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INFORMATION SOCIETY AS AN ENVIRONMENT FOR CREATING NEW KNOWLEDGE

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ІНФОРМАЦІЙНЕ СУСПІЛЬСТВО ЯК СЕРЕДОВИЩЕ СТВОРЕННЯ НОВОГО ЗНАННЯ

Purpose. To develop the methods of creating new knowledge to increase the quantity of innovative goods and services which will be competitive on the world market through the use of patent information in the terms of modern information society. To describe the main characteristics and challenges of modern information society.

Methodology. To solve the problems we used the following methods and approaches: analysis of patent search databases necessary technical conditions for the relevant groups and subgroups in the ASI; examination of the content of the International Patent Classification; statistical analysis of documents full-text websites of international patent organizations and national patent offices; overview of patent documents found on the links index IPC.

Findings. The main characteristics of modern information society and network economy are outlined in this paper. The main patent world resources are analyzed and chosen. The methods of searching patent documents in the world and national patent data bases is developed and proposed. The fundamental principles of the information society development and network economy are identified. Major Russian government programs defining development strategy in the fields of information society development and innovations, the State Program “Information Society 2020” and The Strategy of Innovative Development of the Russian Federation for the period up to 2020 “Innovative Russia – 2020” are reviewed in this paper.

Originality. The research aims to improve the process of knowledge creation through the use of global patent information in today’s information society in order to develop technological innovations for the domestic and international markets.

Practical value. The rapid growth and differentiation of the demand for all kinds of information, including scientific, technical, economic, financial and commercial data, as well as increasing demand for the information content and the forms of its presentation, are the dominant incentive for the development of information systems to exchange electronic data. Patent information, contained in the world patent databases, allows the company to create new knowledge, to determine the existing state of the art and the leading direction of innovations, to develop technological innovations on the basis of the achieved technical level and to register the enterprise’s exclusive rights on new invention and innovations.

Keywords: *information society, network economy, economic entity, informational resources, information technologies, innovative activity, patent information, scientific-and-engineering information, research and development organization*

Introduction. Many modern theories are built on enhancing the role of information in society, which explain the profound changes in the economic and social structures of advanced countries. Information technologies have radically changed and continue to change our world. Nowadays, modern business cannot be build without any appropriate computer tools. An era of the information society is coming, the era in which content production occupies the dominant place, which can be distributed through using WWW, smart phones, a variety of mobile devices, television, etc.

This paper describes the main characteristics and challenges of modern information society. The rapid growth and differentiation of the demand for all kinds of infor-

mation, including scientific, technical, economic, financial and commercial data, as well as increasing demand for the information content and the forms of its presentation, are the dominant incentive for the development of information systems to exchange electronic data. Thanks to scientific and technological achievements and innovative process, we can see and apply new hardware and software. So-called information revolution as a consequence of scientific and technological progress of recent decades can be characterized by the emergence of the network economy and the development of the information society. International communication and implementation of information technology in the production and management processes, integration of global information networks provided the emergence of new management models aimed at the cooperation processes of economic entities operating on the basis of a global network of business interactions.

The necessity of quick response to the rapidly changing economic situation and permanently changing environment forces the companies to make constant adjustments in the existing control system in order to minimize the costs. These factors make the companies use available flexible tools, which allow the rapid acquisition and exchange of reliable information to adapt new business requirements.

Improving systems of any nature, including economic objects control systems, is characterized through translational evolutionary stages of development, resulting from constant occurrence and subsequent resolution of contradictions between subject and object management, and within them. The development of business entities is determined by two groups of factors: external and internal.

External factors generate contradictions arising from the interaction with the objects of the enterprise environment (banks, businesses, fiscal, law enforcement and others) and related areas, which reflect these interactions (marketing, finance, logistics, etc.). Internal factors generate a group of contradictions arising from the interplay of production (goods, works and services in a particular area) with providing services and staff management.

Inappropriate control system response to external changes or changes related to the development of production or lack of them, lead to the accumulation of contradictions that might be resolved by changing management tools and techniques. Business development, globalization of society and its increasing computerization lead to the highlighted decade problems, which need the appearance of appropriate computer tools to provide the right solutions.

The development of information systems as a part of Russian economy's control is closely linked to changes in the various fields of their use. Transition to a civilized market economy is characterized by changes occurring on both macroeconomic levels – in the economy as a whole, and at the microeconomic level – in enterprises, organizations and institutions. The result of above is the emergence of a fundamentally new economic concepts and objects, changing the nomenclature provided by business entities and services. Under these conditions, the information systems, which are tools that support the business, undergo radical changes. The rapid growth and differentiation of the demand for all kinds of information, including scientific, and technical one, and increasingly, economic and financial information, as well as increasing demands for its content and presentation, is the main reason for the development of information systems for electronic data exchange. Due to scientific and technological progress, new hardware and software solutions, new approaches related to the design and use of electronic data interchange between business entities as a means to support management decision-making, which is a necessary and sufficient condition for survival and profitability in an increasingly competitive struggle.

Many contemporary theories and concepts, which explain of the profound changes in the economic and social structures of advanced countries, are based on the recognition of increasing value of information in society. Started in the middle of the last century a radical qualitative transformation of the productive forces, a qualitative

leap in their structure and dynamics, a radical restructuring of the technical material production based on science becomes a leading factor of production led to the transformation of industrial society in the post-industrial and later in industrial society.

A recognized American classic of postindustrial theory Daniel Bell identifies three technological revolutions in his works: the invention of the steam engine in the XVIII century, scientific and technological advances in the field of electricity and chemistry in the XIX century and the creation of computers in the XX century. Scientific discoveries of the late XX century gave rise to the industry high technologies. These include electronics, security systems (the brightest among them, biometrics, detectors, and electronic analyzers), covert surveillance, and navigation technology. Among them is also the IT industry, including artificial intelligence, wireless technology, robotics, nanotechnology, clean technology, energy conservation and alternative energy (waste management, nuclear energy, solar energy, hydrogen energy); defense technologies and dual-use technologies; microbiological industry and biotechnology, including genetic engineering and gene therapy. Scientific and technical progress, carried out under the influence of major scientific and technological discoveries, affecting all aspects of society and presenting increasing demands on the level of education, skills, culture, organization, responsibilities of employees, along with industry cover agriculture, transportation, communication, medicine, education.

Putting into practice the achievements of scientific and technological progress as a radical, qualitative transformation of the productive forces on the basis of the growing interaction between science and production, in a competitive market allows the companies to offer better products, works and services, reduce their costs of production. Economic entities have to follow the technological achievements in related fields of scientific knowledge to adapt them and react to them. Some of these companies have to make significant investments in science, ordering certain scientific developments.

Conversely, technologically backward companies become uncompetitive due to the impact of scientific and technological progress. This applies to all processes of production and management in the economic subject. The driving force for the subject of the economy here is high return on production and sale of science-technological and advanced products. The result of scientific and technological progress of recent decades has become a so-called information revolution, characterized by the emergence of the network economy and the development of the information society. International communication and implementation of information technology in the production and management processes, combining global information networks provided the appearance of new management models aimed at the integration processes of economic entities operating on the basis of a global network of business interactions. Globalism, extra-territoriality, accessibility, interactivity, anonymity and others characterize the interaction in the business network. The network economy is considered to be the environment, in which any company or individual located at any point of the

economic system can contact easily and cost-effectively with any other company or individual for the purposes of co-operation, trade, exchange of ideas and know-how, or just for personal needs.

The term “information society” means the post-industrial society, in which the production of information products takes precedence over production of material values. Information society is a society of knowledge (know-how), occupying the fundamental positions in all sectors of the market economy. Knowledge has become a key factor in the society development, its strategic resource, including the concentration of theoretical knowledge, information processing and analysis, intellectual capital, human intellectual abilities, skills, qualification had professionalism.

Analysis of trends in information society suggests that the network economy will dominate the post-industrial economy, opening up new possibilities in the development of civilization. In Russia, the network economy is gaining strength; there is a mass market of information services. They include systems of scientific and technical information, distance learning, tickets reservation, insurance, billing, utilities paying, e-commerce, etc.

Formulation of the problem. In Russia, in October 2010 the State Programme “Information Society 2020” was developed [1]. In this program the emphasis was made not only on the information media, but also on the possibility of delivery of the information with the help of these instruments. The purpose of this state program is to ensure the country’s technological breakthrough in the use of information. Under this state program the primary objectives of electronic government in the Russian Federation are as follows:

1. Ensuring single information space.
2. Providing safe and automated access to information.
3. Rapid response to the growing needs of individuals and organizations.
4. Improving the efficiency of staff in ministries and departments.
5. Supporting the implementation of the resolutions and decisions of the government.
6. Provision of reliable and user-friendly interface for collaborative work.
7. Ensuring the security and confidentiality of information.
8. Minimizing overhead.

Development of information society creates the conditions for innovation processes of globalization, but so far these processes have remained local in essence.

The Strategy of Innovative Development of the Russian Federation for the period up to 2020 “Innovative Russia – 2020” (Ministry of Economic Development Project Government Decree № 2227-р) was adopted by the Russian government In December 2011. The purpose of this strategy is to provide the population with the high level of wealth and to strengthen the country’s geopolitical role. The only way to achieve these goals is to transform the economic model into an innovative and socially-oriented one. According to this strategy quantitative economic indicators for 2020 are to be the following: the

market share of high-tech products should reach 5–10%, a rise in the proportion of high-tech sector of GDP from 10.9 to 17–20%, an increase of the innovative products in the manufacturing output by five – six times, the growth of the number of research and development organizations from 9.4 to 40–50% [2].

Formulating the objectives of the research. To ensure the growth of innovations and economic performance in industrial sectors, it is necessary to conduct scientific research and inventive activity in the industrial enterprises by developing technological innovations and through supporting, completing, replenishing, and updating one of the most important intangible components of the business – patent resources: protective documents on inventions, industrial designs, utility models, trademarks etc.

Scientific-and-engineering information, contained in international patent funds, allows creating new knowledge, determining the world state of the art, registering and securing the companies’ exclusive patent rights to the innovations. Patent information is characterized with laconicism and brevity of the technical solution statement is the claim; informative completeness as a claim of the invention includes the necessary and sufficient signs for implementing technical solution; determinacy as the signs entered into a claim of the invention doesn’t allow any other interpretation.

Only with the help of patent information the technical level of industrial goods and the novelty of developed products and technologies can be surely established. As the main source of information provision of innovation, 70% of patent resources contain unique and precise information, which is not published in other sources the main source of information provision of innovation, 70% of patent resources contain unique and precise information, which is not published in other sources [9]. *Table* shows the opportunity of obtaining patent information in Russia by means of using various Russian and international databases and abstract journals that can help to investigate the world state of art in a given technological field.

FIPS means the Federal Institute of Industrial Property (in Russian: Federal Institute of PromyshlennyaSobstvennost). The main resources of patent information are described in detail in the sources [4, 5, 8–10]. Using the above sources of patent information based on a variety of domestic and international databases and referred publications, researchers and developers can define the overall level of development that means the world state of the art.

To handle this information the International Patent Classification (IPC) was established in 1971. It provides for hierarchical hand-built system of symbols for the classification of patents and utility models in a standardized international format according to the different areas of technology to which they pertain.

IPC has been continuously revised and updated due to new technological areas appearance. IPC is a mean of obtaining timely and accurate information. Learning at least one patent analog and not knowing a particular foreign language it is almost possible to determine the content of the patent, the key word in any foreign language and to select patent analog samples.

The complexity of the world patent information is accounted for its huge amount, of continuous renewability, the absence of unified world patent databases, many sources of information collection, language barriers, the diversity of patent resources structures and their search engines that re-

sult in problems of retrieving patent documents. All these factors stipulate high requirements for qualification of the specialists engaged in patent any activity.

By the IPC rubrics the data on the studied matter and on the countries of interests are quickly elicited.

Table

Main Sources of Patent Information

<p>1. Patent Databases of FIPS online: http://www.fips.ru and on other informational electronic media</p>	<p>1.1. FIPS Patent Databases with free access on FIPS site: http://www1.fips.ru 1.1.1. Databases of Russian Patent Information 1.1.2. Open registers 1.1.3. Electronic bulletins</p>
<p>2. Patent Databases of international and foreign organizations with free access to the Internet sites</p>	<p>1.2. FIPS Paid databases 1.2.1. Databases http://www.fips.ru 1.2.2. Databases on other information electronic media</p>
<p>3. Publications and periodicals on paper and on other informational electronic media</p>	<p>2.1. European Patent Office (EPO) Databases http://www.epo.org/ 2.2. World Intellectual Property Organization (WIPO) Databases http://www.wipo.int 2.3. Eurasian Patent Organization (EAPO) Databases http://www.eapo.org 2.4. Patent Databases of national patent offices</p>
	<p>Library funds Periodicals Monographs Unpublished sources Scientific-and-engineering information</p>

Patent research is the investigation of the state of art and trends in developing technical objects, their patentability, patents' validity, competitiveness, based on patent and other scientific or legal information. Search on the definition of prior art or information retrieval should determine the currently attained level of development in a particular technological activity to prevent groundless costs on research and development of the inventions that are already known. There are the following search types: thematic – by using keywords and the IPC indices, nominal (corporate) – by the name and surname of the inventor, the applicant or patent owner; numeric – by the registration numbers of patent documents.

Basic material and the results of research. The department of Rospatent – Federal Institute of Industrial Property (in Russian: Federal Institute of Promyshlennaya-Sobstvennost or FIPS) provides protection of legal rights to intellectual property objects, examines applications for patent rights, grants protective documents and keeps public registers of the Russian Federation for inventions. Using the Rospatent information resources, any company conduct a patent search to determine the technical level in a given field of the technological innovations development.

Determining the required patent classification symbols can be done with the help of Alphabetical Subject Index (ASI) to the IPC and the IPC on the site of FIPS and WIPO. Thematic search on the selected keywords is conducted on the abstract of the invention, through selecting the relevant documents. The proposed method and algorithm for integrated search and use of patent information by the company to determine the state of art in the patent resources is illustrated in the diagram shown in figure.

On the basis of principles of the IPC, we can conclude that it is an effective instrument for the orderly storage, a quick search of patent documents and deter-

mine the state of the art organization in their area of expertise in the development of technological innovations.

The implementation of the algorithm comes to the following procedure (see figure):

1. Analysis of the external environment. Specification of requirements for technological innovation – new products, services, production processes and production methods, which should meet the criteria of novelty, focus on the demand and potential profitability for the enterprise.

2. Establishing the subject of the search – the technical field, technical objects and special terms to define this technical field more broadly:

2.1. For the selection of terms related to the technical object, use the ASI to the IPC. With the ASI you are to find the group and the subdivision of the IPC. After selecting the division we are to find a suitable group, subgroup and the full classification index of the invention.

2.2. An alternative method of finding the right classification index is the search for full text and abstracts of patent documents using key words – selected technical terms. Conduct a statistical analysis of classification indices of documents found, select the most common indices of the IPC and include them in the search of subclasses.

3. Conducting the retrieval using the IPC indices and analysis of obtained documents.

4. Repeated search on related IPC rubrics in the links of patent documents already found, and obtaining search results.

5. Careful study of the description of the claims of patent documents.

6. A generalization of the results and assessment of the state of art.

If a patent search on the database of registered industrial property does not yield any results, it is necessary to continue retrieving databases of applications for the grant

of patents. While investigating the technological activities of main competitors introducing new products, technology and services into the world market it is prerequisite to implement relevant patent search for industrial property objects in selected countries – developed countries and market leaders on the sites of their national patent offices, containing the largest number of inventions in appropriate languages.

Descriptions of the inventions and their brief pointer are contained in the database “Inventions of the World Countries” on optical disks and other electronic media. Database, created by Rospatent on the bases of these resources, contains more than six million patent docu-

ments. Search engine of Russian Internet segment esp@cenet provides access from Rospatent site to the sixty million European Patent Office documents from 76 countries worldwide. The state of art can also be obtained through examining printed scientific and technical literature [8, 9]. With the help of IPC one can quickly find the patent materials on the topic and the country of someone’s interest. Using of Rospatent information search engine on the site <http://www1.fips.ru> it is possible to retrieve and review the abstracts and the full-text patent documents in the Russian and the English languages. The databases and search engine structures stipulates the search on text fields, numbers and dates.

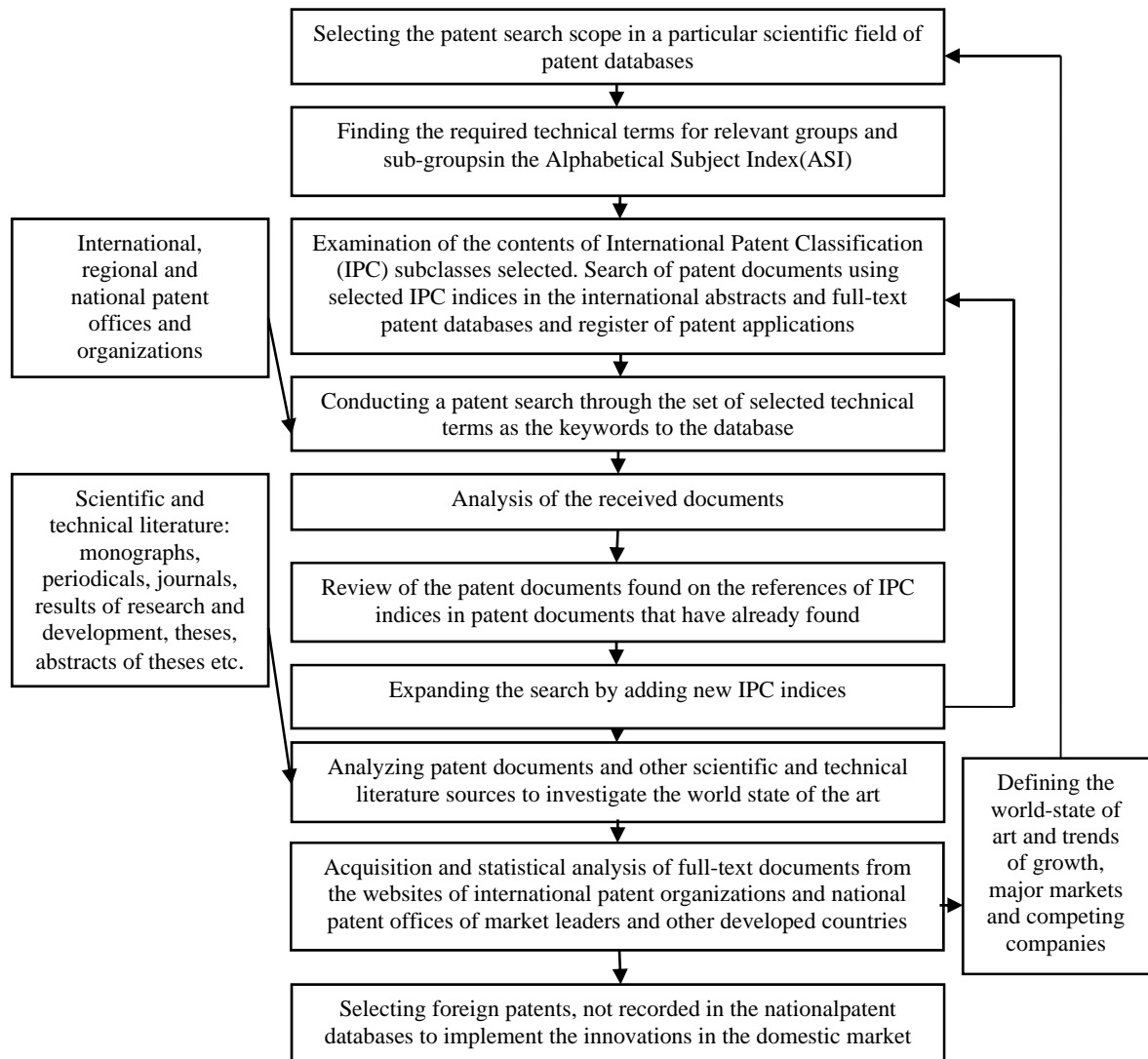


Fig. The method of complex search and use of patent information

Conclusion. Unfortunately, nowadays, Russia is lagging behind the innovative development. Even in the case of successful development of the main directions of technological breakthrough (energy efficiency and conservation, nuclear, space, telecommunications, health, information technology), these clusters will be upgraded to

operate in an inefficient legal system, economic and social institutions, surrounded by backward branches of the national economy and outdated public frustration of the state innovation policy. The time allotted for the technological evolution of the modernizing reforms in Russia is limited to 2020–2025 years. In case of backwardness in

ten or fifteen years our country will face the danger of losing the national competitiveness.

Development of information society is characterized by the growth of new information and knowledge. Knowledge has become a commodity, for which the demand is growing every day. At present it is not enough just to know, we must constantly update received knowledge. Informatization of the society is accelerating. New information and communication technologies lead to a radical reassessment of values and needs of the modern market.

We can assume that the specific features of the information society development are the following:

1. Solving the problem of information overload.
2. Priority of informational resource compared to other types of resources.
3. The emergence of the information economy.
4. The global nature of the information technologies distribution.
5. Automating the formation of collective knowledge.
6. Availability of free access to the collective knowledge through the application of information technologies.
7. Increasing the proportion of self-employment in social production through the adoption of network technologies.
8. New opportunities electronic education and distant learning.

The above suggests that in the near future economic subjects will have to constantly monitor and quickly adjust their activities to the formation and development of the information society to provide adaptability of the economy subject to permanent changes in the business.

Pursuing sound marketing and pricing policies the companies have to introduce different innovations – new products, technology, customer service forms, forms of work organization, production and management, etc. These processes are most relevant to economic subjects related to high-tech developments and solutions.

In terms of financial instability, acute competition, declining profitability of operations and other features, that characterize modern universal variability of the business, economic entities are required to be able to quickly adapt to all these changes. Modern markets, technology, consumers' demands are changing so rapidly in those conditions, when the control mechanism acts on the old, largely bureaucratic foundations. That is why this mechanism often loses its ability to adequately control the efficiency. It cannot provide the necessary continuity to adjust production, technology, marketing and market policy under production and marketing of the best-selling competitive products.

Discussing the growing role of information in modern society, as well as the factors of variability of business processes within the globalizing world economy, the internationalization of economic, political and cultural cooperation between the countries we can draw to the conclusion, that the external environment has become much more dynamic manageable. That volatile external environment of the information society has become the most important factor in organizational changes within the economic subject.

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Мета. Розробка методики створення нового знання для збільшення випуску російськими підприємствами інноваційних видів продукції, конкурентоспроможної на світовому ринку, за рахунок використання патентної інформації в умовах сучасного інформаційного суспільства.

Методика. Для вирішення поставлених завдань були використані наступні методи та підходи: аналіз патентних баз даних пошуку необхідних технічних умов для відповідних груп та підгруп в ASI; експертиза змісту Міжнародної патентної класифікації; статистичний аналіз повнотекстових документів веб-сайтів Міжнародних патентних організацій і національних патентних відомств; огляд патентних документів, знайдених на посиланнях індексів IPC.

Результати. Представлені основні характеристики сучасного інформаційного суспільства та мережевої економіки. Розроблена та запропонована методика пошуку патентних документів у міжнародних і національних патентних базах. Визначені основні принципи розвитку інформаційного суспільства та мережевої економіки. Розглянуті основні російські урядові програми, що визначають стратегію розвитку в області розвитку інформаційного суспільства та інновацій – Державна програма „Інформаційне суспільство 2020“ та Стратегії інноваційного розвитку Російської Федерації на період до 2020 року „Інноваційна Росія – 2020“.

Наукова новизна. Наукова новизна дослідження полягає у вдосконаленні процесу створення знання на основі використання світової патентної інформації в умовах сучасного інформаційного суспільства з метою розробки технологічних інновацій для зовнішнього й внутрішнього ринків.

Практична значимість. Стрімке зростання та диференціація попиту на всі види інформації, включаючи наукову, технічну, економічну, фінансову й комерційну, а також зростаючі вимоги до змісту інформації та різноманіття форм її подання є домінуючим стимулом для розвитку інформаційних систем обміну електронними даними. Патентна інформація, що міститься в міжнародних патентних базах даних, дозволяє компанії створювати нові знання, визначати існуючий рівень техніки та провідний напрям розвитку інновацій, розробляти технологічні інновації на основі досягнутого технічного рівня й реєструвати виняткові права на нові винаходи та інновації.

Ключові слова: інформаційне суспільство, мережева економіка, господарюючий суб'єкт, інформаційні ресурси, інформаційні технології, інноваційна діяльність, патентна інформація, науково-технічна інформація, інноваційно-активні підприємства

Цель. Разработка методики создания нового знания для увеличения выпуска российскими предприятиями инновационных видов продукции, конкурентоспособной на мировом рынке, за счет использования патентной информации в условиях современного информационного общества.

Методика. Для решения поставленных задач были использованы следующие методы и подходы: анализ патентных баз данных поиска необходимых технических условий для соответствующих групп и подгрупп в ASI; экспертиза содержания Международной патентной классификации; статистический анализ полнотекстовых документов веб-сайтов Международных патентных организаций и национальных патентных ведомств; обзор патентных документов, найденных на ссылках индекс IPC.

Результаты. Представлены основные характеристики современного информационного общества и сетевой экономики. Разработана и предложена методика поиска патентных документов в международных и национальных патентных базах. Определены основополагающие принципы развития информационного общества и сетевой экономики. Рассмотрены основные российские правительственные программы, определяющие стратегию развития в области развития информационного общества и инноваций – Государственная программа „Информационное общество 2020“ и Стратегии инновационного развития Российской Федерации на период до 2020 года „Инновационная Россия – 2020“.

Научная новизна. Научная новизна исследования заключается в совершенствовании процесса создания знания на основе использования мировой патентной информации в условиях современного информационного общества с целью разработки технологических инноваций для внешнего и внутреннего рынков.

Практическая значимость. Стремительный рост и дифференциация спроса на все виды информации,

включая научную, техническую, экономическую, финансовую и коммерческую, а также растущие требования к содержанию информации и многообразие форм ее представления являются доминирующим стимулом для развития информационных систем для обмена электронными данными. Патентная информация, содержащаяся в международных патентных базах данных, позволяет компании создавать новые знания, определять существующий уровень техники и ведущие направления развития инноваций, разрабатывать технологические инновации на основе достигнутого технического

уровня и регистрировать исключительные права на новые изобретения и инновации.

Ключевые слова: *информационное общество, сетевая экономика, хозяйствующий субъект, информационные ресурсы, информационные технологии, инновационная деятельность, патентная информация, научно-техническая информация, инновационно-активные предприятия*

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DECISION SUPPORT METHODS IN BALANCED SCORECARD

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МЕТОДИ ПРИЙНЯТТЯ РІШЕНЬ У СИСТЕМІ ЗБАЛАНСОВАНИХ ПОКАЗНИКІВ

Purpose. Development of the method of KPI tree transformation into the decision tree to be used in BSC.

Methodology. Creating mathematical model of inverse calculations to achieve the above purpose.

Findings. Mathematical tool of the inverse computation to transform the tree of KPI indicators in the decision tree for application was developed. The Balanced ScoreCard concept appeared 15 years ago. But even now many companies face a great amount of problems during its implementation due to unavailability of clear methods and tools. There is a list of problems that appears during the implementation process: suitable performance indicators definition and calculation methods, connection of indicators in different management levels, decision preparation based on the hierarchy of goals, intuition influence on the decision-making process, decision-making support systems design and so on. To solve this problem an enterprise should develop new formalized methods and tools and find new indicators that can be decomposed easily and utilized in the decision-making process.

Originality. For the first time the method of inverse calculations was adapted for extending functionality of balanced scorecard.

Practical value. The method shown in this paper can be used independently, without the formation of cards, within the BSC framework. This method allows improving such class of enterprise information systems as Business Performance Management.

Keywords: *inverse calculation, management by objectives, KPI, BSC, Business Performance Management*

Scientific Problem. In spite of the development of information technology as a tool for all procedures of decision-making support and availability of mathematical

methods, nowadays corporate management experience problems, which are determined by system character. These problems can be grouped as follows:

- problems of strategic goals and indicators conformity on both tactical and operational levels;