



## DEVELOPMENT PROBLEMS OF INFORMATION PROVISION ON THE MANAGEMENT OF HIGH TECHNOLOGY PARK

**Alovsat Garaja Aliyev<sup>1\*</sup>**  
**Roza Ordukhon**  
**Shahverdiyeva<sup>2</sup>**

<sup>1,2</sup>*Institute of Information Technology of Azerbaijan National Academy of Sciences, Baku, Azerbaijan, Azerbaijan Republic*



(+ Corresponding author)

### ABSTRACT

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The paper investigates transition to innovation-based information economy in Azerbaijan. The features of new economy are analyzed and the roles of high technology parks are shown. The main objectives, functions and features of the establishment of high technology parks, as well as organization of the activity of the structural elements, which are the parking complex and their interactions are analyzed. The development of comprehensive management system at high technology parks is studied. In addition, the methods are proposed for the development of information systems supporting decision making in systematic and sustainable management of the parks. Various blocks, functions and structural elements included in the information provision systems of high technology parks are analyzed.

### 1. INTRODUCTION

Modern economy develops on the basis of innovations. In this regard many world countries develop development strategies of their national economies. Modernization of the economy assumes a transition to innovative development. This requires the development of new approaches to solving management problems of economic systems [1]. In the National Strategy for ICT and Science Development, "Future outlook: Azerbaijan 2020" development concept, it is aimed to strengthen the mutual relations among science-education-production spheres, to develop new administrative mechanisms, to create innovation centers, technological complexes, technoparks, business-incubators and to solve the organizational issues of their activity [1, 2]. In order to develop innovative economy in Azerbaijan, Sumgait industrial and chemical technology park, Ministry of Communications and High Technologies "High Technologies Park" in Baku, Science and Technology Park in Azerbaijan National Academy of Sciences (ANAS), Eco-industrial park in Balakhani, agro and other high tech parks in regions have been established to form manufacturing of competitive, innovative products or service with high export potential [3]. The efficiency of innovation management system also depends on the search engine, mining, storage and use of information. Modern enterprises need management information very much. It is defined by the tasks content of the organizations. Obviously, organizational and practical activities of the manager and administrative staff, as a whole, are largely informational. Since such activities include access to timely and accurate information for management decision-making.

Providing managerial decision-making with complete, reliable and timely information is the essential and most difficult problem of the management organization in the enterprises. This usually requires the information of economical, organizational, social, and scientific and technical content.

Therefore, the development of information management system for the management of innovative enterprises is a relevant and necessary issue.

*Priority development areas of the national economy of Azerbaijan.* Future social-economic development perspectives of Azerbaijan depend on the salvation of the issues of efficiency increase of the organisation and management of economic activity.

In modern world, in order to achieve the diversification of the economy of republic and improvement and development of relevant infrastructure and service level in regions, sustainable increase of peoples' living standards, the Government Program on social-economic development of regions of the Republic of Azerbaijan was accepted [4].

As it is known, the main objective in the program is 1)to accelerate the development of industrial sectors and agriculture in regions, by using the current potential of republic regions, 2)to support entrepreneurs in these issues, 3)to increase the living standards of people, 4)to solve the poverty problems 5) to achieve overall economic development of the country etc. One of the implication trends of mentioned objectives is the efficient management of high technology parks in order to increase the importance of these parks in of social-economic provision in republic.

The priority trends of economic development enhance the following: 1)the provision of macroeconomic stability; 2)the development of non-oil sector; 3)by creating favourable conditions for expansion of income capabilities of people in regions and villages, to provide the economic development targeting the balanced and immediate reduction of poverty etc.

The priority trend of social-economic development policy set by the president is the diversification of economy, provision of dynamic development of non-oil sector, increase of competitiveness and the acceleration of investments in this sector. In accordance with this policy, as a result of the work done GDP growth is also obtained by non-oil sector, the production of competitive products increases.

The improvement of high technologies – is one of the innovative development methods of economy, which helps to solve several complex issues aimed at development of country. In modern world, innovation infrastructures play prominent role in providing the innovative development of economy.

Today the country is at the stage of its own innovation structure, which includes high technology parks, techno-implementation zones, innovation-technological centers, technology transfer centers, etc.

*Innovative structures in the economy of Azerbaijan.* In order to provide the sustainable economic development and increase the competitiveness, expansion of ICT sectors which are based on modern scientific and technological achievements, conduction scientific researches and creation of modern complexes based on the application of information technologies, high technologies park was built in the Republic. "HT Park" will provide the conduction of researches in information and communication technologies, telecommunication and space, energy efficiency sectors, development of high technologies [3].

The creation of high technologies park will affect significantly the development of economy of country, especially non-oil sector, the exportability of the country, increase of employment rate, modernization of economy, formation of innovative and science-intensive economy, expansion of competitive product production based on high technologies, maintenance of entrepreneurship.

At present, the notions as postindustrial society, information society, information economy, knowledge economy, innovation economy are used to characterize the modern development of society and economy.

Though these terminological notions sound differently, they don't differ essentially too much. Thus, all of them characterize recently formed society and its newly emerging economy.

Distinguished characteristics of the new economy include: 1) dependence mainly on the scientific technical technological achievements of the productivity, and on the quality of information and management; 2) transition to the information production rather than material production; 3) profound changes in the organization of the production process; 4) globalization of the economy; 5) revolutionary nature of the technological changes, and so on. Successful development of the information society depends primarily on the development of the new economy, as well as information society based on information and knowledge, modern technologies and innovations [5].

Information economy implies the economy in which production, processing, preservation, and dissemination of a large part of the information and knowledge of the gross domestic product (GDP) are provided, and more than a half of the employees participate. Formation of information and knowledge economy both nationally and internationally is closely connected with the globalization. Recently, information and knowledge economy has become the subject of research.

Different characteristics of information economy. Global informatization of the society, the rapid development of information technology and the technical means, increased demand for a variety of information services, formation of national and global information and communication systems led to the emergence of new type of the economy as information economy. Information economy has a number of distinctive characteristics. One of them is that the production of information, products and services are science-intensive.

Therefore, their quality, competitiveness in domestic and foreign markets significantly depend on the rate of technological development in this and other country, and primarily on the rate of development and use of modern information technologies. In its turn, it is determined by the development of knowledge, education and culture. Formation of information economy is an important factor to accelerate the development of various economic sectors, such as industry, construction, transportation, and mining. It also provides the fields of science and education with new tools becoming their key development tool itself. Information economy necessitates high mobility of production, its orientation toward new product types and its efficiency. Many types of information products and technologies may be used for many purposes for its functional capabilities. They include a large number of computing and data transmission means, information technology of real-time management facilities, as well as modeling and prediction of complex systems and process traffic. Information economy provides knowledge generation and efficient use, which contribute to save raw materials, energy, material and human resources.

Therefore, it is a key factor to overcome the global economic crisis, and to shift the humanity into sustainable and safe development phase.

The development of the information economy generates a new employment structure of the population, stimulates the development of new types of individual labor and creativity, creates and distributes new types of products and services, changes welfare of the people radically, and creates new opportunities for the development of an individual, and for the emergence of new information culture and spiritual values of the society.

Information economy has specific information and knowledge resources, which combines the typical characteristics such as to be replicated, distributed and used as a commodity. The U.S., Israel, South Korea, China and other countries have achieved significant success in formation of Information economy, primarily in the field of informatization of the national economy [5].

*Effect of ICT on formation of new economy.* Main distinctive properties of the new economy include massive expansion of creative, intellectual labor, increasing role and volume of knowledge, development of communication of devices etc. At the same time, development of ICT is a necessary condition for formation and development of information society and relevant economy, as well as innovative economy.

Technological innovation is quite important in new economy. Thus, ICT sector in itself is highly productive and its growth affects overall economy. Expansion of ICT to other fields principally changes their character; increases the exploitation level of information technology resources. This finds reflection in increasing productivity growth, as well as growth of GDP. ICT creates new capabilities for collection, processing, storage, presentation,

transmission, protection of information and knowledge. ICT affects the real economy through ICT production, as well as use of ICT in different fields. This is explained by, transformation of ICT sector to an important field on a global level by developing service sphere. ICT production sector is very important for overall GDP growth in real economy, and properties such as rapid technological progress characteristic for this field, strong and stable demand, relatively low prices, increasing quality and growth of product types causes growth of share of this field in GDP.

Information and knowledge resources act as production factor and direct participation form in production process. Information and knowledge resources can reduce the demand to material resources relatively and in total. Former financial minister of USA U.M. Blumenthal noted information as the main resource in modern economical activities, i.e. relevant to the significance of labor, capital and labor force in the past. At the same time, information in itself, only possesses potential importance and can demonstrate itself only in relation with other resources.

Alongside with the general specifications of economic resources, informational resources possess the characteristics stemming from specific characteristics of information which causes changes in character of effect on labour productivity and efficiency [6]. Russian researcher V. Inozemtsov characterized the specific features of information resources, that the land and capital are exhaustible, but the knowledge can be generated and accumulated unrestrictedly. And has limited exploiters, whereas the knowledge can be accessible for numerous exploiters. Information communication technologies become the main mean of use of information and knowledge resources.

*Elements of innovation structures.* In modern literature innovation infrastructure is considered as sum of mutually-related, mutually-complementary production-technical systems, organisations, firms and relevant organisational-administrative systems, which are necessary and sufficient for efficient implementation of innovative activity and realization of innovations. In other words, “innovative infrastructure” – is all administrative, information, educational, marketing and other networks, the aim of which is practical realization of ideas and finding the consumers of innovation products.

With the help of various elements of innovation structures several main objectives of innovation activity is solved, such as [7] 1) information support; 2) production-technological maintenance of innovation activity; 3) certification and standardization issues of innovation products; 4) assistance of promotion of effective development and realization of innovation projects; 5) organization of exhibitions of innovation projects and products; 6) consulting assistance; 7) staff training, retraining and personnel development for innovation activity and etc.

Main innovative infrastructures are following [8]: 1) technical infrastructure, 2) financial infrastructure, 3) staff infrastructure (infrastructure training of staff), 4) information infrastructure.

The high technologies parks, which are one of the main elements of innovation infrastructure will comprise the enterprises of high-technology sectors of economy, such as in nanotechnology-, biotechnology-, information and other technologies, scientific organizations, educational institutions which provide scientific and staff potential of these enterprises, also other enterprises and institutions, activity of which is technologically related to mentioned sectors' institutions or is aimed their service [9].

## **2. HIGH TECHNOLOGY PARKS IN THE FORMATION OF KNOWLEDGE ECONOMY**

*Main activities of high technology parks.* High technology parks are necessary infrastructure element of economy's innovative development and are aimed to provide the development of high-technology spheres, creation of scientific basis of production, infrastructure, qualitatively new jobs, involvement of skilled experts, etc.

High technology parks, represents the separate territory, where real estate and infrastructure venues are located and necessary resources are provided to high-technology companies, which allows to concentrate on its main activity [10].

Currently, the high technologies parks are one of the most important elements of modern economy: 1) technopark – is specific type of free economic zone, where science-intensive products are developed and new staff

are trained; 2)technopark – is the form of support for small entrepreneurship, development of which allows to achieve qualitatively new step of public production; 3)it is in industrial parks, where the financial and other additional opportunities are provided for conducting researches. In accordance with it, technoparks are attractive form of production of national science.

High technology parks, contributing to the formation of science-intensive sector in high-technology industry sphere and being the specific catalisator, forms scientific-technical core of world economy [11].

As an organisation managed by experts, main aim of technological park is the increase of welfare of local community with the promotion of innovation culture, also with competitiveness of innovation business and scientific organisations. For achieving these goals, technopark encourages and controls knowledge and technology flows among universities, scientific-research institutions, companies and markets. It simplifies the creation and growth of innovation companies with the help of processes of incubation and creation of new companies from existing ones (spin-off processes).

The main objective of high technologies parks building are 1)transformation of knowledge and inventions to technologies; 2)transformation of technologies to commercial product; 3)technology transfer to industry through the science-intensive small entrepreneurship sector; 4)formation and market establishing of science-intensive organisations; 5)support of organisations in science-intensive entrepreneurship sphere.

As social-economic systems, high technologies park have following cooperating elements: 1)government organisations and enterprises; 2)private organisations and enterprises; 3)universities and academic institutions. As social-economic system it consists of two independent, but interrelated subsystems: managing and managed subsystems. Managing subsystem comprises elements, which provide direct process of creating material and moral welfare or service, managed subsystem includes – elements, which provide management process, e.g. process of goal-oriented impact on people collectives, employed in managed system. The most important element of managing system which supports the interrelation among system elements, is organizational structure of management [10, 12].

Key factors that high technologies parks successfully apply designs for Research and Development management process: 1)analyzing product value with deconstruction technology brings up strategies for an enterprise and plans for its internal functional divisions; 2)process of the new product development will bring open innovative operation; 3)responding to the globalized market, techno parks horizontal integration, strategically aligning crucial cooperative alliance; 4)dynamic environment needs the strategic thinking; 5)in the Research and Development management process, integrating concurrent engineering in order to solve problems for design and manufacturing processes [13].

### 3. MANAGEMENT OF HIGH TECHNOLOGY PARK

Management of innovative infrastructure must be realized in the frame of relevant institutions of innovation system, which allow to generate, reproduce and use innovations, such as scientific-technical innovations with minimal share of commercial risk.

Management methods in innovation sphere are not within one organisation. Choosing one or another management method, it is necessary to consider that every object of innovation infrastructure – is separate business entity, where it is very important not to violate the basic characteristics which are given by legislator [14].

Information plays prominent role in management. For operative, objective and effective decision-making or comprehension of the real scopes of problem the main requirement is the accurate information.

As relation of information with management systems of object and management process in general, communication in management can be considered overall, covering all management functions, as well as on the individual functional management works, for example, forecasting, planning, accounting and analysis. This allows

to note the specific moments, that are inherent in the functional management communication, by revealing the general features.

Information support consists of information gathering and processing, which is necessary for sound administrative decision-making. Information transmission about status and activity of facility to higher administrative level and exchange of information among all interrelated subsections of facility is realized on the basis of modern ICT.

Information in management has several features [12]: 1)information support became significantly important for successful functioning of management apparatus and enterprise in general; 2)information transmission about status and activity of enterprise to higher administrative level and exchange of information among subsections of enterprise is realized on the basis of modern ICT; 3)the content of information messages is determined by needs of administrative links and produced solutions.

In modern times, it is impossible to imagine the management process apart from communication and decision-making processes. Planning, organizing, motivation, control and marketing functions of management are related to them with general features.

In every level of economy preparation and implementation of management decisions must provide the improvement and flexibility of management.

The administrative decision-making is also one of the important issues in organisation of sustainable activity of high technology parks. The basis of preparation of administrative decisions is the provision of management entity with accurate information.

While manager is making a decision, following steps can be implemented: 1)determination of objectives or problem; 2)revealing the options; 3)comparing and assessing the options; 4)choosing between the options and decision-making; 5)adoption of corrective measures; 6)comparing the decisions and conclusions; 7)obtained conclusions; 8)application of chosen option and functioning, etc.

#### 4. INFORMATION MODELS OF MANAGEMENT

Information models have the following properties, which are used in the management [7, 14] to reflect the properties of the objects, and assisting to fill the gaps between economics, mathematics, and computer mining, 2)to be the foundation for modern methods of solving economic and administrative problems and different types of analysis, 3)to promote economic coordination procedures with different requirements occurring in the development of production and management, 4)to be the elements of a single economic information space, providing the possibility of an integrated and distributed mining, production and management.

We conclude, that information used in information technology and systems are used not in arbitrary forms, but only in the form of information models (IM). Information models can be viewed from different aspects, such as syntactic, semantic and pragmatic, visual.

Syntactic aspect is related to the method of building information model. It uses the rules of construction and interpretation, and the rules of model interaction with other models. This approach makes it possible to compare the rules of building IM and evaluate their complexity.

Semantic aspect is associated with the transfer of the semantic content through information model and the correlation of its meaning with the previously received information. The concepts of meaning and significance should be differentiated. This approach makes it possible to evaluate the content of IM, and to determine their compliance with the objects of description.

The visual aspect is related to the presentation of the information in a convenient form for analysis by a human. In this regard, we talk about cognitive graph and cognitive visualization models. This approach enables the generalized analysis of models using cognitive abilities of the human.

Pragmatic aspect reflects consumer properties of the information model and the possibility to use its quality in different situations. In a narrow sense, pragmatic aspect reflects the significance of the model. In a broad sense, it reflects its properties as an information resource. This approach makes it possible to compare the models to the applicability of their significance as an information resource.

Currently, three classes of information models are classified in the management systems and manufacturing [7, 8]: information-descriptive, information-resource, information-intellectual (Fig.1).

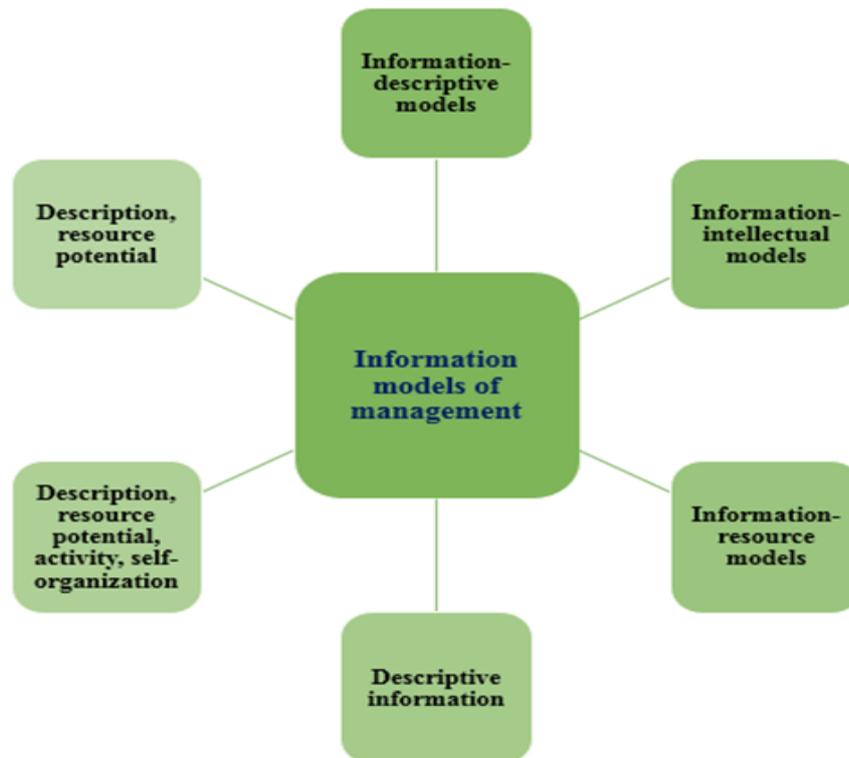


Fig-1. Classes of information models of management

Information-descriptive class of IM includes the models that are built in accordance with the classical definition of information as a description of a certain process, phenomenon, object, entity, etc. Models in this class function as an informational message.

Information-resource class of MI includes the models with the features of information-descriptive class, and the models which have additional features of accumulation and improvement. This feature is called the resource potential. Resource potential of the model is the possibility, based on the accumulation of information, qualitative change of the features of the model, for example, to increase its life cycle that is used in the CALS-technologies.

Intelligent models is a class of IM, which have the ability to generate information, improvement and self-improvement, and the implementation of active performances, regardless of the subject or object, that created these models.

The lifecycle of the latter class of models is more than the lifecycle of the first two classes. Knowledge base, some types of computer viruses, models of human response to the impact of the external environment can be example of these models.

All three classes of models are included into information resources. Organized data refer to the resource and intelligent models and create a new type of information resources. It enables multidimensional analysis, including visual analysis.

## 5. INFORMATION PROVISION SYSTEM AND ITS MAIN COMPONENTS

The management is not possible without implementation of supplementary or supporting activities. One of such activities is information provision. It represents the regular activities to obtain information product or to provide information services. Content and definition of the key components of information provision are as follows [15]: 1)providing factual data of management structures, 2)using information data for automatic control systems, 3)using information to provide functioning of various organization consumers.

## 6. MANAGEMENT INFORMATION PROVISION

Note that information management usually means the population of information about what happens within the organization and its surroundings. Availability of such information helps the manager to navigate in specific situations and make the best management decisions. Therefore, the management should start from the collection, storage, mining and interpretation of information. Management as an information process is to exchange information between the management subject, managed object and the environment.

Requirements to management information are as follows [16]: 1)relevance; 2)significance; 3)effectiveness; 4)briefness; 5)clarity; 6)uniqueness of language; 7)timeliness of submission; 8)correct selection of primary data; 9)permanence of data collection and data mining; 10)accuracy and reliability; 11)optimal systemizing.

Note that, information used in the management can be obtained from the following sources: 1)information centers, 2)press and mass media, 3)trade – chamber of industry, 4)committee on statistics, 5)committee on standardization and metrology, 6)ministry of economic development, 7)banks, 8)services and consulting firms and etc.

Information support can be regarded not only as a whole, covering all management functions, but also as an individual functional management work, such as forecasting and planning, accounting and analysis. This makes it possible to evaluate the issues specific to information support functional management, revealing its common properties. Thus, to meet all above mentioned requirements, it is necessary to use different methods of data collection, conversion, transmission, storage and data mining.

Currently, successful achievement of the objectives of the enterprise needs the formation of complex information provision for decision-making.

Tasks of information provision for management process are as follows [16]: 1)providing information needs of the governing bodies; 2)definition and selection of information sources; 3)correct interpretation and systematization of data; 4)verification of the accuracy, completeness and reliability of data; 5)exclusion of data duplication; 6)presenting the data in a single and easy-to-understand format; 7)multiple use of received information; 8)constant data update.

## 7. VARIOUS LEVELS OF STRUCTURAL ELEMENTS OF INFORMATION SYSTEMS

The management of the development and implementation of innovations at various levels is inextricably linked with the stable decision-making and controlling their implementation. Both these activities involve the receipt and mining of certain information, i.e. both the external environment and internal processes.

Therefore, we can talk about the existence of the information environment, that is internal and external space, which potentially contains information to perform decision-making about innovations and controlling their implementation [16-18]

Structural composition of information provision system of innovation structures can be set in blocks as presented in the Figure 2.

We can conclude that the timely development of information provision systems of innovative structures in the above mentioned composition makes it possible to make effective managerial decisions on the interaction of structural elements and increase of efficiency [19, 20].

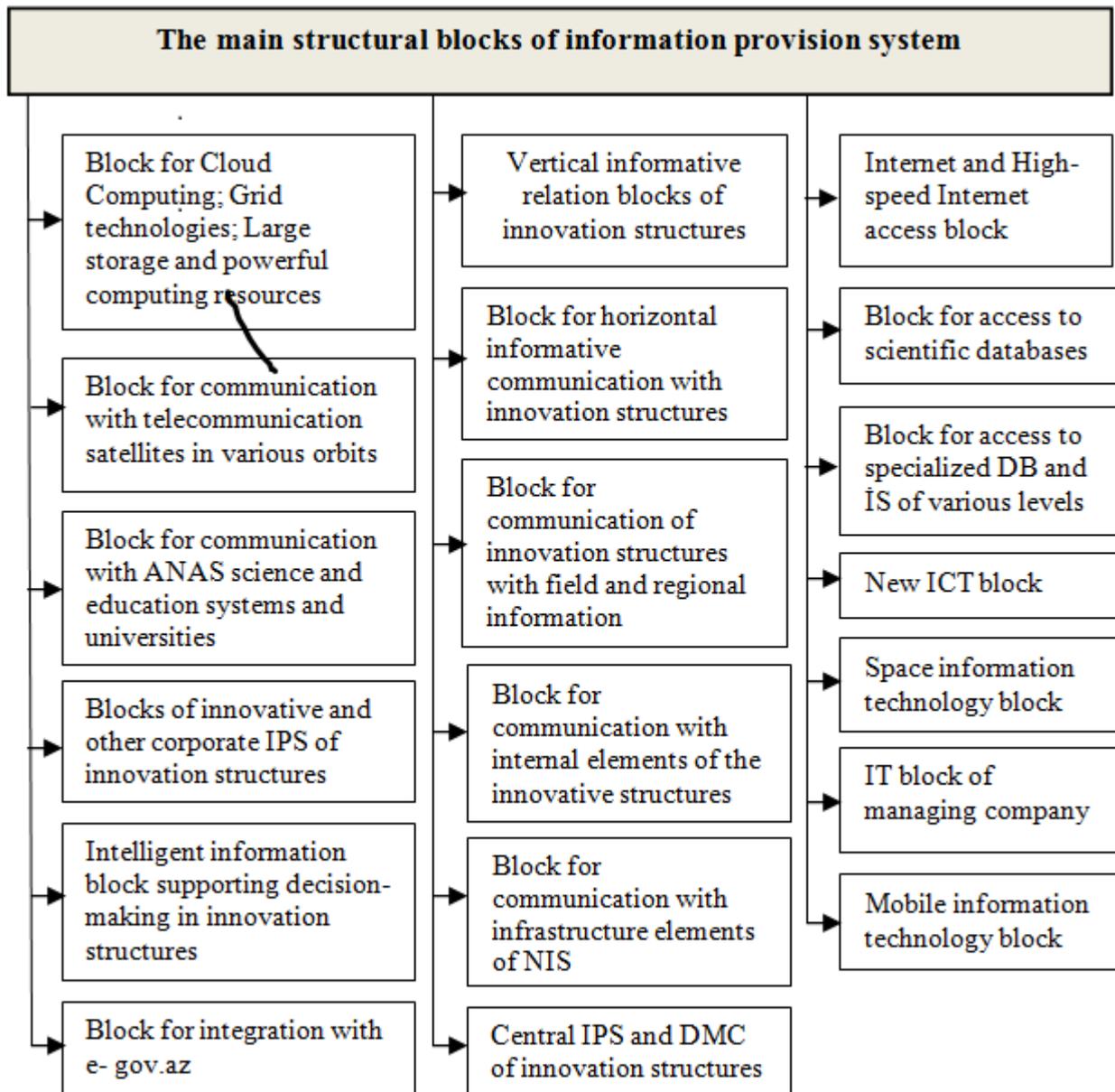


Fig-2. High technology parks elements of information provision system

## 8. CONCLUSION

Research shows that the building and effective management of high technology parks will affect economy of country, especially the development of non-oil sector, the expansion of exportability of country, increase of employment rate, modernization of economy, formation of innovative and science-intensive sectors, expansion of production of competitive products based on high technologies, increase of attractiveness of investment environment, support of entrepreneurship, also increase of employment rate and reduction of poverty significantly.

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