

**Hasmik Hovhannisyan,**  
Ph.D., Associate Professor,  
Department of Economics and International Economic Relations,  
Yerevan State University,  
Yerevan, Armenia

**Armine Chobanyan,**  
Ph.D. Student, Market Researcher,  
Union of Young Economists, European University,  
Yerevan, Armenia

### ECONOMY IMPACTS OF ICT INDUSTRY: CASE OF ARMENIA

*This article capitalizes possible impacts of ICT to the economy of Armenia with forecasts and distinction with ICT related succeeding several countries. It is introduced in article the current situation in Armenia and gives policy recommendations. Pointed in article, that the world economy is transforming from an industrial age to an informational/knowledge based age, where the role of ICT is becoming increasingly powerful and vital compared to labor force and capital. The article aims to show that Armenia with its objective and subjective economic and political problems could become developed and wealthy with well-built ICT industry promoted strategy. Authors suggest the recommendations to the Government of Armenia needs in establishment of healthy operation of the political-economic body of the country based on market-oriented cooperation between public-private and research development centers/educational sectors of the country to better utilize the benefits of ICT industry. It is noticed in article, about the important role of several indicators that have been developed by international organizations and consulting companies to assess the correlation between ICT and economic growth as well as the major factors of ICT growth. Authors emphasis the impacts of ICT on a country are on both levels of the economy: macro and micro levels. On the macro level of national economy, ICT impacts the information and knowledge assessment process; speeds up and reduces the costs of production and transactions; and connects people, NGOs, enterprises, and communities. Bellow in article, is presented the cases of several countries for better illustration of the economic, political and social benefits of ICT industry growth. It is pointed that that the ICT industry has become the carrier of modern national economy development: the country is better equipped, it would better benefit from the process taking place in the world market.*

Keywords: ICT, e-commerce, Armenia, ICT industry, innovative model, technopreneurship.

**Introduction.** The world economy is transforming from an industrial age to an informational/knowledge based age, where the role of ICT is becoming increasingly powerful and vital compared to labor force and capital. This era for creating opportunity opens the door for any country, developed and developing, to jump into a wealthy economy. Moreover, ICT is an industry where small countries and enterprises can compete and win in the market against large countries and companies, which required investments and Government strong support. The examples of it are fast-growing exports of ICT services of Singapore, India, Taiwan, China, Korea, Malaysia, Ireland, Israel, and Finland. Nevertheless, Armenia is the country with limited natural resources and ICT industry with well formulate national ICT policies and strategies could be based for further economic growth and national wealth.

The article aims to show that Armenia with its objective and subjective economic and political problems could become developed and wealthy with well-built ICT industry promoted strategy.

**Analysis of recent researches and publications.** The better equipped a country is for ICT, the greater the benefits. Martin L. Weitzman's recombinant growth model attests to this. According to him, the neoclassical model considers technological progress as exogenously given, while it is an endogenous

factor. Weitzman believes that new ideas are formed through combinations of old ideas. At as the number/stock of ideas/knowledge 7 exploit offered ICT opportunities for the competitiveness of nations. It has three components: the environment for ICT (market, political and regulatory, infrastructure environment), the readiness of the country's key stakeholders (individuals, businesses, and governments) to use ICT, and the usage of ICT amongst these stakeholders.

When correlating NRI rank and GDP growth, it is clear that overall a decrease in one leads to decreases in the second indicator. For example, a decrease in the NRI rank of the USA led to its decrease in GDP, and even led to the crises unfolding in other countries as well. The same is with the case of Armenia as shows Table 1.

The important information in NRI for each government is the scores for each sub-indexes: environmental, readiness, usage, and impact. At the same time, if the country has a high NRI ranking, it would have a higher Global Competitiveness Index (GCI) and visa-versa. Another index is the Global or International Innovation Index is calculated annually by the Business School for the World (INSEAD) and World Intellectual Property Organization (WIPO). This index is more centralized on ICT-related calculations.

*Table 1 – NRI and GDP growth rates for Armenia (Statistical Committee)*

	2016	2015	2014	2013
Growth Rate of NRI of Armenia	2.3	4.2	7.2	0
Growth Rate of GDP of Armenia	0.5	3.1	3.9	3.5

The Knowledge Index (KI) is an interactive tool to benchmark a country's position in the global knowledge economy. The World Bank Institute created KI using the Knowledge Assessment Methodology (KAM). KI measures a country's ability to generate, adopt, and diffuse knowledge, acting as the simple average of the three Knowledge Economy pillars—education and human resources, the innovation system, and ICT. The Knowledge Economy Index (KEI) determines how effectively knowledge can be used for economic development or simply, economic incentive. Essentially, it is an aggregate index presenting a country's overall level of development towards the Knowledge Economy. KI and KEI are directly related to the keystones of ICT, which makes this industry growth possible with its corresponding impacts on all sectors of the economy.

Professor Michael Porter is sure that today's economy is more dynamic than in the late 1980s, making comparative advantage less relevant to economic growth than competitive advantage, thus more productive use of inputs based on continual innovation. Best examples of the knowledge economy are Silicon Valley in California; aerospace and automotive engineering in Munich, Germany; biotechnology in Hyderabad, India; electronics and digital media in Seoul, South Korea; and the petrochemical and energy industry in Brazil. Armenia had a good starting point after independence for ICT sector development, but now it is losing its advantages to other countries as its steps on the wrong side without moving ahead.

**Main material.** The impacts of ICT on a country are on both levels of the economy: macro and micro levels. On the macro level of national economy, ICT impacts the information and knowledge assessment process; speeds up and reduces the costs of production and transactions; and connects people, NGOs, enterprises, and communities. On the micro level of national economy, ICT impacts on media and communications, retail, education, transportation, manufacturing, health care, government, and social sectors; agriculture, defense, infrastructure, and utilities; taxation, security, privacy, and profitability; development of new international standards; markets, organizations, competitive strategies, innovation, financial, and other services; employment, regional, and spatial development; poverty reduction; and so forth. ICT is also creating new sectors for the economy in social and political spheres accelerating its

impact on the development of the economy.

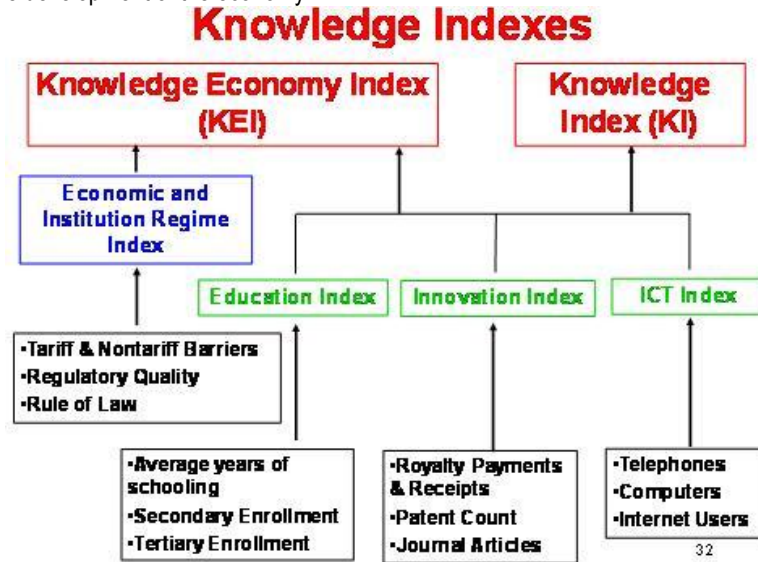


Figure 2 – Components of Knowledge Indexes (KAM, 2009)

Continued low investments in ICT creates a risk for a country's overall competitiveness, as ICT increases productivity and effectiveness of the economy overall. ICT has a higher contribution to economic growth in countries that have a higher technological input. Since ICT is mostly related to information processes, it has a stronger productivity impact in sectors with high transaction costs and/or high labor intensity (financial services, tourism, lodging, etc.). Another important aspect of ICT is that its economic impact is higher where innovative businesses and ICT-promoting incentives exist and are quite active.

In any case, below is presented the cases of several countries for better illustration of the economic, political and social benefits of ICT industry growth. Case of Ireland: In 1970s, the economy of Ireland was totally dependent on the agriculture, especially sheep breeding. Several protectionist actions were taken by the Government to promote economy, but without significant results. After 1970s, the Government of Ireland choose another sustainable development policy for with major stress on scientific intensive sector development. The principal corners of this policy were modernizing non-fee educational system; upgrading and/or developing infrastructure in the country; through USA Diaspora FDIs promotion into high tech sectors with very favorable business environment. Today, Ireland is among top 10 countries where high tech sectors are well developed such is ICT and biotechnologies.

**Case of Israel:** Until the 1970s food processing, textiles, chemicals, pharmaceuticals, and metal products characterized the economy of Israel. Currently, it has an economy with high technology fields, such as medical electronics, telecommunications, computer hardware and software, and diamond processing.

What are the major phenomena of Israel's high-tech industry? First, it is promotion of intensive technopreneurship activities with hundreds of startups. The society deeply understands the importance of ICT products and services in the economy with a high level of private-public cooperation. These two preconditions generated investments from abroad into Israel's high-tech industry, where there is a potentially high return on investments and it covered:

- 
- Incubator programs with government backing;
  - Rigorous and high-tech focused educational institutions;
  - Defense industry support and innovative focus by the Government;
  - Highly educated labor force.

Israeli defense products are in high demand. Moreover, Israel's boost was based on the government's high investment in the defense industry, R&D as well as in e-commerce.

**Case of Rwanda:** Rwanda has limited natural resources and it is a landlocked country like Armenia, and this limitation presents an opportunity for Rwanda to take an approach to development that differs from that of its neighbors. With the existing conditions, the government has chosen ICTs industry to fundamentally transform its economy. In 2000, the Government of Rwanda developed Vision 2020, outlining required initiatives, programs, and strategies for transforming Rwanda into a middle-income country through moving from an agrarian into a knowledge-based economy by 2020. The major actions were massive public and private investments in infrastructure, skills, and institutional frameworks to provide a techno-environment to meet its targets. Currently, Rwanda is considered a country with huge potential to turn into a leader in its region, becoming an excellent example of a landlocked country with limited natural resources that can succeed when investing in human capital.

In summary, all countries have stressed the strong role of government in the high-tech sector with investments/and or with e-government, which had to be understood by the governments of any country id they stress development of economy.

**GDP impact of e-commerce:** E-commerce according to World Trade Organization (WTO) is the sale or purchase of goods or services conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. To generalize this definition, e-commerce is the trade of goods and services over electronic devices across networks. Currently, the most used methods of e-commerce for e-trade is web sales and Electronic data interchange (EDI-type) sales. E-commerce opens borders and increases markets for the realization of products and services, especially for countries with limited access to the world market.

As mentioned above, e-commerce is not limited by borders and nationality. It fosters trade turnover of a country domestically and internationally. As trade turnover is part of GDP, the increase of trade turnover leads to the increase of GDP.

Types of e-commerce include Business to Business (B2B), Business to Customers (B2C), Customers to Customers (C2C), Government to Business (G2B), Business to Government (B2G), and Government to Citizens (G2C). So, e-commerce implements methods with direct impact as well as methodology and market sales tools, and each type requires specific approaches.

E-commerce impacts the economy two-ways: on micro and macro levels as ICT industry. At the macroeconomic level, e-commerce leads downward pressure on inflation through the decrease of paper-money transactions, yet increases productivity, profit margins, and competitiveness. At the microeconomic level, e-commerce leads to a substantial reduction in transaction costs, improved supply chain management, and reduced costs for domestic and global sourcing.

B2B e-commerce accounts for the vast majority of total e-commerce sales and plays a leading role in global supply chain networks. According to estimates by eMarketer, for B2C e-commerce sales grew 21.2 percent to top \$1 trillion in 2012, and it is expected to grow by 18.3 percent reaching \$1.29 trillion worldwide in 2013. Moreover, the e-commerce enables consumers to save money and time. The average annual rate of growth of the e-commerce is calculated more than 20 percent in the world. To lose this opportunity being present on-line in the world market could have quite negative impacts on the economies preferring to stay out of it or just to follow the flows of the world market trends.

The role of a strong, focused government to promote e-commerce in the economy is very vital. Examples include Israel, Columbia, Rwanda, and the United States. For this reason, government needs

to take several required actions, such as establishing a well-developed infrastructure covering telecommunications and goods delivery systems, adopting e-commerce-related business laws, fostering a positive public and business attitude towards e-commerce, and promoting awareness and education, financial services, and a strategy of e-commerce development. In short, failing to consider e-commerce opportunities will lead the country to lose potential markets in the future.

Technopreneurship, R&D centers and Human Capital in the development process of the national economy: A technopreneurship is a type of entrepreneurship involved with high technology, where technopreneurs are entrepreneurs engaged in technology-based business, or in using technology to make new or innovative products for commercialization. This term was first used within Singaporean culture. Technopreneurship is usually characterized with high growth potential stressing strong knowledge and intellectual property, where technopreneurs are required to be equipped with technical and business skills to be competitive. Technopreneurship could not boom without the existence of a knowledge-based worker force/human capital and R&D centers. Human capital is required for starting up and sustaining technopreneurship, while R&D centers are required for its fast development.

Similar to Armenia, Singapore is a small country with scarce natural resources relying on its human capital for sustaining development. Thus the government of Singapore made large investments in education for creating a knowledge-based workforce, which was backed by high-tech industry development. Singapore is currently among the top countries within all high-tech related international indexes, and the government promotes cooperation of venture capital with technopreneurs.

Another specifics of technopreneurship is a high rate of foreign direct investments (FDI) with the existence of a favorable technopreneurship environment. The Governmental policies are one of the major preconditions for promotion technopreneurship in a country as it is one of the major consumers and investors in the ICT industry. The US and Israel, for instance, are huge clients of ICT industry developed products and services, namely defense and security. Israel has a well-developed e-government system, where the government acts as the major consumer of this sector, boosting ICT industry development.

It is already well known fact that in the 21st century, the solution for success is knowledge, not resources. One of the cores of knowledge is the number of qualified R&D centers within a country and companies. In Armenia there are almost 30 education and research laboratories. If that is not appropriate for sustaining healthy ICT industry growth, then the country needs to build up facilities for research and development and creative capital to support them. R&D centers are the platform for research, development, and deployment, where the problems can be viewed and addressed and solutions developed by technopreneurs.

According to OECD assessments, a 1 percent increase in the stock of R&D leads on average to a rise in output between 0.05–0.15 percent. The countries with strong investments in R&D centers or projects today are characterized by economies with developed high-tech sectors. The best examples are the US, Japan, Germany, and Israel.

The R&Ds and educational expenditure of the Government of Armenia is weak without any significant investments of modernization of this sector of economy. Country surrounded with historical enemies having no spending in R&Ds development in army industry could be considered non-serious in the world market. Moreover, having no economic important natural resources and not stressing high tech sectors development, the future of the country could be worse than in “bananas republics” not in the far future.

At the same time, R&D is the key for the generation of new ideas. The fact is the bigger the company or the economy of the country, the greater the opportunity for making investments in R&D. At the same time, the countries with high governmental investments in R&D are more successful in ICT product implementation in the economy.

Recalling the Weitzman recombinant growth model, it could be stated that R&D centers are considered as generators of old ideas and new ideas. At the same time, R&D centers could not operate without a

---

knowledge-based workforce. So, the next issue important to be considered is human capital.

Another well-known fact is that ICT industry growth leads to new job creation in multiple industries and sectors, including new activities of the third sector of the economy. Different assessments indicate dependence from 1.5 to 3 percent between a 10 percent increase in the ICT industry and employment level. For example, Gartner Group estimates that “by 2015, big data will directly create 4.4 million IT jobs globally, of which 1.9 million will be in the United States. With the multiplier effect, each of these additional IT jobs will create employment for three more people outside the tech industry in the United States, adding 6 million jobs to the economy.” It means that each job created in the ICT sector will lead to an increase of three more workers employed in other sectors of the economy.

Another assessment done by the World Economic Forum found that a 10 point increase in the digitization score decreases unemployment by 1.02 percent.

Policy recommendations: The ICT industry has become the carrier of modern national economy development: the country is better equipped, it would better benefit from the process taking place in the world market. Thus, Government of each country had to accept that for the 21<sup>st</sup> century, the solution for economic success is knowledge, not resources, where technopreneurship, R&D and human capital play key role.

From this point of view, the following question is urgently asked: What had to be done to benefit from the techno-processes taking place in the world economy by the Government of Armenia based on the above assessments?

For a developed strategy of Armenia’s ICT industry the following should be undertaken: strengthen the workforce with making innovation easier and promoting it; strengthen the information infrastructure for creative knowledge and an information-based society by upgrading telecommunication networks and through information education and legal/institutional reforms; increase the national productivity by utilizing ICT and infrastructure through digitalization of administrative work to boost government productivity and transparency; and enhance corporate productivity by using ICT.

Taking into consideration that the e-commerce is not limited by borders and nationality, the Government of Armenia is better to stress promotion on the establishment of e-commerce in the country through: a well-developed infrastructure covering telecommunications and goods delivery systems, adopting e-commerce-related business laws, fostering a positive public and business attitude towards e-commerce, and promoting awareness and education, financial services, and a strategy of e-commerce development. E-commerce growth in the country could lead to increase of GDP almost by 1 percent annually. Another option for the economy of Armenia could be the EU-developed Entrepreneurship 2020 Action Plan, which strictly stresses the five pillars important for strategy boosting technopreneurship for any country, which are:

1. Increase industry digital transformation;
2. Create a digital entrepreneurial culture;
3. Attract, develop, and retain digital entrepreneurial skills and talent;
4. Ease the access to finance and enhance investments;
5. Boost a digitally powered Single Market;
  - By raising awareness through a Europe-side information campaign;
  - By facilitating networking to spark and support new business ideas;
  - By launching specific actions for w-entrepreneurs — 1. a startup European partnership to unlock expertise, mentoring, technology, and services; 2. a w-entrepreneur leaders club to bring together world-class w-entrepreneurs and strengthen the w-entrepreneurial culture in Europe; 3. a European network of w-business accelerators; 4. work with European investors in order to increase the flow of venture capital and crowd-funding into w-start-ups, and 5. fostering w-talent by stimulating the emergence of massive online open courses and setting up platforms for mentoring and skill building);

- By strengthening competencies and skills.

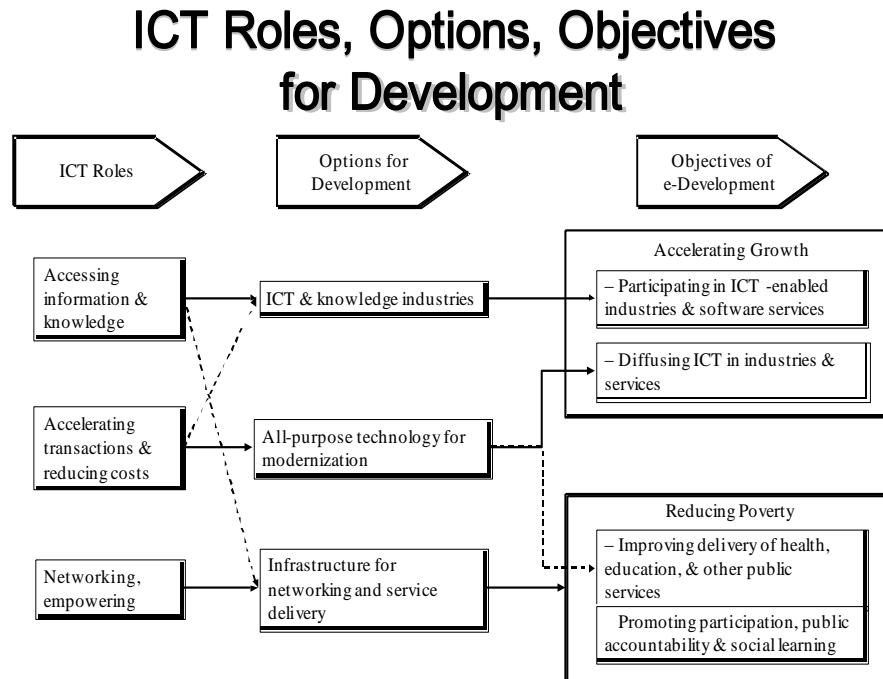


Figure 2 – Options for Development (Information Solution Group)

**In summary**, the Government of Armenia needs in establishment of healthy operation of the political-economic body of the country based on market-oriented cooperation between public-private and research development centers/educational sectors of the country to better utilize the benefits of ICT industry.

Clifford Bekar, Kenneth Carlaw, Richard Lipsey General purpose technologies in theory, application and controversy: a review available at <https://link.springer.com/article/10.1007/s00191-017-0546-0>

Eric, M. Engen, Jonathan Skinner, Taxation and Economic Growth, [Retrieved 2016-11-10] Available at: <http://www.nber.org/papers/w5826>

Giersch, H. Innovation as an Engine of Economic Growth: Retrospect and Prospects'

Martin, L. Weitzman, (1998) "Recombinant Growth," The Quarterly Journal of Economics, Oxford University Press, vol. 113(2), pages 331-360.

Martin Weitzman (1995) Recombinant growth., Harvard Institute for International Development, Harvard University

Pinter, (1988) Technical Change and Economic Theory, G.Dosi et al (eds)

Porter, M. (1998) Clusters and the New Economics of Competition. Harvard Business Review.

Report of the World Commission on Environment and Development: Our Common Future [Retrieved 2018-05-10] Available at: [www.un-documents.net/our-common-future.pdf](http://www.un-documents.net/our-common-future.pdf).

Statistical Committee of the Republic of Armenia [Retrieved 2018-08-05] Available at: [www.armstat.am](http://www.armstat.am)

Tübingen: J.C.B. Mohr (Paul Siebeck), (1982) Emerging Technologies: Consequences of Economic Growth, Structural Change and Employment, proceedings of Kiel Symposium, 1981 Technopreneurship Development – Daniel Mankani. [Retrieved 2016-12-10] Available at : <http://www.banktech.net/technopreneurship/2002-technopreneurship-development/>

The Economic Impacts of the U.S. Space Program [Retrieved 2016-11-10]. Available at: <http://er.jsc.nasa.gov/seh/economics.html>

Tax incentives for research and development: trends and issues [Retrieved 2017-11-10]. Available at: <http://www.oecd.org/science/inno/2498389.pdf>

---

**А. Оганесян**, к.е.н., доцент, Єреванський державний університет (Єреван, Вірменія);

**А. Чобанян**, аспірант, Рада молодих економістів, Європейський університет, (Єреван, Вірменія).

**Вплив ІТ сектору на економіку країни: приклад Вірменії**

*У статті досліджено вплив інформаційних і телекомунікаційних технологій (ІКТ) на економіку Вірменії, здійснено прогноз її подальшого розвитку на основі досвіду країн-лідерів у галузі ІКТ. З метою систематизації економічних, політичних і соціальних переваг розвитку ІКТ автори проаналізували досвід країн-лідерів у ІТ секторі. На основі результатів аналізу тенденцій розвитку економіки Вірменії автори сформуваали основні передумови її переорієнтації з урахуванням наявних та можливих переваг від поширення ІКТ. У статті підкреслюється, що світова економіка переходить від індустріальної до інформаційної (заснованої на знаннях) епохи, де ІКТ стають найголовнішими ресурсами у порівнянні з робочою силою і капіталом. Метою статті є аналіз об'єктивних і суб'єктивних економічних і політичних проблем Вірменії, а також оцінка потенціалу її економічного розвитку, заснованого на розбудові ІКТ. На основі результатів дослідження авторами було сформовано систему першочергових заходів та рекомендацій для органів влади по розбудові ІКТ з метою забезпечення стабільного економічного зростання країни. При цьому виокремлено основні принципи розвитку ІКТ, які мають бути засновані на підходах ринкового співробітництва між державними і приватними науково-дослідними центрами країни, з метою підвищення ефективності впровадження інновацій у галузі ІКТ. Використовуючи економіко-статистичні методи, автори оцінили взаємозв'язок між ефективністю функціонування ІКТ та економічним зростанням країни. Автори підкреслюють, що вплив ІКТ на економіку країни відчувається як на макро-, так і макрорівнях: вони впливають на процес оцінки інформації і знань; автоматизують та прискорюють виробничі цикли, знижують виробничі витрати; виступають невід'ємним комунікаційним інструментом суспільства, неурядових організацій та підприємств.*

Ключові слова: ІКТ, електронна комерція, інноваційна модель, технопідприємництво.