

## DIGITALIZATION PROCESSES AND MAIN DISSEMINATION DIRECTIONS IN RA, 2000-2022

**Gayane AVAGYAN**

Ph.D., Associate Professor, Chair of Macroeconomics at ASUE

**Suren KARAPETYAN**

MA in Macroeconomic Analysis, ASUE

Key words: digitization, digital technologies, digital public services, decentralization

**Introduction.** Digitization and the use of digital technologies are reasonably analyzed and discussed topics, and having a unified digitization policy by states and governments has become one of the essential conditions for the development of the economy as a whole. In RA (Republic of Armenia), however, similar government-level discussions began only at the end of the last decade. Adopting the RA Digitalization Strategy is a practical step because until then, there was no centralized state policy on digitalization and the use of digital technologies. It is not deniable that after RA's independence, many successes and positive developments have been registered in the digital ecosystem. Nevertheless, the results were not systemic, controlled or led by the state. It caused digitalization processes and the application of digital technologies to be concentrated, led by the public administration, IT, and partially by the financial and banking sectors. The article aims to reveal the trends of digitalization processes in RA by phase analysis monitor the digitalization strategy and observe the main directions of their spread.

**Methodology.** The research methodology employed in this study involved the use of comparative analysis, which allowed for the identification and differentiation of the digitization processes within the RA based on their stages of development. This method enabled the researchers to compare and contrast the different stages of digitization within the RA, highlighting the similarities and differences among them. Additionally, the study utilized both observation and statistical methods to analyze the trend of indicators within the sector being studied. Observational methods involved the systematic and structured observation of the digitization processes in the RA, while statistical methods used quantitative data to measure and analyze the trends within the sector. By using both observational and statistical methods, the researchers were able to obtain a comprehensive understanding of the sector's performance and trends over time. Overall, the research methodology employed in this study allowed for a thorough and systematic examination of the digitization processes in the RA, providing insights into the sector's development, performance, and trends.

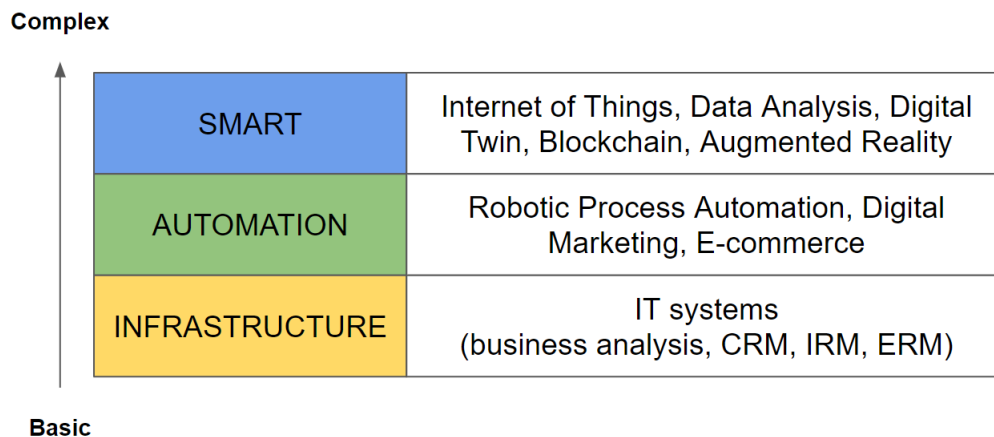
**Literature review.** In the course of the research, approaches that interpret and define the digital economy and digital technologies were studied. Don Tapscott's scientific works illustrated the advantages and revolutionary potential of the digital economy

[Tapscott, 1994, 67-69]. Lane explained the digital economy as driven by a convergence of information, computing, and communications, which we call the Internet. Also, he mentioned the importance of spreading new knowledge and understanding of the digital economy throughout society as quickly and widely as the Internet did [Lane, 1999, 317-320]. Few countries quickly responded to digital developments and developed their digital concept. Among them was, for example, Estonia, which aimed to create a digital society and a state that serves citizens, promotes their participation in public administration and cares for their well-being [Estonian Council of Informatics, 1998, 8]. Now the country is the leader in the digital world. The digital economy is a virtual environment that complements our reality and allows us to have relationships that are impossible or ineffective to imagine in the physical world [Ivanov, 2017, 12]. According to the Bureau of Economic Analysis, the digital economy has three directions of economic expansion: Infrastructures, E-commerce and Priced digital services [Highfill et al., 2020, 2]. These are the three main components on which the interpretation of the digital economy is built in the United States. During its development period, digital technologies and the Internet itself have merged, leading to the formation of Web 1.0, Web 2.0, and Web 3.0. The digital environment transformed from the "read-only" concept to the "read, write and own"[Naik, 2009, 6].

**Scientific novelty.** The novelty of the research lies in the fact that it has carried out a thorough analysis of the policies implemented by the RA government at each stage of digitalization and classified them into different phases. This classification provides a new perspective on the digitalization process in RA and can help policymakers and researchers better to understand the evolution of digitalization in the country. Moreover, the research has identified the main directions of digitization in RA, which is another contribution to the field. By highlighting these directions, the research can serve as a guide for future policymaking and research in the area of digitalization in RA. This is particularly important in today's world, where digital technologies are transforming societies and economies at an unprecedented pace and policymakers need to stay informed about the latest trends and developments.

**Analysis.** The digital economy and technologies enable society, enterprises and the state system to create added value, improving overall well-being. That is why expanding the scope of the digital economy, its development, and reasonable control and management should be one of the essential goals of society and the state. Digitization is transforming information into a digital form, making it possible to find hidden opportunities, establish new ways of production, and reduce production and operational costs. Digitization is the driving force of modern life, a current trend in developing of the economy and society, which increases the economy's efficiency and quality of life [Khalin, 2018, 47]. It has created new markets that are impossible or ineffective to imagine in the physical

world. Thanks to digital technologies, capital management has become more profitable. Also, the competition is being promoted. Moreover, digitalization allows for the involvement of a larger number of citizens in government activities, increases the number of services available to the public, and creates conditions for the efficient and transparent work of the state apparatus. Digitization processes can be classified according to conventional degrees of complexity.



**Figure 1.** Classification of digital technologies according to their complexity<sup>1</sup>

As we can see, IT systems and software are the simplest stage from the point of view of the complexity of digital technologies, which implies an infrastructure. The next level is automation, from robotic process automation (RPA) to digital marketing. To visualize RPA, consider physical robots that perform tasks such as cleaning the house or lifting heavy objects as a human would complete the job. A similar process is in the case of RPAs "robot" refers to a virtual rather than a physical system that helps automate repetitive computing or business process tasks, for example, providing a loan to a client without the intervention of a specialist. The next and most complicated stage is the smart one. It is the sum of data analysis of the physical world and the creation and development of its virtual systems.

It is logical that in RA, after independence, the development processes of digital technologies started from the most basic stage, from the infrastructures. The Armenian diaspora, especially the American-Armenian, played a significant role in that matter, thanks to whose efforts the first foreign IT companies spread their branches not long after the independence of the Republic of Armenia. The IT sector gained a new development momentum when the communication and telecommunication sector began to overgrow. In the whole world and in RA, too, 2004 was a turning point when the term "Web

<sup>1</sup> The figure was created by the authors.

2.0" began to be widely used, marking a new stage in the development of the Internet [Wilson, 2011, 2]. During this time, the mass distribution of mobile phones and the rapid spread of social networks contributed to the immediate growth of Internet users. Moreover, the Internet has turned into a domain of creators from being only a consuming environment [Abdullahaji, 2015, 43]. RA also stayed caught up with the trends. If in 2004 only five percent of the population used the Internet, in 2014, the number was already 55%. According to 2020 data, 77% of the population used the Internet at least once in the last 3 months, and in January 2023, this share in the total was 78.6%<sup>1</sup>.

**Table 1.** The basic concepts of Web 1.0, Web 2.0, Web 3.0, structures [Naik, 2009, 6]

Name	Web 1.0	Web 2.0	Web 3.0
Period	1991-2004	2004-to present	2014- to present
User Experience	The read-only Web	Read and write	Read, write and own
Appearance	Simple web information	Two-way pages, multimedia	3D world of own digital assets, one unified avatar, transparent and decentralized virtual platform

As for web 3.0 in RA, 2022 can be considered a turning point from the point of view of its development. During 2015-2019, five companies operating in the web 3.0 domain in RA were founded, two of which launched with the participation of foreign capital: Russian and Dutch. Moreover, in 2020-2022, five companies were established at once, 4 of them with Armenian capital<sup>2</sup>. The companies involved in developing blockchain technologies and their security in RA mainly specialize in developing software and other relevant solutions. However, Armenian Fastex, founded in 2022, launched its cryptocurrency, Fasttoken, and most importantly, started offering a blockchain-as-a-service platform. It is crucial that third party companies can use or apply the solutions provided by Fastex without developing their blockchain system. As for the digitization processes in the Republic of Armenia and the policy of the RA government in this direction, it can be conventionally divided into four stages.

*Early or embryonic* (years 2000-2010). Some primitive public electronic control systems were developed. Also, the government enacted some legislative documents and decisions related to the sector, for example, the Law "On Electronic Document and Electronic Digital Signature." It is important to emphasize that at this stage, the government already recognized the IT industry as one of the priority sectors of the development of the RA economy. Although, for implementing information technologies and digital solutions in the public sector, practical steps began to be observed only after 2010.

*Infrastructure* (years 2010-2014). This stage begins the era of public sector digitalization in RA. In particular, two digital platforms were launched in 2010: www.e-

<sup>1</sup> <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=AM>, <https://datareportal.com>

<sup>2</sup> Because of the lack of statistical data, the social platform LinkedIn was the basis.

gov.am (state) and www.dasaran.am (with state support). E-gov aimed to start digitalization processes in the public administration sector, and Dasaran.am in the education sector. The E-gov platform gradually introduced new public management tools and resource links in the previous decade. As of January 2023, their number of digital public management tools has reached 34. We can divide the tools into five main groups:

- Notices and applications
- Decisions and agendas
- Judicial and legal activities
- Business and taxes
- Statistics and databases

*Digital economy and digital services* (years 2014-2019). The phase started when the parliament adopted the Law "On State Support of the Information Technology Sector." It defined tax benefits for representatives of the IT sector, as well as the procedure for issuing the IT sector certificate. As a result, the IT industry experienced dramatic growth. We must consider that before 2018 accurate statistics on the sector were not carried out. However, according to the RA ICT Register, as of February 1, 2022, 6,354 ICT companies are operating in RA<sup>1</sup>. An important initiative at this stage was the launch of Electronic Government Infrastructure Implementation Office (www.ekeng.am) platform. It aims to facilitate citizens' communication with the state. Another essential step in this phase was the launch of Armed, the national e-healthcare operator. By the way, the mobile application offered by the system was widely used during the coronavirus pandemic. The growth of demand for digitization and digital services within the economy also distinguishes this period.

*Development of strategic bases for digitizing and publicizing digital services* (2019 - present). The phase began with the fact that the RA government considered digitalization and high-tech production as one of the main goals for developing the RA economy. As a result, to activate the Armenian high-tech ecosystem, by the decision of the RA Government on June 1, 2019, the RA Ministry of Transport, Communication and Information Technologies was renamed to the Ministry of High-Tech Industry of the Republic of Armenia. It has set itself the task of turning RA into a country engaged in high-tech production and export<sup>2</sup>. Legislative and strategic foundations regarding digitalization and digital tools in RA have been laid since the 2000s, but the initiatives have become organized only since 2010. Moreover, they were mostly organized within the laws and decisions framework without a national strategy. Since 2019, it has been implemented based on the national strategy. RA has set a goal to improve electronic governance tools and increase the number of digital services available to citizens. The strategy

---

<sup>1</sup> <https://ictstat.am/en/registr>

<sup>2</sup> <https://www.arlis.am/documentView.aspx?docid=131156>

strongly focuses on the public sector, as 18 of the 19 programs refer to it, and 11 targets only the public administration sector. Moreover, studying the RA digitalization strategy and other related legislative projects and decisions, it becomes clear that there are no direct references and state policies to the use of technologies that have made or promise a great revolution in the IT sector, such as artificial intelligence, automation, 5G, the Internet of Things (IoT), blockchain, etc. This approach is quite risky because, in this way, RA lags behind international trends. Such technologies are being used in the private sector, led by IT and financial institutions. However, discussing them at the public level in RA is necessary to develop legislative and strategic bases for their introduction. It is essential for the country's branding and representation on international platforms as a state striving for complete digitalization. From 2014-2019, the demand for digitization and digital services within the economy increased dramatically. 11 of the 18 commercial banks of RA (Fast Bank CJSC got a license to engage in banking activities only in 2022) have released a mobile application and started mobile (digital) services. The use of digital technologies in the financial sector is otherwise called FinTech. As for the RA banking sector, Evokabank is one of the fastest and most successfully integrated organizations here. It was recognized as the best consumer digital bank in Armenia in 2022 (6th year in a row)<sup>1</sup>. Being the first and only mobile-first bank in the Armenian market (every service offered by the bank will be tested and adapted first for the mobile phone user), in the summer of 2020, Evocabank launched the first banking bot, EvocaBot, which provides information to customers and performs transactions.

**Table 2.** Online banking mobile applications released in RA, 2014-2022<sup>2</sup>

APP	Release Date	Downloads (Google Play Market)
InecoMobile	OCT. 15, 2014	100,000+
Converse Bank Mobile	DEC. 23, 2014	50,000+
Idram & IDBank	JUN. 13, 2015	1,000,000+
Ameria Mobile Banking	FEB. 16, 2015	100,000+
EvocaTouch	APR. 3, 2015	100,000+
Unibank Mobile Banking	NOV. 9, 2016	50,000+
Ardshinbank Mobile Banking	DEC. 4, 2016	100,000+
Byblos Bank Armenia	OCT. 11, 2017	1,000+
AraratMobile	JUN. 20, 2018	50,000+
ABB MOBILE BANK	JAN. 11, 2019	50,000+
HSBC Armenia	NOV. 4, 2019	10,000+
AEB Mobile	JUN. 13, 2020	50,000+
Artsakhbank Mobile	JUL. 30, 2020	10,000+
ACBA Digital	SEP. 13, 2020	100,000+

<sup>1</sup> <https://www.evoca.am/hy/news/prizes/global-finance-2022/>

<sup>2</sup> The table was compiled by the authors.

In parallel with the banking sector, digital technologies have become popular in payment service organizations. In 2015, "IDRAM" LLC released its mobile application one year after the banking sector. Currently, 6 of the 12 payment service organizations registered in RA offer digital services and have a mobile application.

The insurance sector, a part of the RA financial sector, also offers digital services. Two companies with a significant market share, "Ingo Armenia" CJSC and "RGS-Armenia" ICJSC, were among the first to provide digital services by signing CMTPL contracts online. If in 2018, only 2% of the CMTPL contracts concluded in RA were drawn up online, then already in 2022 (as of December 31) - 24%<sup>1</sup>. Currently, such services as travel insurance, contract validation, or booking an appointment with a doctor are available online<sup>2</sup>. However, there is currently no insurance company in RA that offers a platform (for example, a mobile application) that will allow the user to control insurance packages, submit a claim for compensation if necessary (the author did not consider the "ASWA" application, because it is extremely limited and refers to a specific insurance case, that is, an accident registered with an agreed declaration, the amount of the expected damage compensation does not exceed AMD 100,000 (in RA regions) and AMD 200,000 (in Yerevan).

Despite applying innovative solutions in the RA financial sector, it has yet to be able to meet business requirements. In particular, the vast majority of electronic payment systems that are widespread worldwide are not available in RA. Such systems make it possible to make money transfers within seconds and charge relatively small commissions (as opposed to traditional bank transfers, which can take 1 to 3 working days). For example, payment solutions systems that are used around the world, such as Stripe and Skrill (which are especially popular in the startup and technology sectors), Alipay, Amazon Pay, Adyan, Square, myPOS, TransferWise and other systems are not available in RA [Grigoryan et al., 2021, 83]. Nevertheless, the payment systems offered by two technological giants, GooglePay and ApplePay, became available in Armenia only at the end of 2022. As for PayPal, it is partially available in RA (citizens of RA can make payments but cannot accept transfers). All this creates additional complications for the RA technological sector because similar systems not only solve operational problems but also their availability in a specific country is used in several prestigious indexes and statistics, serving as a unique "branding" tool for a country.

Great progress has been made in the adoption of digital technologies in the field of non-formal education as well. In particular, the Armat engineering laboratories network has contributed significantly to the technological sector. Its purpose is to develop

---

<sup>1</sup> [https://www.appa.am/index.php?al=appa\\_statistics](https://www.appa.am/index.php?al=appa_statistics)

<sup>2</sup> <https://online.ingoarmenia.am/>

technical skills among the students of Armenia and Artsakh by using digital technologies, contributing to career orientation of a technical nature. Moreover, Armat is also exporting the educational model—namely, Georgia and India. According to the data for 2022, there are 626 Armat engineering laboratories in the territory of Armenia (including Artsakh), Georgia and India, where about 17,000 children receive free engineering education<sup>1</sup>.

The following successful example in education is the TUMO creative technologies center (operation since 2011). It offers 14 programs designed to foster creativity among students and provide hands-on training in various sectors of the economy. Courses include animation development, game design, film production, robotics, 3D printing, artificial intelligence, etc. The center's activities range from virtual reality design to website development and programming. In addition to being an educational institution, the center is also considered a major employer (in many cases for its students). As of December 1, 2022, according to unofficial data, the center has about 400 employees. During its activity, TUMO has educated more than 60,000 students.

Interestingly, the center is also engaged in the export of educational technologies. Currently, it is represented in 11 cities (4 in RA, 2 in France, and one center each in Lebanon, Russian Federation, Albania, Germany and Ukraine). Moreover, the center also has six mobile stations - TUMO Boxes across Armenia<sup>2</sup>.

The agricultural sector should also be discussed when examining digitization processes in RA. It is one of the priority sectors of the RA economy, with a significant share of the GDP, where about a third of the total employees of the RA are employed. Moreover, in the last decade, the percentage of the sector's products in the total export of RA has almost tripled, from 2.8% to 7.7%. Nevertheless, we must emphasize that a high level of informal employment distinguishes the sector. In particular, if the total level of informal employment in RA was 35.2% in 2021, it was 95.6% in the agricultural sector, while the indicator in the non-agricultural sector was 18.1% [Avetisyan et al., 2022, 75]. This is a severe problem in terms of the spread of digital technologies.

The next component of the RA economy, which has an insufficient level of digitization and needs to be given adequate attention, is the transportation sector. Remember that Armenia's Ministry of High-Tech Industry was created with having in background the former Ministry of Transportation and Communication. However, the digitalization of transportation and practical steps are not directly addressed in relevant strategies and legislative decisions. Until now, no unified digitization system has existed for passenger and cargo transportation in RA. Digital solutions are used in large volumes

---

<sup>1</sup> <https://web.archive.org/web/20220715191920/https://armath.am/hy/about>

<sup>2</sup> <https://tumo.org/locations/>



in the private sector, while public transport is not involved in similar solutions. Electronic payment systems still need to be introduced (the possibility of introducing a unified electronic payment system in Yerevan has been discussed in recent years, but there are no practical steps yet). The digitalization of transport enables the discovery of more efficient, reliable and cost-saving solutions. Similar technologies allow for tracking traffic patterns and managing traffic flow. This helps reduce congestion, improve safety and reduce pollution. These three factors are essential for the overloaded Yerevan, the capital city.

As we have discussed, there needs to be more interpretation of Web 3.0 in RA, which is based on blockchain technologies, at the state level. Only the Central Bank has regularly opposed cryptocurrencies based on blockchain technologies in RA. However, there are no developments for the application of the blockchain itself, even though similar technologies have been discussed in Armenian scientific circles since the middle of the last decade.

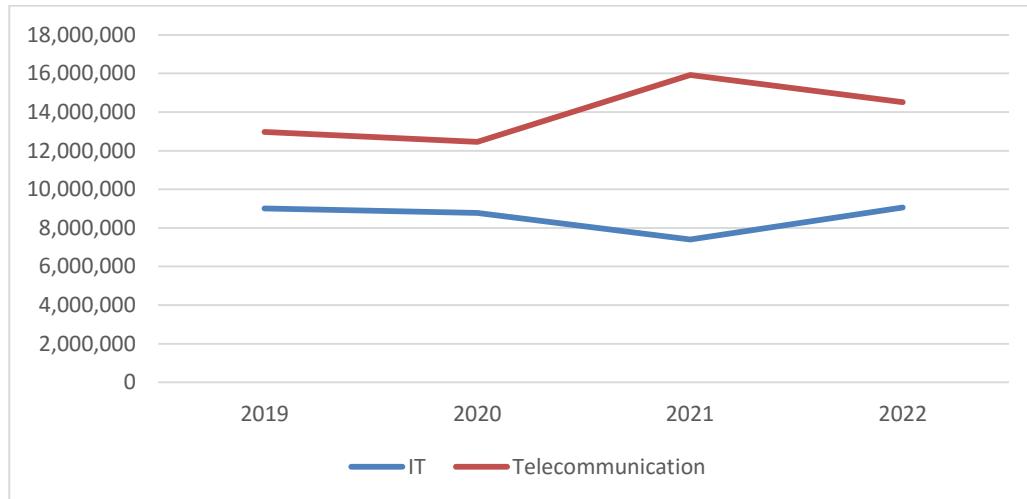
Digitization is quite a complex process, not only providing digital services and solutions. As we mentioned, the scope of its spread refers to all spheres of the state, economy, and society. Digitization in RA is primarily considered in ICT, public administration and partially in the financial sector. As for business, human capital development, education, construction, agriculture and other sectors, they are practically excluded from the digital concept.

**Table 3.** IT sector specialization in RA by services provided, %, 2018-2022

	<b>Proprietary Software Publishing</b>	<b>Software development and related activities</b>	<b>Data processing, distribution of information on the network</b>
2019	0.14	87.08	12.78
2020	0.71	86.20	13.10
2021	0.68	90.41	8.91
2022	0.86	93.10	6.04

The digital economy in RA experienced rapid development starting in 2010, and since 2014, the field of information technologies and information services has registered super growth. During 2010-2022, it increased more than 14 times, from 20.9 billion drams (\$54M) to 294 billion drams (\$760M). However, it is also essential to analyze the specialization of the IT sector according to the services provided. We notice that the IT sector is mostly specialized in software development and outsourcing. It is mainly distinguished from international markets by relatively lower prices and, therefore, by generating less added value. Moreover, for example, the share of data processing and information distribution, a sector that creates greater added value, has continuously decreased during 2018-2022, even though it has increased in absolute terms. As a result, the effectiveness of the IT sector has decreased. We see that from 2018-2021 the productivity of

the RA IT sector by one employee has continuously declined. Only in 2022, it showed a positive move. Although the notable gap between telecommunications and IT sector productivity continues to exist. Many professionals move from the telecommunications sector to IT, a sector with relatively less productivity in RA.



**Figure 3.** Productivity of RA IT and Telecommunication sectors by one employee (until 2019, no distinction was made between the number of employees in the IT and Telecommunication sector), 2019-2022

The lack of data does not allow for a more detailed analysis, but it can become the subject of further investigations.

**Conclusions.** Studying the experience of using and implementing digital technologies in RA, we can conclude that RA already has a developed digital management services and tools infrastructure. Their development and improvement are continuous, which is the primary goal of the RA digitalization strategy. From the point of view of forming infrastructures, the second and third stages were quite significant. As for the first stage, 2000-2010, the digitization processes were elementary. The fourth stage is a turning point because strategic foundations for digitization were formed only in this stage. However, analyzing the strategic and legislative foundations of digitalization and the development of digital technologies in RA, we conclude that the direction of its spread in RA mainly refers to the state sector and the development of digital infrastructures. As for the economy and society, there are only a few practical proposals here. Moreover, the strategy aims to improve and develop the results of the previous stages. Meanwhile, it is necessary to form a unified approach to the latest technologies in the digital sphere, their adoption, implementation and development. In this case, RA loses its innovative potential, becoming a secondary producer, which we are witnessing in the form of outsourcing in the IT sector.

**References:**

1. Abdullahhaji, A. The Business Ecosystem of The Creator Economy, Ewha Womans University, 2015, p.43
2. Avetisyan S. et al., Development Trends and Analysis of Structural Shifts of RA Agricultural Sector, Banber ASUE N5, 2022, p. 75
3. Estonian Council of Informatics, Principles of Estonian Information Policy, 1998, p. 8
4. Grigoryan K., Voskanyan T. E-commerce. Possible risks, losses and development opportunities, Amberd series, ASUE, 2021, p. 83
5. Highfill T. Surfield C. New and Revised Statistics of the U.S. Digital Economy 2005-2020, Bureau of Economic Analysis, 2020, p. 2
6. Ivanov V. G. Malinetsky G. Digital economy. myths, reality, perspective, Russian Academy of Sciences, 2017, p. 12
7. Khalin V., Chernova V. Digitalization and Its Impact on the Russian Economy and Society: Benefits, Challenges, Threats and Risks, N 10, 2018, p. 2
8. Lane N. Advancing the Digital Economy into the 21st Century, Information Systems Frontiers 1:3, 1999, p. 317-320
9. Naik U. Shivalingaiah. D. Comparative Study of Web 1.0, Web 2.0 and Web 3.0, University of Allahabad, 2009, pp.5-7
10. Tapscott D. The Digital Economy: Promise and Peril in the Age of Networked Intelligence, 1994, p. 67-69
11. Wilson D. Et al., Web 2.0: A Definition, Literature Review, and Directions for Future Research, Association for Information Systems, 2011, p. 2

**Gayane AVAGYAN, Suren KARAPETYAN**

**Digitalization Processes and the Main Dissemination Directions in the Republic of Armenia, 2000-2022**

*Key words: digitization, digital technologies, digital public services, decentralization*

Digitization and digital technologies have become the driving force of the modern economy. As in the economic and political world, here, too, states and societies are at different stages of development. All of them, including RA, started digitization processes from the infrastructure stage. Few have moved on to the other stages of development: automation and the smart economy. During the research, we analyzed the digitization strategy of RA and RA government policy from 2000-2022. Our research aims to visualize the digitalization stages and its characteristics in RA. The country's digitalization strategy is a key document that is called to lead and regulate the digital environment and its development path. Having adopted the digital strategy, RA is trying to develop digital technologies and infrastructures without considering the next development steps. RA should pursue a state policy to interpret and apply technologies that have made or promise a great revolution in the IT sector. Also, RA should implement decentralization by expanding the directions and areas of application of digital technologies.