

Methodology for Evaluating the Management of Innovative Processes in the Field of Information and Communication Technologies

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Abstract

This article discusses the definitions of innovation and innovation processes. Based on the definitions, a classification of innovations in the field of information and communication technologies is proposed, as well as a methodology for evaluating innovative processes in the field of information and communication technologies is proposed.

Keywords

Innovation, Innovation Activity, Innovation Processes, Information and Communication Technology, Efficiency.

Introduction

In the field of communications and information-communication technologies, innovation has a special property: the life cycle of innovative products and services is very short. Therefore, the process of innovation should be carried out at a certain time at a fast pace. According to statistics, research and development in the field of communications and information technology over the past five years, on average, increased by 22, 3%.

The acquisition of rights to patents and patent licenses in this area over the past five years has increased by an average of 4%, the purchase of software respectively 36.8%, the education and training of personnel in this field exceeds 21.7% on average. [1]

In the current study, we examine the role of innovation processes in the development of information communication technologies (ICT) enterprises. We use the hypothesis that the classification of innovation processes in the field of ICT helps to assess the impact of innovation in the field of ICT. The conceptual model of "management of innovative

processes" was proposed to determine the main goal of managing innovative processes in the field of ICT.

Literature Review

The term "innovation", being an economic and legal category, provides a semantic basis for a number of concepts, the content of which characterizes various aspects of relations related to the development, implementation of progressive innovations, stimulation of this kind of activity and opportunities for its implementation. The main of these concepts are the concepts of "innovation process" and "innovation activity".

There are many definitions of "innovation" for innovations and innovative processes. The analysis of various points of view allowed us to define the innovation process as a purposeful, irreversible, qualitative change in the system, its subsystems, components, carried out by means of successive internally integral and relatively independent stages. The stages of the innovation process, in accordance with the criterion of its completeness, are: development, perception, development, adaptation, implementation, use and diffusion of innovations. [2]

The definition of innovation as a deliberate change in all areas of the company's business to adapt to the external environment in order to achieve long-term effectiveness of the company's functioning. [3]

A.V. Khutorskoy emphasizes the unity of the three components of the innovation process: the creation, development and application of innovations. [4] A.A. Golubev presents the innovation process as a complex set of sequential and parallel actions to obtain a scientific result and its use to achieve a socio-economic result. [5] A.E. Abrameshin proposes to consider the innovation process as a sequential chain of events from a new idea to its implementation in a particular product, service or technology, and the further dissemination of innovation. [6] Zh.D.Darmilova offers a systematic organized set of sequentially carried out types of productive activities as an innovative process. [7] According to T.A. Averin, the innovation process consists in the development and commercialization of the invention, new technologies, types of goods and services, industrial, financial, administrative or other decisions, as well as other results of intellectual work. [8] V.D. Dorofeev suggests that the innovation process is an activity in which an invention or an entrepreneurial idea receives economic content. [9] T.I. Shamova defines the innovation process as innovations, innovations and conditions ensuring the successful transfer of the system to a new qualitative state. [10]

In all these definitions, the innovation process is presented in terms of the development of scientific and technical enterprises. We are interested in innovative processes in the field of ICT where services are provided simultaneously with the production process. To determine the essence of innovation processes, it is necessary to classify innovations in the field of ICT. In the literature, there is a classification of innovative activities in the field of ICT, but previously presented classifications included only information systems. Below we provide a classification of ICT innovation.

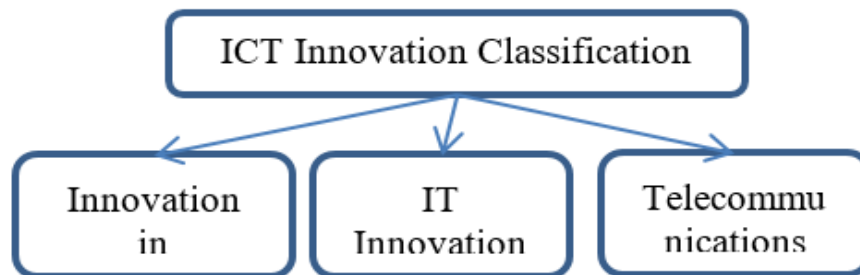


Fig. 1. ICT Innovation Classification

We have presented the classification scheme for innovations in the field of ICT, which is divided into three groups: innovations in information systems, innovations in information technologies and innovations in telecommunications. In turn, each of them includes separate areas.

Innovations in information systems include:

- Innovations in functional activities;
- Innovations in the object of management;
- Innovations in service in IP.

Innovations in information technology include the following:

- Innovations in the user interface;
- Innovation by type of service sector;
- Innovations by types of information processing;
- Innovations in interactive mode activities.

Innovations in telecommunications:

- Innovations in types of network connectivity;
- Innovations in the telecommunications transport network;
- Innovations in the distribution activities of the network.

To classify innovation activity helps to evaluate the effectiveness of innovation for each direction separately and to identify the overall effectiveness of innovation in this area.

The field of information and communication technologies is developing very rapidly. Innovative processes contribute to the development of new types of goods and services that are directly reflected in the country's GDP. E-commerce and online stores are developing through social networks and even through instant messengers. There was a need to manage innovative processes in the field of ICT for the most effective development of this industry.

Currently, the development of innovative processes in Uzbekistan is constrained by a complex of factors: insufficiently developed infrastructure, poor quality of mobile communications, poor level of Internet access, poor integration of information systems of government agencies, insufficient level of development of the software products industry and others.

However, according to experts, Uzbekistan is able to provide ICT products and services in the international market. Successful organization of ICT activities requires significant investments in the infrastructure of the industry, training qualified personnel, teaching entrepreneurs how to compete in this market, and organizing more effective state assistance. The transition to an innovative development path is one of the indicators of the successful work of the ICT sector, requiring significant investment. It is necessary to correctly distribute these investments between innovative processes in the enterprise.

Developing factors of innovation in the field of ICT are formed and developed by the knowledge and high-tech economy accompanying industries that are related to education, high-tech medicine, R&D, communications, and also to industries that develop and implement innovations. Without the introduction of innovations in these segments of the services market, it is impossible to achieve the main goal of innovation policy.

Today, extensive work is being carried out in our country on the consistent implementation of information and communication technologies in public administration, economic sectors, social sphere and everyday life, in 2017 the coverage of digital television increased from 88% to 100%. The number of mobile users increased by 7% to 22.8 million. In 2017, IT services totaled 7.7 trillion soums, or 26% more than in 2016. Under the investment program, \$ 260 million was used.

The share of information technology in GDP is 9% in South Korea, 5.5% in Japan, 4.7% in China and India, and only 2.2% in Uzbekistan. This is confirmed by the fact that Uzbekistan ranks 95th out of 176 countries in the Index of Information and Communication Development.

In our opinion, achieving high results requires effective management of innovation processes in information and communication technologies. Indeed, the effective introduction and management of innovative processes in the field of information and communication technologies will give a powerful impetus to the economic and social development of the country. According to world experience, the development of this sector will increase national income and ensure the effective functioning of the national economy as a whole.

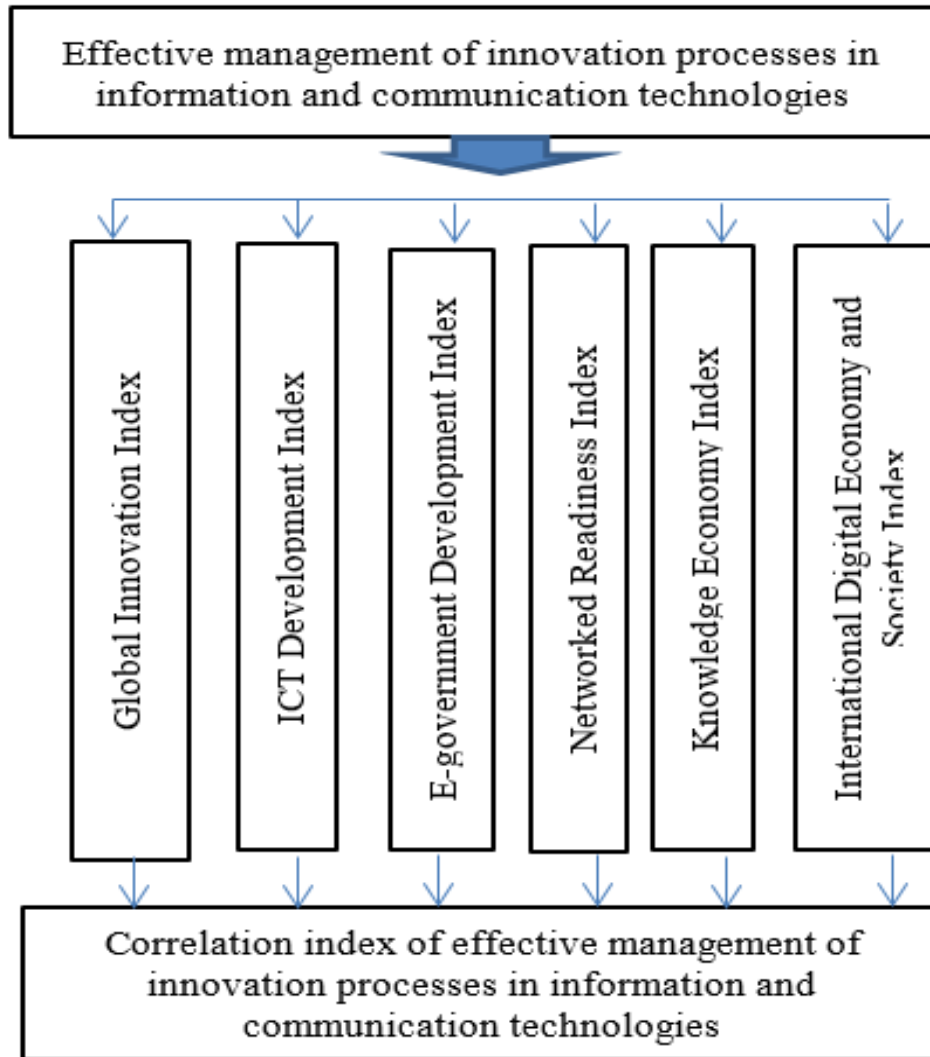
Research Methodology

In our opinion, one of the main conditions for the systematic monitoring of innovative development of the ICT industry is the inclusion of our country, including the ICT sector in international rankings. For this purpose a system of indicators is required for the implementation of the accounting books reflecting the introduction of innovation in ICT. This system of indicators allows evaluating the competitiveness of ICT products and services and the effectiveness of innovative processes.

In recent years, there have been a number of ways in which international innovation has been evaluated by countries in the field of ICT development. Improvement of Uzbekistan's position in these indexes depends, first of all, on the introduction, development and effective management of the ICT sector in the process of innovation. It is well-known that ICT is one of the fastest growing industries and is widely used in all sectors of the economy. Timely introduction of changes in this area to the national economy sectors will increase revenues and technical and technological re-equipment of the sector. The low share of the industry in the country's GDP requires efficient use of untapped opportunities.

From this point of view, as a result of research conducted by the author in order to develop and effectively manage innovation processes in the field of information and communication technologies in our republic, a methodology for the development and effective management of innovation processes in information and communication technologies is developed.

The general overview of the methodology is given in Figure 2, after a separate review by the authors of the key principles of effective management of innovation processes in information and communication technologies in Uzbekistan.



Pic 2. Effective management of innovation processes in information and communication technologies in Uzbekistan

Effective management of innovation processes in the field of information and communication technologies in Uzbekistan will contribute to the successful solution of the following tasks:

- Increasing the competitiveness of the national economy in international rankings;
- Achieve an increase in the share of ICT in gross national product;
- Creation of monitoring and efficient use of state budget funds;
- Increasing the speed of access to the international Internet;
- Introduction of information systems and software products to improve production and management efficiency;
- Support for the development and implementation of information technologies;

- Support for local software developers;
- Expanding the single interactive state services online services;
- creating favorable conditions for stimulating the development of private entrepreneurship, improving the business environment and reducing the share of the “shadow” economy;
- reduction of government participation in economic processes, elimination of bureaucratic barriers, provision of access to financial and production resources, and efficient use of the potential of small industrial zones;
- Introduction of innovative developments and technologies, increase of labor productivity, accelerated development of processing industries
- Increasing the export potential of the national economy and reducing its dependence on imports;
- Development of strategies for the development of national sectors in line with global and regional development trends;
- Development of strategic directions for the development of foreign economic activity;
- Ensuring the introduction of modern information and communication technologies in the activities of government agencies and businesses;
- Improving the effectiveness of the programs on attracting foreign direct investment in the regions;
- Accelerating the introduction of digital economy, e-government and information systems into public administration;
- Intensification of public services and interagency e-cooperation through the development of e-government infrastructure;
- Coordination of the unified technological approach to implementation of the system of "electronic government";
- effective development of e-government interaction between the state, population and business, and the integration of the global digital space;
- Enhancement of digitalization of public administration;
- Coordination of measures to strengthen the social protection of the population, including permanent employment of the unemployed, especially young people in the regions, improving the quality of life, improving living conditions, development of medicine, education and services.

The developed methodology is based on objective static information, takes into account all important aspects of the development of the ICT sphere, is based on quantitative and

qualitative characteristics of the development of this sphere, and allows quantitative assessment of innovative projects in Uzbekistan without the involvement of experts.

Information and communication technologies and innovations are closely interconnected and play a crucial role in the growth in the country's global competitiveness. In the context of the formation of a global information society, the availability and quality of communication services and information technologies directly determine the standard of living of the population and economic growth.

Analyses and Results

It should be noted that the indices studied do not allow an accurate assessment of changes in the economy under the innovations in ICT. Moreover, there are no accurate statistics on the market for information services for quite objective reasons, since information services as such it's generally difficult to count and their volumes with distortions in terms and sizes are given in international and national statistics.

Nevertheless, the formation of international indices as a process is incomplete, which leaves the opportunity for their improvement. This fact, in spite of the revealed discrepancies in The data noted above allowed the development of an ICT innovation progress index (ICTIP_n) countries allowing for integration into a single composite index a number of indicators that are used to assess the level of innovation and ICT development of the country.

The proposed ICT Innovation Progress Index (ICTIP) is based on four indicators:

- Global Innovation Index (GII);
- The ICT Development Index (IDI);
- Network readiness index (Networked Readiness Index, NRI);
- E-government Development Index(EGDI);
- Knowledge Economy Index (KEI);
- International Digital Economy and Society Index (IDE&SI).

Data obtained from reports published by the UN, ITU, WEF, World Bank for the corresponding year were used us to calculate ICTIP which represents the geometric mean (score) of the three indices according to the formula:

$$ICTIP_n = (GII_n \times IDI_n \times NRI_n \times EGDI_n \times KEI_n \times IDE\&SI_n)^{1/5}$$

where GII - Global Innovation Index;
IDI - ICT Development Index;
NRI - network availability index;
EGDI - E-government Development Index;
KEI - Knowledge Economy Index;
IDE&SI - International Digital Economy and Society Index;
n is the country.

Obtained using the formula data will allow to build a country's index of innovative progress in ICT (ICTIP) and present its results by country. The obtained data will allow us to level the discrepancies in data and clarify the picture of innovative development of ICT in a particular country, based on its network readiness, readiness for e-government and the degree of development of ICT, global innovative development and global digitalization of the economy and society. However

It should be borne in mind that each of the six components of the IIP index represents a complex multi-structural characteristic of the country's innovative development.

The next step towards assessing the global level of ICT innovation development is calculation of the global ICT Innovation Development Index ICTIP_{glob}. This index expresses the generalized result of innovation in the field of ICT of all countries per year and is determined by the formula:

$$ICTIP_{glob} = \left(\frac{1}{N} \sum_{n=1}^N GII_n \times \frac{1}{N} \sum_{n=1}^N IDI_n \times \frac{1}{N} \sum_{n=1}^N NRI_n \times \frac{1}{N} \sum_{n=1}^N KEI_n \times \frac{1}{N} \sum_{n=1}^N IDESI_n \times \frac{1}{N} \sum_{n=1}^N EGDI_n \right)^{\frac{1}{6}}$$

where N is the number of countries;
n - country in the corresponding indices.

The calculation method is based on the arithmetic mean (points) for each index, from which ICTIP_{glob} is then calculated as a geometric mean. Important to keep in mind that the number of countries in each composite The indices in the global index of innovative progress in ICT are different. The movement of indicators of this index over the years determines the direction of innovation in the field of ICT of countries of the world.

Below is the algorithm developed by the author to evaluate the results of ICT innovation progress index:

```
package com.company;
import java.util.Scanner;
public class MyMain {
    static double y, G_H_n = 0, IDI_n = 0, NRI_n = 0, KEI_n = 0, IDESI_n = 0,
    EGDI_n = 0;
    static int N, G, H_n, I, I_n, D, R, K, E, S;
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        N = scanner.nextInt();
        G = scanner.nextInt();
        H_n = scanner.nextInt();
        I = scanner.nextInt();
        I_n = scanner.nextInt();
        D = scanner.nextInt();
        R = scanner.nextInt();
        K = scanner.nextInt();
        E = scanner.nextInt();
        S = scanner.nextInt();
        for (int i = 0; i <= N; i++) {
            G_H_n += G * H_n; }
        for (int i = 0; i <= N; i++) {
            IDI_n += I * D * I_n;}
        for (int i = 0; i <= N; i++) {
            NRI_n += N * R * I_n;}
        for (int i = 0; i <= N; i++) {
            KEI_n += K * E * I_n;}
        for (int i = 0; i <= N; i++) {
            IDESI_n += I * D * E * S * I_n;}
        for (int i = 0; i <= N; i++) {
            EGDI_n += E * G * D * I_n;}
        y =
        Math.pow(1/N*G_H_n*1/N*IDI_n*1/N*NRI_n*1/N*KEI_n*1/N*IDESI_n*1/N
        *EGDI_n, 1 / 6); } }
```

Conclusion

Today, one cannot but note the positive trends in the use by Uzbek enterprises and companies of innovation in information and communication technologies. But,

nevertheless, Uzbek companies often do not pay due attention to this issue. Companies need to be aware that the use of innovation in ICT is the only chance to remain competitive in today's business. And, ultimately, the competitiveness of the whole country depends on this.

The proposed two new indexes allow you to create a comprehensive system of indicators to measure the level of innovative progress as a single country, and complement the international experience in developing performance indicators that strengthen the scientific and methodological apparatus for organizing monitoring of information economists and the global market for information services in the context of globalization.

Despite the existing problems, Uzbekistan undoubtedly has great potential in the development of innovative processes in the field of information technology. At present, many state programs for the development of the industry and the use of new products of this industry are being developed and are being implemented, the implementation of which is gradual and leads to positive results.

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