in the product market. The theory of over-accumulation has developed in 2 main directions.

1. Proponents of monetary economics believe that the cause of economic fluctuations and crises is money - the growth of lending. Demand for credit resources grows in productive industries during the crisis, as fixed capital is upgraded. The reduction of the loan interest rate contributes to the expansion of credit volumes. Increased production contributes to increased revenue and expenditure. In an attempt to save the economy from overheating by achieving full demand and stimulating business activity, banks usually raise interest rates so that the process of economic expansion can be inertial.

2. Proponents of non-monetary economics attribute the economic crises to the influence of non-monetary factors, in particular technology, innovation and discovery.

Proponents of exogenous theories try to explain the emergence of economic crises by the influence of external factors outside the economic system. Exogenous factors include human psychology, the discovery of new technologies, solar activity, climate change, epidemics, wars, political change, population growth and migration, class struggle, and more. Psychological theories occupy a special place among exogenous theories. According to this approach, fluctuations in business activity are mainly due to the optimistic and pessimistic expectations of the people.

In general, the development of psychological theories can be divided into three periods. The first direction originated in the early 20th century, and proponents of this direction considered the speculative nature of transactions in commodity markets or stock exchanges as the cause of economic fluctuations (*V. Pareto*). That is, people's expectations for commodity prices and stock market fluctuations. In this case, the stimulus of business activity is the naturally optimistic moods formed among the population. This behavior is also spreading rapidly among entrepreneurs, which leads to the so-called "following the example of others". Such an artificial exaggeration of the total demand in the market is conditioned by the large-scale use of credit resources. As a result, production volumes increase unreasonably, leading to an imbalance between production and consumption. This approach explains the reason for the end of the rising phase of the economic period is the increase in interest rates and the decrease in the growth rate of market prices. Rising interest rates and falling prices create a pessimistic mood among entrepreneurs, so the production volumes are gradually reduced and the economy declines. This view explains the reduction of interest rates and the emergence of so-called new generation of entrepreneurs can be a precondition for overcoming the crisis.

The second direction of psychological theories, which arose in the 20s and 30s of the 20th century, is mainly connected with the approaches of *A. Pigou and J.M. Keynes***.** The authors of this approach attribute the economic fluctuations to the specificity of capital investments. They point out that in the face of imperfect market information, venture capitalists can not accurately predict the profitability of these investments, which could lead to an economic crisis.

The third concept of the psychological theory of economic crises was formed in the second half of the 20th century (*R. Lucas*). The basic idea of this approach is that as a result of the sudden increase in the money supply, entrepreneurs are unable to correctly determine whether the prices of their products have risen under the influence of real demand or inflation-driven demand. Therefore, each new rise in prices is followed by an increase in investment and employment. R. Lucas believed that the uneven fluctuations in inflation in the economy, associated with rising public spending, were leading to an economic downturn. However, this increase is temporary, as it is associated with an increase in unrealistic aggregate demand. The phase of economic growth stops and it

enters a phase of decline when entrepreneurs understand the real reason for the rise in commodity prices and reduce production and employment. And as this process is accompanied by constant inflation, stagflation occurs. *The theory of political business cycles* considers the government monetary and fiscal policy to be the cause of crises and economic cycles. It is assumed that the government has full control over these levers of economic regulation. The rulling executives, seeking re-election, are pursuing a "soft" or "cheap" monetary and fiscal policy during the pre-election period, with the aim of gaining the trust of voters. In the post-election period, a "tough, restraining" monetary and fiscal policy is being pursued, which, of course, can lead to economic downturns.

Most modern economists explain the causes of economic crises by *combining exogenous and endogenous theories of crises* which are based on fluctuations in investment. This volatile nature of investments is explained by a number of external factors affecting them: technological innovations, population growth dynamics, exploitation of new mines. To these external factors can be added a number of internal factors that lead to increased investment. An increase in the income of workers in industries that produce goods leads to an increase in demand for consumer goods, as they spend part of the increased income in that sector. The expansion of such processes is a signal for firms to attract new loans to the manufacturing sector. This fact makes a positive shift in the behavior of entrepreneurs, leading to the emergence of optimism. Such positive changes contribute to the implementation of new investment programs.

One of the *eclectic* or synthesized theories of economic crisis is *the theory of real business cycles* considering macroeconomic fluctuations as a rsult of shock changes in productivity some sectors of the economy and in general by production technology.One of the modern theories of the real business cycle is American economists *Kydland and Prescott's* the of *"supply shocks"* theory. They showed that the "supply shocks" that appear from time to time in the economy due to technological innovations are the driving force of economic fluctuations. As an external factor, they contribute to the internal factors of the economy, and, in particular, to labor productivity. The economic period has the following appearance: with the development of technology, the productivity of labor in the economy increases causing it and the level of real wages increase, and people are ready to work more than to rest. However, the more people work today, the more they will value their free time tomorrow. So even if their wages stay the same, their productivity levels stabilize and even decline. As a result, the economic crises begins and lasts until the next technological shock. If the "supply shocks" are negative (i.e., sharp rise in oil prices in 1970s), this mechanism works in the opposite direction.

Real business cycle theory was the basis for another synthesized *influence-spatial theory*. The founders of this theory (Russian E. Slutsky, Norwegian Nobel Prize winner R. Frisch) suggest that the economic growth encounters many signals that cause fluctua-

tions. These external impulses (wars, scientific discoveries, sharp changes in commodity prices, "shocking" reduction or expansion of the money supply, coups), impact on internal mechanism of the market by the action of the multiplier and accelerator, lead to periodic fluctuations in the economy. And since there are so many external influences on the development of the economy, the economy is constantly in periodic fluctuations. The economic depression in 1929-1933 has shown that the market mechanism is unable to solve the issues the market faces from time to time. We may note that the economic theory was in crisis with the economy at that time, because the existing theories that substantiated the self-regulatory nature of the market economy were simply unable to identify the causes of the economic phenomena. 1929-1933's economic crisis gave rise to new approaches to economics. The founder of such a new evolutionary development is *J.M. Keynes* with the view that the market from time to time loses the ability of internal self-regulation. That is why the economy does not return to the previous level of production and employment when full demand is reduced leading to a long and deep economic crisis. Following Keynes's publication, the development of Keynesian theories of economic periods and crises began in economics. His followers considered demand markets to be the reason for the development of economic cycles. In particular, Keynes considered the growth of investments to be the main source of economic fluctuations, and the decision to invest is mainly influenced by the level of profitability expected from it. However, those expectations as such are not stable. Referring to such changes in expectations, he noted that the decisions regarding the volume of investments are directly influenced by the optimistic and pessimistic expectations of entrepreneurs. From this angle, he believed that the volume of investments that causes the economic crisis is determined by entrepreneurs with a living instinct. Changes in the volume of investments in the economy lead to structural changes in aggregate demand. He blamed economic fluctuations on the inflexible nature of supply, and structural fluctuations in aggregate demand lead to fluctuations in aggregate supply rather than price changes. Keynes proved the economic cycle as the result of the interaction of three components: national income, consumption and capital accumulation and economic cycles – based on the dynamics of aggregate demand, which in turn was driven by the incomes of households and firms. He found the marginal efficiency of capital as a cause of economic crises. During the crisis of economic cycles, the marginal efficiency of capital decreases sharply. According to Keynes, the duration of the economic period is connected with the restoration of the marginal efficiency of capital. One of the main explanations for the monetary theory of economic crises was that changes in real income, employment, and price levels were greatly influenced by the amount of money in circulation. Monetarists argued that there was a direct correlation between money supply growth and nominal income growth rates. *M. Friedman* tried to explain the periodic development of the economy and the phenomena of crisis from the point of view of the stability of the mo-

ney supply in circulation. According to him, the growth phase of the money supply corresponds to the rise of economic periods, and the decrease of the money supply corresponds to the crisis phase. As the demand for money is usually stable, and changes in the economic situation do not directly affect the demand for money, according to Friedman, the reason for the economic fluctuations is mainly the anti-cycle policy pursued by the state, which can happen unpredictable changes in money supply. Friedman concluded that changes in the money supply, as a rule, always precede the corresponding changes in the economic situation by an average of about 12-18 months. According to the monetary rule, the money supply in circulation should be increased by 3-5% each year, which will help to avoid some crisis situations.

Conclusion. The causes of economic crises are diverse and can be interrelated. These factors affect economic systems to varying degrees and over different periods of time, individually or simultaneously. Their nature can be unpredictable. Therefore, there are some difficulties in assessing the causes of economic crises in terms of applying mathematical methods. In this context, the effectiveness of anti-crisis policy can also be unpredictable.

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Firdus BAGHDASARYAN

Basic theoretical provisions on economic crisis

Key words: economic theory, coronavirus, economic growth, provision, economic crisis

Some economists (K. Wicksell, A. Spitgoff, J. Schumpeter) explain the economic crises with *technological innovations:* by developing new mines and involving new resources in exploitation. According to them, in the stage of economic development, the technical re-equipment of production leads to changes in economic living conditions, which in turn leads to an unequal crisis situation. One of the exogenous theories is the theory of solar activity. The founders of this theory are W. Jevons and K. Moore. According to them, the appearance of spots on the sun affects yields, grain prices and the trading period. At the same time, W. Jevons and his descendants explained the level of employment by solar activity. A. Chizhevsky also studied the connection between economic crises and solar activity in his works. As a result of these studies, he concluded that the periodic activation of the sun also affects people's psychology. In particular, during the period of the highest activity of the sun, people are aggressive and irritable. As a result, an increase in the intensity of people's mental activity leads to instability of economic activity, which is the cause of the economic crisis.

EXISTING PROBLEMS OF ROAD-BUILDING AND THE WAYS OF ITS IMPROVEMENT IN THE REPUBLIC OF ARTSAKH

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Key words: road-building, road surface, building codes, project, road infrastructures

***Introduction*:** Road-building is one of the most important and basicspheres of building, which covers highways and urban roads designing, road reconstructions and maintenances. Moreover, road-building covers pavement tiles and installation of drainage systems. A characteristic feature of road construction is that its products - roads - all structures on them - are an integral part of road transport, which means its consumption is possible only when transported by road. [1]

Usually, road construction companies are engaged in specialized road-building, which undertake the tasks of organizing and managing complex and multi-stage works, the necessary construction materials and equipment acquisitions, constant monitoring and maintenance of the road condition. There are several types of roads based on its purpose, type of traffic, permissible speed and other factors. Based on these factors, the type of construction of each road and road surface is determined. In Artsakh, you can find roads of various purposes which were built by using different technologies, the most common of which is paved road.

Literature review: The design, construction, repair and maintenance of highways are carried out in accordance with the current building regulations. Coordination and approval of road projects and construction, commissioning of repair and maintenance and handing over, as well as the status of settlements on roads (with the exception of roads included in the list of public use), utilizing them, and the issues related to construction, repair, maintenance and financing are regulated by the legislation of the Republic of Artsakh. [2] Organizations performing design work, employees, road works, equipment for traffic management (road signs, traffic lights) and the rest of related works, in accordance with the established procedure, are coordinated with the State Road Authority.

Methodology:The methods of induction, deduction, analysis and comparison were used in the course of the research. The scientific basis for the study was the research and analysis conducted by Armenian-foreign researchers in this field. The information base

was the laws and legal acts of the Republic of Artsakh and Republic of Armenia, as well as information obtained from websites and other sources.

Scientific novelty:The conducted research works and analyses have led to a number of scientific results, the following of which can be considered a scientific novelty:

- Road infrastructures damaged by the war in the Republic of Artsakh have been identified and options for their reconstruction and repair have been suggested.
- The strategic importance of major repairs and reconstruction of interstate and intercommunal highways for 2020-2022 has been developed and suggested.
- The current problems in the field of road construction in the Republic of Artsakh are identified, and possibilities of the main directions for their solution are proposed.

Analysis: After the 44-day war, many built-in reconstructed roads have been under control of Azerbaijani, the construction of which was mainly carried out with the help of Hayastan All Armenian Fund and by state means.

In 2002, the 10-kilometer KarmirShuka-Hadrut road was completed. More than1 billion AMD were invested in the construction. In 2011, the 11.2-kilometer Karmir-Shuka/Dzagouni-Hadrut road was constructed, Tsakuri-Hadrut road surfaces were repaired as a result of a total investment of 3 billion and 172 million AMD. The construction of the second road connecting Armenia with Artsakh, the Martakert-Vardenis highway, was one of the largest projects implemented in Artsakh. 17 billion 318 million 753 thousand AMD were allocated for the construction of a road with a length of 114.6 km. The highway opening took place in 2017. According to the declaration of November 9, 2020, Qarvachar region, through which a significant part of the highway passed, came under the control of Azerbaijan, as a result, Armeniacan now use only the section of the Martakert-Stepanakert road. During 2019 and 2020 the Hayastan All Armenian Fund allocated 719-6 million AMD for the construction of the Martakert-Mataghis highway.

Apart from the above, roads have been built and reconstructed in Shoushi, Hadrut, Ukhtadzor, Talysh and other settlements. Generally, more than23 billion 385 million AMD were spent on the construction of roads only allocated by the Hayastan All Armenian Fund which came under the control of Azerbaijan, In 2020 the initial volume of road construction under the capital investment program was 3 billion 830 million 900 thousandAMDwhich increased by about 3 billion 854 million 600 thousand AMD, amounting to a total of 7 billion 985 million 500 thousand AMD. In the Republic of Artsakh, each settlement must have at least an automobile road connecting to the interstate highway system, provided with passability.In the

Republic of Artsakh, the main road construction companies engaged in asphalting, construction and repair of roads are:“Caravan” LLC, “Veratsnund” LLC, “Kapavor” LLC, “Chan-shin”LLC, VirazhPC (Table 1).(AMD)

Table 1. The main road construction companies of the Republic of Artsakhand the cost of the work done by them.[3]

Road construction companies	From 2010 to 2022	From 2020 to 2022	From 2021 to 2023
“Caravan’’ LLC	4314,456	1758,96	2207,953
“Veratsnund’’ LLC	584,848	976,373	294,845
“Kapavor’’LLC	-	2564,514	2029,169
“Chanshin’’LLC	3369,102	453,077	1758,299
“Virazh’’ PC	1852,041	520,769	167,036

It is clear from the data in the table that the leading road construction company in the Republic ofArtsakh for 10 years, from 2010 to 2020 is“Caravan” LLC. Its main competitor was “Chanshin” CJSC, which, however, was behind by 945.36 thousand drams. However, the post-war situation is different: Kapavor LLC, joining the road construction works, is ahead of the leader of the road construction market of Artsakh Republic, exceeding the volume of works by 805.55 thousand drams. At present, with the forecast for the next year, Caravan LLC will increase its workload again, returning to the leader of the road construction market in Artsakh Republic, but in the post-war period, “Chanshin” LLC has reduced its volumes by about 7 times, and has no tendency to return to its previous volumes. Thus, in 2010-2020, interstate-intercommunal roads were overhauled or reconstructed:

- ✓ ֏1204,449 thousand were spent on 8 km road from the M2Interstate highway system of the Republic of Artsakhto Haterq village
- ✓ ֏295,081 thousandwere spent on 3,4 km road from the M2Interstate highway system of the Republic of Artsakhto Harutyunagomer village
- ✓ ֏447,845 thousand were spent on 3,3 km road from the M2 Interstate highway system of the Republic of Artsakh to Kochoghot village
- ✓ ֏85358 thousand were spent on 1 km road from Stepanakert-Vank highway to Arajadzor villageof the Republic of Artsakh
- ✓ ֏272,614 thousand were spent on 3,6 km road from Stepanakert-Drmbon P1 highwayto Khndzristan villageof the Republic of Artsakh
- ✓ ֏2865,46 thousand were spent on the improvement of Azatamartikner Street of Martuni town
- ✓ ֏1002,513 thousand were spent on the improvement of Sakhqarov Street of Martakert town
- ✓ ֏616,157 thousand were spent on 4 km road from Vaghuhas village to Vardenis Martakert highway

- ✓ ֏117,249 thousand were spent on 4,6 km road from the P3highwayof T4-1KarmirShuka-Gishito Herher villagesof the Republic of Artsakh
- ✓ ֏87,186 thousand were spent on 1,2 km road from the P3 highwayof T4-1KarmirShuka-Gishi highway to Herher- Tsovategh- Kherkhan villages of the Republic of Artsakh
- ✓ ֏93,166 thousand were spent on 1,7 km road from the P3highwayofT4-1KarmirShuka-Gishito Tsovategh- Kherkhan villages of the Republic of Artsakh
- ✓ ֏67,773 thousand were spent on 0,6 km road from the P3highway ofT4-1KarmirShuka-Gishi to Herher villages of the Republic of Artsakh
- ✓ ֏147,024 thousand were spent on the main street improvement of Noragyugh village
- ✓ ֏861,17 thousand were spent on 7,9 km road from Stepanakert-Martuni highway to Berdashen village of the Republic of Artsakh
- ✓ ֏97,842 thousand were spent on 1 km road, from Stepanakert-Askeran highway to Berdadzor village of the Republic of Artsakh
- ✓ ֏241,632 thousand were spent on the improvement of NikolDuman street of Stepanakert town
- ✓ ֏72,450 thousand were spent on the improvement of the 2nd cul-de-sac of the courtyard of the apartment building N5 on Tigran Mets street of Stepanakert town of Republic of Artsakh
- ✓ ֏205,389 thousand were spent on the improvement of Magda Neyman street of Stepanakert town
- ✓ ֏849,528 thousand were spent on the improvement of Daniel-Bek Pirumyan cul-de-sac at the intersection of Vagharshyan street of Stepanakert town
- ✓ ֏145,670 thousand were spent on the improvement of the courtyards of the buildingsN52,N54,N56 on Sasuntsi David street of Stepanakert town

In 2019 the main organizations carrying out the above-mentioned road construction works were from the first 300 major taxpayers of Artsakh. [4]

Table 2: Amounts of taxes paid by road construction organizations

N	Company name:	Total	Direct taxes	Indirect taxes	Other taxes, duties, mandatory fees
1.	"Caravan'' LLC	416 132,70	24 398,20	381 525,60	10 208,90
2.	"Virazh'' PC	248 615,70	138 109,00	103 626,70	6 880,00
3.	"Kapavor'' LLC	142 068,90	127 481,20	6 445,90	8 141,80
4.	"Chanshin'' CJSC	84 414,80	46 020,80	35 809,20	2 584,80
5.	"Veratsnund'' LLC	27 579,00	12 495,20	14 347,00	736,80

Since LLC "Caravan" is the leading organization in the Republic of Artsakh, it is the largest taxpayer in the Republic of Artsakh in this area. During 2020-2021 Artsakh restored the road infrastructure damaged due to the war. During the 44-day war, three

bridges were destroyed by enemy shelling, roads were damaged, and restoration work was completed. The bridges controlled by Artsakh such as the Getavan, Sousi and Aghavno bridges were damagedwhich are being reconstructed.

The border with Armenia from Stepanakert is served by the organization "Vahe Karapetyan", subordinate to the Ministry of Urban Development, which also carries out the construction of infrastructure: road construction, asphalting, restoration of lighting. The Stepanakert-Goris highway, intercommunal roads are being asphalted, lighting is being restored. Thus, in 2020-2021, interstate-intercommunal roads have been re-paired or reconstructed:

- ✓ ֏269,251 thousand were spent on 2 km road from the M2Interstate highway system of the Republic of Artsakh to VerinHoratagh village.
- ✓ ֏182,474 thousand were spent on 1,6 km road from Martakert-Drmbonhighway to Maghavuz village of the Republic of Artsakh.
- ✓ ֏105,811 thousand were spent on 1,2 km road from Haterk-Aknaberdhighway to Zadakhach village of the Republic of Artsakh.
- ✓ ֏146,281 thousand were spent on 1,4 km road from Khndristan village to Hilis village of the Republic of Artsakh.
- ✓ ֏178,25 thousand were spent on the improvement of Avanesyan and GareginNzhdehstreets of Martuni town.
- ✓ ֏2564,514 thousand were spent on the M1 highway ofGoris-Stepanakert-Askeran.
- ✓ ֏691,24 thousand were spent on 6,6 km road from Stepanakert to Lernavan, Aygestanhighwayof the Republic of Artsakh.
- ✓ ֏249,307 thousand were spent on 2,2 km road from the P3 highwayof T4-1KarmirShuka-Gishi to Qecht villages of the Republic of Artsakh.
- ✓ ֏98,282 thousand were spent on the improvement of Noragyugh villagestreets which was 1,5 km.
- ✓ ֏156,335 thousand were spent on 1 km road from the Berdashen village to Ashan of the Republic of Artsakh.
- ✓ ֏520,769 thousand were spent on 4,4 km road from the StepanakertNngi, Martuni highways to Kaghartsi village of the Republic of Artsakh.
- ✓ ֏141,499 thousand were spent on the improvement of the courtyards of the apartment buildingsN4 and N4bonManukyan street of Stepanakert town.
- ✓ ֏212,35 thousand were spent on the improvement of streets sections of 20 Petrvari, Khachatryan, Spandaryan and Metaqsagortsaranner of Stepanakert town.
- ✓ 128,546 thousand were spent on the improvement of Gagarin streets of Stepanakert town.

- ✓ ֏967,854 thousand were spent on 7,9 km road from the M2 Stepanakert-Drmbonhighway to Astghashen - Patara villages of the Republic of Artsakh.
- ✓ ֏464,732 thousand were spent on 5 km road from the M2 Stepanakert - Drmbonhighway to Dahrav villages of the Republic of Artsakh.
- ✓ ֏1210,093 thousand were spent on 10 km road from Haterq village to Martakert - Drmbonhighway.
- ✓ ֏628,784 thousand were spent on 4,5 km road from the T4-1 KarmirShukahighway to Tghavart village of the Republic of Artsakh.
- ✓ ֏294,845 thousand were spent on 4,5 km road, from the P3 highwayof T4-1KarmirShuka-Gishi to Kolkhozashen village of the Republic of Artsakh.
- ✓ ֏392,527 thousand were spent on the improvement of the 1st cul-de-sac onBaghramyan street of Stepanakert town.
- ✓ ֏394,8 thousand were spent on the improvement of StepGES street, StepGES 1st alley and a part of StepGES 2nd alley of Stepanakert town.
- ✓ ֏603,928 thousand were spent on the improvement of a part of alleys of Naberezhnaya and HovhannesLararev of Stepanakert town.
- ✓ ֏759,571 thousand were spent on the improvement of HovhannesLazarev streets and its centers and 1st and 2nd Naberezhnaya alleys of Stepanakert town.
- ✓ ֏997,86 thousand were spent on the improvement of GargeginNzhdeh, ArsenAmiryan, Hovhannes Shiraz, MarietaShahinyan streets and the dead-end streets and alleys of MarietaShahinyan of Stepanakert town.
- ✓ ֏167,036 thousand were spent on the improvement of the courtyards of the residential buildingsN30, N32, N34, N36, N44 onVagharshyan street of Stepanakert town.
- ✓ ֏204,056 thousand were spent on the improvement of thesection between General Parsegov and V. Mamikonyan and Kamo streetsof Stepanakert town.

During 2021 and 2023 it is planned to:[3]

- ✓ Improvement of the road leading to Shahmasur village
- ✓ Improvement of the road leading to Tsmakahoghvillage
- ✓ Improvement of the road leading to Poghosagomer village
- ✓ From Stepanakert-Nngi – Martuni highway to Paravatumb village of the Republic of Artsakh
- ✓ From M2 Askeran district highway to Khramort village of Republic of Artsakh
- ✓ Improvement of the courtyards of the apartment buildingsN5, N7, N9, N11, N13, N15, onIsakov street and N56 on Azatamartikneri street of Stepanakert town
- ✓ Improvement of General Parseghov street in Stepanakert town
- ✓ Improvement of the courtyards of the buildingsN121 and N123onHovhannesTumanyan street of Stepanakert town
- ✓ Improvement of the residential blocks of N187 apartment of Stepanakert town

✓ Improvement of the courtyards of 23 Stepanyan, 68 Nzhdeh and 28 Knunyatc of Stepanakert town

✓ Improvment of Zarge quarters

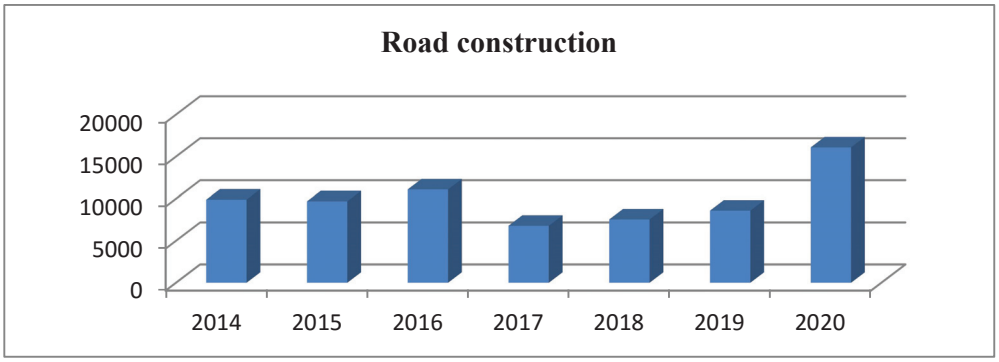

Chart 1. Dynamics of road construction of the Republic of Artsakh in 2014-2020 [5]

As can be seen from the diagram, the volume of road construction has increased compared to previous years, especially after the war, the road construction for Artsakh is of great importance both strategically and economically, which is directly under the control of the President of the Republic and the Government. Studies of the activities of road construction organizations of the Republic of Artsakh show that in 2010-2021 have been carried out works on the following costs: 8281,369 thousand AMD by LLC Caravan, 1856,066 thousand AMD by LLC Veratsnund, 4593,683 thousand AMD by LLC Kapavor, 5580,478 thousand AMD by CJSCChanshin and 2539,846 thousand AMD by LLC Virazh.

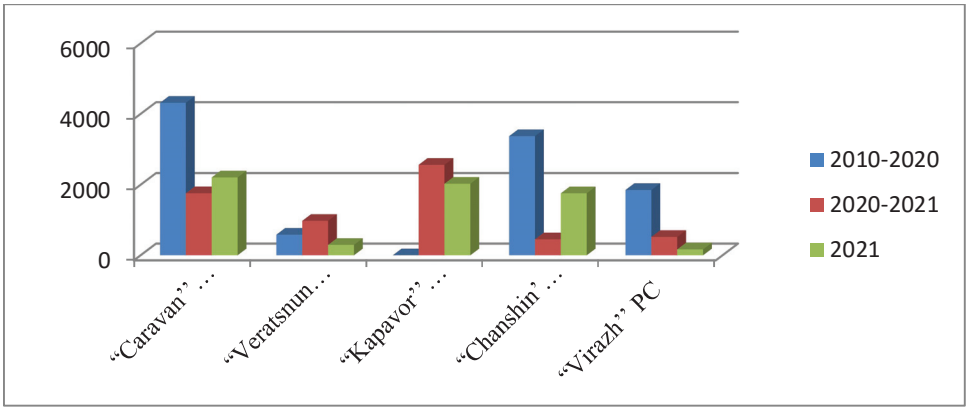

Chart 2. Dynamics of activities of road construction companies of the Republic of Artsakh during 2010-2021

Conclusions. Thus, we can say that in the Republic of Artsakhin the post-war period, programs for the elimination of the consequences of hostilities were launched by the Ministry of Urban Development of the Republic of Artsakh immediately after the end of the war. In the Republic of Artsakh, measures will be taken in road construction to organize the construction and operation of roads using new technologies. [6]

In 2021-2023, road improvement and asphaltingworks in the field of road constructionare planned for the amount of2078,296 thousand AMD.

To solve existing problems in the field, to improve the condition, we offer:

Currently there are no concrete roads in Artsakh, however, with the improvement of road construction companies and the use of the latest technologies, the option of concrete paving of roads becomes necessary, since concrete roads are extremely strong and durable, they can last for 30-40 years without repair, and there is a need for repairs at least 10-12 years after the construction of the road, the costs incurred will be justified.

Ensuring access to informational interconnection, information, accessibility of road construction works, programs, and current results.

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Tatevik VERDYAN, Tatev POGHOSOVA, Karine SHINDYAN

Existing problems of road-building and its improvements in the Republic of Artsakh

Key words: road-building, road surface, building codes, project, road infrastructure

The construction of roads is of great strategic and economic importance for the Republic of Artsakh. It is obvious that the war in Artsakh caused quite serious damage to various roads and adjacent infrastructure, the restoration of which, in addition to the urban component, also has a serious security component. Repair, rehabilitation andasphalting of all intercommunal roads as a whole with ensuring passabilityof at least one road connecting each locality with the interstate road network is very important,which should be under the attention of the Government of the Republic of Artsakh.

THEORETICAL - METHODOLOGICAL DEFINITIVE APPROACHES OF TAX PLANNING

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Key words: taxation, tax planning, tax burden, tax liabilities, effective fiscal policy.

Introduction.The need for tax planning has always been used by theorists as an effective financial management tool, encouraged to be actively used in practice. The formation of tax liabilities is an integral part of the activity of each economic entity. Although mainly economic entities are mostly aware of the importance of taxation from the point of view of public interests, in particular, they consider the tax levied on organizations as an additional financial burden, and then try to lighten it as much as possible. In this regard, the tax planning toolkit is being implemented.

Methodology. Studies show, that there is no common definition of tax planning in the professional literature. However, in general, tax planning is considered by organizations as a tool to reduce the tax burden legally [1]. Thus, tax planning is considered by the taxpayer as a targeted legal activity aimed at reducing tax expenditures, duties and other mandatory budget expenditures. According to another approach, tax planning is defined as a means of reducing tax liabilities when legal benefits are used and tax reduction opportunities [2]. It is argued, that tax planning is simply a choice of legal entity status, with the aim of reducing the amount of tax liability incurred in the course of economic activity [3]. Moreover, it is suggested to engage in tax planning even at the roots of starting a business, in order to understand what legal status of the economic entity in terms of taxation is most favorable for the businessman [4].

Literature review.In this regard, it is believed that tax planning combines the strategic decisions of the organization's economic activities to reduce tax costs and increase net profit as much as possible [5]. It is further emphasized, that tax planning should take into account macroeconomic and microeconomic factors in terms of identifying and preventing risks of sharp increases in tax liabilities [6].

Tax planning is also considered from the point of view of financial management of organizations, considering that it is an integral part of the financial management system, using the opportunities provided by law to present a strategy for achieving optimal tax liabilities [7]. In this regard, tax planning is defined as the most important area of the organization's strategic financial management, with the aim of increasing cash inflows and, to increase profits, to contain tax liabilities as much as possible in foreseeable future [8].

In the professional literature, it is also stated that tax planning is one of the most important areas of managing the financial and economic activity of an economic entity, the purpose of which is to legally circumvent a certain amount of tax liabilities by applying tax privileges and even existing legislative gaps [9]. According to another definition, tax planning is a way of predicting the possible behavior of the organization in the event of a change in the tax regime, as well as through cooperation with regional tax authorities, the development of methods to reduce tax costs [10]. In this regard, tax planning is considered as an area of activity, that can alleviate the impact of the external environment on the current and prospective activities of the organization, ensure a balance between fiscal regulatory functions and thereby enhancing the role of the tax system, reducing investment risk, increasing entrepreneurship [11].

Scientific novelty. Based on the above, we present a new definition of tax planning, according to which: "Tax planning is the formation of goals, which is accompanied by the optimization of the tax burden by measuring and evaluating the expected results of treasury functions aimed at business efficiency." In our definition of tax planning, in fact, the emphasis is not on reducing the tax burden, as is done in the classical literature, but on optimizing the tax burden on business efficiency.

Analysis. Tax planning was referred to in the "Concept of Tax System Reforms" adopted by the Ministry of Finance of the Artsakh Republic, where mentioned, that fight against aggressive tax planning of illegal business states the need to reveal the use of tax evasion mechanisms. In particular, the concept states that in contrast to illegal business, which is directly legislated as a case of tax evasion as a consequence, sanctions are applied, aggressive tax planning is more difficult to qualify as a violation of tax law, as additional evidence is needed. Thus, in order to increase the effectiveness of the fight against aggressive tax planning, it is proposed to improve the system of receiving, comparing and selling information by third parties [12].

Tax planning is also correlated with the range of forecasting functions, when businesses assess the composition and structure of future tax flows by a number of criteria, thus finding ways to optimize the tax burden in the foreseeable future. Thus, the analysis of the theoretical-methodological definitions of tax planning in the professional literature shows, that there is still no common approach to the definition of tax planning among the authors. This is justified by us only because this financial function can be used for different purposes hierarchies. Thus, if we generalize the key goals of tax planning in the economic level, we will see that they are in different macro and micro economies (see Figure 1). The main purpose of tax planning at the state level is to record tax revenues to the state budget by structure. Not only sound education but his alertness and dedication too are most required. The tax policy pursued by the state is not limited to the fiscal function, but also aims to activate the tax incentive, regulatory and control func-

tions. Therefore, macro-level tax planning is based on goals that, on the one hand, provide the necessary tax revenues to the state budget and, on the other hand, promote the implementation of effective tax policy. Consequently, if macro-level tax planning only sets itself the task of maximizing the collection of state budget revenues, bypassing the social, redistributive, incentive principles of taxation, it can not contribute to the implementtation of an effective fiscal policy by the state.

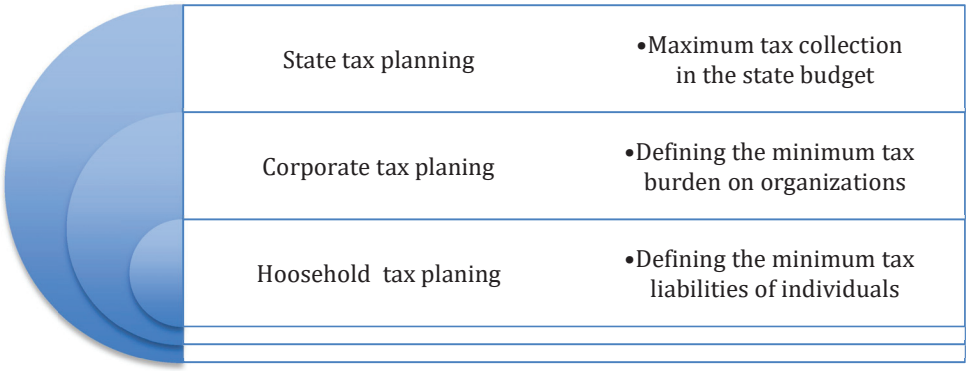

Figure 1. Main objectives of tax planning in economic hierarchy (composed by author)

In the case of corporate tax planning, the key is not only the circumvention of legal obligations, as is customary in the professional literature, but also the optimization of the tax burden, so that it does not hinder the development of business, reduce tax costs and increase business profitability. Therefore, in the case of corporate tax planning, the organization's efforts to reduce taxes, to set the minimum tax burden, need to be redirected to structural tax liability improvements, contributing to the sustainable development of the business and prevent tax risks.

Tax planning operates at the household level when individuals try to take advantage of tax breakdowns, tax deductions set by the state, as well as behavioral, environmental, social, environmental tax allowance. In this case, households tend to tax planning, so that in the foreseeable future they can enjoy the legislative benefits provided by the state to reduce their tax liabilities to the state. Thus, if we consider planning in the financial management system as a special tool to achieve the set goals, then at different levels of the economic hierarchy, it is the same, in the case of tax planning we will have the following series of actions:

- setting goals;
- clarification of software activities;
- identifying the necessary resources and sources for the implementation of the planned activities;
- clarification of measurability and materialization of planned results.

Therefore, although tax planning has different goals at different levels of the economy hierarchy, it is consistent with the general rules of the planning process, but has unique functions (see Figure 2).

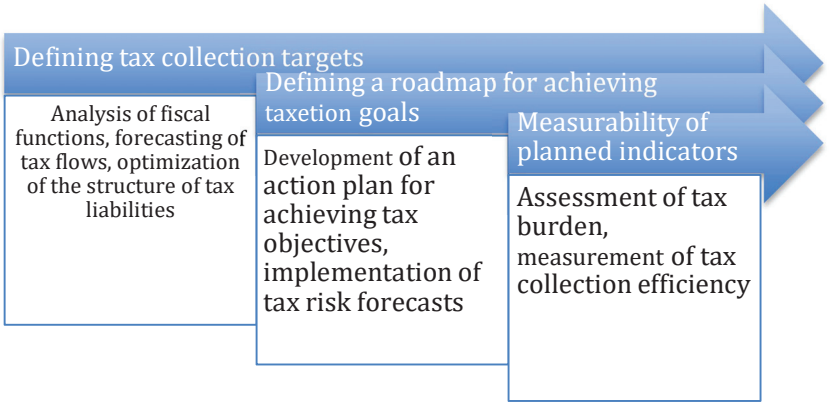

Figure 2. Roadmap for tax planning implementation (composed by author)

Conclusion. Finally, at the macro level, it is possible to increase tax collections, state budget expenditures, but without creating a sound tax burden, without supporting the sustainable development of the economy. In the same way, organizations can reduce the level of business activity, slow down the process of economic activity, thereby achieving a certain reduction in tax expenditures, to achieve a lightening of the tax burden. However, with this approach, neither organizations nor householders will be in a favorable position when conducting tax planning. Even in individual tax planning, when householders seek to legally reduce their tax liabilities by simply reducing their personal income, it will simply lead to a decline in society's standard of living. Therefore, in tax planning, it is necessary to combine the formed tax liabilities with the efficiency of taxation, which we consider important in terms of increasing the efficiency of the economy.

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Varduhi KHACHATURYAN

Theoretical - metodological definitive approaches of tax planning

Key words: taxation, tax planning, tax burden, tax liabilities, effective fiscal policy.

The main purpose of tax planning at the state level is to record tax revenues to the state budget by structure. Not only sound education but his alertness and dedication too are most required. The tax policy pursued by the state is not limited to the fiscal function, but also aims to activate the tax incentive, regulatory and control functions. Therefore, macro-level tax planning is based on goals that, on the one hand, provide the necessary tax revenues to the state budget and, on the other hand, promote the implementation of effective tax policy. Consequently, if macro-level tax planning only sets itself the task of maximizing the collection of state budget revenues, bypassing the social, redistributive, incentive principles of taxation, it can not contribute to the implementation of an effective fiscal policy by the state.

ON SOME ISSUES RELATED TO MACHINE LEARNING IN 2022

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Key words: Machine learning, artificial intelligence classification, algorithm, methods.

***Introduction*.** Many difficulties and tasks related to the epidemic, whether they are directly or indirectly related to the synthesis of vaccines and drugs, the analysis of x-rays, the distribution of patients and resources, and so on, can only be solved rapidly and easily with the use of sophisticated computer technologies and tools [Ashinov, 2020]. One of the key factors for developing such effective technologies and tools is machine learning [Vorobeva, 2020]. However, for its successful implementation, as a rule, numerous and diverse data are required, which in many cases may be difficult to collect and prepare [Tsogoeva, 2020]. In this regard, the search for ready-made data acquires a special role.

Economic significance. Machine learning enables economists to solve significant issues faster by processing of large datasets. Indeed, the impact of machine learning on the economy is already being seen, so some of the effects may not be difficult to anticipate. Machine learning is reshaping the world, transforming industries such as healthcare, education, transportation, food, entertainment, and various assembly lines, among others. It will have an impact on almost every aspect of life, including housing, cars, shopping, ordering food, and so on.

Methodology. Machine learning refers to methods that use a dataset to predict behavior [Bryukhina, 2020], is one of the fastest growing areas of information technology. Previously, this area was considered fantasy. However, now machine learning is applied in real industries. In 2021, the latest innovations in this field have made it possible to solve many problems more efficiently and accurately than ever before. The term "machine learning" refers to artificial intelligence methods, one of which is the solution of a task through learning based on the application of the results of similar tasks. Mathematical statistics, numerical methods, mathematical analysis, optimization methods, graph theory, and techniques for working with data in digital form are used to create such algorithms. Strict formulas are not used to determine the solution, but rather the established relationship of the results with certain features and their values.

Literature review. The article by D. Yu. Sakhanevich explores the approaches and methods of applying artificial intelligence and machine learning in socio-economic pro-

cessses. The goal of this article is to categorize and systematize aspects of machine learning in order to accelerate the development and implementation of artificial intelligence and machine learning algorithms in order to improve management efficiency in socioeconomic processes. In addition, the article discusses mathematical and statistical methods for developing algorithms and learning machines. Statistical methods based on the construction of classification and regression algorithms; pattern recognition method; prediction method; exponential mixing method; method for constructing an online multivariate regression algorithm; based on the use of an aggregating algorithm; methods related to game and probability theories were used to apply this classification. It would be easier to build AI [Sakhanevich, 2020].

In the article of Ekaterina V.O. decision-making methods for managing credit resources using machine learning and optimization have been studied. This article talks about credit operations, which mainly rely on the activities of banks and provide a significant share of their income. The main goal of the author is to substantiate and develop new technologies and models of bank lending management that reduce credit risks and increase lending efficiency. Methods of system analysis, control theory, statistical methods, optimization methods and machine learning were used [Ponyrko, 2020].

In the article of Ponyrko R.M. "The impact of the digital economy on the processes of the banking sector", the leading directions in the development of the mechanism of digitalization of the economy are analyzed. As a result of the study, the importance of digital technologies in the value chain is highlighted. The results of the study can be applied in the formation of the strategy of business entities [Baryshnikov, 2018].

In the article by S. Russell, R.V. Klimenko, P. Norviga, M.Yu. Openkova and others, approaches to creating algorithms in machine learning were identified, similar in terms of research topic, but different in the way of classifications (articles or books are divided by subject, as well as similar courses) and the form of representation of their essence [Sidorov, 2017]. There are many areas of use of machine learning, such as medicine, financial institutions, manufacturing, and other areas of human activity.

Scientific novelty. Understanding the possibilities and latest innovations in machine learning is critical for businesses to chart a course for the most efficient ways to conduct business. It is also critical to maintain industry competitiveness, therefore, deep understanding of this topic is required. Before using machine learning to create a tool or conduct research on it, one should have a good understanding of its benefits and drawbacks. This paper is based on conducted research on those types and provided information on which one fits in the solution of various types of problems.

Analysis. There are two types of machine learning:

1. Inductive (according to precedents). It is based on the discovery of patterns observed in the input data.

2. Deductive machine learning, which includes the formalization and transformation of expert knowledge into digital form as a knowledge base.

Because the second type is commonly referred to as expert systems, "machine learning" can be used interchangeably with "inductive learning." Use cases are a collection of input objects and their associated results. The goal is to develop an algorithm that can produce accurate results for any input. The decision is based on an examination of previous experience. Simultaneously, the learning system's ability to generalize is critical; it should normally respond to data that is not included in the training sample. There are three types of inductive learning: supervised learning (supervised), unsupervised or unsupervised learning, and reinforcement learning. In addition, other learning methods are being developed, for example: active, multitasking, transfer, etc. Recently, “deep learning” has begun to develop most strongly, combining algorithms for both learning with a teacher and without a teacher. Data and data-related labels are used in supervised machine learning. For instance, we can see a pear in one image and an apple in another. After placing the markers, the person acts as a teacher for the machine. The machine determines the features that allow it to distinguish between images with pears and images with apples based on the data and markers. Thus, an algorithm is created that produces a result based on the description of the data. Once an algorithm has been chosen, it can be used to label other previously unknown data. Supervised learning includes classification tasks and regression tasks [Maisuradze, 2019]. Unsupervised machine learning means an iterative process of analyzing data without any markers and finding relationships between them without human intervention. Such models include problems of clustering, searching for association rules, and dimensionality reduction. Clustering algorithms serve to isolate individual groups of data. Dimension reduction algorithms, on the other hand, are designed to search for more compressed data representations. We can see examples of algorithms based on unsupervised learning in social networks when selecting recommendations or when issuing search results in search engines. There are also non-classical but quite popular machine learning methods such as reinforcement learning and deep learning. Reinforcement learning is a subset of supervised learning in which the "teacher" is the environment. At the same time, the machine does not have a reference set of data and information about the environment to begin with, but it can perform actions within it. As a result, the environment's reactions to actions will be information for the machine, which it will use to develop an algorithm. This training method is used for more complex tasks, such as a robot navigation system. Deep learning, on the other hand, is always associated with big data, which suggests that it is impractical to process such an array of information with one machine. Therefore, artificial neural networks (ANNs) are used. They are a network of artificial neurons. Neurons play the role of

devices built on the foundation of relatively simple processors. Deep learning divides a large amount of information into smaller pieces, and the processing and analysis of these data fragments is delegated to other devices. This type of learning is only applicable to more complex neural networks with multiple levels. Each next level of the ANN searches for the relationship in the previous one. Thus, more complex neural networks can find both simple relationships and relationships between relationships.

Given the long path of development of the field, we will consider the specific, most relevant machine learning technologies in 2022. The most developed technologies are AutoML, TinyML and QuantumML. Below is a description of each technology, as well as the scope of its application.

AutoML (Automated Machine Learning). The demand for labeled data has resulted in the establishment of a data labeling industry staffed by human annotators. Because of the risks associated with using offshore labor, the market has sought alternative methods to avoid or minimize this part of the process. Improvements in semi- and self-paced learning are assisting businesses in reducing the amount of manually labeled data. By automating the work of choosing and tuning a neural network model, artificial intelligence becomes cheaper, and new solutions take less time to enter the market.

In the general case, AutoML can be considered, regardless of whether classifiers or training regressions are built, as a generalized search concept with specialized algorithms for finding optimal solutions for each component of the machine learning pipeline [Evsyukov, 2020]. By building a system that automates just three key elements—feature engineering, hyperparameter optimization, and neural architecture discovery—AutoML promises a future where democratized machine learning becomes a reality.

Since automated machine learning can solve several problems at once, several strategies for using it have emerged. There is currently a focus on improving solutions such as PlatformOps, MLOps and DataOps. This group of solutions is called XOps and allows you to create an enterprise technology stack that provides automation and reduces the duplication of technologies and processes.

TinyML (Tiny Machine Learning). TinyML is a rapidly evolving approach to developing artificial intelligence and machine learning models that run on devices with limited hardware, such as microcontrollers used to power cars, refrigerators, and utility meters. TinyML is a rapidly evolving approach to developing artificial intelligence and machine learning models that run on devices with limited hardware, such as microcontrollers used to power cars, refrigerators, and utility meters.

Tiny machine learning is the next logical step in every organization's journey to becoming a digitally intelligent enterprise that connects data with company-wide actions. Hardware partners such as Dell support TinyML with specialized hardware that

hosts and integrates intelligent data at the edge. Not only does this help provide an intelligent platform for analysis, but it also opens the organizational doors for modern architectures while supporting industry standards including 5G and Wi-Fi 6. Moreover, TinyML can improve privacy by processing data on the device and transmitting only what what is important.

TinyML algorithms are expected to be increasingly used for localized parsing of simple voice and gesture commands; identifying common sounds such as gunshots or baby crying; analysis of environmental conditions and vital signs. Companies are already considering adopting new approaches to the development, security, and management of TinyML.

QantumML (Quantum Machine Learning). Quantum computing holds great promise for creating more powerful artificial intelligence and machine learning models. The technology is still out of reach in practice, but the tide is starting to change: Microsoft, Amazon, and IBM are making quantum computing resources and simulators readily available through cloud models.

The intersection of quantum computing and machine learning could bring huge benefits to companies, allowing them to potentially solve problems that are not being solved today. The developers of QuantumML recommend that companies start exploring the potential impact of quantum computing on their industry now and adapt their AI strategies to enable resources to explore quantum computing and machine learning when platforms (expected in the next two to three years).

Conclusions. Every year, industries advance due to advancements in data science and machine learning. In some cases, this forces businesses to employ machine learning in order to remain competitive. However, the use of this technology on its own can only benefit businesses. Some businesses must innovate in order to achieve goals and gain a prominent position in the market, as well as enter a new future that was once considered science fiction.

Each goal necessitates a different approach. Discussing what is best for a specific company with experts will help you understand which technologies, such as machine learning, can improve business performance.

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On some issues related to machine learning in 2022

Key words: machine learning, artificial intelligence, classification, algorithm, methods

The advent of the Internet and faster computers has made the transition faster, and the world has moved to an automated and digitized format, which has led to the introduction of advanced technologies into everyday life. Currently, humanity is actively using technology in personal and professional activities, which mainly includes communication and business transactions. A variety of technologies and tools based on artificial intelligence are becoming more widespread and become more significant not only in various fields of science, technology, economics and production, but also in the everyday life of ordinary people. The global pandemic of the coronavirus COVID-19 has demonstrated the vulnerability of mankind not only to epidemic threats and related problems, but also in terms of the long-term consequences and restrictions they cause. At the same time, the pandemic has once again shown and confirmed that it is possible to deal with emerging difficulties successfully, effectively and efficiently in various fields of activity by using computer tools and information technologies, including those related to the field of artificial intelligence. The article discusses trends and ways to apply the main approaches and methods of machine learning.

LEGISLATIVE FRAMEWORK REGULATING THE SPHERE OF STARTUP ECOSYSTEM IN ARMENIA AND ITS IMPACT ON THE VENTURE CAPITAL MARKET OF ARMENIA

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Key words: startup, startup ecosystem, ICT, venture capital

Introduction. Armenian startup ecosystem and ICT sector in general are rapidly growing. In this context the legislative framework that regulates Armenian ICT sector plays a vital role for the sustainable and continuous growth of Armenian startup ecosystem. We examine the laws and government decisions that motivate entrepreneurs to launch their startups and develop Armenian startup ecosystem. Furthermore, we compile the model of Armenian venture capital market and the impact the government policies can have on the market to find out the optimal policy to implement to further develop Armenian startup ecosystem in the long-term.

Methodology. We use economical and mathematical approaches to design Armenian venture capital market and Armenian startup ecosystem entrepreneurs utility to find out the impact of existing and possible government policies on the long-term sustainable development of Armenian startup ecosystem.

Literature review. In our study we review laws and government decisions targeted to develop Armenian ICT sector and startup ecosystem. In particular, we examine the RA Law on "State Support of Information Technology Sector" [1] and the benefits provided to Armenian ICT sector entrepreneurs by the RA Law on "Profit Tax" [2] and the RA Law on "Income Tax" [3]. Besides, we also review the decision N 399-L of the Government of the RA on "Approval of the procedure for providing state support to IT companies and individual entrepreneurs" [5]. At last, we examine the legislative framework of "Simple Agreement for Future Equity" in USA [6] and UK [7].

Scientific novelty. We examine the laws and government decisions targeted to develop Armenian ICT sector and startup ecosystem. Then we compile the model of Armenian venture capital market with its respective demand and supply curves and consider the impact of the legislative reforms on the model to determine the utility of Armenian startup ecosystem entrepreneurs. We also examine the possible government policy to promote the Armenian venture capital supply by providing benefits to the investors and its impact on Armenian venture capital market and startup ecosystem. At last, by

comparing the existing and possible policies of Armenian startup ecosystem development we find out the most optimal policy to implement in the future.

Analysis. The RA Law on "State Support of Information Technology Sector", adopted on December 17, 2014, which entered into force on January 9, 2015, was a turning point for the development of the startup ecosystem in Armenia. [1, article 18]. One of the main goals of this law is to increase the competitiveness of IT companies established in Armenia, to attract qualified IT specialists in Armenia, to continuously develop the skills of existing specialists, to support research centers, to carry out quality research work, which can help different actors of Armenian startup ecosystem to make decisions, as well as to develop venture capital market and encourage foreign investments in Armenia's IT sector [1, article 4].

The state support within the framework of the legal regulations of this law is mainly aimed at the development of entrepreneurial entities in the IT sector, which are new to the market or are in the early stages of their life. In addition, it focuses on the development of enterprises or individuals using innovative and state-of-the-art technology, the development of infrastructure and actors supporting the startup ecosystem, in particular startup accelerators and incubators, technoparks and technocenters, as well as on the development of the working environment of organizations and individuals, conducting research in this field [1, article 5]. Startups or early-stage innovative IT companies that apply for the benefits provided under this law must have no more than 30 registered employees [1, article 8].

The law provides tax benefits to IT companies that meet the requirements of the law, which through state support can ensure sustainable and continuous development in the context of the country's startup ecosystem and the overall development of the IT sector. In particular, the RA Law on "Profit Tax" does not recognize as income the revenues from the sales of information technology of IT enterprises that have received a certificate in the manner prescribed by the RA Law on "State Support of Information Technology Sector" for the entire duration of the certificate [2, article 8]. In addition, the above-mentioned Law on "Profit Tax" does not recognize as an expense the expenses related to the receipt of income from the sales of information technology of IT enterprises that have received a certificate in accordance with the RA Law on "State Support of Information Technology Sector" [2, article 11]. These two legal regulations mean that IT companies that have received a certificate in accordance with the RA Law on "State Support of Information Technology Sector" are exempt from paying profit tax or, in other words, a 0% profit tax rate is set for them throughout the entire duration of the certificate.

According to another law, the RA Law on "Income Tax", for IT enterprises that have received a certificate in accordance with the RA Law on "State Support of In-

formation Technology Sector", the income tax on salaries paid to their employees during the entire validity period of the certificate is set at 10% [3, article 10].

It is due to these reforms that since 2015 the number of ICT enterprises in Armenia has been growing rapidly. The RA Law on "State Support of Information Technology Sector" encouraged ICT enterprises operating in the shadow to register using the privileges defined by the law, as well as to motivate entrepreneurs, who have not yet entered to the sector, to establish their ICT enterprises and start doing business in the sector. So, the number of ICT enterprises from 2009 to 2021 is presented below.

Table 1 [4] Number of ICT enterprises from 2009 to 2021

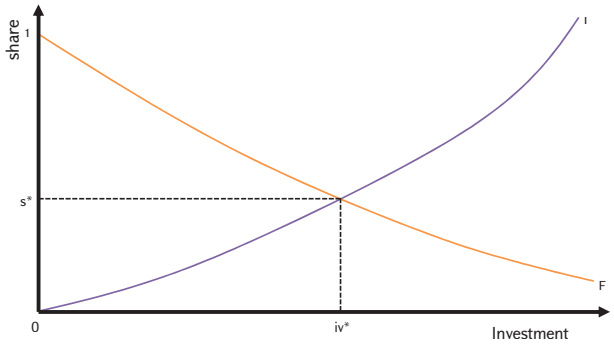
Year	Number of ICT enterprises	Growth rate
2009	649	-
2010	685	5.55%
2011	698	1.90%
2012	695	-0.43%
2013	696	0.14%
2014	700	0.57%
2015	815	16.43%
2016	908	11.41%
2017	1090	20.04%
2018	1728	58.53%
2019	1599	-7.47%
2020	1751	9.51%
2021	1777	1.48%

The presented data show that the enterprises in the field of ICT have almost always increased, registering a rapid growth in some years, and a small one in others. This is a positive phenomenon, which means that the sector is on the path of sustainable development, which shows the full potential of Armenia's ICT sector and startup ecosystem and the opportunities that have not yet become a reality. It should be noted that from 2010 to 2014, the sector was in a relatively more stable period in terms of registration of new enterprises, when the annual growth rate did not exceed 10%. And the annual 10% annual growth rate threshold has been exceeded since 2015, when relatively more new enterprises were established, which, as already mentioned, is explained by new legislative reforms that granted privileges to ICT enterprises.

In the context of the analysis of the legislative framework of ICT sector, the recent decision N 399-L of the Government of the RA on "Approval of the procedure for providing state support to IT companies and individual entrepreneurs" should also be noted, which entered into force in March 26, 2022. [5, article 2]. This decision stipulates that state support is provided to those enterprises and individual entrepreneurs that

operate in the field of ICT, whose number of employees has increased by at least 50 as of March 1, 2022. [5, Appendix, point 3, sub-point 2]. Moreover, each of the at least 50 newly registered employees must not be an employee registered in Armenia during the 6 months preceding March 2022 [5, Annex, point 3, sub-point 3]. In addition, the ICT enterprise or individual entrepreneur claiming to receive the state support provided by this decision should not have a tax liability in excess of AMD 100,000 as of the day preceding the application date [5, Annex, point 3, sub- point 4]. And the state support provided to ICT enterprises and individual entrepreneurs who meet these criteria is the refund of 50% of the income tax paid from the income of the newly registered employees. This income tax refund can be received by the ICT enterprise or individual entrepreneur for the month of March and for the following 11 months, as long as each month meets the above-mentioned conditions [5, Annex, point 7].

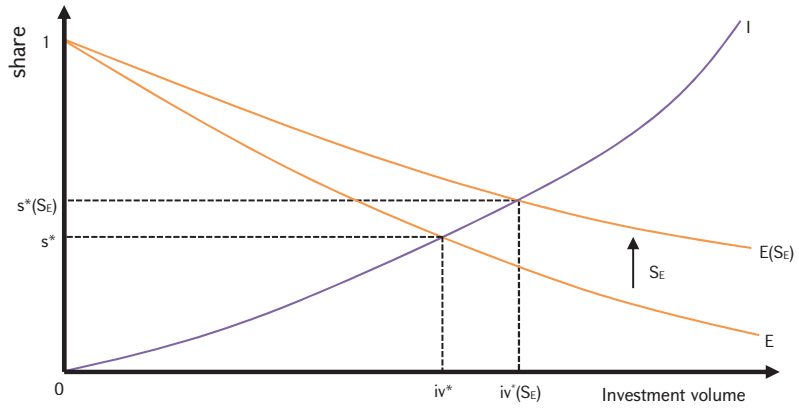
Chart 1. Supply and demand of Armenian venture capital



However, studies show that the RA legislation does not regulate a very important issue, which forces Armenian entrepreneurs to register their startup abroad, particularly in the United States. This is due to the fact that investors in the US invest in startups at an early stage of life by signing a "Simple Agreement for Future Equity", which, for example, in the US [6] and in the UK [7] is regulated, but the legislation of Armenia does not even define what it is. The main reason for signing such agreements is the fact that the value of startups is not yet determined at an early stage of their lives, which makes it impossible for investors to gain the startup's equity share at that stage, but “Simple Agreement for Future Equity” guarantees that in the future, when the value of the startup is determined, the investor will receive the share of the startup's equity within the framework of certain logic specified in the agreement. Therefore, in order to increase the opportunity to attract investments, many Armenian startups are registered abroad, where there are legal regulations on "Simple Agreement for Future Equity", which is an additional guarantee for investors. And if the startup is registered in Armenia, the risk for investors not to receive a share of equity in the future increases, as there are no legal regulations on such agreements in Armenia. If we try to compile the model of demand

and supply of Armenian venture capital, it will look like Chart 1. The vertical axis represents the level of share given to investors, which is designated by variable "s" and can accept the value from 0 to 1. The horizontal axis represents the volume of investments required or offered for each defined level of share, which is denoted by "iv" variable. The "I" curve shows the supply of venture capital in Armenia, and the "E" curve shows the demand. For simplicity, for venture capital supply in the startup ecosystem we will look at traditional venture capital funds and angel investors. Angel investors, in turn, can be of two types. The first type refers to the angel investors who have accumulated their wealth as a result of entrepreneurial activities outside the startup ecosystem of Armenia, and the second type refers to the angel investors who have accumulated their wealth as a result of entrepreneurial activities in the Armenian startup ecosystem. Venture capital funds and the first type of angel investors will be called foreign investors, and the second type of angel investors business investors.

Chart 2. The Impact of Startup Subsidies on Armenia's Venture Capital Market



As Armenian startup ecosystem is still young to have business investors, Armenian venture capital supply includes only foreign investors. In this case, the supply of venture capital becomes always directly correlated relative to the price of capitaland it has an upward and right direction. That is, the higher the expected share of potential investments in startups, the greater the desire of foreign investors to invest in startups, hence the higher the supply of venture capital. And when the share equals to 0, the venture capital supply also becomes 0, because then foreign investors have no incentive to invest in startups. At the intersection of supply and demand curves, where the share is equal to "s*", "iv*" volume of investments in the venture capital market of Armenia is confirmed. If we denote the profit generated by the startups by "p" variable and the expenses by "c" variable, then we can calculate the utility of the founders of the startups, which will look like this:

$U_E = (1–s)\times p – c_E$

In Armenia, the RA Law on “State Support of Information Technology Sector” has encouraged the creation of new startups, which is a subsidy targeting startup

entrepreneurs. Therefore, the demand curve for Armenia's venture capital has moved upwards.

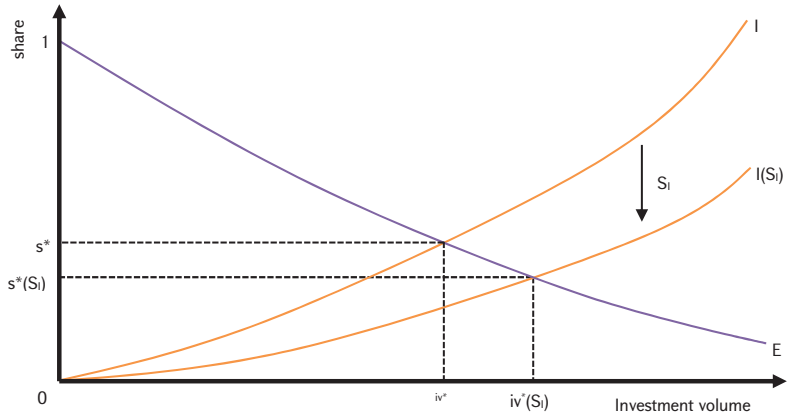
In this case, the general utility of the startup founders in the new equilibrium point has become:

$U_E = (1–s^*(S_E))\times p – (c_E-S_E)$

It is obvious that the founders of startups have increased their utility by the amount of S_E, but as the share of investors in the new equilibrium has increased, it has also decreased by "$(s^*(S_E)-s^*)\times p$". Therefore, it is not clear that this subsidy has increased the utility of entrepreneurs in the startup ecosystem of Armenia.

It is worthy to consider the case when the state stimulates the supply of venture capital in Armenia by subsidizing the investments made by foreign investors in the amount of "U_I". In that case, the supply of Armenian venture capital will move downwards and will look like this:

Chart 3. The Impact of Investment Subsidies on the Armenian Venture Capital Market



As a result, the utility equation of each entrepreneur looks like this:

$U_E = (1–s^*(S_I))\times p – c_E$

The equation shows that in the case of this subsidy, the utility of Armenian startup ecosystem entrepreneurs increases by "$(s^*-s^*(S_I))\times p$".

Therefore, we can state that this subsidy, which, although not directly targeting entrepreneurs in the startup ecosystem of Armenia, is more optimal for their overall benefit. As a result, they accumulate more wealth, which allows business investors to appear in the startup ecosystem of Armenia, who will invest in startups that will be created in the future.

Conclusion. Armenian legal framework related to ICT sector and startup ecosystem development is targeted to motivate the entry of new ICT enterprises and startups which is a policy to promote Armenian venture capital demand. In our model of Ar-

menian venture capital market we find out that this policy is not the most optimal for the long-term sustainable development of Armenian startup ecosystem. The policy that gives benefits to external investors of Armenian startup ecosystem is more beneficial for entrepreneurs as it increases their utility in a much higher volume and creates new angel investors in the ecosystem. Besides, Armenian legal framework does not regulate "Simple Agreement for Future Equity" contracts which stimulates investors to make investment in startups acting as a guarantee for investors to receive startup shares in the future.

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Legislative framework regulating the sphere of startup ecosystem in Armenia and its impact on the venture capital market of Armenia

Key words: startup, startup ecosystem, ICT, venture capital .

Armenian ICT sector and startup ecosystem are rapidly growing. In this context the government of the RA implements a policy that encourages the entry of new startup to the ecosystem by giving them tax incentives. Particularly, the startups, that have no more then 30 employees, are exempt from profit tax and the income tax for their employees is set at 10% rate. Besides, in case they employ at least 50 employees that were not employed in Armenia from September to February, 2022, they receive 50% refund of the income tax accumulated by newly hired employees for each month for the month of March, 2022 and the following 11 months as soon as they meet the requirements for each month. These benefits stimulate the growth of Armenian venture capital demand which also increases the startup share level controlled by the investors in the equilibrium point of the market. Armenia has not yet implemented the policy to encourage the investment in the market by giving tax incentives to investors of the ecosystem. In that case the new equilibrium point sets much lower level of startup share controlled by the investors which increases the utility of startup entrepreneurs and may guarantee the long-term sustainable development of Armenian startup ecosystem.

EFFICIENCY OF THE USE OF AUTOMATED DESIGN SYSTEMS IN THE MACHINE-BUILDING INDUSTRY

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Key words: information technology, mechanical engineering, integration

Introduction. Information technology (IT) is an integral part of human life today. These technologies work based on using a variety of means and methods for collecting, processing, and transmitting data to obtain information of the required quality and the state of an object, process, or phenomenon. The main goal of information technology is the improvement and automation of production processes at the enterprise and the personal needs of a person [Nauka i innovacii,. 2016, 23 – 32]. Information technologies are the leading direction in the professional sphere of a person. Completely new and previously unexplored technologies are being introduced and developed everywhere. In modern enterprises, there is an intensive distribution with the joint improvement of digital and information technologies. This direction for a long time determines the main trajectories of the development of the economy and society and has also led to tremensdous changes in people's lives more than once. Information technologies are widely used in modern enterprises and rationalize the work activities of people in the modern world. The introduction of IT in the information sphere of the enterprise and the use of telecommunication means communication has determined a new stage in the development of information technology in the activities of a process engineer. New information technology is an information technology that has a "friendly" user interface, and also uses personal computers and telecommunications facilities [Sborka, 2015, 112 – 116].

Literature review. Over the years, IT has proven its superiority over mechanical human labor. These technologies have a number of advantages, through which the importance of their use in modern enterprises in the activities of a technologist is proved. Information products are the basis for the work of information technology. It is through the information that a system of sequential operations is organized to use the resources and methods of automating various processes. It should be noted that today there are many approaches to the problem of classification of information technologies. Despite its prevalence, the term "information" remains one of the most discussed concepts in science, and the term itself has many different meanings in different areas of human activity. Through information and information technology, confidential data is transmitted, transactions are made at various enterprises, storage and work with classified information are carried out, and so on. This list can be listed endlessly since in the age of

information technology, almost all processes occurring in human life are based on the use of information technology and information in particular [GIAB. 2014. 32-38.]. To date, almost every engineer prefers to work with computer technology to a greater extent. Information technologies make it possible to save modern enterprises from numerous paper drawings and explanatory documentation, which significantly slow down all production processes in the area under consideration. Automation is one of the most relevant areas of scientific and technological progress in various professional areas of the life of a modern person, in particular, mechanical engineering. The term "automation" includes a broad concept that describes all processes performed by specialized software or robots.

Analysis. Thus, through automation, many tasks are performed that do not require human participation. Robotization, on the other hand, is that part of automation, when physical mechanisms are presented to replace people. One of the most relevant and promising areas in the field of automation in the development and integration of intelligent tools that greatly simplify and increase the efficiency of industrial processes [Young scientist, 2016, 65-74]. Artificial intelligence is a disruptive technology with tremendous potential. The introduction of AI in mechanical engineering significantly increases the efficiency of enterprises and companies, as well as their competitiveness with the parallel development of industry markets by stimulating the creation of new technologies. The key technology on which artificial intelligence is based is the ability to "self-learn", as well as the use of accumulated data to predict the future. The main distinguishing feature of AI from conventional digital decisions is that when performing tasks, artificial intelligence is not based on logical schemes previously set by programmers, but independently configures complex decision-making mechanisms, based on the data and tasks that were originally set by programmers. Artificial intelligence today can bring factories to a completely different level of profitability. With it, you can improve any process - from designing a future product to delivering it to the end customer. Moreover, AI today is capable of evaluating the overall performance of an enterprise and suggesting to the manager in which direction to move forward.

Continuing the conversation about the introduction of automated information technologies in mechanical engineering, it is necessary to note the high relevance and efficiency of the integration of computer-aided design systems. Computer-aided design (CAD) systems are also one of the main tools that allow you to automate the execution of drawings through computer graphics. Computer graphics is supported by application software packages, the main purpose of which is to solve, with the help of computer systems, qualification, analytical, economic, and ergonomic problems related in turn to the design activities of machine-building enterprises. CAD is used in almost all scientific and technical fields, examples are automotive, electrical engineering, mechanical engi-

neering, construction, and more. Processes aimed at design automation occupy a key place among information technology and other production systems. CAD hardware is based on the use of resources of electronic computing systems and telecommunication technologies. The mathematical component of computer-aided design systems contains the distinctive features of the mathematical methods used, statistics, as well as programming, and discrete mathematics. Programmable CAD systems are one of the most complex software systems in the modern world, implemented through operating systems of the Windows family, Unix, high-level programming languages C ++, C, Java, and other modern CASE technologies, database management systems, standards of computer systems [Mashinostroenie, 2019, 71-76]. Figure 1 shows the main criteria by which the choice of CAD is classified when planning the implementation of an enterprise about the tasks required for solving:

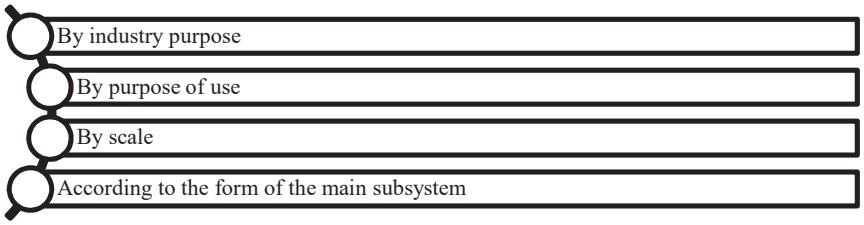

Figure 1. CAD classification criteria

In modern enterprises, to increase work efficiency, almost every development engineer needs to be able to work with CAD software. It is the enterprises that use the technologies of automated production systems that are the main non-competitive objects capable of performing and developing some of the most rational and efficient products [Inter-disciplinary dialogue, 2014, 43-49]. The result of the activities of enterprises using CAD directly depends on how quickly and optimally such systems work. Figure 2 shows the classification according to the purpose of use, repeats components of classic CAD:

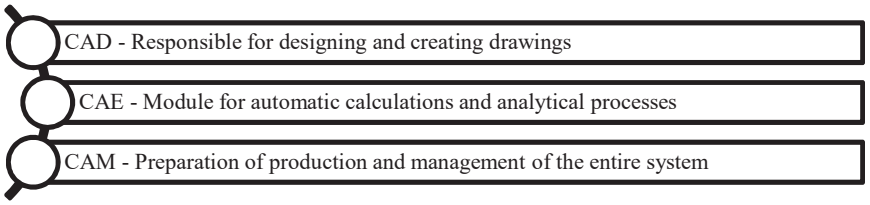

Figure 2. Classification of CAD by purpose of use

To date, the following CAD technologies are widely used and effectively used: ArchiCAD, APM CivilEngineering, K3-Cottage, ProjectSmeta CS, GoogleSketchUp.

The main goal pursued in the development of modern computer-aided design systems is to increase the efficiency of the work of development engineers by providing a more rational interaction with the computer. This factor is achieved through the creation and implementation of an interface that is understandable for any level of engineer,

as well as the introduction of regulatory instructions that optimize familiarity with the software and the subsequent execution of tasks in general [MNIZH, 2014, 32–35]. Thus, to successfully operate enterprises in modern conditions, it is necessary to use advanced information technologies. They allow solving a wide range of tasks in any area due to the complex automation of the main technological and production processes. This became possible through the use of CAD, the productivity of which is increasing every day, and its use is simplified. CAD capabilities help enterprises reduce material costs, energy costs, and time for the production of work, optimize the main production processes, and improve the quality of products. The highest production efficiency is achieved in the case of using integrated design automation systems. Also, one of most effective and most common IT technologies in mechanical engineering is computer mathematical modeling. A mathematical model is a mathematical description of an object, the main purpose of which is its study or management. In the general interpretation, the model is a conditional image of the object of study, developed to simplify this study. When constructing mathematical models, it is assumed that its direct study can provide completely new knowledge about the object being modeled. One of the most effective and innovative technologies used in mathematical modeling at machine-building enterprises is neural networks. A neural network (also called an artificial neural network, ANN, or neural network) is a mathematical model that includes software and hardware implementation. Neural networks are a system that includes simple processors (artificial neurons) combined and interacting with each other. Each of these processors performs exclusively the role of receiving a signal and sending a signal to other processors. Despite such a simple operation algorithm, neural networks that include many processors can perform quite complex tasks [Research and modeling, 2012, 98-104]. It should be noted that ANNs are not programmed, but trained. The possibility of learning is one of the key advantages of neural networks over traditional algorithms for mathematical modeling of various objects. The issue of learning in the technical aspect is to find the coefficients of connections between neurons. During training, ANNs can identify complex dependencies regarding the input and output data of the object and generalize. The consequence of this factor is that, with successful training, the network can return the correct result based on data not present in the original sample, as well as incomplete or distorted data.

In addition to modeling specific objects or parts, computer modeling can be used to solve other applied problems from the field of mechanical engineering related to planning and resource management. In addition to everything that was mentioned earlier, the effectiveness of using mathematical modeling in the study of processes lies in a wide range of problems that can be solved. Such tasks, for example, are tasks of network planning and management; inventory management tasks; tasks of distribution of resources; tasks of planning and placement, and others. The scientific and technical efficiency of CAD applications is determined by the contribution of the application of new approa-

ches and methods to the development of science and technology in general. The social component of efficiency reflects the social and cultural consequences of the introduction of CAD. The economic efficiency of CAD is characterized by a reduction in costs as a result of its use (including the future). As a rule, in works devoted to the evaluation of the economic efficiency of CAD, special attention is paid to the effect of reducing the cost of developing a product design and technology for its production.The greatest effect from the use of computer-aided design systems should be expected with complex automation of all processes for creating documents for products. An accurate assessment of the economic effect of the introduction of CAD meets certain difficulties since it is necessary to take into account earlier entry into the market of new product and its higher competitiveness. In concluding the study of the effectiveness of computer modeling of objects and processes in mechanical engineering, we note the main advantages of using mathematical models indicated in Figure 3:

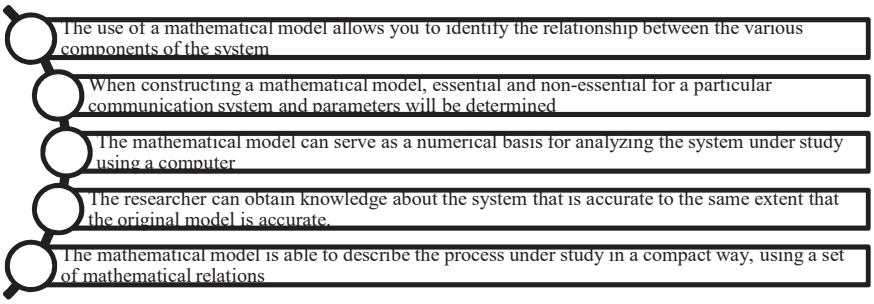

Figure 3. The main advantages of using a computer modeling

Conclusions. Thus, it has been found that information technologies are of great importance in the field of mechanical engineering, allowing modern enterprises to move to a higher quality level. Modern computer tools make it possible to increase the efficiency and quality of processes performed at enterprises through the use of various specialized software and computer mathematical modeling tools. The main purpose of the presented article was to study the issue of integration and use of information technologies in mechanical engineering. The scientific novelty of the work lies in the unique conclusions obtained based on a comprehensive study of the issue of using computer-aided design systems in the engineering industry. The author highlights the main aspects that confirm the effectiveness of the use of these technologies in this industry. The results obtained can be used in further studies by other authors from this field. Also, the scientific novelty lies in the possible assessment of the economic efficiency of CAD integration in enterprises provided by the author. Using the structure of CAD quality indicators presented in the paper, the technology department will be able to develop the most effective measures for the integration and development of innovative technologies from the industry. The work considered individual automation technologies, their clas-

sification, and integration for solving individual problems in the field of mechanical engineering. Also, the work studied in more detail the issue related to the integration of computer modeling tools, which also improves the quality and efficiency of the processses produced at the enterprise and the relevance of using information technologies in the study area as a whole.

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Arman MARTIROSYAN, Zareh Isayan

Efficiency of the use of automated design systems in the machine-building industry

Key words: information technology, mechanical engineering, integration.

The role of information technologies is being actualized in almost all professional spheres of the life of a modern person. Thus, one of such areas in which information technologies have proven themselves on the positive side, allowing to increase the quality and efficiency of ongoing processes, is the engineering industry. The main purpose of the presented article is to study the issue of integration and use of information technologies in mechanical engineering. The subtasks of this work are: to study the main factors through which the role of information technologies in the modern world is actualized; to study the issue of the relevance of the use of information technologies in the field of mechanical engineering. In the course of completing the work, theoretical research methods are used. To fully disclose the topic and obtain reliable data, the author uses publications and materials from domestic and foreign sources. The main part of the presented article is devoted to the development of the issue of the effectiveness of the use of computer-aided design systems in the field of mechanical engineering. The author reveals in more detail the technical aspects, relevance, and necessity of developing innovative technologies for integration in real production. The paper classifies these tools and provides a list of advantages in their widespread use in various industries.

THE MAIN DIRECTIONS OF THE AGRARIAN POLICY OF THE REPUBLIC OF ARTSAKH

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Keywords: agricultural sector, intensive agriculture, agro-food system, gross agricultural output, food security, state support

Introduction: Agrarian policy is an integral part of the country's economic policy.This is a set of measures taken by the government of the country aimed at increasing the growth rate of agricultural production, improving the efficiency of the organization of peasant farms, increasing the volume of agricultural products, improving the structure of acreage, meeting the domestic demand of the country for the most important types of agricultural products, increasing the competitiveness of agricultural products in domestic and foreign markets, efficient use of material, labour and financial resources in agriculture, as well as fixed assets, introduction of scientific and technical achievements and advanced technologies, etc.[Goschyan et al., 2008, 129] The importance of these events is increasing at present stage, since main guarantee of improving the welfare of our population is developed agricultural sector, which is the basis for development of the state.

***Literature review*.** The improvement of the state regulation of agriculture in the Republic of Artsakh should be aimed at the development of the industry in the long term. Currently, according to the subsectors, the agrarian policy is developed and implemented by various government bodies: the Ministry of Agriculture of the Republic of Artsakh (agriculture, forestry, development of agro-processing and logistics systems), the Ministry of Territorial Administration and Infrastructure of the Republic of Artsakh (development of rural settlements, irrigation system), the State Cadastre of Real Estate under the Government of the Republic of Artsakh (monitoring of protection and effecttive use of Land Resources), Ministry of Education, Science of the Republic of Artsakh, The Ministry of Culture and Sports (scientific support and training of professional personnel), etc., which reduces the effectiveness of the development, implementation and accountability of the full policy of the industry:

Methodology. In the course of the study, various methods of analysis and comparison were used. The scientific basis of the study was the research and analysis conducted by Armenian and foreign researchers in this field. The information basis was the

laws, legal acts of the Republic of Artsakh and the Republic of Armenia, as well as information obtained from Internet sites and other sources:

Scientific novelty. The conducted research and analyses have led to a number of scientific results. The following can be considered scientific innovations:

- The consequences of the 44-day war in the Republic of Artsakh on the agricultural sector are revealed, options for their elimination and restoration are proposed.
- the existing problems in the field of agriculture are identified and the main directions and possibilities of their solution are put forward.

Analysis. In the real sector of each country, the agricultural sector has its own special place and role, which is one of the most important areas of economic development, employment and the general standard of living of the population [Hovsepyan, 2014, 56].

Based on the modern requirements for the effective use of the potential of the agricultural sector of the Republic of Artsakh and the definition of new ways and mechanisms to solve existing problems, as well as the coordination of the processes of introduction of the latest technologies and advanced methods of agricultural production used in international practice, a concept for the development of agriculture has been developed in Artsakh, approved by the Decree of the Government of the Republic of Artsakh No. 76, dated February 7, 2018, providing the concept of food safety. The analysis of the above documents has led to some considerations that should be taken into account:

a) the Ministry of Agriculture presents a large number of priorities, for the implementtation of which, however, there is no funding;

b) there are no actions aimed at attracting investments.

Agriculture plays an important role and contributes to the development and stabilization of the economy of Artsakh.

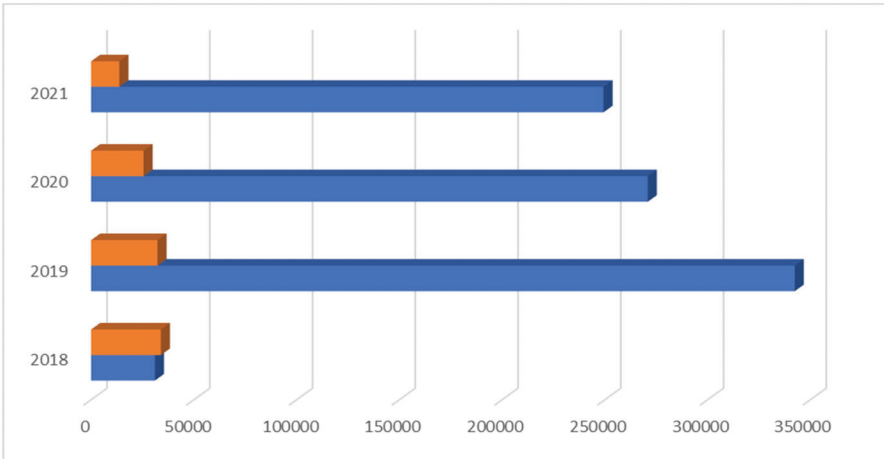

Figure 1. The share of agriculture in the structure of GDP

Share of agriculture in 2018-2021 In the structure of the GDP of the Republic of Artsakh, it was periodically reduced, amounting to more than 11% of the gross domestic product of the country in 2018, and in 2021 - about 5.5% in the post-war period[1].

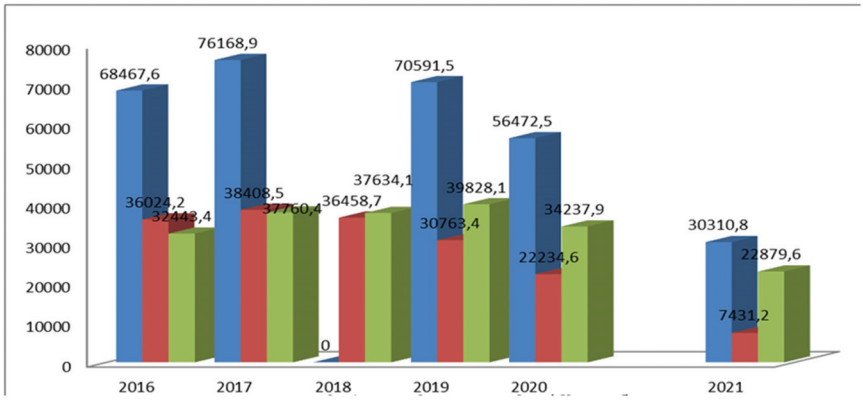

Figure 2. Gross agricultural output by industry / at actual prices, million AMD/

From the data shown in Figure 2, it can be seen that in comparison with 2020, in 2021, gross agricultural output amounted to 56472.5 million drams, having decreased by 46% compared to last year, due to the latest military actions. In 2021, the gross product of crop production amounted to 7431.2 million drams, and livestock production - 22879.6 million drams. Compared with similar indicators in 2020, which in crop production amounted to 22234.6 million drams, and in animal husbandry -34237.9 million drams, in crop production decreased by 66%, and in animal husbandry -by 34.The losses in post-war Artsakh are quite serious and in themselves indicate their negative impact on the economy. In particular, if in the past Artsakh exceeded the pre-set threshold in terms of grain production per inhabitant by exporting part of the harvest to the Republic of Armenia, now export is not provided. All the existing potential in the near future will be directed to meeting the needs of the local population.[4, www.minagro.nkr.am]

Proper and competent management of this resource will allow us to fully ensure the food security of the people of Artsakh over time. According to preliminary estimates, about 20% of orchards, irrigation water supplies, livestock, pastures and agricultural machinery have been lost. The losses are quite large in the horticultural industry. Of the 7,000 hectares of perennial plantations available in Artsakh before the war was about 2,500 hectares of orchards, including 500 hectares of newly planted pomegranate orchards, 900 hectares of vineyards, 650 hectares of mulberry orchards, 450 hectares of nut, stone, walnut orchards. Significant losses were particlarly in terms of orchard yields.

[1] www.stat-nkr.am

As a result of the war, the number of livestock in Artsakh decreased by more than 50%.

Based on the consequences of the war in the Republic of Artsakh, it became necessary to revise the policy pursued in the field of agriculture, bringing it into line with current realities, to clarify the main directions and means of implementation, in particular, the conditions, mechanisms and tools for providing state support to peasant farms. Thus, the development of agriculture constantly needs state support, therefore, from year to year, the Government of the Republic of Artsakh makes serious investments in order to develop agriculture, and a number of targeted programs are being implemented.

2020 the Rural Agricultural Support Fund (RFAS) of the Republic of Artsakh continued to implement measures to implement the policy arising from the strategic program for the development of agriculture of the Republic of Artsakh, and their assistance, in particular

- Agricultural development assistance programs,
- Programs to promote the development of animal husbandry
- Programs to promote the development of infrastructures for the procurement, storage, processing and sale of agricultural products
- Other applications [5, www.minagro.nkr.am]

Through the application in agriculture as a priority target policy of assistance to land users under separate programs, the full use of the existing potential can increase the stability of the agro-food system in the republic. In 2019-2021 the support provided by the fund for programs is as follows:

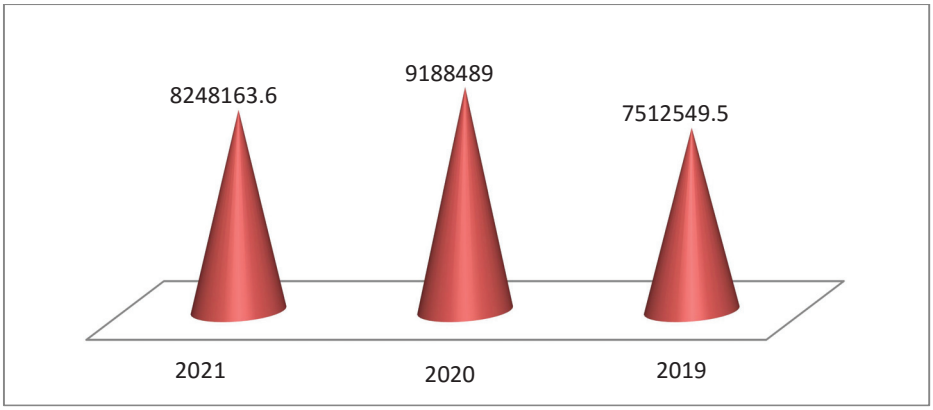

Figure 3. Support provided by the Rural Agriculture Support Fund of the Artsakh Republic in 2019-2021 (thousand drams)

Figure 3 shows that the main part of the agricultural development assistance programs is the farming development support programs which include.

- support program aimed at stimulating greenhouse farming,
- program of assistance in stimulating the production of grain crops (winter crops),
- a program to promote the development of spring crops, a program to promote the development of horticulture,
- a program to promote the stimulation of the production of vegetable crops.
- a program to facilitate the implementation of works on the installation of a drip irrigation system.

Livestock development programs is including:

- cattle development support program
- small cattle development assistance program
- poultry Industry development assistance program
- pig breeding promotion program
- program to promote the development of beekeeping
- fish farming promotion program
- chinchilla breeding promotion program

In 2020 the support provided by the fund increased by 22.3% as compared to the previous year, and in 2021 it amounted to 8248163.6 thousand AMD, which is 10% less than the previous year (Figure 3).

The above-mentioned support programs are implemented in the form of loans, gratuitous assistance, direct purchase and sale, partial subsidization of the cost, partial subsidization of interest rates on loans provided by commercial banks.

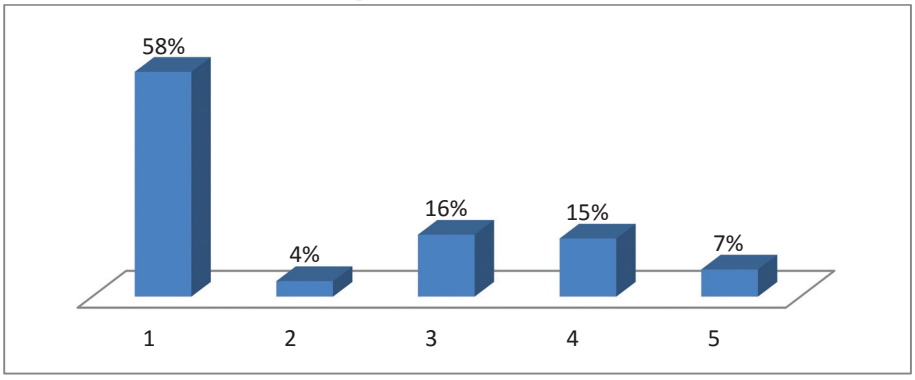

Figure 4. Support structure for agricultural development in Artsakh Republic, 2021

In 2021 the majority of the support structure provided by the Fund was in the form of loans, gratuitous assistance and direct sales, which accounted for 58% of the total support, 16% of gratuitous assistance, and 15% of direct sales (Figure 4).

Conclusions. Thus, taking into account the peculiarities of the agrarian sphere, the situation in agriculture, the scale and relevance of the problems, the priority of the country's food security and rural development, active state assistance to agriculture is emphasized. Basically, it should be aimed at forming a legal framework in the agricultural sector, providing favourable conditions for business entities in agriculture, efficient use of resource potential, attracting foreign investment, developing agricultural infrastructures, increasing the availability of basic resources used in agriculture, stimulating export-oriented production, the introduction of modern technologies, the development of professional consultations and food safety systems.

As a result of the implementation of an effective agrarian policy, it will only be possible to outline the main priorities in the field and achieve the desired result.

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Lusine HARUTYUNYAN, Anush HARUTYUNYAN, Tatevik VERDYAN, Tatev POGHOSOVA, Karine SHINDYAN

The main directions of the agrarian policy of the Pepublic of Artsakh

Key words: agricultural sector, intensive agriculture, agro-food system, gross agricultural output, food security, state support

The policy pursued by the Government in the agricultural sector of the Republic of Artsakh is aimed at improving the efficiency of agriculture and its service structures, the sphere of sale and processing of agricultural products and, on this basis, stabilizing the agro-food sector, organizing further development and expansion of reproduction, increasing labour productivity, increasing real incomes of peasant farms, creating favourable conditions for economic entities in agriculture, increasing the level of self-sufficiency and food security of basic foodstuffs. The development of agriculture in the Republic of Artsakh can be through the development of science, stimulating local and foreign investments and the introduction of the latest technologies.

CAUSES AND MANAGEMENT OF STRESS

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Key words: stress, stress management, distress, tension, feeling of pressure.

Introduction: In modern life, stress has a serious impact on human behavior, performance, health, interpersonal relationships and family relationships. Stress is a state of strong and prolonged psychological stress that occurs in a person when his nervous system receives an emotional load. Stress is currently one of the most frequently discussed problems.

Methodology. While conducting our research and writing the article, we used the following methods at different stages of the study: theoretical analysis of the literature on the topic, comparison, comparison and a systematic and situational approach, and other methods.

Scientific novelty. Considering the importance of applying knowledge in the field of stress management in working structures and industrial enterprises, for the first time in our article we have considered anti-stress means of occurrence, management and overcoming stress in modern life. This is also the first time that the nature of work is taken into account for the use of anti-stress means of labor stress.

Literature review. In stressology, it is considered that a number of biological, social and psychological factors that affect the body very intensively can be considered as stressful. Stressors (factors causing mental stress) can be both negative and positive events, phenomena and factors. Stressor - a requirement for the psyche, pressure. In the characteristic question of a stressor, the role and importance of emotional (pleasant and unpleasant) and cognitive factors are great. The American expert R. Lazarus attaches great importance to cognitive assessments of the stressor. The effects of stress are manifestted both on the psychological and physiological levels.

There are three stages of stress manifestation in the literature. This stage is characterized by irritability, inability to make decisions, suppressed anger, inability to concentrate, desire to cry, feeling tired, lack of interests, etc. With prolonged exposure to stressors, the second stage occurs, at which secondary somatic symptoms appear. At the third stage, negative emotions lead to disturbances in the normal functioning of the

body, which at the physiological level are manifested by fluctuations in blood pressure, manifestations of heart and gastrointestinal pain, back pain, headaches, suffocation, visual disturbances, loss of appetite, sleep and sexual dysfunction.

Methodology. The methodological basis of the science of stress management is the scientific ideas known to human civilization about the laws of the development of the surrounding world and socio-economic life and, in particular, about the mechanism of action of economic laws that make it possible to deeply and comprehensively recognize controlled phenomena. As R. Luft wisely pointed out, "the volume of literature on stress was so great that he could throw anyone into stress" (1965). This phenomenon, although it has been studied well enough for a long time, but there are many questions that have not been answered. This understanding is actively discussed not only in medicine, but also in economics, politics, business and education. Moreover, in various spheres of life, unfortunately, it is also sometimes used in medicine in the wrong sense. The concepts of "stress" and "stress effect", "stress" and "stress harm" are often confused. These confusions have not only applied, but also scientific consequences. Back in 1910, about 15 years after Osler, Walter Cannon began using the word "stress" when studying the reactions of "fight and flight" ("fight or flight") :

Almost at the same time, the Canadian scientist Hans Selye took up this problem. He is the author of the theory of stress. [Ababkov, 2004, 65-67] In 1935 H. Selye and T. McCone first used the term "stress". The specific date of the "discovery" of stress by Selye was on July 4, 1936 when his article "the syndrome arising from various damaging effects" was published in the journal “Nature”. Later, he described this phenomenon as a "general adaptation syndrome", and, according to Selye, "stress or general adaptation syndrome is a general nonspecific neurohumoral reaction of the body to any demands made to it."Based on the characteristics of Hans Selye and other authors, we characterize this phenomenon as follows: "A set of general nonspecific reactions of the body under the influence of factors that violate homeostasis or threaten it is called stress or stress reaction, the biological purpose of which is to resist the influence of the factor until the development of sustainable adaptation". [Bodrov, 2006, 58-59] Stress is a complex biological phenomenon inseparable from life. How can you live without stress if you live and therefore relate to environmental factors, adapt to the influence of internal and external impulses? "Stress is the life, and life is a stress".

Analysis. Each of us from time to time finds himself in a tense, stressful situation. Interacting with different people and phenomena, we can worry, experience anxiety, get angry, etc. All people experience stress, which is a normal reaction of our body to unusual or dangerous situations. Short-term tension helps us to stimulate our potential, be filled with motives and successfully complete the tasks we have undertaken. But

excessive stress can put people in a "borderline state". This can negatively affect the quality of life and cause physical and mental health problems.

There are various methods of coping with stress, but first you need to understand how it affects your health and life. Overcoming stress begins with finding the cause of the stressor, after which steps should be taken to prevent, eliminate this cause or reduce its impact. Each person is different from the other. For one, a stressful situation may be indifferent to another. The fact that something, phenomenon or situation will cause stress, in turn, depends on various factors: personal characteristics, cultural environment, circumstances related to the past, stage of life, attitude to others, etc.

Some of the most common causes of stress are: relationship problems, illness, conflict, death, pressure related to work or training, the impact of a traumatic event, including physical or emotional abuse, childbirth, financial problems, job loss.

Many causes of stress can be changed, but others are beyond our control. It is necessary to understand which of them are within control and try to change them. For example, if the problem is the uncontrollability of family expenses, it is necessary to draw up a family budget with all mandatory and possible expenses and monitor the project.

In another case, if the source of stress is work, it is necessary to try to understand the causes of tension and anxiety, and the possibilities of their change. You may need to change your working hours, office or job responsibilities.

If the problem comes from a relationship, then you need to take the time and try to resolve all the contradictions. [Grinber, 2002, 21-22]

Sometimes it may be necessary to discuss the causes of stress and ways to overcome it with a friend, family members or a mental health professional. You should never ask for or receive support.

Stressful situations call into question fundamental human relationships and disrupt the ties between family, friends, partners and society. Stressful situations have a primary impact not only on the psychological structure of the self, but also on the system and meaning of attachments that connect the individual and the community. Mardi Horowitz defines a stressful situation in life as something that cannot be compared to the victim's "inner scheme" in dealing with the world. A stressful situation destroys the victim's fundamental ideas about the security of the world, a positive assessment of himself and a meaningful order of creation.

When this connection is destroyed, a person in a stressful situation loses the basic sense of "I". The conflicts of development between childhood and adulthood, which were not resolved in time, open up again.

Stress forces the survivor to revive old battles that encompass autonomy, initiative, competence and identity. Stress management is the only and most important way to guarantee reliable protection against it. It can be applied at the right time:

The basic rule is to lead a healthy lifestyle. Frequent sports, sufficient rest, eating healthy food. In addition, a person easily copes with stress if he lives a balanced life and is part of a group of people who support and help him. Family, friends, employees, and groups unrelated to other work, such as community and religious organizations, help them cope with stress. Personal and work stress is often experienced by those who do not care about their physical and emotional state [Lazarus P. 1970, pp. 41-42]. The attitude to work as a duty and a duty arose in the early days of the formation of civilization. This positive attitude to work was passed down from generation to generation until a new, different society was formed. With the development of society, the attitude to work has also changed. Instead of asking "how will my work affect me?" the question arose, "how will the work affect me?". Work, considered a means of improving society, has gradually replaced work that improves our personal status and raises the standard of living. And since stress in the workplace has become a common phenomenon, its elimination by changing work habits, working conditions and labor relations should become the main element of the universal fight against stress. Of course, people can and should cope with stress on their own. But the best modern organizations have a good feature. They help their employees cope with stress and increase productivity. In modern conditions, staff care is becoming both a practical and ethical norm. Support at least may consist in the fact that the organization provides employees with breaks and rest days. Many companies offer employees advice from specialists on proper nutrition and subscriptions to visit sports centers. Some go further and strive to maintain a balance between work and personal life. They introduce flexible working hours and allow you to work outside the office, organize kindergartens, gyms, dry cleaners and laundries on their territory. Employees consider a permanent flexible schedule to be a more effective practice when an employee can work at a convenient time for him. [Selye, 2007, 13-14] For example, it is allowed to go early from work to go shopping with older parents, or take a free day to attend a child's performance at school. Thus, almost any work situation can be a potential source of stress. Our understanding of working conditions determines how stressful the situation will be for us and will lead to stressful symptoms.

Conclusion: Finding ourselves in situations where there is nothing we can do or change to eliminate certain stressful work factors, it is necessary to resort to exercises that will change behavior and attitude to these factors. It is also necessary to study the discharge and time distribution systems. Stress at work should be considered as just a kind of stress. It must be remembered that regardless of the type of stress, the identification of symptoms, the identification of their causes and the definition of specific

goals to eliminate these causes are the main stages of anti-stress drugs. Thus, such initiatives help employees cope with stress, increase productivity and quality of life, increase job satisfaction and commitment to the organization.

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Causes and management of stress

Key words: stress, stress management, distress, tension, feeling of pressure.

The article discusses the causes of stress, its negative consequences and ways to eliminate and manage it. The relevance and usefulness of the article is conditioned by the above. Thus, let's talk about the universality of the phenomenon we are studying, that is, regardless of gender, age, profession, people respond to stress through the body's ability to adapt and rebuild. In a changing environment, the body's mental adaptation system, like any operating system, is a collection of relatively tightly connected subsystems. In addition. We can also conclude that a person's resource of adaptation, as a biological feature of his organism, has no pronounced gender-ethnic, ethnic, professional differences, which allows us to view stress as a universal mental manifestation. As he's article, we talked about stress management, stabilization measures that everyone can use to avoid stress and aggravation, through which they can cope with work stress, make their daily work more productive and useful. The scientific novelty we put forward was that, taking into account the importance of applying stress management knowledge in enterprises, for the first time in our article we studied the anti-stress means of creating, managing and overcoming stress in modern life. This is the first time that the nature of work has been taken into account in the use of anti-stress measures.

PERSPECTIVES FOR THE DEVELOPMENT OF ECO-ETHNO-VILLAGES IN THE REPUBLIC OF ARMENIA

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Key words. eco & ethno-village, agro-tourism, problems of the economic system, recreant, national ethno park.

Introduction. From the point of view of the development of the tourism sphere, the rural areas of the Republic of Armenia are considered realistic, which is conditioned by geographical location, landscape diversity, favorable climatological environment, abundance of mineral waters, natural monuments, forested areas, strong historical and cultural heritage, which is especially interesting for tourists. The latter are especially inclined to create conditions for their peaceful and harmonious old age to harmonize with nature. Taking into account the above-mentioned advantages of tourism development in the Republic of Armenia, the article aims to offer the idea of creating eco-ethno-villages in the country, which in turn will solve a number of problems related to tourism, economy and environment in Armenia. An eco-village is an ecological settlement located in a rural area, which is characterized as a settlement of reasonable size with all the features of human activity, which is safely integrated into the natural and/or historical environment, ensures healthy human development, can successfully survive indefinitely [Yearbooks 2020]. It can be created on the basis of an exis-ting or abandoned village, or in a new place, the way of life of which is similar to the way of life of a normal (traditional) village, that is, the fact of being engaged mainly in agriculture, the existence of separate houses and plots of land for families. In this way, the eco-village differs from other types of eco-habitats: agricultural communes, urban cohousing, kibbutzim, summer-type eco-habitats (without permanent residence), ecolo-gical orientation of monasteries, and other communities of loners. At the same time, an eco-village differs from a traditional village in that it is an ideological community where people are united around certain ideas or principles, not because they were born or happened to be in a neighborhood [Gilman, 2020]. Often they are former urban dwellers who have chosen to be close to nature, and in ordinary villages the majority of the population is native to the countryside. The human scale is a mandatory characteristic of an eco-village. The latter is explained by the fact that all members of the community know each other, everyone feels that they can influence the development of the community. As a rule, the number of members of that community does not exceed 500-700 people. In its turn, Ethno-village is a real or artificially created settlement, which reflects the historical-ethnographic features of the life of a certain ethnic group. In eco-ethno-villages, all aspects of human

life must be represented in a balanced proportion. Another important aspect is the circulating use of materials . Use of renewable energy sources (solar, wind, tidal, etc.), fertilization of organic waste, return to soil, secondary wastewater treatment, non-use of toxic and harmful substances. The best model of an eco-village is the traditional village, in order to restore the pre-existing harmony of nature with each other, it is necessary to interest certain groups of people to live there.

Methodology. Many groups have been creating eco-villages for decades. In order to assess difficulties faced by pioneers, let's discuss their problems [Stroyizdat, 1984].

Bio system issues. In order to ensure the safe inclusion of the eco-ethno-village in the natural environment, it is required that:

- preserve the natural environment in its territory,
- produce food, fuel and other living resources on the spot,
- disinfect and recycle all its waste,
- avoid adverse effects on other parts of the environment through products produced outside the village,
- preserve rituals, traditions, costumes, crafts of given ethnic group and cuisine.

Problems of construction environment. It is necessary that eco and ethno village:

- be made of environmentally friendly materials,
- use renewable energy sources,
- minimize the use of mechanized vehicles,
- be constructed to minimize the impact on the local ecosystem,
- develop the road network using secondary raw materials of the Republic of Armenia's masonry ores.

Due to the current globalization conditions, the expand of the escalating scale of the Russian-Ukrainian war, the socio-economic situation of the population of Armenia will worsen, especially from April 1, 2022, the rise in gas prices, electricity, as well as the volume of mainly imported grain, fertilizers, combined food will be in a sharp decrease. The situation of the Armenian village will deteriorate, which will be similar to the Energy Crisis of 1992-1996, when the forest and the green areas of the cities will once again bear the full weight of the energy-fuel crisis. In order to prevent and neutralize the new threat to the forest, the inhabitants of the mountain villages, by being involved in recreational activities, routes, organization of resources, operation and maintenance, will use their lands, providing the benefits from them to recreational farms. The villagers (residents of eco-ethno-villages), loving their natural environment, will not allow illegal logging, unnecessary change of natural landscape, exercise self-control, as all resources for recreation are dual in nature, as a recreational resource, and as a condition for the development of recreational activities. Due to contractual care with forestry, sani-

tary felling, ruthless illegal logging, legalized logging will eliminate the accumulation of large amount of timber (100-200 thousand cubic meters of timber) per year. To take care of the personal needs of the recreants, as well as the areas for the organization, furnishing of future routes, cleaning, preparing new areas.

Analysis. Taking into account the above-mentioned, it is proposed to organize a key route from the north-west to the south-east with the conditional name of the key route "Solar" from "Lake Arpi" National Park to "Areviq" National Park [Futuropa-Naturopa, 2016-17, 86-89]. Branches to eco-ethno-villages will be separated from the main route. Topographic extraction will be carried out along all the routes, the routes will include history, architecture and natural monuments, will include various recreationnal activities. The routes will be equipped with mobile modules (recreation cottages) every 10-15 km, and the overnight stay will be organized in the recreational farms of the above-mentioned villages (overnight, breakfast, guest houses, tent stations), which is directly related to the recreational burden of the landscape. The landscape capacity of an eco- or ethno-village is determined by the maximum number of vacationers living in the area who can be in recreational areas at the same time without established nature conservation rules and violation of the psychological comfort of rest due to overcrowding. The basic data for determining the capacity of eco-ethnic villages are:

1. quality and capacity of recreational resources approved by one person,
2. the size of the areas allocated for organization or formation per capita,
3. permissible load norms on different landscapes, taking into account the size of the areas allocated in natural landscapes,
4. the size of natural and artificial beach resources and their surface coastline,
5. existence of objects of natural-historical attraction.

The total recreational load of the area is determined taking into account the allowable load on the natural landscape. Below are the indicators of recreational allowable loads on the natural landscape (man / ha). Based on the above, it is proposed to create a network of eco-ethno-villages in all regions of Armenia, which will be based on the Pan-Armenian route from "Lake Arpi" National Park to "Areviq" National Park, which will provide recreational services to recreants. Moreover, the abandoned villages with a small population will be divided into categories (eco-villages and ethno-villages) according to location, rituals, customs, biodiversity. The latter can later be united in national ethnoparks. Border eco-villages must be provided with individual self-defense measures. Thus, “Argina” and “Lernamerdz” settlements with a population of 534 people and 384 people were selected as an example of an eco-village from Armavir region (respectively, according to the 2011 census) [Statistics, 2012]. “Shenik” and “Yervandashat” settlements (respectively 975 people and 654 people as of 2011) were chosen as an example of an ethno-village from the same region, one as representing the traditions, rituals, cos-

tumes and cuisine of the ethnographic regions of the emigrants from Western Armenia, the other as one of the former royal capitals of Greater Armenia, with its archeological excavations and minerals. "Vardashat" settlement with a population of 178 people (as of 2011) was chosen as an example of an eco-village from Ararat region. "Hnaberd" settlement (611 people, as of 2011) was chosen as an example of an ethno-village from the same region, as the royal capital of Dvin, Greater Armenia, with its archeological excavations and minerals. In the above-mentioned ecological villages, the future inhabitants can be engaged in fruit growing, vegetable growing, animal husbandry, the ecologically clean products of which will provide the needs of the recreants.

Table 1. Indicators of recreational allowable loads on the natural landscape

The normalized component of the landscape and the type of its use	**Criterion (man/ha)**		
	biological	technological	psychological
Forests (for walks) - pine forest on extremely dry soils - dry mixed broadband forest on fertile lands	0,5 – 1 2 – 3 3 - 5	-	0,5 - 1
1. Meadows (for walks) - dry valley and other dry meadows, - other meadows of low, flood and moderate humidity	5 – 10 10 - 20	-	-
2. Beaches (for sunbathing) - natural beaches	-	1000 - 1700	100 - 200
3. River and lake water (for swimming)	-	500 - 600	100 - 200
4. Coastal water for amateur fishing - for fishing from a boat (2 people / boat) - for shore fishing (man / km)	-	10 – 20 50 - 100	-
5. For tent camps (people / km) - for deep areas - for coastal areas	-	250 – 300 300 - 400	15 – 30 50 - 100

"Getik" and "Daranak" settlements with population of 370 people and 168 people were selected as an example of an eco-village from Gegharkunik region, respectively. From the same region, Akhpradzor (355 people) and Martuni (521 people as of 2020) settlements were chosen as locals, representing the ethnographic regions of Western Armenia and Persian-Armenia [3]. "Ahnidzor" and "Antaramut" settlements with a population of 180 people (2018 .) and 306 people (2011) were selected as example of an eco-village from Lori region. "Ardvi" (177 people as of 2011) and "Tumanyan" (1600 people as of 2015) settlements from the same region were chosen as examples of ethno-villages as settlements representing the rituals, costumes, cuisine and traditions of surrounding areas of Lori, the homeland of the all-Armenian poet Hovhannes Tumanyan. "Lor", "Shurnukh" and "Kuris" settlements with a population of 365 people (2011,), 224 (2010) and 44 people (2011) were selected as an example of an eco-village from Syunik

region. “Khoznavar” (396 people) and “Tatev” (864 people as of 2011) settlements from the same region were chosen as an example of an ethno-village as settlements representting the rituals, costumes, cuisine and traditions of the Syunik world, Artsakh and neighboring regions. “Alvar”, “Byurakn” settlements with population of 140 people (2011) and 921 (2012) were selected as an example of an eco-village from Shirak region. “Anipemza” (505 people in 2012) and “Norshen” (Kharkov) (1 person as of 2019) settlements from the same region were chosen as examples of ethno-villages as settlements representing Shirak rituals, costumes, cuisine and traditions [3]. The latter is located directly in front of the medieval capital of the Armenian state, Ani. “Chknagh” and “Ghazaravan” settlements with a population of 239 people (2011) and 450 (2011) were selected as an example of an eco-village from Aragatsotn region. From the same region, “Mughni” (781 people in 2011) and “Tlik” (123 people, as of 2011) settlements were selected as an example of an ethno-village. The settlements of “Acharkut”, “Yenokavan” and “Hovk” from Tavush region were chosen as an example of an eco-village with a population of 200 people (2011), 537 (2011) and 435 people (2011). “Chinchin” (646 people), “Nerkin Gosh” (281 people) and “Voskepar” (819 people as of 2011) were selected as an example of an ethno-village in the same region as settlements with rituals, costumes, cuisine, traditions of Tavush, Artsakh and surrounding regions of the world.

Finally, “Horbategh” and “Gnishik” settlements with a population of 242 people (2011) and 44 people (2011) were selected as an example of an eco-village from Vayots Dzor region. “Yeghegis” (369 people) and “Gndevaz” (829 people as of 2011) settlements as Vayots Dzor and settlements representing the customs, costumes, cuisine and traditions of Persian-Armenians in general were chosen as an example of an ethno-village from the same region. “Geghard” and “Hankavan” settlements with a population of 399 people (2012) and 6116 people (2012) were selected as an example of an eco-village from Kotayk region [State Statistics Committee of the Republic of Armenia, 2012].

Scientific novelty. Taking into account the opportunities for tourism development in Armenia, the article proposes the idea of establishing eco-ethno villages. The latter can be considered as a scientific novelty, as such an idea has not been developed in our country yet. Moreover, our research work proposes the establishment of an Armenian trail route, which will run from Lake Arpi National Park to Areviq National Park, including certain villages from all regions of the Republic. Finally, the above-mentioned novelty in its turn will solve a number of social, economic-recreational problems.

Conclusion. All the above-mentioned villages with their various recreational resources can help the people, first of all the poor, who have many health problems. Some of the listed settlements are known to both local and foreign tourists for their recreational resources. Agrotourism has been developing in these settlements for 10-15 years, and ethnotourism needs rapid development. That is why the list includes settlements with a

population of more than a thousand, where the established agro-tourism infrastructure can be a stimulus for the further development of ethnotourism. The creation of an Armenian trail, the organization of infrastructure, the furnishing will contribute to the development of ecotourism (agro tourism) and especially ethno tourism, the formation of sustainable flows of tourists, recreation, especially the stabilization of abandoned or aging populations, as well as the stabilization of urban settlements. Future eco-villages and ethno-villages created in the proposed settlements will be established by applying the norms of the presented landscape capacity and recreational load. Finally, the creation of eco-villages and ethno-villages will solve the housing, social, economic, as well as health problems of the population returning to those settlements, will create an additionnal source of income from the service of recreants and the sale of food.

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Tigran GHLIJYAN, Armine SMBATYAN

Perspectives for the development of eco-ethno-villages in the Republic of Armenia

Key words: *eco & ethno-village, agro-tourism, problems of the economic system, recreant, national ethno park.*

From the point of view of the development of the tourism sphere, the rural areas of the Republic of Armenia are considered realistically to be perspective, which is conditioned by geographical location, landscape diversity, favorable climatological environment, abundance of mineral waters, natural monuments, forested areas, strong historical and cultural heritage, which is especially interesting for elderly tourists (recreants). The latter are especially inclined to create conditions for their peaceful and harmonious old age to harmonize with nature. These conditions can be satisfied by future eco-ethno-villages.The article also attempts to raise the issues typical of all abandoned and sparsely populated settlements in Armenia, which are the basis for future eco-ethno-villages, following the example of several settlements selected from all regions of the Republic of Armenia. The proposed settlements are planned to be included in future Armenian trail routes (from Arpi lich National Park to Areviq National Park).

PROBLEMS OF ECONOMIC AND TECHNICAL AND EFFICIENCY OF INTEGRATED CIRCUIT PARAMETERS

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Key words: digital blocks, analog blocks, leakage power, corner, area, measurement system

Introduction. In modern economic conditions, any activity relates to economic issues. Currently, there are more and more research organizations in the field of integrated circuit design, which occupy a special place in the development of the field. At present, about 60% of IC customers list power consumption as the main problem, and area as the secondary problem. The software used to measure these parameters is a component of some expensive programs. The system presented in the paper will take its unique place in the market of low-cost devices due to its ease of use.

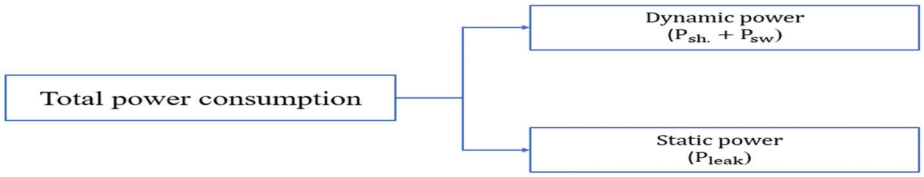

Figure 7. The total power consumption of integrated circuit

Methodology and literature review. Dynamic energy consumption is formed by the power conditioned by short-circuit and switching currents. Power due to switching current occurs when a logical level between logical 1 and logical 0 in the circuit. Short-circuit current occurs when there is a direct connection between the power supply and ground: In CMOS integrated circuits, the dynamic energy consumption mainly depends on the switching component. Power consumption due to static current of CMOS integrated circuits occurs when the circuit is connected to the power supply, but there is no switching at a logical level. The total component of the leakage current is mainly formed based on three components: the current passing through the valve, undercurrent, and the current due to the opposite deflection. The effect of the components on the output current has changed over time, in particular in the technological process above 180 nm only the undercurrent is taken into account, in the technological process above 90 nm the total scatter current is formed by the undercurrent loss current and valve loss current and below 90 nm In the technological process, the total scatter current is formed by the subthreshold current, the valve loss current, and the reverse deflection current. This is shown in Figure 2 [Agarwal et al., 2006, 692-696; Vashishtha et al., 2015; 2900-2903].

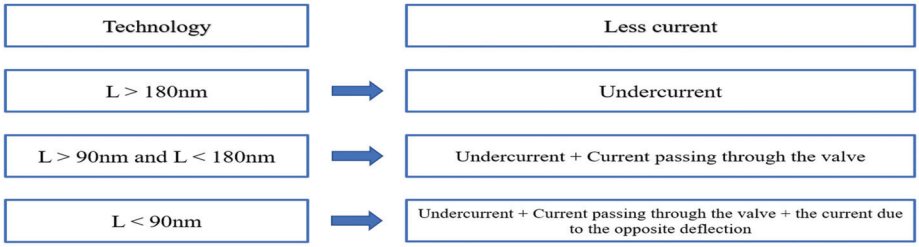

Figure 8. Leakage current

Depending on the technology, the ratio of dynamic to static energy consumption is changing, and currently static energy consumption is several orders of magnitude higher than dynamic energy consumption. Figure 3 shows the energy consumption ratio in the integrated circuit [Dilip, Prasad, Bhavani, 2012, 72-73].

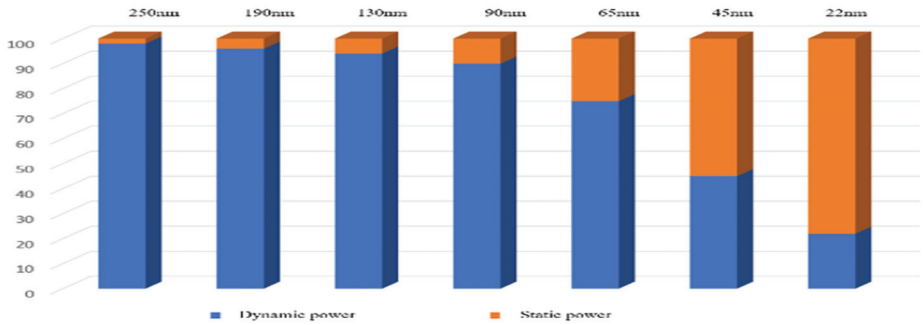

Figure 9. The Dynamic and static power consumption

The operation of measuring systems (or devices) is based on two basic principles: either system speed or system accuracy. For large designs, accurate measurements take quite a long time (for it me use spice simulations), and the designer needs measurement results at different stages of the design process. Therefore, it is necessary to have a system that will perform fast measurements, the amount of allowable error. At present, integrated circuits have both digital and analog nodes. The design of digital circuits is mainly done using electronic automated design software, for which the input information is the behavioral presentation of the circuits in Verilog, VHDL languages, the constraint file, as well as the libraries of standard elements that we will use during the measurements [Chukhajyan, 2014;13-21].

Proposed algorithm. This is the proposed algorithm of the presented system:

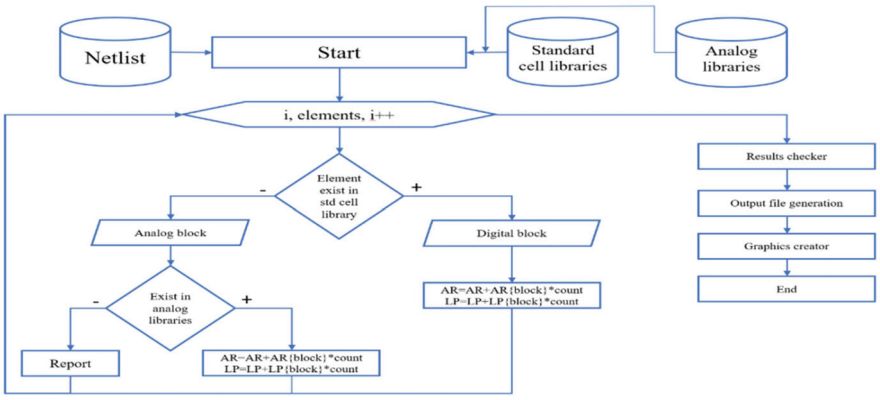

Figure 10. Proposed algorithm

The input for the work of the software is the gate level netlist, analog and standard cell libraries. At the beginning of the work, the elements used are extracted from gate-level netlist and grouping: the number of elements used in the process is determined. Then the presence of the received elements is checked in the library of digital standard elements, in the absence of which it is checked in the library of analog elements, in the absence of the latter it is presented as a missing element. If the corresponding element is found, information from libraries are extracted, which, if multiplied by the amount of application, is added to the result. It should be noted that the measurement is performed at once for all Process-Voltage-Temperature cases, then the results are checked, the results containing the largest number of elements are extracted. Based on the mentioned algorithm, a software tool has been developed, the input information for the software tool is gate-level netlist, digital standard cell library and analog block library. The mentioned libraries can be given for all possible process-voltage-temperatures and the number of mentioned libraries does not affect the speed of the system.

Scientific novelty. CMOS technologies are constantly changing. The increase of the number of transistors in integrated circuits and the reduction in area size is characterized by Gordon Moore's 1965 law, which states that the number of transistors in integrated circuits doubles every one and a half years, now exceeding ten billion. As a result of transistor size scaling - also changing requirements for other parameters in integrated circuits, such as power consumption of integrated circuits. It should be noted that over time, the power consumption requirements of integrated circuits are increasing, as most integrated circuits currently operate in systems for which portable lithium-batteries are the main source of supply. The three main challenges arising from Gordon Moore's law are high speed, small area, and low power consumption. The parameters of the integrated circuits are inversely proportional; the improvement of one lead to deterioration of the other. For example, in multi-core processors, the power consumption is improved

due to the reduction in speed. The total power consumption of integrated cir-cuits consists of two components: dynamic and static (Fig. 1) [Melikyan et al., 2018, 1-5].

Analysis. Mixed-signal integrated circuits were acclimated to test the system, the first being a logic-arithmetic unit and the second a processor belonging to the MSP430 family. For expeditious application of the system, has been developed a graphical inter-face, through which the system input data is provided. Below is the graphical interface.

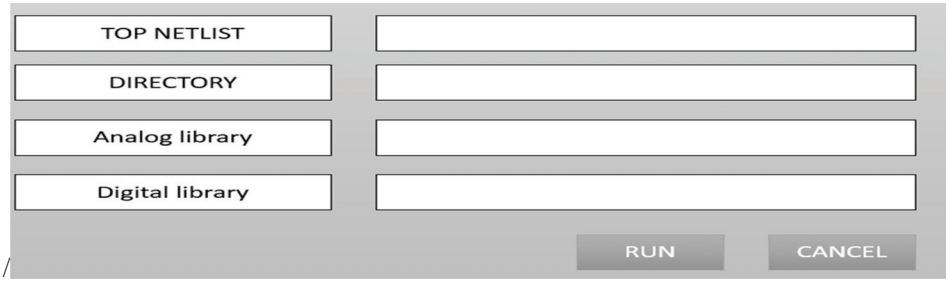

Figure 5. Graphical interface

The directory is optional input, it's connected with the gate-level netlist because in netlist we can have a hierarchical structure where submodules can be in other directory. From the results presented in Table 1 can be concluded that algorithm is 45% or more expeditious, and the precision of the obtained results is deviated by a maximum of 16%.

	Runtime			Leakage power		
Elements count	**Classic method**	**Proposed System (s)**	**Difference (%)**	**Classic method**	**Proposed System**	**Difference (%)**
46	32	15	53	3,362	3,762	12
1532	34	19	45	4,5	5,22	16

Table 1. Test results

To make the results more perceptible, in integration to the final text file, graphs are engendered, which are shown in Figure 5, respectively.

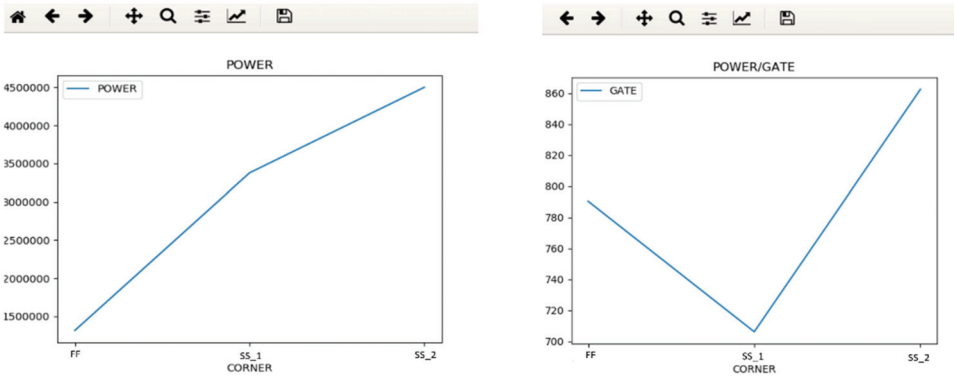

Figure 11. Graphics result

In output text file the result given in corner by corner format. The results show that the presented system will be in demand both for starters and integrators, who mainly have a research function and for astronomically immense organizations that carry out consummate projects. One of the advantages of the system is that it is independent.

Conclusion. During the work, the difficulties of making quantifications in sizably voluminous integrated circuits were studied, which in turn affects the period of market ingression. The optically canvassed complications are mainly connected with the fact that in modern integrated circuits there are analog and digital subunits. An automated system for quantifying the parameters of integrated circuits is introduced, which can be utilized in all stages of integrated circuit design. The presented software it is at least 45% more expeditious than the subsisting approaches, and the quantification error in the results is a maximum of 16%. Utilizing the presented algorithm, information on the parameters of integrated circuits for different process-voltage-temperature processes can be obtained at different stages of design. In additament to tabular version of receiving data, the system exports a graphical interface that is more convenient for visual inspections.

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Davit BABAYAN, Artur GHAZARYAN, Gurgen GRIGORYAN, Tigran GRIGORYAN
Problems of economic and technical and efficiency of integrated circuit parameters
Keyword: digital blocks, analog blocks, leakage power, corner, area, measurement system.

One of the main requirements during the process of designing integrated circuits is TTA (time to market) which is basically the period of the time spend on developing IC chips as well as decreasing power consumption and area. At present, the technology has reached up to 3 nm and most of the designed circuits are used in systems for which the power supply is lithium-based batteries. From what has been said, energy consumption is becoming a more powerful challenge now. Studies have shown that alongside with technology downscaling static energy consumption can be several times greater than dynamic energy consumption. In large integrated circuits, different methods are used to calculate energy consumption, which differ in speed and accuracy. For example, in spice modeling, the exact power consumption of the circuit can be obtained, but in the case of large projects, this can take a very long time. At the same time correctly measuring area or power consumption during development of IC design become a critical point to solve.

OPPORTUNITIES FOR THE APPLICATION OF EXTERNAL DEBT RESTRUCTURING MECHANISMS FOR DEVELOPING COUNTRIES

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Key words: foreign debt, debt restructuring, debt forgiveness, paris club, the Brady plan, G20, common framework

Introduction. The application of debt restructuring mechanisms for developing countries with heavy debt has a history of decades, but these mechanisms have been taken on a new meaning since the outbreak of COVID-19. According to the World Bank (WB), the total global debt reached 263% of world GDP in 2020, while the debt of both the public and private sectors, as well as advanced and developing countries increased [WB, 2021]. Nevertheless, the most problematic was the public debt of developing countries, which increased by 9 percentage points in 2020 alone, accounting for 63% of the total GDP of those countries [WB, 2021]. The conditional liabilities of these governments are expected to increase due to loans and guarantees provided to companies, while the debt generated by SOEs will also increase [Melecky, 2021, p. 3].

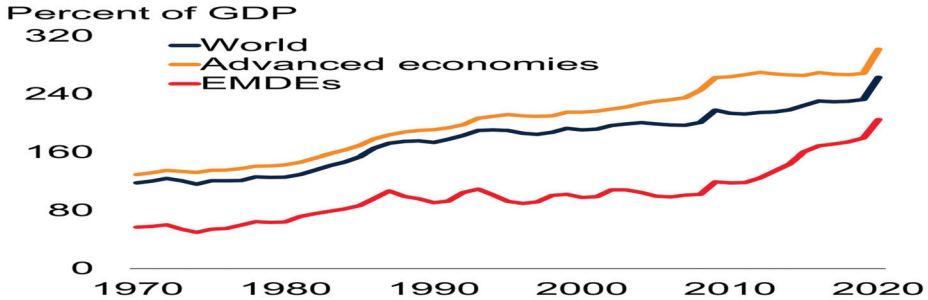

Figure 1. Total debt/GDP ratio for the world: developed, developing nations [source: WB]

In the current situation, leading international financial institutions (IFIs) and advanced countries started to develop new mechanisms for debt restructuring to apply for countries with debt management issues, recognizing that existing tools are not capable of helping to solve the issues of debtor countries. However, what were those restrictions and why could the debt of developing countries not be restructured within existing mechanisms? In order to answer the question, this article intends to analyze and assess various tools applied by advanced countries and IFIs since the middle of the 20th century to restructure the external debt of developing countries.

Methodology. The methodological basis for conducting the research is the use of secondary information collection tools. The collection of secondary information will be

based on works of leading economists and publications of academic and financial organizations (like WB and IMF), as well as the foundations of classical and modern economic theories. The comparative method was used in the article as well to identify the main similarities and differences between the various debt restructuring mechanisms.

Literature Review. Along with the continuous growth of sovereign debt, theorists focused on the economic development of countries with large volume of debt. Myers (1977) was one of the first theorists to discuss the sovereign debt issues and called such a case debt overhang, a situation where the high level of debt distorts the possibilities for borrowers to make optimal future investment decisions. The concept of debt overhang was further used in the macro literature where the debt overhang has been analyzed mainly in the context of sovereign-debt crises. Indeed, due to the debt crises in the 80s and 90s, this theory has been extended in a sovereign context with the aim to explain the effects that the high debt had produced on the level of investment in the "less developed countries" [Picarelly, 2016, p. 4]. In general, debt studies can be divided into two main groups: the studies of the first group are focused on the effects on investments (Deshpande (1997)), while the others go further and examine the direct effects on GDP growth [Clements et al., 2003]. Since the 1980s, in parallel with the development of debt restructuring initiatives, researchers have focused on these mechanisms and their potential impact on beneficiary countries. Moreover, some researchers (Arslanalp and Henry 2004) referred to the positive consequences both creditor and debtor countries. The early researches included comparative analysis of several restructuring episodes occurred between 1950 and 1980. In this researches in particular, some differences between the restructuring processes implemented by haircut and processes implemented by lengthening maturities are highlighted. Others analyze the different consequences produced by restructuring processes implemented via haircut or via lengthening maturities. They show that the debtor countries' conditions improve significantly just in case of debt write-offs. Different form of debt reliefs instead, such as lengthening of maturities, are not generally followed by such results. [Picarelly, 2016, p. 5].However, given the emergence of new debt restructuring mechanisms and the aggravation of debt management issues around the world, the topic requires ongoing research. While available literature mainly refers to the historical debt relief mechanisms, this article covers information of two latest debt relief initiatives as well - the Debt Service Suspension Initiative and the Common Framework, presenting them in comparison with existing mechanisms.

Analysis. Historically, the first of the debt restructuring mechanisms was the *Paris Club*, founded in 1956 as a non-formal organization of major lender countries, with the aim of developing systemic solutions for borrowers with debt issues. The first beneficiary of the Paris Club was Argentina, whose debt of USD 500 million to 11 countries was restructured in accordance with the Club's basic conditions. Similar to the Paris Club, the

London Club was created as an informal association of private lenders, with the aim of restructuring the debt of borrowers with debt issues. The club was founded in 1976 and the first deal was the debt restructuring of the Republic of Zaire (currently, the Democratic Republic of the Congo).The *Brady plan* was proposed by the US Treasury Secretary in 1989 to address the volatile sovereign debt issues of Latin American countries lent by US private financial institutions in the 1970s and 1980s. Concerns over US financial stability were also at the heart of the Brady plan. The latter called for more than 100 private-sector lenders to reduce the debt stock of 17 debtor countries by 37% of the NPV.

The *Heavily Indebted Poor Countries Initiative* was launched in 1996 by the WB, the International Monetary Fund (IMF) and other multilateral, bilateral and commercial lenders to address sovereign debt repayment related issues of low-income countries. The initiative determined the amount of debt write-off that the country would need to get out of its volatile debt level permanently. Meanwhile, debt restructuring was ensured only when the borrowing country was implementing major structural and social development reforms. The initiative was complemented in 2005 by the *Multilateral Debt Relief Initiative*, which offered a full debt forgiveness from the WB, the IMF, the Inter-American Development Bank and the African Development Bank. Currently, 37 countries are among the beneficiaries of these initiatives, in which debt forgiveness of about USD 100 billion has been implemented. All of these initiatives set themselves the task of developing common principles that would be applied to a large number of borrowing countries. However, each borrower's debt restructuring process was viewed in its own way (“case by case” approach), which sometimes led to inconsistencies in different processes, reducing the transparency and credibility of the process. These initiatives had much in common (significant reduction in debt stock, broad participation of borrower countries, protracted debt restructuring processes, replacement of less ambitious debt repayment efforts by debt restructuring/forgiveness), as well as a number of differences: they differed in their structure and basic principles, with the participation of private creditors, as well as the accessibility of borrowing countries to participate in the process. It should be noted that all these tools have always been sharply criticized, and the subject of criticism has been not only the lack of transparency and credibility of the process, but also the challenges that have arisen as a result of debt restructuring to borrowers. At first glance, debt service deferral may provide financial opportunities for borrowers in the short term, but critics argue that debt restructuring creates a "decade of lost economic growth" for the borrower, as the process did not involve structural reforms.

As noted, debt restructuring tools have gained new relevance in the wake of the COVID-19 epidemic as a number of poor developing countries face serious debt service difficulties. As a result, in 2020, the G20 proposed the *Debt Service Suspension Initiative (DSSI)*, which aims to suspend sovereign debt service for poor countries creating a

fiscal space to increase social, health or economic spending in response to the crisis. The DSSI, however, did not involve debt forgiveness and private lenders do not participate.

Later, the *Common Framework* was launched by the G20 to address the shortcomings in existing tools. It was essentially a platform to consider debt restructuring and forgiveness opportunities for DSSI beneficiaries and to offer systemic solutions using lessons learned from previous tools. The framework mainly envisages debt restructuring by extending the repayment period and/or reducing the interest rate, rather than reducing the nominal value. The option of canceling or writing off the debt is provided for in the "most difficult cases", which will be determined by a joint assessment of the WB and the IMF, as well as other creditors involved in the process. The framework does not yet have a final methodology for evaluating the process, but is currently used in three countries: Chad, Ethiopia and Zambia. The Common Framework, however, has some significant similarities with each of the previous initiatives, and it is inappropriate to state that it will effectively replace their implementation. Moreover, the implementation of the framework faces a number of old and new challenges, including lack of incentives for private lenders, expansion of borrower debt structure (complication of communication between large lenders) and diversification (including at the expense of private lenders, creditors whose distinction is not clear between private and public, such as the KfW). Despite the limited application of the debt restructuring process, it is, of course, inappropriate to state that limitation is due to shortcomings of tools. Obviously, it is impossible to cancel the accumulated debt indefinitely, as it is a successive chain of commitments on each side, but existing debt restructuring tools have essential limitations, in particular:

i. they are mainly used in low-income countries, while a number of middle-income countries also have difficulty in managing public debt, and these issues have been exacerbated especially after the outbreak of the COVID-19 epidemic, as governments' socio-economic measures were largely financed by external borrower financing as well [Kose, Ohnsorge and Sugawara, 2021, p. 9];

ii. it is debatable that the debt restructuring of developed countries and IFIs is based solely on economic reasons, and lenders do not pursue geopolitical goals to support or influence borrowers;

iii. debt restructuring significantly focuses on deferral and/or reduction of interest rates, while direct debt forgiveness is crucial for effective debt management. As a result, debt forgiveness is addressed by lenders only years after debt management issues arise and several failed restructuring attempts, when the borrower's debt service capacity has already been exhausted.

Conclusions. Effective application of debt restructuring mechanisms can have a positive impact on heavily indebted countries. However, there are some issues with the development and application of these mechanisms that hinder their widespread and

effective application. Thus, in the context of supporting countries with debt management issues, it is more expedient to expand the scope of debt restructuring tools, both from the point of view of the beneficiaries and the instruments used, giving priority to the possibility of direct debt forgiveness. Meanwhile, the debt forgiveness process needs to be linked to structural economic reforms, combining them wherever possible with the commitments made by developed countries and international organizations (including the EU) to combat climate change, protect the environment and support the developing world.

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Opportunities for the Application of External Debt Restructuring Mechanisms for Developing Countries

Keywords: foreign debt, debt restructuring, debt forgiveness, Paris Club, The Brady plan, G20, Common framework

Since the second half of the 20th century, lending countries and organizations have undertaken a number of external debt restructuring/forgiveness processes, which, however, have had limited application. Moreover, in no case was it possible to present a complete methodology for the implementation of the process, the application of which would be universal in nature and would be free from substantial, justified criticism.
Since the outbreak of COVID-19, the world, including both advanced and developing countries, has faced serious challenges in raising large amounts of new debt and servicing it in the future. If debt service was not as risky in advanced countries, a number of developing countries have seen huge amounts of debt accrued, once again bringing the tools of debt restructuring (including debt forgiveness) to the forefront.
The author aims to study and summarize the various mechanisms and tools of debt restructuring developed by advanced countries and international financial institutions for borrowing countries. Meanwhile, the purpose of the article is to assess the opportunities and limitations of the existing mechanisms for developing countries.

OPTIMAL ALLOCATION OF PENSION FUNDS AND RISK BUDGETING

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Introduction. In order to achieve maximum efficiency of the pension fund investments, the latter should be optimally allocated based on the risk diversification principle. The main goal of pension fund managers is to manage the portfolio under various asset investment restrictions and asset allocation strategies under a well-defined optimality criterion. An optimal portfolio has been built under various restrictions on the investment of pension fund assets. Greater attention is paid to the optimum portfolio risk diversification measures such as marginal contribution to risk (MCTR), asset contribution to risk (ACTR) and percentage contribution to risk (PCTR), which are used to represent the relationship between asset weight and portfolio risk.

Methodology. Theoretical basis of the research are the classic articles on mean-variance optimization, risk budgeting and diversification. The studied literature gives a comprehensive and multi-level view of the role of the relationship between asset weights and portfolio risk. The empirical part of the analysis is based on data available from RA Central Bank, Bloomberg and Yahoo Finance. Optimal portfolio analysis is done in MATLAB based on linear boundary conditions for asset, currency and country groups.

Literature review. The total risk of a portfolio depends on the risk of the assets included in it, the magnitude and sign of their correlation with the portfolio, the nature of the weight of each asset in the portfolio. The weight of the asset in the portfolio does not imply the same share in the risk of the portfolio. The share of an individual asset in the risk of the portfolio depends on the risk of the asset, its weight in the total portfolio, and the correlation between the returns on the asset and the portfolio. Diversification is a way to reduce risk by directing investments to assets which will respond to the same event differently. The main goal of diversification is to reduce risk. Marginal contribution to risk (MCTR), asset contribution to risk (ACTR) and percentage contribution to risk (PCTR) are considered as indicators of portfolio diversification level [Thierry Roncelli, 2020, 104-117]. The latter are used to represent the relationship between asset weight and portfolio risk. There are different approaches regarding optimal asset management. The most common and classic model, which is the basis of many other models, is the Markowitz model [Kasilingam, 2014, 187-204]. According to Markowitz, in the

optimal portfolio selection the return of the portfolio and its risk shall be considered together, where the risk is measured by standard deviation of asset returns. Markowitz' classic model is used as a basis for evaluating the optimal portfolio. The setup of the model is the Markowitz model under various both equality and inequality constraints:

$$\Pi(w) = w^T \times \mu - \lambda \times w^T \times \Sigma \times w,$$
$$A \times w = b,$$
$$C \times w \leq d,$$
$$\mu_p(w) = w^T \times \mu, \quad \sigma_p(w) = (w^T \times \Sigma \times w)^{0.5},$$

where μ is a $Nx1$ vector, whose i element is the expected return of the i^{th} asset; ω is an $Nx1$ vector whose i element is the weight of the corresponding asset in the portfolio, $\Sigma\omega = 1$; μ_p and σ_p are the return and standard deviation of the portfolio, respectively; Σ is a covariance matrix of NxN asset returns, λ is the risk tolerance coefficient.

Risk budgeting allows to assess the extent to which assets have an impact on portfolio risk or which assets diversify portfolio risk. For risk budgeting, portfolio's annualized VaR is considered at 99% confidence level. VaR of portfolio is assessed assuming that asset returns are jointly normally distributed [Roncelli, 2020, 69-88].

$$VaR_{p,Student}(w) = -\left(\mu_p(w) + \sigma_p(w) \times Z_{normal,1-\alpha}\right),$$

where $Z_{normal,1-\alpha}$ is the quantile function of univariate standard normal distribution and $(1-\alpha)$ is the confidence level.

MCTR, marginal contribution to risk, shows the effect of changes in the weight of each asset on the portfolio risk. It has the following mathematical representation:

$$MCTR = \left(\frac{\delta VaR_p(w)}{\delta w_1}, \dots, \frac{\delta VaR_p(w)}{\delta w_N}\right)^T = \frac{\delta VaR_p}{\delta w} = -\left(\mu + \frac{\Sigma \times w}{\sigma_p} \times Z_{1-\alpha}\right),$$

ACTR, asset contribution to risk, indicates the contribution of each asset to the portfolio risk and its mathematical representation is:

$$ACTR = diag(w) \times MCTR = -diag(w) \times \left(\mu + \frac{\Sigma \times w}{\sigma_p} \times Z_{1-\alpha}\right)$$

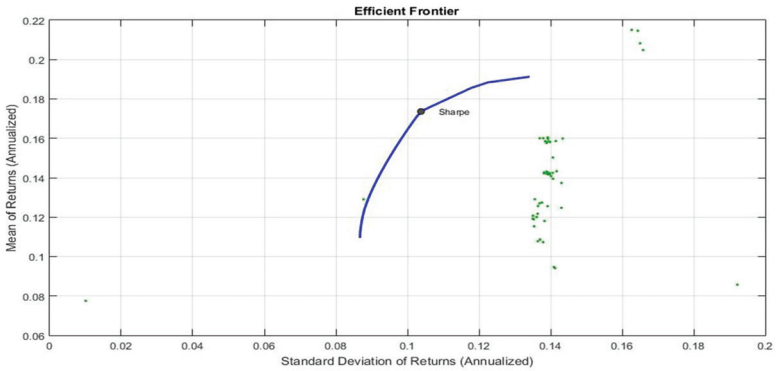
PCTR, percentage contribution to risk: share of asset's risk in risk of portfolio:

$$PCTR = \frac{diag(w) \times MCTR}{VaR_p} = -\frac{diag(w) \times \left(\mu + \frac{\Sigma \times w}{\sigma_p} \times Z_{1-\alpha}\right)}{VaR_p};$$

Scientific novelty. The scientific novelty of the research is the analysis of eligible asset classes for pension funds under looser boundary conditions than imposed limits by law based on the mean-variance portfolio optimization model where marginal contribution to risk (MCTR), asset contribution to risk (ACTR) and percentage contribution to risk (PCTR) are used as diversification measures to describe the relationship between asset optimal weights and portfolio risk. The proposed analysis can be used in optimal management of pension funds for asset allocation purposes.

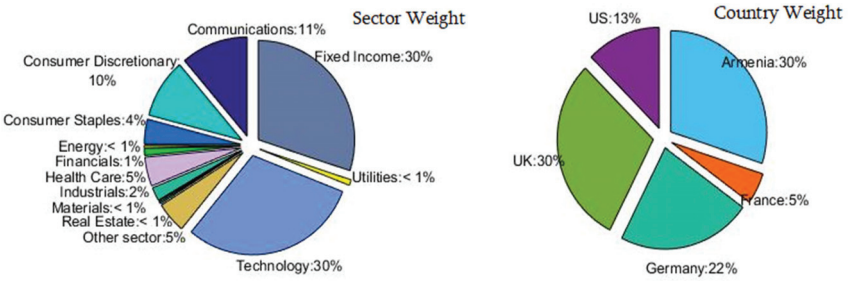
Analysis. Optimal portfolio assessment and risk budgeting is done in MATLAB program. An optimal portfolio is built under different restrictions. The optimal portfolio is defined to be the portfolio corresponding to Sharpe's maximum coefficient [Alexander et al., 2015, 111-135]. For the construction of the portfolio, the unhedged returns are first calculated based on the return of assets in Armenian drams. Optimal portfolios are constructed using restrictions based on the currency of the asset in which the trade is conducted as well as restrictions on country limits. As there are missing data in the asset price time series, the expected return and covariance matrix are estimated by the missing data method, and then the covariance matrix is filtered based on the random matrix theory. For the optimal portfolio, risk statistics are assessed by currency, country and sector. In order to evaluate the optimal portfolios, investments in ETFs (Exchange traded fund) and RA government bond indices / ETF and index, currently active / are considered. Data are monthly for the period ranging from 01.01.2014 to 28.02.2022, Bloomberg. The selection of ETFs is done according to the following criteria: monthly price, Morningstar Performance Rating 4 and 5 stars, region: USA, Great Britain, France, Germany, market capitalization of more than 100,000, 3-month average volume of more than 10,000, turnover coefficient is greater than 1 /the source is https://finance.yahoo.com/etfs/. As a result, 48 ETFs are selected with the above parameters. The indices of treasury securities with up to one-year remaining time to maturity (TBI) and more than 5 years of remainning time to maturity (G5I) are considered for AMD investments (www.cba.am}. Restrictions by country and currency are defined as follows: as a lower limit - a minimum of 5% in each country, and in the case of a currency - 10%; the return on risk-free assets in this paper is estimated at 8%. As a result of the optimization, based on the expected return-risk assessments for the above assets, the efficient frontier is calculated, Chart 1. The diagram also shows Sharpe's optimal portfolio.

Chart 1. Effective limit. Sharpe coefficient: 0.26



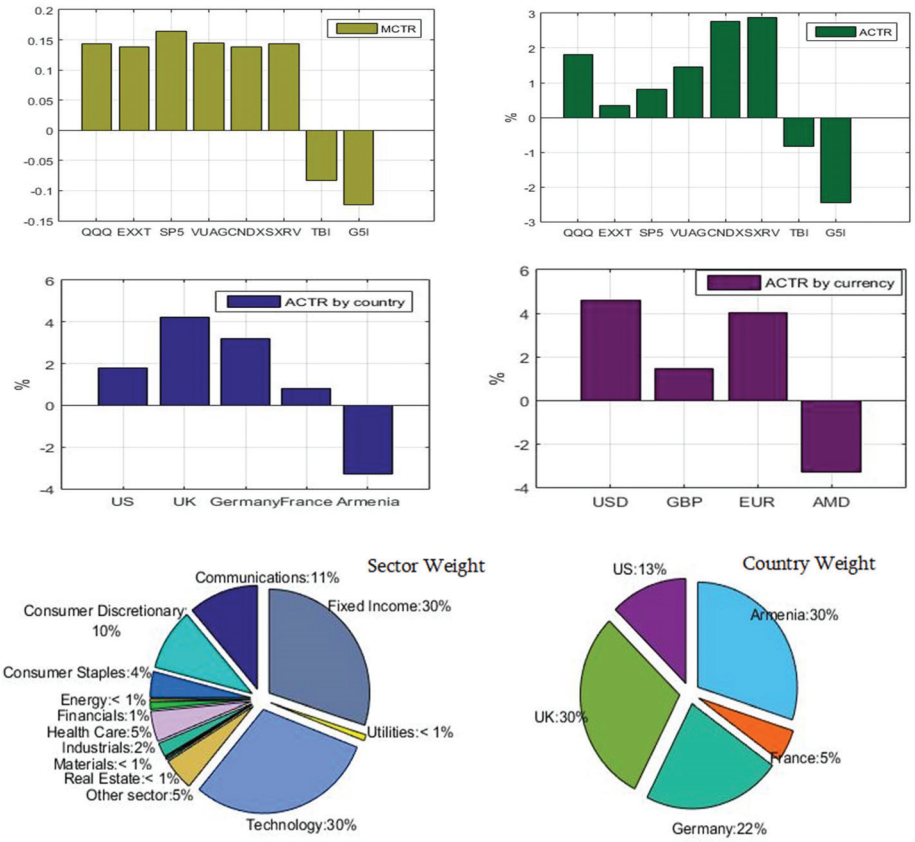
The graphs in Chart 2 show the optimal weight distribution of the Sharpe portfolio by sector and country.

Chart 2. Distribution of Sharpe portfolio weights by country and by sector



Next, graphs in Chart 3 show the MCTR and ACTR by country and currency.

Chart 3. MCTR ACTR by country and currency



Next, graphs in Chart 4 show the MCTR and ACTR by country and currency.

Chart 4. MCTR ACTR by country and currency

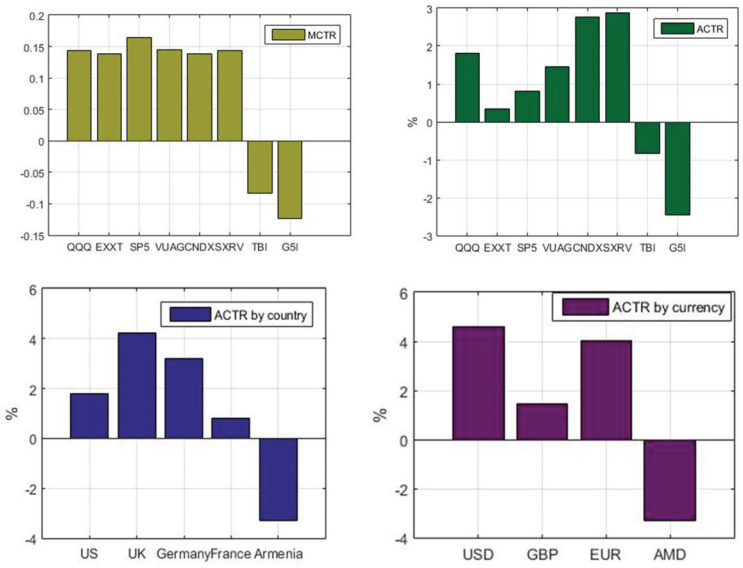
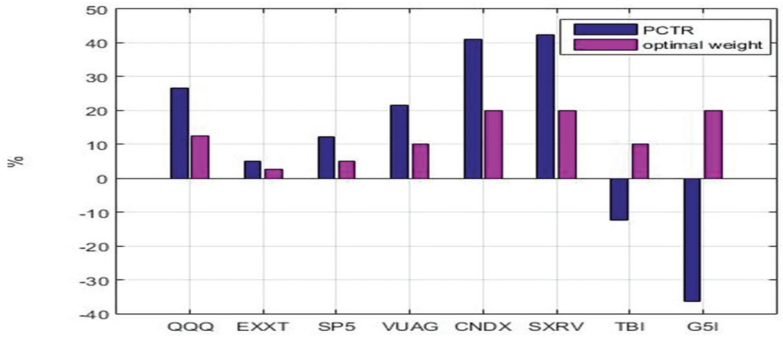


Chart 4 also shows the asset sensitivity to portfolio risk. For example, a change in the weight of the QQQ index in the MCTR chart results in a 0.14-point increase in portfolio risk. Though, in the optimal portfolio TBI and G5I together make up 30% of the portfolio, they play a role of diversifying assets, reducing the risk of the portfolio. The ACTR diagram shows how much risk comes from each index and shows the risk distribution of the portfolio. In ACTR by country and currency chart the risk is the share of assets by currency and country. 4.58% of the 6.77% risk of the portfolio comes from USD, 1.45% from GBP, 4.03% from EUR, and -3.29% from AMD, moreover: 1.8% of the risk comes from the USA, 4.23% comes from Great Britain, 3.21% from Germany, 0.82% from France, and -3.29% comes from Armenia. Next, in Chart 4, the share of each asset's risk in the optimal portfolio risk is calculated.

Chart 5 shows that TBI makes up 10% of the optimal portfolio, but the latter plays a risk-reducing role. In parti-cular, the weight of TBI risk in the total portfolio is -12-26%. The same applies to the G5I index. As a result, optimal portfolio management can have a significant impact on portfolio risk diversification. Depending on the share of assets in the portfolio, the de-pendence between the asset and the portfolio, as well as the risk of the asset, the participation of a given asset in the total risk of the portfolio is different.

Chart 5. Percentage of PCTR risk, optimal weights



Conclusions. The optimal portfolio is built under the restrictions, and portfolio corresponding to Sharpe's maximum coefficient is considered as the optimal portfolio. Then, a study of the diversification level of the portfolio is carried out by using the marginal contribution to risk (MCTR), asset contribution to risk (ACTR) and percentage contribution to risk (PCTR) as measures. As a result of the analysis, it turned out that the AMD assets play a role of diversifying assets in the portfolio. In particular, in contrast to foreign currency assets, the risk-weighted participation of AMD assets is negative, which leads to a reduction in the overall risk of the portfolio.

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Optimal allocation of pension funds and risk budgeting

Key words: optimal portfolio, risk budgeting, diversification

An optimal portfolio is built under various restrictions on the investment of pension fund assets. Greater attention is paid to the level of optimal portfolio diversification: sensitivity of the risk measure to asset weights and assets' correlation with the portfolio are used to represent the relationship between asset weight and portfolio risk. The Markowitz model setup with equality and inequality constraints is used to evaluate the optimal portfolio. Optimal portfolio assessment and risk budgeting are estimated in MATLAB. The optimal portfolio is considered to be the one which has the highest Sharpe ratio. As a result of the optimization, the efficient frontier and Sharpe ratio are estimated, also the optimal weight distribution of Sharpe portfolio by sector and country is calculated. Then, a study of the diversification level of the portfolio is carried out, by using the marginal contribution to risk (MCTR), asset contribution to risk (ACTR) and percentage contribution to risk (PCTR) as diversification measures.

PROBLEMS FINDING OBJECTS AND MONITORING THEM IN CASE OF OBSTACLES

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Keywords: Object detection, object tracking, computer vision, Haar cascade

Introduction. In today's world, as technologies evolve with exponential speed, almost every aspect of our lives becomes more and more dependent on AI. One of the most growing AI fields is computer vision. Using computer vision tasks like image processing, object detection, object tracking, and text recognition makes tremendous achievements. One of these achievements is the autonomous security systems, which are heavily used in our daily lives. These use-cases vary from simple home door lock systems and/or smartphone AR camera toys to highly secure government applications and national bank security systems. Object detecting and tracking in an environment with a presence of multiple obstacles is a very common task, but the existing solutions sometimes can be very expensive in computational resources and expensive in general. This paper addresses several concepts of image processing, object detection, and object tracking and suggests optimal use cases for each of the spoken concepts, and also suggests the best general solution for this task.

Methodology. Computer vision is an interdisciplinary scientific field that deals with how computers can gain high-level understanding from digital images, videos, or live footage, for example, from security cameras. From the perspective of engineering, it seeks to understand and automate tasks that the human visual system can do. Computer vision is concerned with the automatic extraction, analysis, and understanding of useful information from a single footage frame or a sequence of frames. It involves the development of a theoretical and algorithmic basis to achieve automatic visual understanding. As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras, or multidimensional data from a medical scanner. As a technological discipline, computer vision seeks to apply its theories and models for the construction of computer vision systems [Roshtkhari, Levine, 2016, 239-255]. Computer vision suggests solutions for a variety of problems some of which are listed below:

Recognition.

- Object recognition
- Object classification
- Object localization

- Frame segmentation
- Object detection

Recognition. In computer vision, recognition is a general term that describes the process of analyzing, classifying digital images and identifying different objects in them. These three main problems of object recognition in the digital frame often create confusion about the meaning and difference between these terms.

Object recognition. The term object recognition is mainly used to encompass both image classification (a task requiring an algorithm to determine what object classes are present in the image), as well as object detection (a task requiring an algorithm to localize all objects present in the image) tasks [Sonka, Hlavac, Boyle, 2008, 131-188].

Object classification. Take a look at Figure 1 shown below:

It's obvious that there is a dog in the image. Let's pause for a moment to analyze how we recognize it instantly. As we already have knowledge about how a dog looks, we can classify the object type shown in the picture above as a dog. And this is a basic concept of the purpose of object classification (Figure 2).

Figure 12

This example describes a case where there is only one main object shown in the image. In the case of having multiple objects in the image, the object recognition algorithm must iterate over all possible predicted classes for every object to correctly classify all the objects. After all classification jobs are finished, the object recognition algorithm stumbles upon determining objects' locations in selected frame of the current content.

Object localization: Object localization refers to identifying the location of one or more objects in an image and drawing a bounding box around their extent (Figure 3).

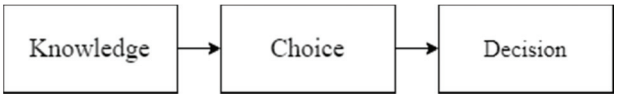


Figure 13. The basic concept of object classification

Frame Segmentation: When we have an object recognition problem, before applying the object detection, classification, and even localization algorithms, it is crucial to

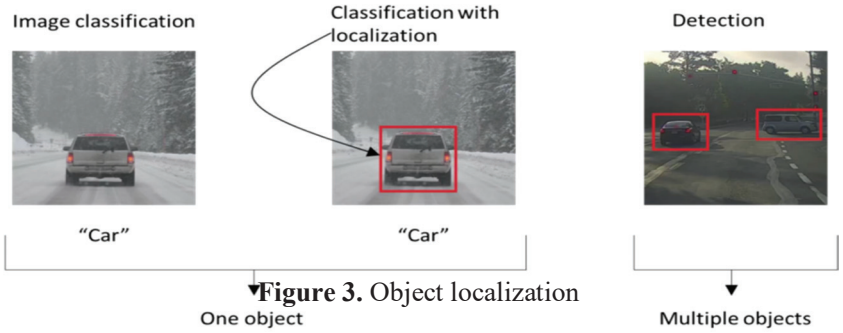


Figure 3. Object localization

understand the consistency of the selected frame firstly. To solve this problem, we rely on the concept of frame segmentation. The algorithm of frame segmentation is basically dividing the selected frame into segments and individually analyzing them to get the essential data for the particular problem. The reason for this procedure is to get rid of the unnecessary data that the selected frame possibly can content.

It is common knowledge that any image consists of a set of pixels. The way the frame segmentation works is by grouping together the frame's pixels that have similar signatures: color range, pixel location, etc. (Figure 4).

Object Detection: As described above, the object localization task is responsible for the single object localization in the selected frame. In the case when the object recognition algorithm must deal with multiple object localization problems, object detection concepts can be used. Object detection does multiple object localization in a single frame [Luo, Xing, Milan, Zhang, Liu, Kim, 2021, 99-129]

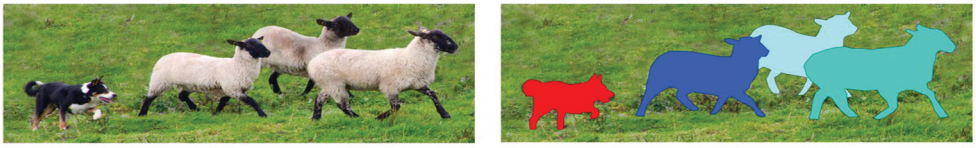


Figure 4. Frame segmentation example.

Literature review: Summing up the computer vision recognition problem. Now we have a theoretical understanding of how each of its main components work.

- Object classification - classifies the content of the current frame
- Object localization - locates a single object in the current frame
- frame segmentation - creates a pixel-wise mask for each object in current frame
- Object detection - locates multiple objects in the current frame

In Figure 5 you can see examples of each problem.

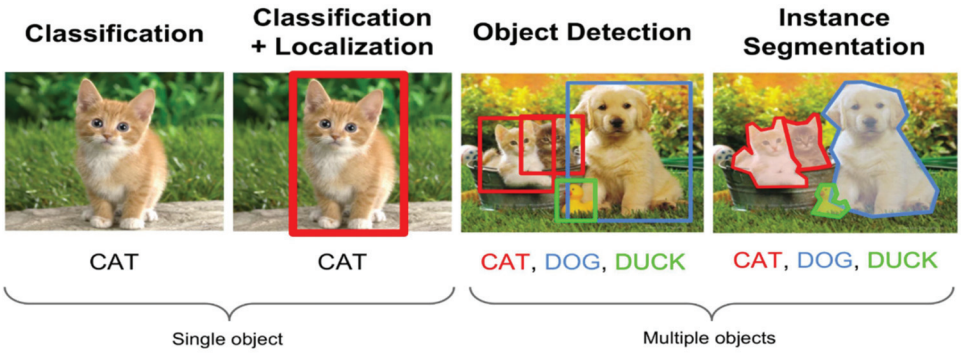


Figure 5. Examples of each computer vision problem

Economic importance: In modern organizations, it is very important to ensure the security of the organization's premises, which is why it is often necessary to hire a large number of security personnel. By replacing them with cameras and the possibility to follow the trespasser, in the long run the organization will avoid the consequences of human error, which will result in minimization of the security-related losses. Moreover this article is offering multiple solutions for decreasing the possibility of the intruder to hide behind different objects from the cameras and ensuring the security of the restricted area.

Analysis. In an environment with a presence of a lot of obstacles, the object detection and tracking problem can be very difficult and in some cases even impossible. To solve this problem some solutions are described below. These solutions may vary in different scenarios.

- Separation of the object of interests from the entire frame
- Generating rough 3D map by one frame and descriptions for each detected object
- Switch the view if it is applicable for the problem

Possible solution 1: This is a very simple solution for this problem, but it is very handy in many scenarios. The separation of the object of interest can be done in many ways. One of these ways is using object detection based on object color and shape. This method can be used in cases when the object of interest has one main color and has a non-complex shape (for example, “red ball” - the object has a circular shape in a 2D frame and it has the one main color, which is red). For separation, the object detection algorithm needs to be initialized with the object of interest, then the tracking algorithm needs to extract that object from the mainframe and consider the case with an empty rectangle and the “shadow” of the tracking object (Figure 7). As you can see, the tracking algorithm (left side) is using the white shadow of the actual red object. The other way to consider only one object from the whole frame is by using Haar cascades. A Haar cascade is a machine learning-based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images. Let’s discuss an example with a face tracking problem. To train the

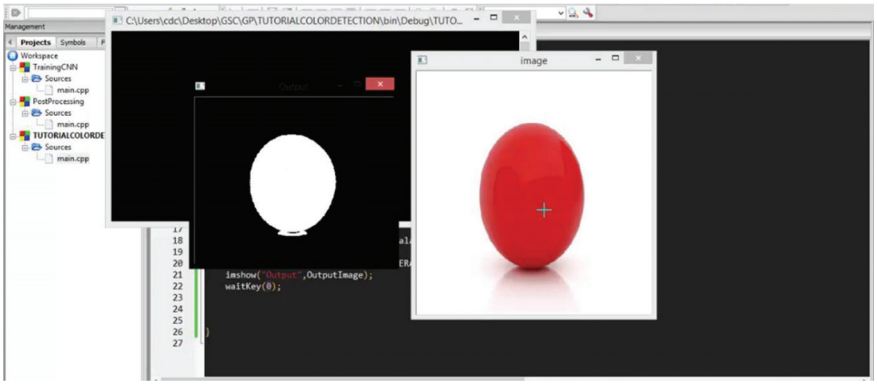


Figure 7. Creating shadow of the red ball.

classifier, the algorithm requires a large number of positive images (images of faces) and negative images (images without faces). After that, we must collect features from it.

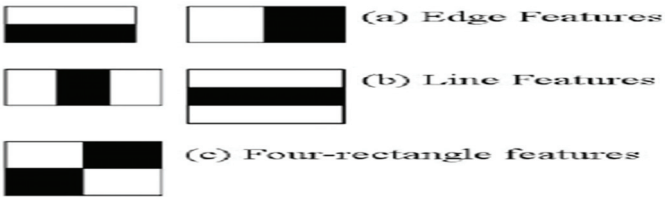


Figure 8. The Haar features

Haar features, as seen in Figure 8 below, are used for this. Each feature is a single value calculated by subtracting the number of pixels beneath the white rectangle from the sum of pixels beneath the black rectangle. (Just imagine how much computation does it need? Even a 24x24 window results in over 160000 features). But usually, the non-face area of an image makes up the majority of the image. As a result, using a simple method to verify whether a window is not a face region is a better idea than analyzing the whole image in order to find the face. If it isn't, throw it out in one go and don't bother processing it again. Instead, concentrate on areas where a face may appear. We may spend more time testing potential face regions in this way. To avoid this let's use the cascade of classifiers. Instead of applying all 160000 features on a window, the features are grouped into different stages of classifiers and applied one by one. If a window fails the first stage, discard it. So, the window, which passes all stages is a face region [Jalled et al., 2016, 1-6]. After determining the face region, the tracking algorithm needs to just cut it from the whole frame and use it like it was used in the above example with a ball.

Possible solution 2: The main goal of this solution is to generate information about the 3D objects in 2D video footage. For example, the video frame shows the big empty room with a square floor. The camera that captures all is mounted in the nearest

top right-hand corner of the room. In the middle of the room, there is a solid box. Also, there is a moving blue ball in Figure 9.

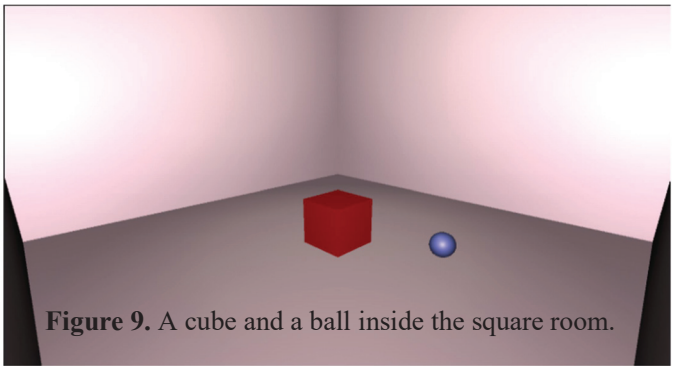
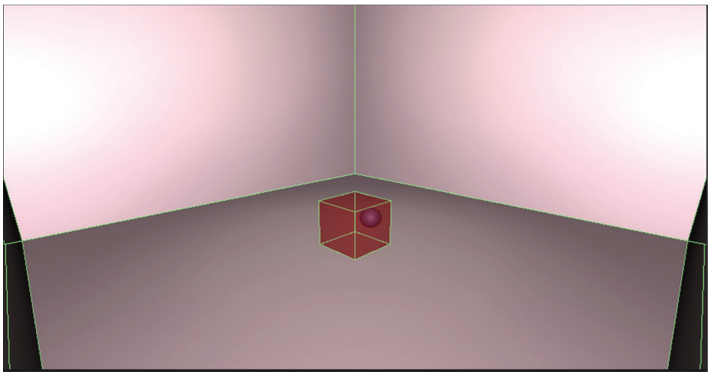


Figure 9. A cube and a ball inside the square room.

When the ball gets behind the cube, the object tracking algorithm will lose the target and it can't be recovered automatically. But what if the algorithm can determine that the obstacle is a cube with certain dimensions and the ball is behind it (Figure 10).



For this task, the algorithm must use several techniques. First of all, it must determine the 2D cube representation as a 3D object to calculate the size of edges. Then the algorithm must use egomotion to determine possible positions of moving the ball after it comes out from the behind of the cube. After that, it must initialize several threads for motion tracking algorithms for each possible position of the frame in which the ball can appear after coming out. When one of the algorithms catches the ball, the other threads must be killed to save the processing resources.

Possible solution 3: Now let's discuss the case when the ball goes behind the cube but the object tracking algorithm can't determine the 3D sizes of the cube and can't perform an egomotion algorithm. The simplest and obvious solution to continue object tracking is to find another viewpoint so the cube doesn't overlap the ball in the selected frame (Figure 10). The main problem of this solution is to calculate which viewpoint to

choose. For this purpose, the object tracking algorithm must use a very well-trained neural network because the object can have a non-symmetric shape.

Conclusion. Computer vision has many use cases and many algorithms for each possible problem. They are based on human vision and decision techniques. For object detecting and tracking in an obstacle-full environment, the algorithm must be

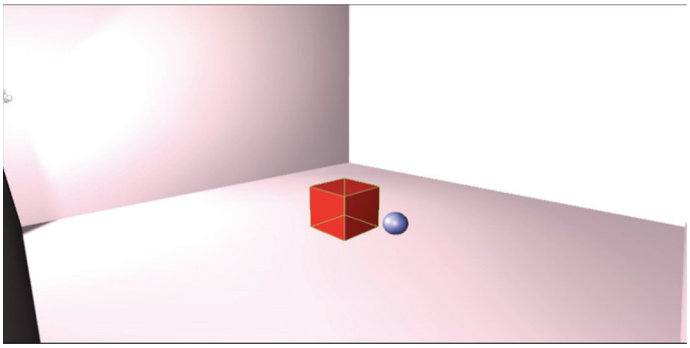


Figure 10. The other viewpoint in the room.

dynamically adjustable and must combine several solutions. It must handle as many corner cases as it can, but it doesn't need to be very complex to save some computing time and resources. We have spoken about 3 simple solutions for this problem, but there can be more solutions depending on selected environment and object of interest.

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Narine Kabakulakyan, Robert HAKOBYAN

Problems finding objects and monitoring them in case of obstacles

Keywords: object detection, object tracking, computer vision, Haar cascade

Object detection and tracking in an environment with obstacles is a common problem, but existing methods can be costly in terms of processing resources and expensive in general. This paper investigates the object detecting and tracking techniques using object recognition, object classification, object detection etc. Moreover it suggests a possible solution for object tracking with obstacles in the frame content using computer vision tools. Automation of tracking people who entered restricted areas in any organizations can lead to long-term profits, as the need to have a large number of security personnel will be lost. As a result this approach may prevent serious consequences from happening. Furthermore, this article provides different approaches for reducing the intruder's ability to hide behind various objects from the cameras and maintaining the prohibited area's security.

MINIMIZING AGING EFFECTS IN HIGH VOLTAGE SUPPLY DETECTION CIRCUITS

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Key words: CMOS structure, ageing effects, supply voltage detection circuit

Introduction. In modern integrated circuits, the length of the transistor channel continues to shrink to 3 nm and downward. Such changes allow the chips to be more functional due to the increase in the number of transistors in the same area. Reducing the size of transistors causes problems with the production of thick oxide transistors for com-panies producing and purchasing ICs. The absence of thick oxide transistors, in turn, causes many problems for the functionally and reliably operating circuits, which are reflected in the high-voltage detection circuit. At the beginning of the operation of the ICs, the supply voltages are established after a certain period of time. According to the power sequence, the low supply voltage is established at the beginning, after which the high supply voltage is asserted. It is very important to have a circuit in the IC that allows to detect the assertion of high supply voltage with the help of low supply voltage. (Fig. 1) shows the classic scheme of high supply voltage detection. The input to the circuit shown in the figure is connected to the high supply voltage which rises from 0 level to VDDH level over time. It is generally accepted that a high supply voltage is established when the voltage level is above 0.7 × VDDH. Problems with the undesirable effect of aging arise here because the values of the gate-bulk and gate-source voltages of the M1 transistor exceed the allowable threshold. The application of such voltages on device terminals results in degradation of linear and saturation mode currents which shows that some of the charge carriers have smashed into the oxide layer and a prolonged operation at this state will cause the oxide layer to break which in turn will cause a functional failure and unreliable operation conditions.

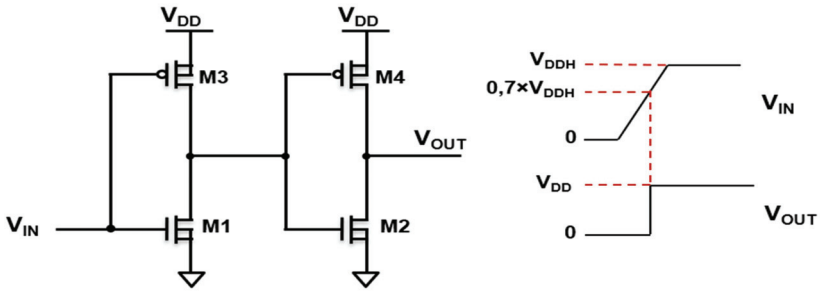

Figure 14. Power supply detection circuit using CMOS structure

The problem and proposed solution. The proposed scheme is based on the classic high-voltage voltage detection circuit with one transistor difference shown in Figure 2.

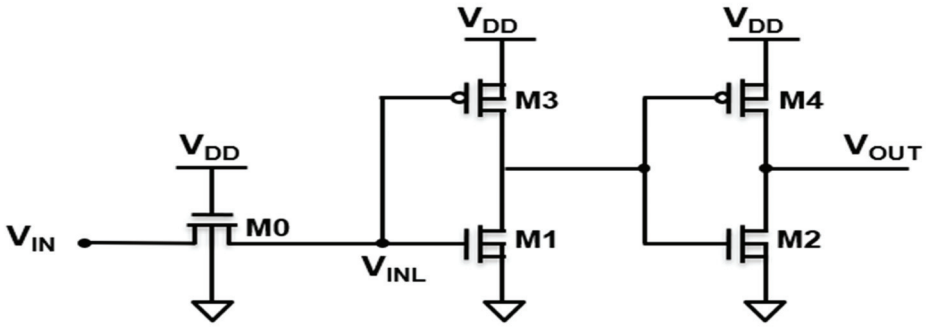

Figure 15. Proposed power detection circuit

In the proposed circuit the added device has its gate always connected to a low supply voltage (V_{DD}), as a result of which as the V_{IN} voltage increases, the V_{INL} voltage also increases. The value of V_{INL} voltage can be increased up to V_{DD}-V_{TH} where V_{TH} voltage is the threshold voltage of transistor M0. The largest value of the difference between the output voltages of transistor M0 is equal to V_{DDH}- (V_{DD}-V_{TH}), which helps to avoid the unwanted effect of aging. As a result, the use of transistor M0 helps to reduce the gate-bulk voltage of transistor M1, which ensures reliable and uninterrupted operation of the aforementioned circuit.

Economic significance. More than ten production masks are used for the production of modern integrated circuits. Most masks are used to create metal layers to provide connections between the layers. In the process of photolithography, different masks are needed to create the gates of different transistors. Each of these masks can cost up to several million dollars, significantly increasing production costs. As technological processses are declining in size, the required metal layers are increasing, it is necessary to reduce the variety of types of transistors used in the IC and to use the same type of transistors in different parts of the circuit. For this purpose, MOS transistors with thick oxide gate have been removed in many small technological processes, and standard thin oxide transistors are used even in analog blocks. Thick oxide transistors are more resistant to the effects of aging due to the high supply voltages at the input/output junctions. In the absence of these transistors, it is necessary to obtain solutions where thin oxide transistors will perform uninterrupted work for as many years as possible.

Simulation results. The proposed circuit is designed using "SAED 14nm" technology [3] and "Custom compiler" software [4]. The modeling was performed using the HSPICE tool [5]. Low supply voltage (VDD) is 0.75 V, High supply voltage (VDDH) is 1.1 V. Figure 3. shows the output signal of the designed circuit.

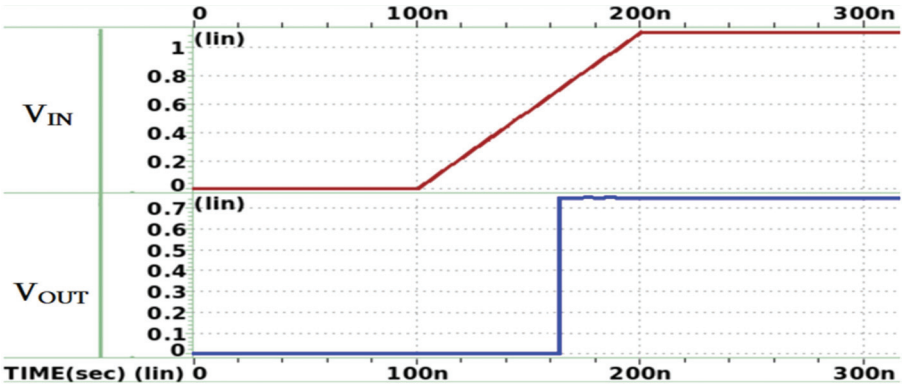

Figure 16. Input/output voltages of the proposed circuit during a transient simulation

Figure 4 shows the degradation of currents flowing in the saturation mode of transistors in the circuit without an ageing compensating transistor expressed in percentages.

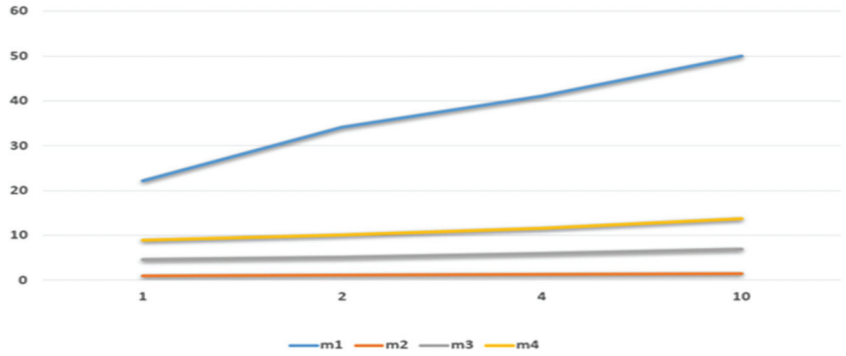

Figure 17. Percentage of current degradation vs Years of usage

Figure 5 shows the degradation of currents flowing in the saturation mode of transistors in the circuit with an ageing compensation transistor.

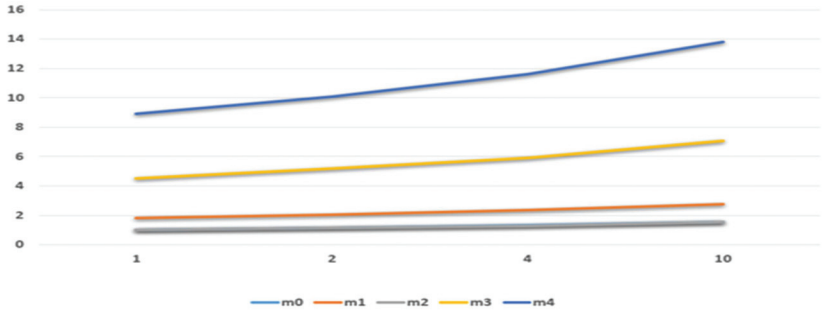

Figure 5. Percentage of current degradation vs Years of usage

Conclusion. A high voltage detection circuit without thick oxide transistors has been designed for the 14-nanometer SAED technological process. A method for reducing the effects of ageing in the circuit has been proposed, which has reduced the maximum degradation current of the degraded transistor from 50% to 14% in the high-voltage detection circuit. The obtained degradation corresponds to the requirements of modern integrated circuits. Such a result was obtained by increasing the number of transistors in the circuit, which in turn implies an increase in surface area. The solution does not cause additional complications at the schematic design stage.

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Hrayr SAHAKYAN, Sergo HARUTYUNYAN, Vladimir MKRTCHYAN
Minimizing ageing effects in high voltage supply detection circuits
Key words: CMOS structure, ageing effects, supply voltage detection circuit

The ageing effects and their impacts in modern SoC circuits linked with continual shrinkage of technological processes and unavailability of thick oxide transistors were studied. These effects are more widespread in analog and mixed signal circuits located at input/output nodes of the system. Studied high supply voltage detection circuits showed that in order to have a long-lasting stable performance a solution is required to minimize the effect of overvoltage on thin oxide devices. A solution is proposed which provides protection to the power detection circuit from high voltage supply stress and greatly reduces the ageing effect thus maintaining the longevity of reliable operation.

PECULIARITIES OF APPLICATION OF ANALYSIS METHODS IN TEACHING "THEORY OF FINANCE"

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Key words: qualitative method, quantitative method, economic-mathematical method, financial planning, analysis, economics, finance

Introduction. Teaching economics to students in universities requires knowledge of different methods and application. The use of successful methods in economics courses creates preconditions:

- Activate and make students' individual work independent;
- Identify students' abilities, skills and abilities;
- Develop the knowledge of future economist financiers and promote application features.

Methodology. Modern economics uses many analytical methods. Some of them are considered general and can be used in any branch of economics, while others have features and can be used only in individual branches.

In general, studies of teaching experience in finance do not clearly suugest which method of analysis should be used in a given situation. Therefore, each teacher in his / her field should be able to master and use the most common methods, present their advantages and disadvantages, as well as the conditions of application. This conclusion is confirmed in practice, when experienced teachers of finance use a limited number of the most common methods. It should also be noted that the chosen methods should correspond to the nature of the branch affiliation of the profession.

Literature review. In the broadest sense, a method is a way of solving a certain problem, a method [Dialectics, 1989, 85].

In economics, the method is described as a way of researching the subject of analysis. Therefore, economic and financial processes and phenomena are considered in interdependence.

The method of analysis is considered as a system of rules, which guarantees the effective application of the method.

The entire set of methods and methodology is the methodological basis of teaching.

All known methods can be classified into 2 major groups:

- qualitative (logical),
- quantitative.

Analysis. Qualitative methods are those methods that are based on logical thinking and the professional orientation of the teacher.

. Qualitative methods have the following classification:

• method of comparison
• method of building analytical spreadsheet system
• method of expert assessments.

All the listed methods can be used in the practical lessons of the "Finance Theory" course, in particular as a result of discussing the following topics:

• "Budgetary relations and budget system",
• "Loans and credit system",
• "Financial Institutions and Markets".

Through the qualitative method, the student is able to get complete information about the object under study.

Quantitative analysis of the obtained data is carried out by means of a quantitative method, which is presented in the form of tables and graphs [Adamov, 2015, 53].

The quantitative method is used with great success in the analysis of the indicators of loans and borrowings provided by commercial banks. At the same time, the task is to choose the most effective alternatives.

Quantitative methods are classified into the following groups:

• accounting,
• statistical,
• economic-mathematical,
• classical methods of analysis.

It should be noted that the listed methods have also found their application in foreign practice outside Armenia.

The widespread use of quantitative methods can play a significant role in the study of the methodological basis of financial activity. Based on the assertion that a high level of competition is an inseparable element of a market economy, then each economic entity needs to properly assess the financial condition of the enterprise and implement measures to ensure normal development.

It is well known that finance theory consists of a number of principles through which the student can demonstrate a systematic approach to discussing the issues of effective redistribution of funds. Particularly, in the finance theory uses the quantitative methods by which alternatives are evaluated, the most important financial decisions are implemented.

In sum, we may conclude that students are able to make comparative analyzes and compile tables through qualitative-quantitative methods. The use of these methods is also recommended to apply not separately, but jointly: the combination of methods allows the application of theoretical knowledge in practice, using statistical data.

The use of the mentioned methods is strongly used in the theory of finance, from that point of view and considering 3 main reasons:

- Requirement for effective cash management;
- Organizing a successful business in the business world;
- Making informed decisions that can have a positive impact on the organization as well as on the country's economic policy.

As a result of the analysis, students can gain a variety of skills through the combination of quantitative and qualitative methods in the perspective of developing the methodology of the "Finance Theory" course and other related courses. Integrated qualitative-quantitative methods can be presented in the form of the following integrated environment, which will strengthen the connection between education, science and "production".

State apparatus - education sector - science sector - industrial sector - business sector. This chain, which can be used effectively during the course, ensures the integrity of the finance methodology.

The use of quantitative and qualitative methods during teaching is the basis for the methodological orientation of the teacher [Barlyabev, 2015, 48-59].

Currently, the use of financial planning methods in general economics, particularly in financial courses, is growing:

- computational analytics,
- normative,
- balance sheet,
- method of optimizing planned decisions;
- economic-mathematical modeling method.

The comparison method is a method of combining 2 and more studies by which patterns and features can be distinguished [Analitikaplus, 2021].

The method of comparison can be used in particular in the analysis of the indicators of the revenue-expenditure parts of the RA state budget, which cover different periods, allow to carrying out a comparative analysis.

In financial planning we use the tools of normative-economic-mathematical methods more. The normative method is one of the simplest methods in financial planning, and its essence is as follows: the demand for sources of financial resources of

economic entities is calculated on the basis of pre-defined norms and technical-economic norms [Barlybaev et al., 2015, 15].

Norms are the tax rates, depreciation rates, working capital demand. The purpose of this method of teaching is to enable students to calculate the demand for financial resources on the basis of a specific organization.

In our opinion, none of the current methods of financial planning alone can provide absolutely accurate planning results. The combination of all the mentioned methods can help to record positive results. The teaching process also uses the method of financial planning indicators, which reveals the main patterns.

In financial planning, financial indicators are calculated and their correlation is determined.

In the "Financial Theory" method, the method of financial indicators can be used to assess the economic activity of enterprises and organizations. These indicators are classified as:

Ability of solvency and liquidity,

- business,
- work efficiency,
- market characteristics of the organization.

The use of this method provides an opportunity to study the financial situation of the organization in more depth, to study the conditions of deterioration of the financial situation, to develop more effective measures related to the improvement of the financial situation.

We believe that in teaching process the method of financial indicators is quite efficient, however, it is advisable to use the indicators that may are among priorities in assessing the financial condition of the organization.

The method of financial indicators can be used to assess the financial condition of commercial banks, which is used in banking management to create opportunities during financial and economic crises.

Now the most popular method in economics is the method of economic-mathematical modeling, which also belongs to the methods of financial planning and describes economic processes [Laenko, 2016, 52-55].

When using this method, a connection is established between the financial indicators and the factors that determine it. Communication is expressed through an economic-mathematical model. The economic-mathematical model is a clear mathematical description of the economic process. In this case, the factors that describe

the structure of a particular economic phenomenon are described, the patterns of change. When using this model, equations, graphs, tables are used, only the main factors are included. We may conclude that the quality control of the model and the efficiency check is required to improve the methods in practice.

It should also be noted that complex models that use multiple criteria are usually unclear in practice.

Through economic-mathematical modeling, it is possible to create an automated financial management system [Adamov, 2015, 28].

The use of planning methods can be considered effective only if their principles are observed:

- Principle of unity, which implies that planning should be systematic in nature;
- Principle of coordination of plans of separate subdivisions;
- Principle of participation;
- Principle of flexibility [Laenko, 2016, 52-55].

It should be noted that the use of financial planning methods is separate from marketing research and is based on the production rather than the sales plan.

Starting from the last decade of the 20th century up to day, the problems of planning have become quite complex. Conducted empirical study has clearly shown that in the context of market relations, several possible options for the development of phenomena must be considered and appropriate planned calculations made.

Conclusion. The listed methods provide an opportunity to take into account the factors that may affect the activities of the organization, as well as to provide options to prevent the negative impact of these factors on the activities of the organization.

The use of these methods in the course of "Theory of Finance", in our opinion, will significantly increase the level of perception by students, which in turn will help to increase the average grades of students in this course, as well as the acquisition of practical skills.

In order to conduct a comprehensive assessment during teaching, not only the set of traditional methods is used, but also the application of specific approaches in the form of alternative methods.

In this article we have tried to single out the most popular and modern methods, they are quite different and attempt to complement each other.

The use of these methods of financial analysis in the teaching process provides an opportunity to clearly assess the financial condition of enterprises, commercial banks, predict the future, make sound management decisions. As a result of the combined

application of the methods, students acquire the appropriate skills and abilities to work in the field in the future.

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The Peculiarities of Application of Analysis Methods in finance theory teaching

Key words: qualitative method, quantitative method, economic-mathematical method, financial planning

The article touches upon the peculiarities of the application of analytical methods in the finance theory teaching. It explores the most common methods and their classification features. Particularly, qualitative methods are discussed, which are based on logical thinking and analyst's professional orientation. The methods listed in the article can be used during the practical trainings of the "Financial theory" course. The article also refers to the classification of quantitative methods and their widespread use, which can play a significant role in the study of methodological bases of financial activities. Since the high level of competition is an inseparable element of a market economy, it is necessary for each economic entity to correctly assess the quality of the enterprise and to prevent bankruptcy. Through qualitative and quantitative methods, students are able to make comparative analyzes and compile tables. The application and combination of these methods makes it possible to apply theoretical knowledge in practice, using statistical data. The most talked about was the method of economic-mathematical modeling which also belongs to the list of financial planning methods and when using this method, a connection is established between the financial indicators and the factors determining it.

PROSPECTS FOR THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN AGRICULTURE IN ARMENIA

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Key words: agriculture, renewable energy sources, alternative energy sources, industry

Introduction. In recent years, there has been active development of alternative energy sources. The leaders in this field are the countries of Europe and the USA, Germany, China, and Japan. Having achieved record figures for increasing the share of renewable energy sources in its energy balance, Germany has for many years continued to be the leader among the EU countries in terms of CO2 emissions into the atmosphere. The Germans, consistently closing nuclear power plants, began to increase coal imports from Russia to make up for the missing electricity. A paradoxical situation was formed: to «green up» its energy sector as much as possible, Germany, on the contrary, increased "dirty" coal generation. Even in Denmark, that switches to renewable energy by 2050, disputes about economic efficiency of renewable energy sources leads to skepticism. Recently, there have been too many high-profile examples of projects that have not been implemented that are related to renewable energy [Khomushku et al., 2019, 67-72].

One of the main disadvantages of renewable energy sources is the dependence on external factors (the presence of solar radiation, wind, and so on) and the instability of electricity generation. To compensate for the differences that arise, again, it is necessary at the expense of basic generation. Technologies related to the accumulation and storage of renewable energy sources can solve this fundamental problem. It is the creation of industrial storage devices that can accumulate very large amounts of energy that will make it possible to make a final and total transition to «green» energy.

Methodology. We use theoretical and empirical research methods. As a result of the work, we made references to scientific materials of such authors as Khomushku O.A., Kuzhuget D.V., Platashin V.S., Shevchenko T.V., Kodirov R.S., Kiryigitov B.A., Libontova T.S., Akulova A.S., Galushko M.V., and others. Each of these papers examines in more detail one of the issues related to the topic of this study. Thus, the literature used revealed such issues as alternative energy sources in agriculture; bioenergy in the sustainable development of agriculture, problems and prospects for the development of the industry; prospects for the development of renewable energy sources; economic efficiency of alternative energy use, and others.

Literature review. There has not yet been a real breakthrough in this direction. Although the existing developments, which are mainly at the startup level, have been

actively conducted for more than one year. If modern lithium-ion batteries give only about 60% of the electricity that was spent on charging them, then this indicator exceeds 90% for supercapacitors. The company "TEEMP" is going to produce up to two hundred thousand supercapacitor cells per year. These modules have already been able to pass successful pilot tests in public transport, on the railway, and in aviation. Large corporations that conduct research in the field of developing unique models of energy storage devices do not lag behind global technological trends. According to the reports of the analytical company Navigant Research, the annual volume of the global electricity storage market will amount to about eighty-three billion dollars in 2025 (annual growth rates - up to 60%). Moreover, almost a third of this volume will fall on commercial and industrial enterprises, industrial equipment, and households [Rednikova, 2020, 31-36].

The size of the Armenian storage market is estimated from $300 million to $800 million per year. That is why supporting the formation of a new high-tech industry in Armenia, which is connected with energy storage systems and their components, is a very important task today. At the same time, one of the main drivers of the growth in demand for energy storage systems will be an increase in the number of "digital" productions with increased requirements for the quality of electricity. The main effects of the use of energy storage devices in the industry are quite obvious - it is a reduction in losses from the shutdown of production activities during power outages, a reduction in the cost of those connections and the electricity itself, savings on fuel consumption and maintenance of diesel generators, the development of related industries. The effect of creating a new high-tech industry that provides import substitution is estimated at seven to eight billion rubles of revenue per year at a localization level of 50%.

Analysis. From 2020 the level of projected electricity prices will be equal to the "upper" limit for industry and even slightly exceed it. At the same time, this price level will continue to be close to the "lower" limit. It follows from this fact that with a similar price level, problems can begin in the industrial sector. At the same time, the electric power industry as a whole will not begin to feel an excess of funds. Based on all this, there is a consequence that without the introduction of innovative resource and energy-saving technologies, without changing pricing principles, and without optimizing invested programs, the current balance of investors and producers will not be achievable [Platashin, et al., 2019, 75-81]. So, as mentioned earlier, one of the most innovative technologies that can qualitatively increase the efficiency of energy generation and significantly reduce the cost of electricity in the future is distributed energy generation networks based on renewable sources. Alternative energy sources are among the most innovative types of energy used today. The main types of renewable energy sources include hydropower, wind energy, and solar energy. In some places on our planet, there is an opportunity to develop wave and geothermal energy. Distributed generation based on renewable energy sources is one of the most relevant and promising areas of energy

development worldwide. These technologies play a key role in improving the reliability and quality of generated and supplied electric energy. One of the positive arguments for the implementation of distributed generation based on alternative sources is the absence of potential man-made disasters. This factor is especially relevant from the position of strengthening energy security in local territories [Libontova et al., 2019, 56-63]. Power plants based on renewable energy sources can be integrated into centralized networks. This scenario is most relevant when the capacity of a power plant based on alternative sources ranges from several tens of kilowatts to several megawatts. It is also worth emphasizing that with a low power source of energy, it is most expedient to install it nearby relative to the end-user. The most relevant role of distributed sources of energy generation belongs to the case in which the end-user has a remote location. In this case, distributed sources of energy generation based on renewable sources will become the most economically and technically efficient technical solution for the delivery of electricity. The studied technical solution makes it possible to solve several urgent tasks, taking into account the current difficulties in traditional energy, in particular, in power supply systems for remote consumers. The installation of autonomous energy sources based on renewable energy sources makes possible to compensate the cessation of electricity generation by other (centralized) power plants more quickly and in real-time.

One of the main factors determining the feasibility and relevance of integrated distributed sources of energy generation based on renewable sources is the assessment of their effectiveness. Thus, the efficiency of the integration of this technology into the energy balance is determined by several factors. One of these factors is an assessment of potential; rationality of placement on the landscape; environmental assessment and others. Distributed generation based on renewable energy sources is characterized by chaotic construction. In this regard, there is a need to change the network topology due to changes in power flows. To solve this problem, various means of intelligent control or full-fledged distributed generation networks at the borders of individual regions are integrated into the modern distributed generation energy complex. It should be noted that the full potential and efficiency of integration of distributed energy generation systems based on renewable sources can be achieved in the presence of intelligent solutions, in particular, intelligent energy networks [Kodirov et al., 2021, 20-23]. The efficiency of power plants using renewable energy sources is judged by the results of technical and economic calculations. When performing them, the energy and design parameters of the power plants under consideration should be taken into account separately. For comparison, a traditional power plant operating on hydrocarbon fuel (for example, a diesel, steam turbine, or gas turbine power plant of low power) is taken as a possible option. At the same time, it is assumed that a conventional power plant has similar energy characteristics (in terms of power and the amount of electricity generated, taking into account the type of fuel consumed). This approach ensures comparability

of different types of power plants when performing calculations of the comparative economic efficiency of their use for energy supply to an isolated consumer. The determining value from the point of view of assessing the effectiveness of investments in a specific project for obtaining energy from renewable energy sources is cost indicators, primarily the specific cost of capital investments in 1 kWh of installed capacity of a power plant. So, for Russian-made BSU, capital investments in 1 kW of installed capacity range from $200 to $500, depending on the configuration, and for foreign analogs $250-750 / kW.

Concerning the use of non-traditional and renewable energy sources in the national economy, it proceeds from the following provisions. It is believed that the rational use of renewable energy sources and local fuels is important in the implementation of regional energy policy. The need to use these types of energy is determined by their essential role in solving the following problems [Zhaksylykov et al., 2019, 131-141]:

- ensuring sustainable heat and electricity supply to the population and production in the zones of decentralized energy supply, primarily in the regions of the North and territories equated to them. The volume of fuel imported to these areas is about 7 million tons of petroleum products and more than 23 million tons of coal;
- ensuring a guaranteed minimum of energy supply to the population and production in centralized power supply zones experiencing energy shortages, preventing damage from emergency and restrictive shutdowns;
- reduction of harmful emissions from power plants in cities and settlements with a difficult environmental situation, as well as in places of mass recreation of the population.

Conclusion. Unfortunately, alternative energy sources in Armenia today and in the near foreseeable future will not be able to fully replace traditional energy carriers. The energy of the sun is not capable of becoming such a source on an industrial scale for a simple reason – the low density of the solar energy flow. Taking into account the fact that only 2700 hours in year is sunny in Armenia: more than 30% of the republic's territory must be given over to solar power plants to meet its electricity demand. Modern progress in the energy field sets trends in the development of global energy based on renewable energy sources in the context of a promising concept of a "smart" energy system. The global energy community regularly continuously studies issues related to "green energy", that is, energy generation based on renewable sources, the type of generation which leads to the development of the concept of distributed energy [Libontova et al., 2019, 56-63]. The scientific significance of the presented work lies in the possibility of using the materials in further research aimed at designing and developing innovative energy supply systems in remote areas. The unique results of the study of the efficiency of integration of renewable energy sources were presented. As a result of the analysis, conclusions were obtained that shortly electricity prices may run

into their limit. Based on what, it is the use of renewable energy sources that can be the solution to overcome this crisis. That is why the development of alternative energy technologies can be considered a powerful driver of innovative development and the basis for the formation of a low-carbon («green») economy - the economy of the future, characterized by high technology, and energy security, and minimal impact on the environment. One can say the following: in the coming decades, developed countries will have economies with a new innovative and scientific, and technological basis.

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Prospects for development of renewable energy sources in agriculture in Armenia

Key words: agriculture, renewable energy sources, alternative energy sources, industry

Analysts consider the key problem of bioenergy in Armenia to be the fact that biogas plants are profitable only with a free and uninterrupted supply of waste. In addition, bioenergy producers need a guaranteed sale of the electricity produced, which is not yet observed in Russian conditions. Over the last period of development, several dozen small biogas plants for individual farms have been implemented by several Russian companies, among which the leading place is occupied by specialized institutes, in particular, the Institute of Electrification of Agriculture together with metalworking enterprises. The development of large industrial installations lagged behind small construction. In the last 10 years, only two large-scale projects have been implemented. Based on this, the problem associated with the development of alternative energy sources in agriculture is being actualized. The presented work is devoted to the study of the prospects for the development of renewable energy sources in agriculture in Armenia. We use scientific materials of domestic and foreign authorship, as well as theoretical and empirical research methods. The predominant part of the work is devoted to the study of problematic issues of the development of renewable energy sources in the agriculture of the country of Armenia.

RELEVANCE OF METHODS MATHEMATICAL MODELING OF MANAGEMENT THE QUALITY OF THE PRODUCTION OF AVIATION AND ROCKET AND SPACE TECHNOLOGY

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Key words: quality control management, mathematical modeling, mathematics, aviation, aviation technology

Introduction. The aircraft industry is one of the most high-tech and priority areas in terms of innovative development of industrial sectors of the national economy of our country today. This factor is large because in the modern world there are deep and wide-spread processes of changing the world economy and intensifying competition for sales markets, including high-tech products.

Methododolgy and literature review. The technological component of aviation and rocket and space technology is developing quite dynamically, regularly replenished with new samples of products, sometimes not having access to "open" printing. Some of them lose their relevance and role before they have time to be realized, while others become breakthrough tools for creating aviation and rocket and space technology of the future, and also find wide application in the national economy. Thus the aviation and rocket and space industry, being the driver of the development of the country's economy, continues to be the most technologically advanced and intensively developing sector of the economy, to increase the efficiency and rationality of the processes performed in which it is necessary to introduce a modern quality management system (QMS) based on the most innovative control methods to date [Bulletin of the ISH FEFU. 2016. P. 143-148]. Modern management currently, as noted above, widely uses mathematical apparatus to analyze possible behavior strategies, support decision-making, study graphs of various dependencies, statistical data processing, and computer modeling of processes. Modeling is understood as the study of the properties of the system using the constructed model. In practice, the following types of mathematical models are often used:

- analytical, which is a set of analytical expressions and dependencies;
- simulation, which is based on a computer experiment; Numerical, which is presented in the form of numerical methods and schemes that provide an approximate solution to the problem;
- algorithmic, which are represented by algorithms in the form of a certain logical sequence of operations performed on a computer.

However, this approach has certain disadvantages, in particular:

- unreliable initial assumptions – not all the prerequisites that are the basis of the model can be evaluated and verified.

- information limitations entail unreliability of assumptions and other difficulties in modeling since the accuracy of the model is always determined by the accuracy of preliminary information on an existing problem.

- fear of users – managers for whom models are created often do not understand result and therefore are afraid to apply them. There is no enough knowledge in this area.

- excessively high cost. It is necessary to estimate modeling costs in advance. Since models with excessively high costs are inefficient.

At the same time, the relevance of quality management in the production of aviation and rockets, and space technology lies not only in the presentation but also in the implementation of high requirements for the quality and reliability of this type of product. Modern aviation and rocket and space technology solve a huge number of strategic, both military and civilian tasks. Based on this, the reduction of defects and the exclusion of unusable machines and mechanisms is a strategically important task in modern aircraft and helicopter manufacturing enterprises, in the rocket and space industry [Vestnik VSTU, 2012, 34-39].

Analysis. The use of mathematical modeling for quality management has a significant advantage. In the theoretical field, modeling (especially the Monte Carlo method) is used if direct calculations in solving problems are impossible or time-consuming. Similarly, in the experimental field, modeling is used when experimental research is impossible or expensive. The advantage of modeling is that it allows you to get time- and cost-effective solutions, and also that in many cases it allows you to get solutions at all.

The benefit of using modeling in training to work with statistical data is obvious since modeling can effectively illustrate random changes. In addition, it should be noted that the current market economy imposes fundamentally new requirements on modern manufacturers of aviation and rocket and space technology regarding the quality of products. To a greater extent, this factor is because the success and profitability of modern factories depend on their stable position in the market, which, in turn, depend on the level of price and quality of products. Moreover, today it is the second factor that takes a higher priority place [Actual problems, 2017, 71-76].

Most modern aircraft manufacturing enterprises are based on process management of production. This type of management differs from the functional one in that the concept of «process» is defined as a sequence of actions aimed at achieving a final, measurable, and concrete result. For each of the sequential workflows, the management and control necessary to achieve the required level of quality of the manufactured equipment are carried out. Thus, production quality management has a particularly relevant role,

through which high efficiency and rationality of work should be achieved in aircraft, helicopter-building enterprises, and when creating rocket and space technology.

Studying statistical information concerning control and supervisory activities, it should be noted that the production quality management system at aircraft and helicopter manufacturing enterprises is imperfect and rather inefficient. This factor is proved by the high number of detected violations in technological processes and, as a result, accidents during real tests and during regular operation of equipment.

The combination of the presented factors determines the need for further improvement, including through the integration of innovative methods of production quality management in the field of aircraft and helicopter manufacturing enterprises. The key issue in this area related to the improvement of the quality management system is the optimization of enterprise planning and management. The solution to optimization issues based on the use and development of mathematical methods and digital technologies is the real and most effective tool necessary to further improve the work of aviation production units. It should be noted that the most relevant role of quality management and operational management of aviation production is precisely in the development and application of the integration of mathematical modeling methods. It is the mathematical apparatus that has the opportunity to provide the necessary tools, based on which the efficiency of the quality management system can be improved. As a result of the fulfillment of these tasks, satisfaction of the production of aviation and rocket and space technology should be achieved [Software products and systems. 2018. P. 39-45].

Thus, the processes taking place in the modern field of aviation construction require the application and use of information technology tools, one example of which is mathematical modeling and operations research through the use of highly efficient computer technology. Mathematical modeling consists in using the available data on certain characteristics of the expected object, processing them using mathematical methods, as well as obtaining a final dependence that combines these characteristics with time, and calculations of the found characteristics of the object at present. Mathematical methods include the use of modeling or extrapolation. Mathematical modeling has limitless possibilities aimed at the study of economic processes and optimization of management processses. To date, there are already developed universal methods and various modeling technologies designed to identify the most useful and rational mathematical model, the basis for the application of which is a wide class of phenomena and economic processes, in particular.

The models that exist today have high requirements. One example of these requirements is that the model should be of a simulation level so that the user can visually see and analyze the process being simulated on the screen of his electronic computer, as well as identify features or highlight statistics. In addition to all of the above,

mathematical models should comprehensively describe the process of reproduction of aviation and rocket and space technology. Models must have high detail, as well as high quantitative and spatial indicators. The developed models are required to provide a wide range of capabilities designed for their use to solve various tasks or simulate a wide range of production processes.

A mathematical model is a mathematical description of an ongoing process or object, the main purpose of which is its research or management. In the general interpretation, the model is a conditional image of the object of study, designed to simplify the analysis. When constructing mathematical models for quality control at aviation enterprises, it is assumed that its direct study can provide completely new knowledge about the object being modeled and the direct control of the functions or operations performed.

The integration of mathematical modeling methods when performing data analysis in production quality management systems is caused by the need to model the behavior of processes, manage their variability, as well as make informed management decisions based on measurements of the characteristics of processes and products. One of the priority tasks in quality control systems at aviation and rocket and space enterprises is to manage the variability of processes at all stages of the life cycle of equipment, starting with market research and design and ending with maintenance and disposal. In this regard, there is a need to process and analyze a large amount of data using mathematical methods. When analyzing data in quality management systems, statistical and computational methods are widely used, for example, approximate calculation of functions or solving optimization problems [Actual problems of aviation, 2020, 10-14].

The scientific novelty of the work lies in the fact that the author found out, that statistical methods are used in measuring, describing, analyzing, interpreting, and modeling the variability of quantitative characteristics of products and processes even in the presence of a relatively limited amount of data. Statistical analysis of this data can contribute to a better understanding of the nature, extent, and causes of variability. This can help in problem-solving, problem avoidance, and prediction of quantitative feature values. Computational methods are used in building models of process behavior, finding values of influencing parameters and solving optimization problems by reducing the problem to controlling simpler or more convenient characteristics, such as those whose properties are already known or easy to measure. Thus, methods of mathematical modeling allow better use of available data for making management decisions aimed at improving the quality of designed and developed equipment, reducing production cycle time, reducing losses in the production of products, as well as achieving customer satisfaction. Thus, the analysis showed that mathematical modeling of quality management is currently relevant for enterprises in aviation and rocket-space technology.

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Relevance of methods in mathematical modeling of management the quality of the production of aviation and rocket and space technology

Key words: quality control management, mathematical modeling, mathematics, aviation, aviation technology

To date, issues related to the development of a quality management system are becoming important in various industries. To a large extent, these issues are being updated due to the constantly increasing requirements for product quality, control, and efficiency of its reproduction. The study of these issues becomes particularly relevant when creating aviation and rocket and space technology, due to the great role of product quality in solving various military and civilian tasks. To analyze possible behavior strategies, support decision-making, study graphs of various dependencies, statistical data processing, and computer modeling of processes, modern management widely uses mathematical apparatus and innovative research methods, including mathematical modeling of quality management. In this article, an attempt is made to analyze the available innovative mathematical modeling methods for product quality management. In our opinion, mathematical modeling can become an important tool in solving many problems related to the quality management system. Thus, the main purpose of this article is to assess the relevance and role of mathematical modeling methods for product quality management in aviation and rocket and space technology. The work was carried out by analyzing the material available in the press concerning mathematical methods of modeling quality management about aviation and rocket and space technology.

CONFLICT MANAGEMENT METHODS AND REGULATION FEATURES

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Introduction. The concept of "conflict" comes from the Latin word "conflict", which literally means "conflict, serious disagreement, dispute". According to the most common definition, a conflict is a social situation in which two or more parties are trying to pursue their opposite interests or incompatible goals.

It should be noted that conflict is one of the indisputable facts of social relations and the driving force of social change.

Methodology. In the course of the research and for the generalization and presentation of its results, philosophical-channel, pedagogical, sociological, conflictological literary methods of analysis, historical–reflexive, conceptual-reflexive, as well as theoretical and empirical methods of analysis and comparison, formulation, generalization and systematization were used.

Scientific novelty. The features of the correlation and interdependence of the main components of personality conflict are revealed, at the same time, the features of working capacity in a complex system of interrelated components were considered as a constructive factor affecting personality conflict. The constructive and destructive factors that cause personality conflict and influence the development of a conflict situation, as well as the features of the ratio of working capacity and emotional, personal and behavioral characteristics of the individual are revealed.

Literature review. Conflict promotes action-from the first clash of opposing forces to the resolution and completion of the struggle. The most characteristic form of conflict in the country with the plot is the confrontation of positive and negative characters expressing the struggle within socio-political forces (for example, the struggle of David of Sassoun and Msra Melik in the epic "David of Sassoun"). This form of conflict is characteristic of epic and especially dramatic works, which usually depict heroes performing in action and struggle. Conflict can also manifest itself in the psychology of cha-

racter, emotions and moods (for example, Hamlet (from Shakespeare's tragedy "Hamlet"), in addition to open confrontation with the outside world, also lives in a tense mental state of internal, acute struggle, doubt and hesitation). The basis of a lyrical work is often an irreconcilable opposition of the poet's ideal and the environment, but not to external conflicts, but to internal dramatic experiences (for example, the tragic experiences arising from the aspirations of the lyrical hero and the opposition to reality in P. V. Duryan's, Teryan's poems). The theory of conflict was first thoroughly developed by G. Hegel. According to him, "the confrontation in the situation" creates the possibility and necessity of the actions of the acting forces representing the conflict. [Mirzoyan, 2005, 16-17]. According to N. Leonov, conflict as a process is gradual and dynamic in nature and has the following structure: the emergence of conflict, the development of conflict, partial or complete resolution of the conflict.

As noted by R. Krichevski and Y. Dubovskaya, three main stages of the conflict development can be distinguished:

1. the latent phase (pre-conflict situation),
2. the open phase of the conflict,
3. the stage of resolution (completion) of the conflict:

Each conflict can be associated with both the psychological characteristics of the conflicting parties, as well as with a specific right, conditions and other factors. That is, the conflict cannot be resolved without the consent or compromise of the parties. And it is on this that the result of the conflict depends, which can have: a positive or negative impact, a constructive or destructive conclusion.

Analysis. In the practical activity of any organization, it is necessary to organize the process of conflict management, that is, it is necessary to analyze and manage them.

Many experts in management and personnel management do not pay the necessary attention to this issue.

Practical management of the conflict process is a generalized direction of the implementtation of means (methods) of managing conflict processes within the organization. The issue of the methodology of influencing the conflict is the most problematic, since it is the methodology that determines the direction of the methods and technologies used, which makes it possible to purposefully influence the conflict process.

To do this, methods and technologies must be effective. Often the selected (defined) method cannot be changed later. The time period does not allow this to happen as the conflict changes, that is, at this particular point it differs from what is at the previous and next points.

In practice, an inefficient conflict management organization can lead to the expenditure of large resources, increase risks for the organization, and also become an unmanageable conflict.

The main organizational methods used in the practice of conflict management include:

- The method of organizing the conflict process,
- Method of motivating conflict processes,
- Method of planning conflict processes,
- Method of managing conflict processes

These methods include all actions aimed at purposefully influencing conflicts, and therefore constitute an effective conflict management organization system.

Methods of managing conflict processes in practice can be applied both separately and systematically:

At the same time, in a certain case, these methods directly depend on the specifics of the organization, process, etc.

Conflicts that carry out functional, dysfunctional and cognitive functions are an inevitable component of modern society that requires a professional approach.

The causes of conflicts can be objective and subjective.

Objective reasons include those factors of the conflict environment that lead to a conflict of motives, interests, interests, opinions, positions of the conflicting parties.

Limited resources, improper distribution of rights and responsibilities, shortcomings in monitoring activities, communication gaps are identified as the objective cause of the conflict. Subjective factors are primarily related to such individual characteristics of the conflicting parties that encourage them to choose a conflict, and not another solution to the problem or contradiction. [Svetlov, 2011, 111-113].

For a more complete understanding of the content of conflict resolution, it is necessary to remember that settlement, like conflict, at any level, whether interpersonal or international conflict, acts as a complex process unfolding over time, having its own starting and ending points. The time characteristics of regulation can be expressed in different units of measurement depending on the specific type and complexity of the conflict:

Thus, the settlement of an interpersonal conflict can be carried out within a few weeks and measured within a few days, while the process of resolving a number of international conflicts takes a very long time and can have tens of years as a unit of mea-

surement. However, every conflict process goes through certain stages of settlement. [Krychevsky, 1993, 52].

Let's try to identify the most general and complete stages of conflict resolution: the stabilization stage, the communication stage, the negotiation stage, the implementation stage.

The first two stages do not involve joint actions of the parties, but their importance in the settlement is enormous.

The main objectives of the first stage of stabilization are the prevention and cessation of violence, prevention of further escalation of the conflict, stabilization of the overall situation. At this stage, the conflict ceases to be arbitrary and becomes more manageable, even if it is not finally resolved later. At this stage, working with the conflict, it should be remembered that the truce does not yet imply the mandatory adoption of a further bilateral regulatory agreement. The stabilization phase can occur quite quickly, it can take several months or years. [Vorozheykin I. Ye., Kibanov A.Ya., Zakharov, 2003, 132-134].

Secondly, the communication stage is aimed at solving the tasks of establishing a dialogue and preparing negotiations. The parties should move from unilateral decisions to the adoption of bilateral decisions, which implies, first of all, the establishment of bilateral feedback. At this stage, in addition to creating communication links and labor relations, a search for a negotiation space is carried out.

The negotiation stage is a discussion of the main contacts, the positions of the parties and the main contradictions. At the last stage of the conflict settlement, the implementation of the agreements reached is ensured. Very often, a regulatory agreement that has already taken place does not come to life. The parties do not fulfill their obligations.

Various studies of the regulatory process have made it possible to identify two of its main principles. The first principle refers to the gradual settlement of conflicts, which is typical for all settlement measures.

According to the principle of gradualness, the primary condition for effective regulation is gradual development. An attempt to move from violent conflict directly to joint action is doomed to failure from the very beginning [Nazaryan, 2016, 61-63].

A gradual approach makes it possible to study in detail the situation, positions and behavior of the parties, prepare them for the development of joint steps or negotiations, form options for possible settlement agreements and only then turn to the final regulatory decision.

The principle of gradualness also concerns the gradual discussion and settlement of existing contradictions, that is, only after making sure of the implementation of some agreements, you can proceed to the formulation of the following agreements. The next principle inherent in the conflict resolution process is synchronicity (synchronicity), due to the mandatory two-sidedness of the conflict. Any conflict, as is known, presupposes the presence of at least two opposing sides, whose interaction is the driving force of the conflict process. The conflict settlement process, merging with the course and development of the conflict, assumes that the conflicting parties must necessarily be at the same stage of the settlement process. If one of the parties returns to the previous stage as a result of certain initiatives, the other party, as a rule, also proceeds to the previous stage. This principle is especially important in terms of organizing negotiations, because in such a situation, when one of the parties is no longer ready to negotiate and, accordingly, move to the negotiation stage, the opposite side is also forced to return to the negotiation stage.

Conclusion. Usually, the conflict is based not only on one reason, it is a combination of several reasons, some of which may not even be understood by the conflicting parties or one of the parties. Thus, the cause of the conflict is not only biological, social or psychological factors separately, but also their combined impact.

Any conflict has both its causes, object, course, conditions of development, and its completion. Negotiations, discussions, concessions, reconciliation are important in resolving the conflict. Naturally, these means cannot be imagined without communication, without speech and language. The practical method of organizing a conflict process assumes a certain influence on the conflict process. Within the framework of the method, technologies aimed at changing the process are used. The method also assumes an active, purposeful impact on the conflict process. In practice, this method is the main one. For example, it can be applied using technology such as the imposition of sanctions.

The technology of applying sanctions means influencing the conflict in such a way that the necessary behaviors are proposed in this situation and sanctions are applied in case of non-compliance. A person is quite complex as an object of influence and execution, so an employee may not obey the methods of the organization, although after that sanctions will be applied against him.

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Conflict management methods and regulation features

Key words: conflict, tactics, strategy, denouement

Thus, the effectiveness of conflict management in the organization became the subject of study, which is conditioned by the use of methods aimed at improving the activities of the organization, as well as the performance of the staff. In case of ineffective management of conflicts, the organization may lose the ability to control the conflict situation, human and material resources և generally increase the risks. Conflict management is the ability to take action to understand and resolve a conflict situation. Each individual must find his or her own way of expressing behavior in a conflict situation her own method of managing conflicts. Regular training and imitation games can help you to choose effective tactics and methods in conflict situations; to acquire conflict resolution skills. Conflicts in organizations are manifested in different ways, which can be based on the conflict of conflicting interests of the individual and the organization. Especially in labor relations and in processes and processes the clash of different organizational cultures, values and creative ideas can be conflicting, affecting individual, organizational efficiency and productivity. However, this conflict can be a signal for the parties to the conflict to rethink their activities and values, as well as to improve working relationships. And finally, conflict is one of the inevitable realities of public relations - the driving force of social change.

AGRICULTURAL LENDING PROBLEMS AND WAYS OF IMPROVEMENT IN THE ARTSAKH OF REPUBLIC

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Key words: agriculture, lendings and loans, support, state programs, credit organizations

Introduction. Agriculture has a special place in the real sector of any country, which is one of the most important areas that determines the development of the economy, the employment of the population, and their socio-economic level. At the heart of solving a number of problems facing agriculture is the issue of financing agriculture. Financing refers to both the process of raising private capital and state subsidies, the implementation of various financing and lending programs through public competition.

Lending to agriculture is still one of the most important problems in the sector due to inaccessible lending terms, such as collateral, interest terms and interest rates, which are difficult to access for most farms.

Methodology. The work used the content analysis of documents related to the research topic. A statistical method of data analysis was used with the development of appropriate graphs for a more convenient presentation of information. Also, we used the method of comparative analysis.

Literature review. The informational basis for the article are the works of Armenian and foreign economists. The sources of litrature and analytical data is taken from a number of sources of the Government of the Republic of Artsakh, including data from the National Statistical Service of the Republic of Artsakh, Ministry of Agriculture of the Republic of Artsakh.

Analysis. Agriculture is one of the key sectors of the economy of the Artsakh Republic, which as of 2018 provided more than 11% of the country's gross domestic product, and in 2021 in the post-war period - about 5.5% [HNA, 2021].

Examining the share of agriculture in the budget expenditures of the republic, it is obvious that the means directed from the budget to agriculture in 2015-2021 have decreased.

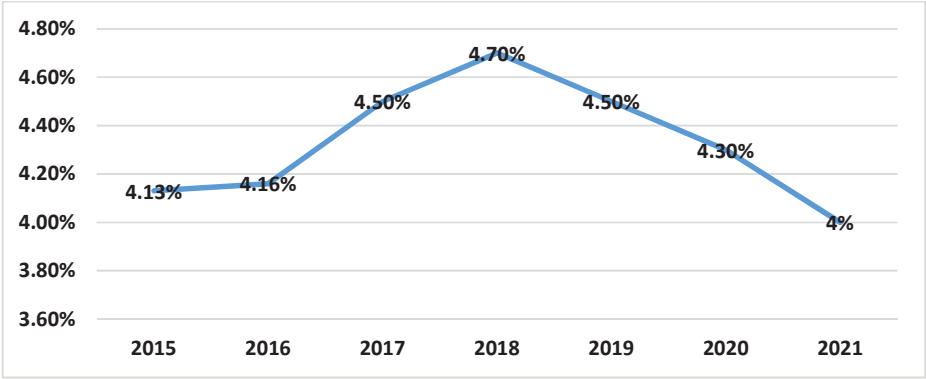

Figure1. The share of agriculture in budget expenditures, %

Considering the targeted use of state funds and the implementation of subsidies, it should be clearly known that, unfortunately, the means of lending and subsidizing can not yet solve the problem of financing in the sector.

This requires reforms that will, in essence, facilitate the use of private capital provided by banks and financial institutions for the purposes of agricultural production. Therefore, in this regard, market lending mechanisms should be in place, where agricultural lending is mutually beneficial for both financial institutions and farms, providing volumes that can develop agricultural specializations, while activating the activities of farms that are a major part of the sector [2. Bayadyan, 2016, p.104].

Agriculture is financed through the banking system and financial opportunities provided by the state.

Table 1. Volumes of agricultural crediting by commercial banks in 2017-2021, mln AMD [http://stat-nkr.am, finans,2021]

	2017	2018	2019	2020	2021	Deviation (+ , -) 2021/2020	
						Absolute	Relative %
Total	118825,1	150025, 7	167354,1	192801,9	206294.9	13493,0	6,9
Agriculture	998.8	1212.5	1810.3	2137.2	2829.6	692,4	32,4
% in total	0.84	0.80	1.08	1.11	1.37	0,26	23,4

2017-2021 lending by commercial banks has been growing steadily, with a growth of 32.4% in the agricultural sector in 2021.

Loans to agriculture from non-banks have been reduced. If compared to 2017, the loans provided to agriculture in 2021 decreased by 2977.2 million drams or 38.2%, then compared to the data of 2019, a 28% increase was registered. (table 2).

Table 2. Loans provided to agriculture by non-banking organizations 2017-2021 [statnkr.am], (million AMD)

Years	2017	2018	2019	2020	2021	Deviation (+ , -) 2020/2019	
						Absolute	Relative %
Total	33032.8	35645.2	17853.5	18660.2	21622.8	2962,6	15,9
Agriculture	7788.3	6047.2	3757.3	4384.5	4811.1	426,6	9,7
% in total	23.5	16.9	33.8	23.4	22,3	-1,1	-4,7

By providing credit management guarantees, the state promotes preferential lending to those organizations and branches whose activities correspond to the targeted programs of economic development [Asatryan, 2004, 245]

Significant work has been done in terms of agricultural sector development and credit regulation in Artsakh by the Rural Agricultural Support Fund (RFAS) of the Republic of Artsakh. For many years it has implemented measures aimed at the development of agriculture in Artsakh, ensuring the necessary level of food self-sufficiency in the country, balanced territorial development.

In 2020 the Rural Agricultural Support Fund (RFAS) of the Republic of Artsakh also continued the implementation of activities arising from the strategic program for the development of agriculture of the Artsakh Republic, the purpose of which is to conduct intensive agriculture, supplementing the resources lost due to the 44-day Artsakh war, by building greenhouses, creating intensive orchards and cultivating valuable crops, breeding livestock.

In 2020 the support provided by the fund increased by 22.3% as compared to the previous year, and in 2021 it amounted to 8248163.6 thousand AMD, which is 10% less than the previous year (Figure 2).

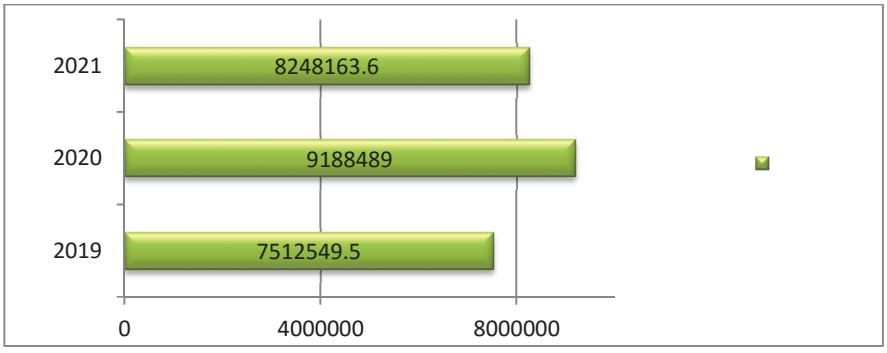

Figure 2. Support provided by the Rural Agriculture Support Fund of the Artsakh Republic in 2019-2021 (thousand drams)

In 2021 the majority of the support structure provided by the Fund was in the form of loans, gratuitous assistance and direct sales, which accounted for 58% of the total support, 16% of gratuitous assistance, and 15% of direct sales (Figure 3).

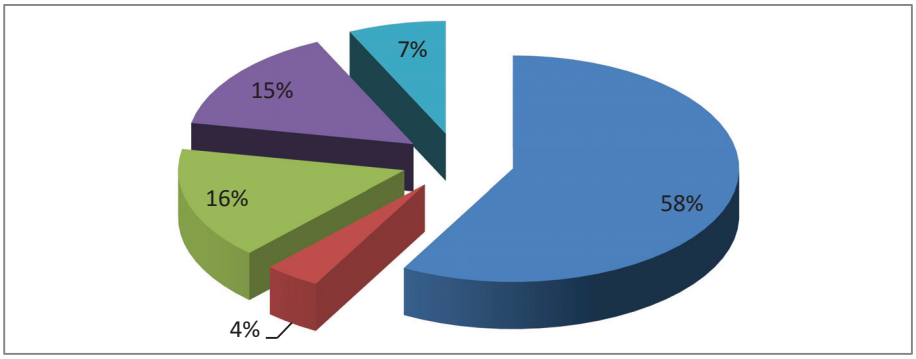

Figure 3. Support structure for agricultural development in Artsakh Republic, 2021

In 2021, 58% of the support provided by the Fund was through loans.

The volume of agricultural crediting by the Village Agriculture Support Fund in 2021 has decreased compared to the previous year, amounting to 231,129.9 thousand AMD, while compared to 2019, a growth of 57.8% was registered.

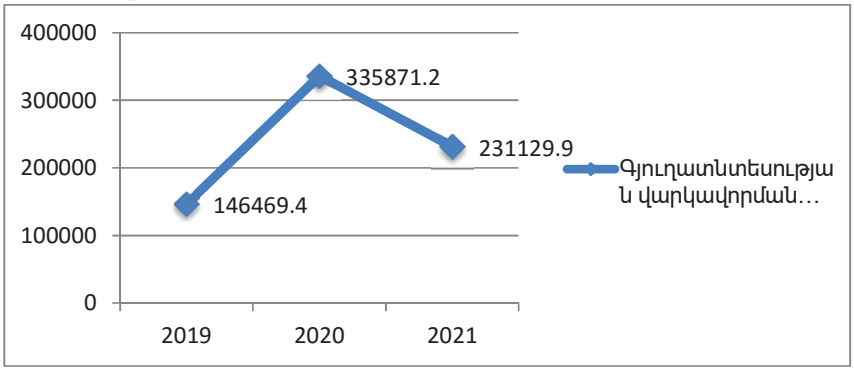

Figure 4. Volumes of agricultural crediting (thousand drams)

In post-war Artsakh, agricultural loans are provided not only by the Village Agricultural Support Fund, but also by FIDES UCO CJSC, where the following conditions for providing agricultural loans are available (Table 3).

In 2021, the following commercial banks cooperated with the Fund in the process of providing agricultural loans: "Armbusinessbank" CJSC, "Artsakhbank" CJSC and "Converse Bank" CJSC.

Table 3. Terms of agricultural loans

		"Fides" UCO CJSC	RFAS of the AR
1	Loan currency	AMD	
2	Annual interest rate	6%	2%
3	Date	Up to 60 months	7 years
4	Loan amount	1.000.000-20.000.000 AMD	100.000-1.500.000 RA
5	The method of granting a loan	One-time, phased, cash, non-cash	
6	Subject of pledge	Agricultural equipment, real estate, mechanisms, vehicles, etc.	Collateral, guarantor or guarantee

Conclusion. The analysis shows that there are a number of problems in the process of agricultural lending, most of which are related to the subject of collateral, foreign currency lending, lack of agricultural insurance, consulting and information system.

Considering that agriculture is quite sensitive to financing due to the weak level of development of agricultural lending and the many problems that have arisen in the process, in terms of the large-scale development of the agricultural lending system and increasing its accessibility, the importance of implementing state support programs are attached.

The growth of agricultural lending has a direct impact on the growth of gross agricultural output. In other words, gross agricultural output, among other factors, is quite sensitive to financing, access to financing on affordable terms can significantly contribute to the further growth of agricultural activity.

Given that agriculture is quite sensitive to financing due to the weak level of development of agricultural lending and the many problems that have arisen in the process, the implementation of state support programs in terms of large-scale development of the agricultural lending system and increasing its accessibility.

State-sponsored loans provided by commercial banks and credit organizations are essential for the advancement of economic entities. However, in terms of agricultural support, it is still incomplete without insurance. In particular, it is necessary to develop a system in which, in case of borrowing from commercial banks and credit organizations by economic entities, the expected crop of the villager must be insured, which will make up the amount of the loan taken. Moreover, the sum insurable must be 3-5% of the loan taken. At the request of the bank, the economic entities must first sign an insurance contract with the insurance company, after which the bank will agree to provide a loan to the villager. Thus, economic entities will receive compensation in case of damage from insurance companies, will be able to repay the loan without difficulty, will not have to demand compensation from the state for the loss.

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Agricultural lending problems and ways of improvement in Artsakh Republic

Key words: agriculture, lendings and loans, support, state programs, credit organizations

In the Republic of Artsakh, agriculture is considered as a sphere of national security, regardless of its development, it has been and will remain one of the leading branches of the economy. In general, providing the necessary preconditions for the further development of the sector and transition to the innovative path requires significant financial resources. In connection with all this, it is vital for agricultural producers to find a reliable and affordable source of financing, including the possibility of lending to comercial banks and credit organizations, which ц can be one of the most effective ways to solve the problems facing the agri-food system, contributing to competitiveness and rural strengthening of лterritories. Based on the study of the credit policy implemented in the agricultural sector of the Republic of Artsakh, the article substantiated the need for lending, clarified the existing problems, and pointed out the ways to improve the lending process.

PRESENTATION OF KEY FACTORS INFLUENCING THE ACCEPTANCE AND APPLICATION OF E-COMMERCE

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Key words: online platforms, key factors, technologies, sales turnover, financial resources.

Introduction. Historically, the Internet has spread much faster than the previous generation of communication technologies. Today, the Internet is not only a network media, but also serves as a retailing tool between suppliers and consumers, becoming a dominant option in retailing every day [Yulihasri et al., 2011]. The Internet affects how people communicate with each other, get information, learn, transmit culture, shop online, or engage in e-commerce. RA also faces challenges in harnessing the potential of e-commerce. Notably, e-commerce can stimulate growth in developing countries by increasing the transparency and efficiency of market operations and public institutions.

Methodology. The research is mainly based on the presentation of existing obstacles in the field, the comparative analysis of selected businessmen with active status, and the presentation of the factors affecting the activity. The study is mainly based on the presentation and identification of the factors affecting the intention to adopt AR technologies, as well as the summary presentation of the results of the activities of RA resident companies doing business through online platforms.

Scientific novelty. Creating the opportunity to penetrate more comprehensive markets as a result of the use of online platforms and the joint launch of augmented reality (AR), which will lead to an increase in the possibility of influencing international markets.

Literature review. Augmented reality can be presented in terms of content in several ways. Augmented reality (AR) is a form of activity implementation in which the real world (RW) is augmented with software content associated with specific locations and/or activities [Yuen et al., 2011]. AR works better especially in terms of allowing customers to experience [Bakırlıoglu et al., 2022]. Augmented reality is closely related to virtual reality because it developed as an extension of or an alternative to virtual reality. Academic interests have greatly increased with the rapid advancement of VR and AR technologies, which have led to the digitization and development of various applications [Perannagari et al., 2019]. The use and future possibilities of VR/AR technology in online retailing are analyzed in different contexts [Chen et al., 2021]. The implementtation of AR technologies also facilitates several fundamental processes in terms of logistics [Cirulis & Ginters, 2013]. As virtual goods become more tangible through the use of AR, consumers more often decide to save money by visiting online stores [Mahr et

al., 2018]. There is a huge gap in the research literature and practical application of VR/AR in retail and various other special applications. Current debates, developments, issues and challenges in the retail industry and the application of VR/AR technologies are of critical importance [Vijayakumar et al., 2021]. Furthermore, the mechanism through which VR induces purchase intentions in a commercial setting has not been deeply analyzed and needs further study [Grewal et al., 2017].

Analysis. E-commerce can be an extremely beneficial tool especially when barriers to e-commerce adoption are mitigated [Lawrence and Tar, 2010]. It is particularly important to ensure that such barriers are minimized for small and medium-sized enterprises (SMEs).Barriers to e-commerce can be categorized into the following five groups:

1) organizational obstacles,
2) financial obstacles,
3) technical obstacles,
4) legal obstacles,
5) behavioral barriers.

All these barriers to e-commerce affect the adoption and diffusion of e-commerce. Legal and regulatory barriers are the most significant barriers to e-commerce adoption. However, regardless of the presence of obstacles, e-commerce companies are also established in RA, which carry out their business activities both offline and online.

Indicator	description	Quantity
Year of registration	During last 12 months	1
	During 1-3 years	3
	More than 3 years ago	17
Average number of employees	2021, first quarter	265
	2022, first quarter	280
Average AVUM	2021, first quarter	49,374.000
	2022, first quarter	49,005.000
Sales turnover	2021, first quarter	30,027,389.774
	2022, first quarter	34,201,105.611

21 resident business entities engaged in e-commerce in RA and beyond were selected for the study. Comparative information on the selected entities is presented below, taking into account that the entities conduct sales and provide services also on their own online platforms.

Based on the above, it can be concluded that one of the factors contributing to the growth of turnover of companies can also be considered electronic platforms, which support the mass and globalization of trade, thus leading to an increase in sales turnover. Within the framework of the study, it also becomes clear that the number of employees involved in the first quarter of 2022 being more compared to the same months of 2021,

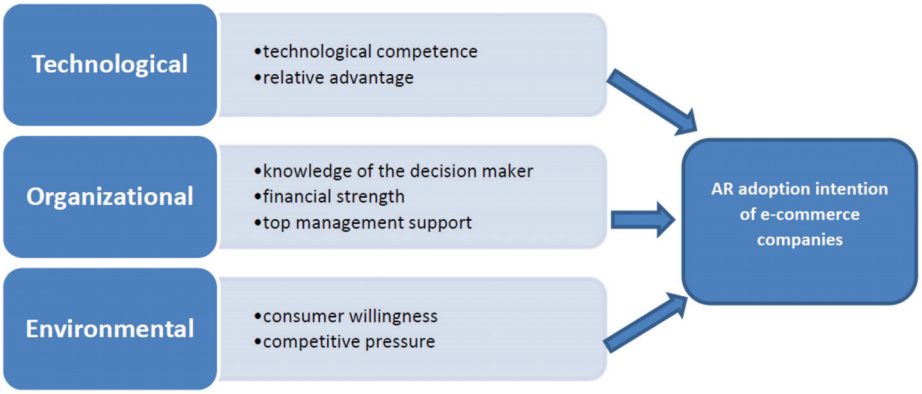
for the companies, they provided a smaller cost in the field of AVUM, which is also positively characterized from the point of view of business implementation.

A unique challenge for e-commerce companies is also to provide online customers with the opportunity to "try before they buy" by leveraging the rich opportunities afforded by the medium. This issue has been shaped by the growth of customers with different needs, who are increasingly curious and require visual and tactile stimuli to make purchases [Huang and Tseng, 2015]. Augmented Reality, where objects in the real world are enriched with digital capabilities, sometimes in multi-sensory ways, is being explored for the proper organization of e-commerce. AR can be defined as a system that includes three main features: the combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects [Wu et al., 2013).

AR technology differs from other innovative technologies by offering customers a deep and personalized experience and requires research attention. A complete reference model of technological innovation adoption from the firm's perspective is evaluated by the TOE framework [Picoto et al., 2014], which analyzes the factors influencing AR adoption intentions of e-commerce companies. TOE provides a useful analytical framework for studying the adoption and adoption of different types of IT innovations.

The TOE framework includes technological, organizational and environmental factors to study the adoption of technological innovation at the firm level [Sila, 2015)]

Below is a chart based on the TOE model depicting the factors and sub-factors influencing companies' adoption intention of AR technologies.



1. The technological context includes both the internal practices applied by the company and the external technologies available to the company (Oliveira, and Martins, 2011). It is critical for companies to understand the competitive advantage new technologies offer over existing technologies.

 The technological competence sub-factor refers to the firm's willingness to adopt new technologies. Innovative companies are interested in supporting the adoption of new technologies, so the higher the company's level of technological competence, the more likely it is to adopt new technologies (Zhu, Kraemer, and S. Xu, 2002).

 Relative advantage is the degree to which an innovation is judged to be better than an existing option. Information technology is one of the best tools for achieving sustainable competitive advantage.

2. Organizational context refers to the descriptive dimensions of the organization, such as its scope, size, management structure, and organizational resources [Oliveira, and Martins, 2011].

 Decision makers must have sufficient cognitive skills and knowledge to understand their own organization, their customers' needs and the latest technologies [Brynjolfsson and Hitt, 1996]. Their role is important in promoting innovation within organizations.

 Financial resources are probably the key element to drive innovation. Limited financial resources can force companies to be extremely cautious in their investments and capital expenditures.

 The role of top management support is critical because employees often resist adopting new technologies, mainly because senior officials do not properly communicate the strategic benefits of new tools [Knight, 2018].

3. The environmental factor includes the environment in which the company conducts its business: consumers, competitors, suppliers, etc.

 Consumer readiness is a combination of the propensity and support received for new technologies. In the context of AR in e-commerce, 'engaging' online shoppers as they visit online stores is a priority for all retailers.

 Competitive pressure affects the adoption of new technologies because under these conditions companies will act quickly to ensure that they stay ahead of the race. Competition strengthens the need and possibility of using innovative technologies in business. Firms that compete aggressively with their competitors embrace technological innovation so that they can reduce their costs. Competitive pressure has been identified as one of the constraints that a firm considers when deciding to adopt new technologies [Zhu Kraemer, and Xu, 2003]. Therefore, it can be concluded that a high level of the above factors and sub-factors is positively related to the adoption intention of AR by e-commerce companies.

Conclusion. Although AR technologies are growing in use, there are some drawbacks here as well. The expected utility and ease of use of any new technology are important factors in its adoption. Not only is it important to understand the factors that influence the intention to adopt AR, but it is also imperative to understand the ways in

which a company will build a business model to increase the total expected revenue and gain a competitive advantage.

Since almost half of the studied organizations were not large organizations, but most of them experienced an increase in sales turnover through e-commerce, it can be said that online platforms are equally applicable and beneficial to both small and medium-sized and large organizations. Electronic marketplaces enable Armenian companies to advertise their products and services to a significant number of online customers, reduce their operating costs, and increase trust and transparency around their operations.

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Elen AVALYAN

Presentation of key factors influencing the acceptance and application of e-commerce

Key words: online platforms, key factors, technologies, sales turnover, financial resources.

The modern age is the age of technologies as online companies try to introduce innovations in order to survive under the conditions of tough competition. This leads to the creation of international values, improves market access, increases the effectiveness of marketing mechanisms and reduces the transaction costs (Humphrey, Mansell, Paré, and Schmitz, 2003, UNCTAD 2015)[1]. Innovation, including technological innovation, is defined as an idea, experience, or item that is new both to consumers and those who supply it. Currently, companies are trying to carry out entrepreneurial activities through the usage of applications. According to Bill Gates: "If you have a business but it's not on the Internet, think that you don't really have it." For e-commerce, organizations are offered Augmented Reality (AR) applications that connect digital content with the real world. Although literature has long introduced AR into the public consciousness, however, in terms of its application, many associate AR with the future. AR in e-commerce helps consumers in the right environment to understand the nature and essence of the product being purchased. However, despite the fact that this technology has great potential and a great future, it is still not used to the maximum extent. The introduction of technologies can be justified if a company as a result of them can cut costs, mitigate risks associated with its own operations, or create new revenue streams by attracting or retaining existing customers.

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AN INNOVATIVE MODEL AS THE DRIVER OF LONG-TERM SUSTAINABLE DEVELOPMENT OF THE INDUSTRIAL ECONOMIC SECTOR

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Key words: innovative model of economy, Russian economy, R&D enterprise, innovation activity

Introduction. In the research context, the category of the "modern model of the Russian innovative development" is understood as the entirety of interrelated industrial enterprises, research and academic institutions, state bodies, infrastructure institutions of development and support, public professional associations etc. that are engaged in the relations aimed to finance, initiate, transfer and commercialize innovations, to enhance competitive ability of the industrial enterprises beyond the energy sector both in the Russian and external markets, to strengthen HR potential, to grow innovations while efficiently using tangible, financial and labor resources for the sake of long-term sustainable social and economic development of the country and its regions.

Methodology and literature review. The following typology groups of innovative models are usually singled out depending on the classification attributes:

- by the intensity level – traditional linear model, interactive model, superactive model, economic industrialization model with external innovations engaged, catching-up development model [Novitsky, 2015, 64];

- by the target use – research leadership (USA, England, France); creating a favorable innovation-oriented environment (Germany, Sweden, Switzerland); encouraging innovations (Japan, Republic of Korea) [Vasilyeva et al., 2016, 74-82];

- the economic development level of the countries – the model of the innovative development of developed countries; the model of the innovative development of developing countries;

- by geographical region – North American, European, Central European, Japanese, Chinese [Arkhipova et al., 2015, 103-112];

- by national peculiarities and the economic potential development - Euro-Atlantic (traditional) (USA, Canada, EU countries, Australia); East Asian (Japan, Republic of Korea, China); alternative (Thailand, Turkey, Portugal, Chile, Jordan); "triple helix" model [Novitsky, 2015, 64]. Table 1 shows indicators of the Russian economy and developed economies in terms of most important parameters of "new economy" (as of 2014 - 2016).

Based on the data shown in Table 1 we may conclude that in 2015:

- labor productivity in Russia was more than 2.5 lower than in the USA, France and Germany. Possible solutions of this issue: production retrofitting, reducing wear and tear of fixed assets, encouraging technology / organization and institution innovations;

- R&D expenses in Russia (1.10% of GDP) are 1.62 times less than those in the United States;

Table 1. The most important technology indicators of the economies worldwide

Indicator	Value	
	RF	leading countries
sp. weight of the technology innovators, % (2014)	8.8	Germany – 55; Sweden – 45.2; Finland – 44.6; Netherlands – 44.5
labor productivity, $./man hours (2015)	25.9	- average for OECD countries – 50.8; -including: USA – 68.3; France – 67.6; Germany – 66.6
amount of technology-intensive export, billion dollars (2015)	9.7	China – 554.3; Germany – 185.6; USA – 153.5; Republic of Korea – 126.5
share of online sales against the total retail turnover, % (2015)	4	USA – 20; Great Britain – 20; France – 15; Spain – 15; Italy – 9
R&D expenses, % of GDP (2015)	1.10	Republic of Korea – 4.23; Germany – 2.93; USA – 2.79; China – 2.07; Great Britain – 1.70
patents issued by the countries of origin of the applicant (2015)	24,998	China – 279,501; USA – 257,108; Republic of Korea – 109,107; Germany – 86,849; Great Britain – 21,503

(The Center for Global Enterprise, 2015; World Bank; OЭCP; Rosstat, Eurostat; International Digital Economy and Society Index (I-DESI) 2016; RBC, National Research University Higher School of Economics, I-DESI 2016; OECD; WIPO; WEF)

- only online retail sales of the goods in Russia can be interpreted as insignificantly lagging behind from these of the technology advanced countries (according to Table 1). Generally, the research and development situation in the country seems troublesome. Import phaseout is another issue that aggravates the situation. Thus, according to the Russian Ministry of Industry and Trade, in 2015 the level of import dependence in the car industry was 44%; in the shipbuilding industry – 55%; in agricultural engineering – 56%; in oil and gas and heavy engineering - 60%; in consumer and pharmaceutical industry - over 70%; in medical, electronic and machine tool industry - over 80%; in aircraft construction - 92% (The Center for Global Enterprise, 2015; WB; OECD; Ros-stat, Eurostat; International Digital Economy & Society Index (I-DESI) 2016; RBC, National Research University Higher School of Economics, I-DESI 2016; OECD; WIPO; WEF).

We singles out the "triple helix" model, a new version of the Euro-Atlantic model, which that is the most widespread in the United States, as the most advanced model that is adequately in line with the Russian national peculiarities and priorities. As seen by its creators [Itzkowitz et al., 2010, 238], the "triple helix" model as a mechnism of "reaching the synergy through continuous updates and accumulation of the knowledge

base [Smorodinskaya, 2011, 66-78] implies a certain algorithm of engagement of every stakeholder of the country's innovative model (authority, power and academic community) at certain stages of the generation (transfer, commercialization) of an innovative product. Since in the current context in Russia it is impossible just to replace the raw-materials export model of economic development with the innovation-driven model, it is necessary to encourage innovations in all their forms promoting non-energy sector productions while retaining the advantages of the commodity-heavy economy that ensures required inflow of petrodollars and activating various instruments of interaction between the state, business and research. Figure 1 shows the author's vision of the structure of the model of the innovative development of Russia built on the principles of the integrative interaction between the science, vocational training system, state and business, with the leading role of science.

As we see in the diagram, the innovative model if development of the Russian economy is based on the close collaboration between **science**, (including such instruments as fundamental and applied research, transfer of knowledge and technologies etc.), state (through instruments of improving the innovations legal framework), vocational training (due to professional training and reskilling etc.) and business (through upgrading physical facilities and engineering and manufacturing resources etc.).

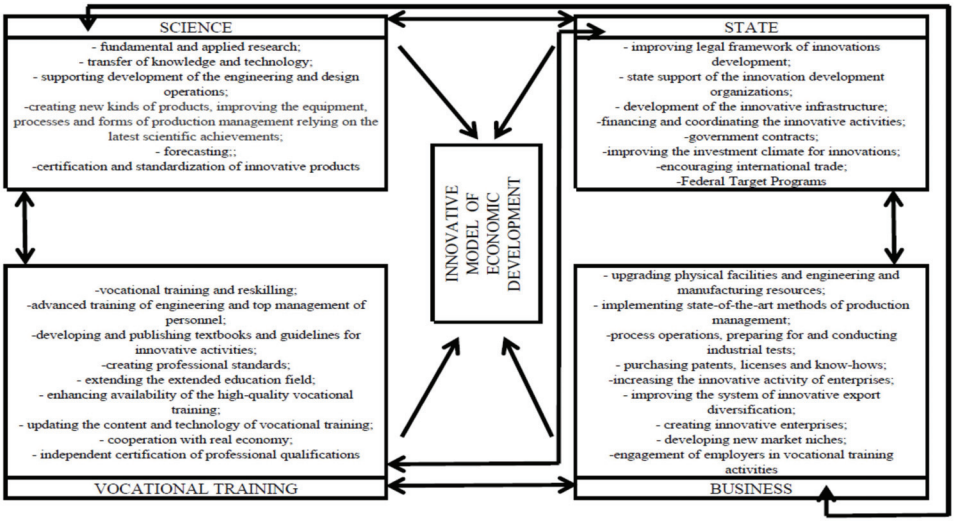

Figure1. The diagram of the integrative interaction of science, vocational training system, state and business as part of the innovative model of development of the Russian economy (author's approach)

Summary. Based on the conducted research, one can assert that at present, R&D enterprises have become one of the main components of creating the national innovations-driven system. According to the findings obtained through analysis of the innova-

tive support of the long-term sustainable development of the industrial sector of the economy, generally, Russian industrial enterprises feature low indicators of innovations development, poor physical amount of expert of the innovative products. One can conclude that the Russian innovative model must be predominantly oriented at the fully-fledged development of the non-energy industries.

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Vardan BOSTANJYAN, Rafael MARGARIAN

An innovative model as a factor in ensuring sustainable long-term development of the industrial sector of the economy

Key words: innovative model of the economy, Russian economy, research and production enterprise, innovative activity

This article examines the main types of innovative models of economic development. A new version of the Euro-Atlantic model, the “triple helix” model, which has become most widespread in the United States, has been singled out as the most modern and most adequate to the national characteristics and priority aspirations of Russia. Comparison of modern types of innovative models in foreign countries is made. The problematic state of the system of scientific and technological development of the country, the difficulties of import substitution are noted. The necessity of stimulating innovation activity in all forms of its manifestation with an emphasis on non-primary production while maintainning the advantages of the mechanisms of the export-raw material economy, which provides the necessary inflow of petrodollars, and activating various instruments of interacttion between the state, business and science, is substantiated. The author's vision of the definition "modern model of innovative development of Russia" is formulated. The author's vision of the structure of the model of innovative development of Russia, built on the principles of integrative interaction between science, the system of vocational education, the state and business, with the leading role of science, is presented. It is stated that at present one of the main components of the creation of the national innovation system has become scientific and production enterprises (SPE). It is concluded that the innovative model of Russia should be predominantly focused on the full development of the non-resource complex.

SECTORAL DEVELOPMENTS AND GEOPOLITICAL TRENDS

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Key words: economic growth, GDP, WTO, sectoral developments, regional trends, competition

Introduction. According to some expert estimates developed nations average agricultural subsidies, at some US$300 billion per year, are larger than the GDP of all of Africa. That number is also equal to six times all of the global aid that is given from developed countries to developing countries. A global simulation had brought down tariff peaks in agriculture; brought down tariff peaks in manufacturing. It lowered averages. A good agreement could boost incomes anywhere from US$270 billion to US$520 billion, depending on the assumptions. These models are open to interpretation because of assumptions, but basically, developing countries would stand to gain anywhere from half to two-thirds of the total benefit from WTO Doha agreement. That's US$350 billion of additional in-come that could be expected in addition to normal growth, the income that normal growth would produce by 2025. But to realize the development promise of WTO, World Bank, FAO and others means reducing the barriers that face poor people all over the world. And here, agriculture is a priority, particularly border protection and subsidies in the rich countries.

Methodology and literature review. Reducing protection on manufactures – and here, tariffs tend to be higher in developing countries against developing country exporters as well. In ag-riculture, one of the striking features about the international trading system is that developing countries have failed to penetrate agricultural markets of rich countries, in contrast to what they have done in virtually every other market. The developing count-ries' share of total world exports in manufacturing to rich countries has risen from about 12 percent to over 22 percent in 2005-2020. Similarly, intraregional trade in developing countries has also expanded. So their share of manufactures in each others' markets has increased. They also have increased in agriculture, but only in trade with each other. Meanwhile, exports to rich countries during this period have fallen.

Some experts attach special attention on how should national governments respond to globalization [Dunning, 1997, 55-66]. Others examine the role of the international organizations, particularly, the World Bank and struggles for Justice in the age of globalization [Goldman, 2005, 45]. Today's world economy cannot be assessed in any way without the growing role China [Hutton, 2005], the trends of globalization and regionalization [Stiglitz, 2002, 112-128). We also take into consideration the United Nations reports on mentioned issues [UN report, 2020], as well as UN recommendations

how to reach the Sustainable Development Goals [SDG, 2015] and going beyond to eliminate poverty and hunger by 2025 [Weber, 2001, 27-36]..

Analysis. As consumer spending remained strong, what was a critical factor was the fall in investment spending. And for recovery to get off the ground there is a need for an improvement in business confidence and capital spending, and these were factors clearly required. Among the improvements in the climate for investment, corporate profits are now advancing at high rates in the U.S. and Japan. There are stronger equity markets across the OECD that had been sustained so far that tend to bolster confidence, and they may also reflect improved economic expectations. And indeed, business sentiment is now picking up, and this includes Europe. When stocks go up steadily in the United States questions begin to arise about economic growth. And job creation figures from the Labor Department, one of the most closely watched barometers of the nation's economic health, begin to fall. After that, confidence in the economy and stocks begin a nosedive, leading to a long drought that pushed the major indexes lower. Why sometimes the stock market cannot perform the same way as after it fell so badly but made a fast recovery. There are three main reasons for that: jobs, oil and the dollar [Market Gyrations, 2005, 11-19].

The Role of Education. Education will be determinative of success in the 21st century at both the individual and country levels. The globalizing economy and technological change inevitably place an increasing premium on a more highly skilled labor force. Adult literacy and school enrollments will increase in almost all countries. The educational gender gap will narrow and probably will disappear in East and Southeast Asia and Latin America. Progress will vary among regions, countries, and social groups, triggering increased income inequalities within as well as among countries. School enrollments will decline in the most highly impoverished countries, in those affected by serious internal conflicts, and in those with high rates of infectious diseases. With the intense demands for education created by the shift to a knowledge-oriented economy centered on intellectual property, educational institutions will experience enormous pressure to reorganize around fulfilling the goals of actually preparing their students for the new economic order. Also, the demographic profiles of students will change significantly, as lifelong learning will become commonplace, with people shifting careers frequently, continuing to be economically productive into old age. Such mature students will be much more demanding consumers of education than today's. Those individuals who do excel at teaching will have new electronic venues for transmission of their knowledge. This will provide a large economic incentive to devote energy to teaching, as they will be reaching millions of students, rather than hundreds. At the pre-university level, many more options will be available to students and parents, and the current state-run monopoly will disappear. Updated versions of “voucher

systems" will be commonplace, and competition among a set of institutions providing a diverse set of educational options will provide exceptional educational preparation for the university environment.

Technology and Place of Work. Global economic restructuring continues to be impacted by various advancements in information technology that have made the world 'functionally smaller' and have drastically changed the work place and where people work, spawning the emergence of the 'technology-integrated' office environment As computer devices become smaller, more portable, and perform more complicated business tasks, they will continue to revolutionize how and where business is conducted.

Cluster Sector Development. Over the last few years, the economy has seen the growth of 'sector clusters' in various municipal settings. Sector clusters represent the concentration of investment and job creation in like-companies located in proximity to each other in relatively concentrated centers. A prominent example of an emerging cluster in the GTA is Toronto's biotechnology industry cluster, which represents a growing critical mass of biotech and related research and development, and related convergent industries.

Emerging Growth Sectors. The 19th-century was the heyday of society's transformation by technology. While its influence was still large in the 20th century, its impact in the 21st will be less dramatic. Nonetheless, one can anticipate the following technology-driven transformations representing the future engines of growth.

Computers and semiconductors (including software and information) & information technologies Computerized society will allow knowledge to be very fluid, via the new educational systems and countries' ability to capitalize on this transforma-tion will be limited primarily by the effectiveness of their social and political institu-tions.

Health and medical care. The major health problems of the 21st-century in the developed world will primarily be related to lifestyle issues, intransigent to simple treatments with surgical intervention or pharmaceuticals and the greatest impetus for change in our health will come from health education, with educated individuals taking responsibility for the maintenance of their health and the prevention of disease.

Communications and telecommunications (including space equipment, radio and microwave communications, and entertainment). ***Instrumentation:*** process controls, environmental equipment and consulting, optical instruments and lenses, engineering and scientific equipment [Nuala, 2020, 31-42].

Innovations will further improve both the systems and the methods of new technologies and modernized equipment and the use of new achievements on earth and in space laboratories.

Transportation. Solar-energy-based fuels will finally replace fossil fuels and the technological hurdles will be solved to convert this biomass into a readily transmuted and transported energy-storage medium; Also, the orgy of highway-building of the 20th-century will finally slow, as technology is put in place to allow more cars to flow over existing highways.

Geopolitical trends. As the world experiences rapid economic changes, world economies are becoming less internalized and are adopting a more global perspective to survive and prosper. Much of the global trends will be more relevant to the economically-developed nations, with the developing nations and the underdeveloped nations catching up to the status of the developed world in coming decades. Let us analyze most significant geopolitical trends in the 21st century.

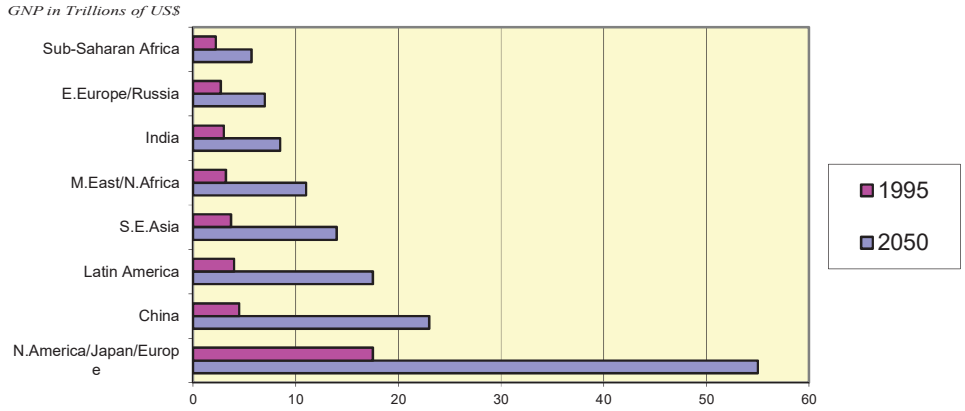

Figure 1. Regional Economic Growth (1)

Conclusions. Thus, the gains in many parts of the world are likely to be lower: As economic uncertainties may persist as well as political uncertainties. This will remain the most troubled region of the world, though its geopolitical importance will diminish as we move away from an oil-based energy economy. In 2050, the Arabs and Israelis may still face some challenges that might need further international assistance. This region will still be hamstrung by poor political leadership, with the exception of a few countries like Israel, Egypt and South Africa, which will cause the global economic trends listed above to largely leave this region behind. While global health organizations will invest a large effort in Africa, with the introduction of vaccines and simple public hygiene, the low level of basic education will leave this region devastated by sicknesses and low life expectancy, in stark contrast to the rest of the world. In Sub-Saharan Africa, persistent conflicts and instability, autocratic and corrupt governments, overdependence on commodities with declining real prices, low levels of education, and widespread

[1] Source: Data from UNCTAD reports 1996-2020.

infectious diseases will combine to prevent most countries from experiencing rapid economic growth. Today's Africa is one of the regions that is unlikely under current projections to meet the Sustainable Development Goals. Nearly half of the total projected increase of the number of people lifted above poverty would accrue in Africa. This region's forecast might be more promising once the developed nations honor their commitments to provide 0.7% of their annual income to be spent on projects to reduce the poverty and eradicate hunger.

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Tatul MANASSERYAN

Sectoral developments and geopolitical trends

Key words: economic growth, GDP, WTO, sectoral developments, regional trends, competition

The countries and regions most at risk of falling behind economically are those with endemic internal and regional conflicts and those that fail to diversify their economies. The economies of most states in Asia, Africa and the Middle East and some in Latin America will continue to suffer. A large segment of the Eurasian landmass extending from Central Asia through the Caucasus to parts of southeastern Europe faces dim economic prospects. Within countries, the gap in the standards of living also will increase. Even in rapidly growing countries, large regions will be left behind. For the long-term outlook, there is a need to compare growth in per capita terms. And here, longer-term trends through 2050 remain upbeat for most regions, contrasted with the performance of the nineties. And this supports, in part, the expected achievement of the Sustainable Development Poverty Goals for developing countries as a group, though Africa, in particular, is expected to fall far short of this target.