The content of innovations and structural analysis of their features in the formation of information economy

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Abstract: The paper presents the relevance of economic development of the information society on the basis of ICT and innovation. Socio-economic essence of innovation, as well as various scientific and theoretical approaches to innovation and formation of innovation theory are analyzed. The types, objectives, content and definitions of innovation are studied. Generalized classification features of innovations are explained, some additions are made in accordance with the new economic conditions. Some factors influencing, accelerating and slowing down the development of innovations and presented. In accordance with the requirements of the information society, content and composition of new electronic innovation based on the achievements of the ICT sector are analyzed. The concept of e-innovation is proposed for the mass dissemination and application of innovation in other areas.
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1. Introduction

Currently, formation and development of the world economy basing on ICT and innovation is still in process. Most countries have developed and carried out their development strategies for national economy. Economy of Azerbaijan is also being developed basing on information, knowledge, ICT, technology and innovation according to the main development trends of advanced countries [1].

The main goal defined in the National Strategy for Development of the Information Society [2], as well as in the Strategy for the development of science [3], which are carried out in accordance with above-mentioned development trends, is to attain significant achievement in education, science, and in the overall intellectual spheres, and to intensify the process of formation of information, innovation and knowledge economy. The implementation of the objectives of the development concept, that defines the country's key strategic objectives in the coming years, requires diversification of the economy, its sustainable development and expansion of innovation-based areas. In this regard, High-Technology Park (HT) is initiated in the republic, in order to conduct researches in this field and to provide modern facilities for the development of new information and innovative technologies. Its creation will significantly amplify formation of innovative and knowledge-intensive economy, and the development of innovative products [4].

Taking into account all of these, we can conclude that conducting researches, studying innovations systematically as an economical category, organizing innovation processes, their efficient use, and finally, formation of the concept of e-innovation system are the matter of urgency. As an integral element of the e-innovation system, a system of indicators characterizing innovation systematically should be developed for the monitoring, as well as basing on it, the establishment of intelligent systems for decision-making support is of great importance.

2.Problem statement

New economy, which is inherent to the Information Society, is described with new content, objectives and characteristics. In accordance with the new economic relations, new economic objects and subjects, new economic categories and processes are emerging. Each product requires its own production and non-production infrastructure, innovation process, new management mechanism and new approach. In such circumstances, the process and the product should be studied more precisely; its content and essence should be explained; and characteristics should be determined in the new environment. In this case, the system of indicators that characterizes its specifications needs to be identified, and existing ones need to be improved, and new ones should be developed, if necessary. This, first of all, requires the examination of the associated factors. The study of

innovation in the context of Information Economy show that the following issues should be consecutively analyzed economy to solve explained problem:

- Comparative analysis of the classical and the latest scientific and theoretical studies of innovations in the context of modern Information Society and Knowledge-based economy;
- Interpretation of the characteristics and the content of innovation products and processes in information economy;
- Studying the features of electronic innovations in the new economic environment;
- Structural analysis of marketing and organizational innovations in the application of ICT;
- Exploring the elements of innovations for new application areas;
- Classification of innovations in accordance with various indications in new circumstances;
- Analysis of the various factors that influence the formation and application of innovations;
- The development of a new concept of e-innovation system for the development implementation and management of innovations.

3.Analysis of approaches to the social and economic essence of innovations in new economic conditions.

Traditionally, innovation denoted, conscious implementation of novelty, and improving the quality of any object purposefully. Economists have always studied manufacturing innovations. However, the main production innovations in the first half of the XVIII - XX centuries were considered in the context of rising development of technical and technological production, i.e. technological progress. The U.S. scientist J.Schumpeter attempted to develop the theory of universal innovation in economics in his work "The Theory of Economic Development". He first used the notions of "innovation", "innovative development" as an economic expression [4].

Analyzing innovative development mechanisms, J.Schumpeter focused on the study of interaction of the factors that contribute to the application of innovations. His approach to the study of social progress was a tremendous step. Analyzing the economic growth in highly developed countries in 50s of the XX century, a number of lacks were revealed in the approaches to content of social progress and economic growth factors. First of all, the rapid growth of the share of data showed itself in the main capital structure in the form of intelligent property.

Appropriate information infrastructure, including data collection, mining and dissemination mechanisms were of great significance in order to maintain high and sustainable development rate of the Economy itself and its separate sectors. The concept of "scientific-technical progress" was determined. American economists and sociologists started studying the mutual relations of scientific and technical and economic progress. In 1950, they returned back to the J. Schumpeter's theory and widely used expressions "innovations" and "innovative activities".

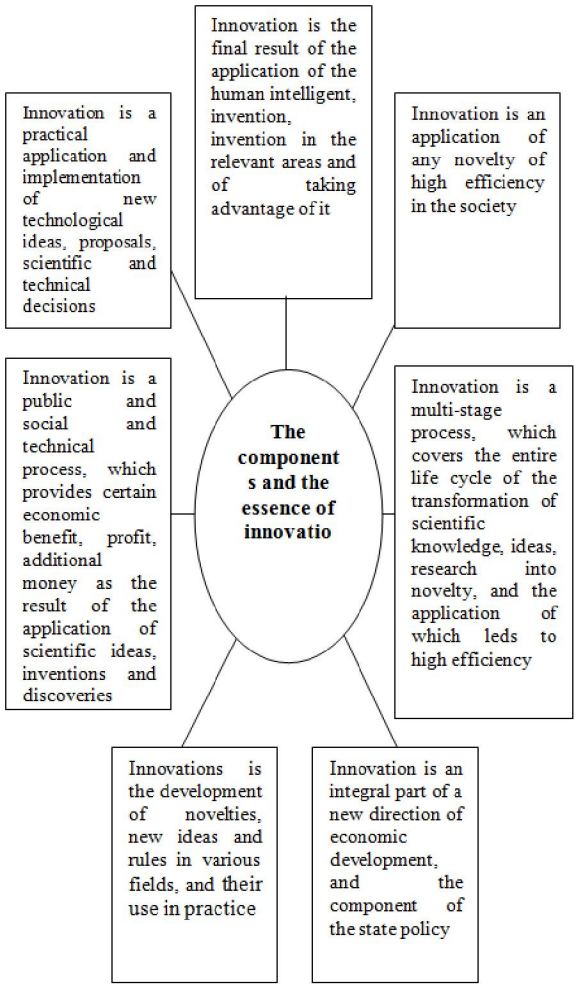

Fig.1. Various generalized approaches to the components and essence of innovations

As the scientific looks to innovations differ, innovations have various definitions and are explained in various forms. Thus, innovation is the final result of the application of the high-efficient novelty, introduction of new human intelligence, invention, and discovery in relevant areas, taking advantage of it. In addition, innovations can be regarded as the process of development and use of novelties, new ideas and rules in various fields. Innovation is a part of the relevant state policy, as well [5]. Generalized forms of various views to

innovations can be categorized in schematic forms in the Fig. 1.

Innovation has the functions of re-production, investment and motivation as a final result of innovative activity. It is realized in the form of new and improved technological process in the market or in the form of new and improved products, which are used in practice [6, 7]. For its presentation and fields of activity innovations can be referred to: 1) product, 2) process, 3) marketing, 4) organizational, and so on.

4.Characteristics of product and process innovations.

Materially, innovation is expressed in the form of product or process. New knowledge and technologies are used for product innovation. Product innovation includes both the consumption of new goods and services, and making significant changes in the functional or consumption specifications of available goods and services. Product innovation includes new or significantly improved commodities and services [7].

The main objective of product innovations may include: 1) continuous demand; 2) increasing profits; 3) increasing the market capacity; 4) being eligible to the interest of the customers; 5) gaining high reputation; 6) creating new jobs; 7) increasing the volume of sales and etc. Product innovation is a result of application of technologically new or improved products in practice or their re-production [6].

Technological innovation significantly impacts on the enterprises' performance, as well as on the results of the use of production factors. It is, particularly, reflected in the sales dynamics generated through the implementation of innovations. For this purpose, various types of technologically modified innovation products are used. The components of innovation product are set according to the type of the technological innovations taking into account their novelty rates. Innovation product covers new or modified, improved products manufactured with advanced techniques. In some cases, the concept of new product is proper to the definition of an improved product. There exist some innovation products that arise as a result of the application of the process innovation.

The process innovation is the development of new or technologically improved production methods and technologies [6]. Objectives of process innovation may include the following factors and features: reduction of product cost, improvement of the quality, manufacture or introduction of new or improved products, advancing labor productivity, increase in income as a result of saved raw materials and supplies, energy resources; and reducing environmental pollution, and so on.

Process innovation includes 1) new or significantly improved production methods of goods and services, 2) new and significantly improved logistics related to the production of products, goods and services, 3) delivery and distribution methods, 4) service systems, new and significantly improved policies, procedures, and steps related to the processes such as accounting, projecting and computerization operations. As a product innovation, process innovation is of great importance in terms of its unique peculiarities.

5.Electronic innovations in the new economic environment.

Product and process innovations can be considered as electronic innovations in the field of computer science and information systems, ICT sector, the process of informatization, computer networks, telecommunication equipments, virtual environment, and etc. Such types of innovation are the main directions in the innovative development of economy, business, education, science, social sphere, and management. The development of supercomputers and the global cloud computing technology, projection of intelligent information systems, the development of methods of analytic analysis, creation of software for global information security, the development of prompt information retrieval systems, creation of mobile Internet technologies, formation of virtual reality systems, the development of space technology, etc. are included into the strategically global electronic innovations, and of great importance in the modernization of society and the economy. Such types of innovations serve as a new electronic innovation platform for more rapid application, distribution, and transfer of traditional innovations, as well. Therefore, to achieve more efficient development of the economy as whole, architectural principles of electronic innovation platform, its scientific and theoretical foundations, and formation technology must be designed comprehensively [12].

Product innovations of this field are equipments, hardware, software, program products, and information systems. E-process innovations, in their turn, are considered as electronic processes that contribute to the modeling of virtual processes, development stages of automated information systems, management of related fields, marketing, economic and other social issues.

Virtual technological innovations or electronic innovations are capable to reflect not only software and hardware, but the features and methodological basis of the activity in the virtual environment.

Compared to traditional innovations the electronic innovations of the virtual environment have a number of distinctive features. Thus, this type of innovation functions as a catalyst, and causes the formation, development and transfer of traditional innovation in other areas. For example, product and process innovations are created as a result of the Trans-Eurasian Information Super Highway (TASIM) launched in the republic, Europe-Middle East Information Superhighway (EPEG), Azerspace-1 spacecraft, and other projects.

6.The components and the objective of marketing and organizational innovations

Marketing innovation is a process innovation and an introduction of a new marketing method, including essential changes in the design or packaging process of the product, its positioning, the movement in the market and fixing the prices. An objective of the marketing innovation is the better satisfaction of consumer needs, gaining new positions to open new markets or to increase sales volume for the enterprise products. Marketing innovation may include the followings: 1) significant changes made for better aesthetic design and packaging of goods or services; 2) new techniques applied to increase the product sales in the market; 3) the product positioning or new investigation methods of sales channels; 4) new methods for fixing the prices of goods and services, and so on.

The essence and purpose of organizational innovations is to apply methods and mechanisms in the organizational and managerial processes of the enterprises and organizations, as well as to apply new organizational method in the organization of new job or external relations [7]. This type of innovations may include the followings: 1) new business practices and management mechanisms in order to create organizational procedures; 2) new methods of work organization and decision-making processes; 3) new methods of organizing external relations with other enterprises and public institutions, 4) the economic, social, and psychological management techniques and innovations. These types of innovative products also include the products produced on the basis of best practices, as well as by means of upgrading new production methods and technological exchange. However, implementation of any technological innovations or production processes of any associated activities are not included into the organizational innovations.

Organizational innovations may exist in the following directions, as well [6]: 1) the development and implementation of new or significantly improved corporate strategy of an organization; 2) the application of modern methods in the organization management. That is, solving projecting and programming of various enterprises using modern ICT tools and particular software, developing decision support systems for assessing the financial situation, technologies supporting automated document management systems and so on. 3) the development and application of new or substantially improved structures of an organization; 4) new methods for the efficient use of working hours; 5) application of a new product or service quality control system using new local and international quality standards (e.g., ISO 9000); 6) new and significantly improved methods of work organization; 7) application of modern logistics systems for the delivery of accessories, materials, and raw materials; 8) the practical implementation of scientific and technological achievements, the creation of specialized units for the implementation of research and developments; 9) development, improvement of marketing services of an organization, or formation of fundamental concept of marketing and etc.

7.The components of innovations the fields of activity

Innovations are classified for its components, definition, content and other features. Note that Russian research institutes of systematic researches define the classification of innovations according to the following criteria, taking into account the fields of activity of the institutions: 1) technological; 2) production; 3) economic; 4) trade; 5) social; 6) management [8].

As a process or activity technological innovation is linked to the development or application of the innovations. In particular cases, it is a production technology of new industrial products and processes or improved products and processes. But id the service sector, it is new or improved production method of services.

However, there are so many examples in the industry that are not included in the technological innovation. For example, changes in product aesthetics, and insignificant technical changes, and expansion of product variety.

Objectives of technical and technological innovations are as follows [9,10]: 1) to reduce the technological complexity of the production through the constructive innovations; 2) to reduce the volume of materials used for the production applying new materials; 3) to implement comprehensive mechanization and automation of technological processes; 4) to improve the quality and technical level technological equipment, tools, and devices; 5) to reduce manual work and technological production complexity through science-based organization of the labor; 6) to implement complex automation and regulation of the management processes of

production basing on electronics and computer equipments, and so on.

Note that technological innovations also include the production methods associated with the manufacture of new or improved products, or the technologies based on microelectronics and computer-controlled manufacturing methods, and new technologies, which have no analogues in the country, production methods developed for the first time with new features [11].

The essence and objective of economic innovations is to make positive changes in the financial area, payments, accounting activity, as well as projecting, pricing, labor motivation and remuneration and performance evaluation. Social innovations function as an activation of the human factor through human resource improvement policy system, and vocational training improvement system, remuneration and labor assessment system and so on. This results in the organization of social conditions of workers, improving their safety, cultural activities, and leisure.

Legal innovations include new and amended laws and legal processes determining and regulating the activity of all types of organization.

Ecological innovations and novelty include the changes in the technical, organizational structure and management systems, which reduce or eliminate the negative impact of an enterprise on the environment.

The essence and objective of the management innovation is set up to accelerate the problem solution, and to enhance or improve the enterprise efficiency. At the same time, its functions oriented to changing the elements of the management system, its organizational structures, technological organization of the management process, purposeful change in the management techniques may be included into the management innovation.

8.Enhanced classification of innovations by its various aspects

Classification is a set of innovation innovations for specific criteria. Classification scheme of innovations starts with the determination of the classification aspects. Classification aspect of innovation is distinguishing and main features of the innovation group.

Using the classification aspects, the innovations can be classified by different circuits. Different approaches to the classification of innovations, as well as to the definition of criteria are available in the scientific literature.

Innovations can be classified according to the following aspects [8]: 1) significance (basic, improving, pseudo), 2) oriented (substitutive, effective, expanded) 3) implementation fields (establishment field, application field, consumption field), 4) changes in depth (initial recovery methods, amount change, re-grouping, adaptive changes, new option, new generation, new look, new types), 5) developments (by the entity power, external power), 6) coverage (for the creation of a new field, application in all areas) 7) the role in the production process (the main product, technological, additional product), 8) the character of the needs (new needs, available needs), 9) novelty rate (basing on a new scientific discovery, application of the new method in existing processes), 10) the term of launching in the market (leader-innovation, traditional innovation), 11) establishment reasons (driving, strategic), 12) application area (technical, technological, organizational, managerial, informational, social, etc.).

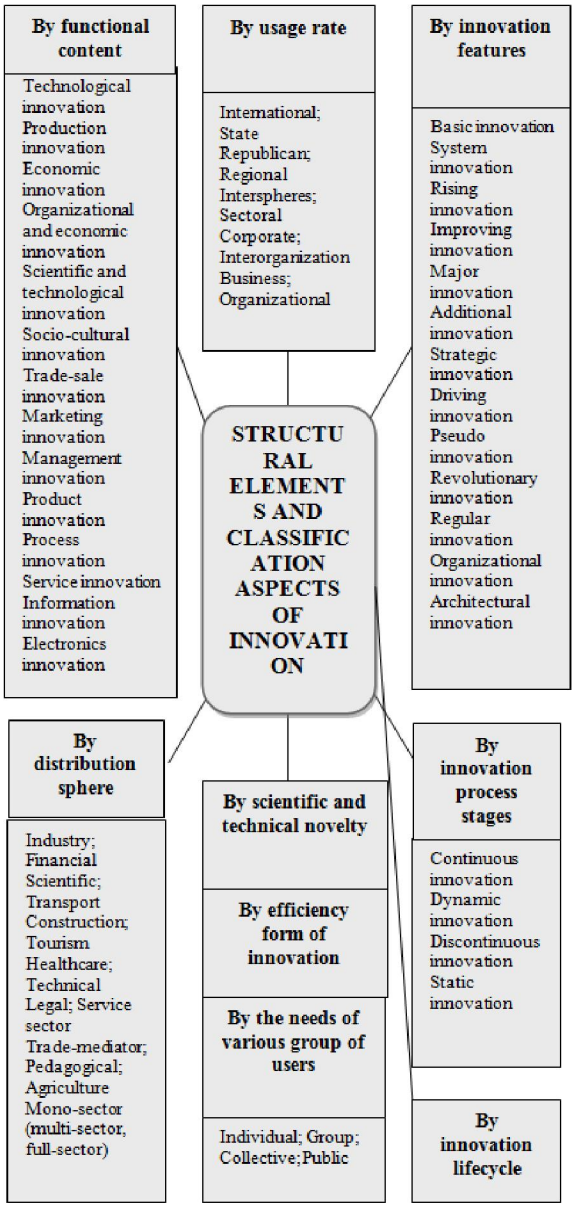

Fig. 3. Summarized classification of innovation by the various aspects

Taking into account all abovementioned facts, summarized classification of innovation by the various aspects may be set as in Figure 2 [12, 13].

Factors affecting the development of innovations.

In practice, there are important factors that accelerate, slow down, and affect the application of innovation. Prior to the introduction of any innovation, these factors should be taken into account in order to decide on the best method of its implementation. The factors that influence the development of innovation can be categorized as social, political and legal, socio-psychological and cultural, economic, technological, and organizational and management [14, 15].

The factors preventing the introduction of innovations are as follows: 1) lack of funds for the financing of innovation; 2) weakness of material and scientific and technical base; 3) the lack of extra production capacities; 4) prevalence of current production interests; 5) legislation restrictions; 6) collapse of the organizational structure; 7) excessive centralization; 8) authoritarian form of governance; 9) lack of organizational and inter-sector interaction; 10) complexity of the interests of innovation participants and so on. In addition, the factors enabling the application of innovation are as follows: 1) existence of advanced technologies and logistics necessary for the scientific-technical and economic infrastructure, 2) availability of financial resources, government support for innovation, and legislative privileges or measures stimulating the application of innovation, 3) mental stimulation of innovation participants, expansion of their realization opportunities, 4) flexibility of organizational structures, the democratic style of governance, decentralization, and the formation of the working group.

Conclusion

Though, the research on the role and features of innovations in the economic development are conducted much, the new economic conditions, particularly in terms of information economy, need to be studied more deeply and comprehensively. Appropriate mechanisms and model should be developed and applied for the operative assessment of the situation related to the innovation in the country, and for effective management decisions. Statistical indicators should be systematized according to the firmly structured and classified features reflecting the content and the characteristics of innovation. Depending on the nature of innovation, its spread and application characteristics, and the factors that influence them should be pre-investigated. The research in the field of e-innovation, which acts as a catalyst in economy as a whole, should be broaden. At the same time, taking into account application, transfer and other characteristics of the innovations, e-innovation system should be developed and applied basing on the automation of management process of innovations. Therefore, we should focus on the information economy emerging in the country and achieve investments in this area.

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