

ERP System as a Method of Effective Economic Management by the Example of the Russian Federation

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Abstract. Russian enterprises have installed systems or accounting modules of various systems that are not integrated among themselves, which cannot provide a complete picture of the financial condition of the enterprise. In this regard, the transition to an ERP system is of particular importance. The article discusses the significant advantage of implementing ERP systems. The state of the Russian market allows us to talk about a significant potential for its growth, provided that the country's economy is stabilized.

1. Introduction

Modern application software presented on the Russian market is very diverse and heterogeneous. First of all, this is the result of the following factors:

- constantly growing customer requirements;
- local preferences of developers;
- volatility of the regulatory environment.

To date, the practice of using information systems puts forward requirements for an integrated approach to classification that would meet the requirements of system analysis with the rational management of resources and relationships at the enterprise. Such an approach would help an unprofessional user to navigate both in the selection of various software products and in their operation. The use of automated information systems by business entities is becoming the corporate standard with the preference for the Enterprise Resource Planning (ERP) systems management concept.

It should be noted that, as a rule, the choice of an ERP system is the responsibility of the department of information technology. At the same time, the specialists of this department do not fully evaluate the advantages of one system over another, since they can only make comparisons in terms of technical characteristics, missing the specifics of the enterprise, its functionality, ease of use, financial and business operations, management accounting, etc. In this regard, software products of this kind are classified according to many criteria.

The authors of this article investigate the issues of the efficiency of using information systems not only to reduce enterprise costs, but also to obtain economic advantages in managing intellectual resources at the regional level, in economic sectors. Trutneva A.A. and others [1] classify ERP systems into categories for large, medium and small enterprises.

2. Methodology

Not all regions of Russia, their sectors of the economy and enterprises can adapt to changes in federal

law or to internal structural changes. Mechanisms that allow you to make changes and configure online, as a rule, are absent or limited.

When choosing an ERP system, the multi-criteria selection method is used. Its essence lies in the fact that information is expressed not in the form of scalar quantities, but in the form of vectors consisting of some indicators. Analysis of the existing economic management systems of countries and their regions allows us to consider ERP systems as a management tool at the upper (state) level, middle (regional) level and at the lower (enterprise) level.

Top-level management is carried out to implement state strategies and programs for the socio-economic development of countries and their strategic sectors of the economy. Good examples are intellectual property management in the Republic of Korea [2] and Japan [3]. Separate proposals on this issue are provided by the World Intellectual Property Organization when developing national intellectual property strategies and their implementation.

Mid-level management is implemented to implement regional strategies and programs for the socio-economic development of individual regions and their budget-forming sectors of the economy and industrial clusters. Here we present an example of the Japanese regional strategy and an example of the Republic of Tatarstan, one of the innovative regions of Russia, which adopted a regional program for the development of the intellectual property market. An analysis of the formation and development of the intellectual property market are considered by Salimov R.I. and Mingaleev G.F. [4], Salimov R.I. and Goryachkin V.P. [5], Salimov R.I., Goryachkin V.P., and others [6].

The lower level management is widespread and applied in nature and in most cases is built using ERP systems.

Trutnev V.V. and others [7] note that the most common ERP systems on the Russian market are software products such as SAP R/3, Axapta, Baan IV, and Galaxy. Corporate ERP systems in the field of intellectual property are represented by the following companies: Research and Production Association "Innovative Systems and Processes", Moscow State Pedagogical University, Ulyanovsk State Technical University, LLC TsSMRneft and others.

As a rule, Russian enterprises have accounting systems or accounting modules of various systems that are not integrated among themselves, which cannot give a complete picture of the financial condition of the enterprise. To some extent, this is due to a number of shortcomings inherent in the Russian accounting system itself. In particular, these are: the focus of reporting forms on fiscal authorities, and not on the management of an enterprise; low efficiency of its provision.

In this regard, the transition to an ERP system is of particular importance, since it helps to deal with these shortcomings. That is why Russian enterprises are increasingly choosing foreign ERP systems. One of the reasons for this is the desire to expand the boundaries of the existing business.

There is an opinion that if an enterprise does not use a modern ERP system, then potential foreign partners may negatively perceive this fact and prefer as partners a competitor company in which such systems are applied. It is believed that for large companies the most important factors are:

- availability of information on all types of activities;
- relevance of information at any given time;
- transparency of information.

Currently, foreign companies come to the Russian market already with their software. If we talk about branches already operating on the market, then there is a replacement of domestic production programs (for example, the "IC-System") with programs of accepted international standards. Companies carry out "typing" of all structural divisions. This is done to more fully realize the advantages of ERP systems, since it works as efficiently as possible, if everyone works in one system, according to the same business processes.

- As a rule, ERP systems are created on the basis of a multi-level architecture the levels of which are:
- database level, data warehouse, which is the most protected component of the system;
 - level of applications, data processing and conversion;
 - presentation level, i.e. data output for the end user.

Such levels together constitute ERP as a system.

For all architectural levels and components of an ERP system, the so-called network infrastructure is the connecting medium. Information security of work in ERP can be divided into several main aspects:

- database security;
- network security;
- application server security;
- information security on the end-user computer.

By the degree of integration, such automated data processing systems are usually divided into medium and large. The purpose of their use is to ensure effective planning and management of production and technological processes. Moreover, such systems, as a rule, have advanced accounting functions. This requires a more complex architecture and significant time spent on implementation and adaptation. According to Kurinko R. [8], the duration of the implementation ERP systems can depend on several factors, for example:

- quality and quantity of formalized and documented business processes;
- a sufficient number of staff;
- qualification of the organization's personnel as a whole and the implementation team in particular;
- number of structural levels in the company hierarchy;
- territorial remoteness of participants of the projects implemented in the company;
- presence of a documented knowledge base on previous projects, statistical information on business processes, information classifiers.

The factors listed above are of a different nature and affect the implementation process to varying degrees. Leveling approaches can also vary. The most significant of them is the availability of human resources and their qualifications, since it is the personnel available in the organization, as a rule, that form the basis of the ERP implementation team. It was established that organizations providing implementations on their own did this due to the higher qualification of internal staff. In addition, subsequent success from implementing ERP depends on the strategic goals of the enterprise at the decision-making stage.

O'Leary D. [9] singles out the following criteria for choosing ERP class systems:

- compliance with current legislation and the practice of interaction between enterprises in part necessary for the full-fledged work of the company with the external environment;
- sufficient system functionality to implement the company's internal business processes;
- the availability of opportunities for changing the system for business development in the medium and short term;
- simplicity of changes and modernization of functions for new business processes specific to a given enterprise;
- performance;
- compatibility with the most common office programs;
- the number and qualifications of personnel required for the implementation team;
- providing technical support to users.

It should be noted that in addition to the above criteria, the most important for Russian enterprises at present are the cost characteristics of ERP systems, including the cost of implementation, the cost of a license and annual payments. For example, the price of an SAP ERP license for one workstation starts at 4,800 Euros, the cost of maintenance is approximately 22% of the license cost. Even without taking into account currency fluctuations in recent years, such a price is significant for most Russian enterprises.

It is also necessary to evaluate the economic efficiency of the implementation and use of ERP systems in enterprises. Such an assessment is an illustrative example for company executives who subsequently decide on the need to create integrated information and analytical systems at the enterprise. To assess the economic efficiency of using integrated information and analytical systems, we consider a number of examples. We propose to build on, for example, one of the topics that are

relevant today - intellectual property and the management of rights to it.

Let us start with an example of the upper macro level. As world experience shows, intellectual property management is an integral part of the development of the country and its companies. Intellectual property strategies in many countries around the world note the link between intellectual property and the economic growth of gross domestic product (GDP). The best examples at the world level are the practices of Korea and Japan, in which there is a direct correlation between the GDP and the submitted applications for inventions. Figures No. 1 and No. 2 show the corresponding dependencies for the Republic of Korea and Japan, where the correlation coefficient is more than 0.9.

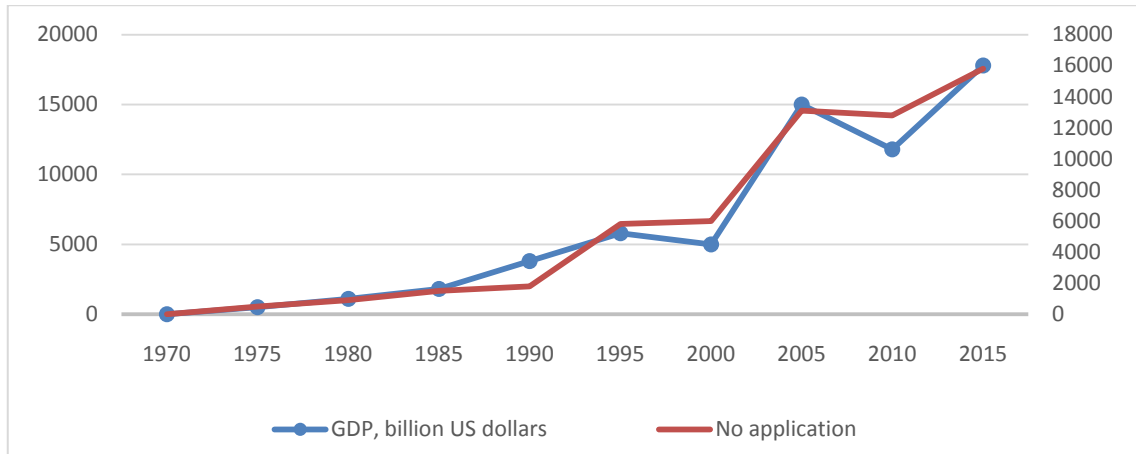


Figure 1. GDP and submitted applications for inventions in Korea.

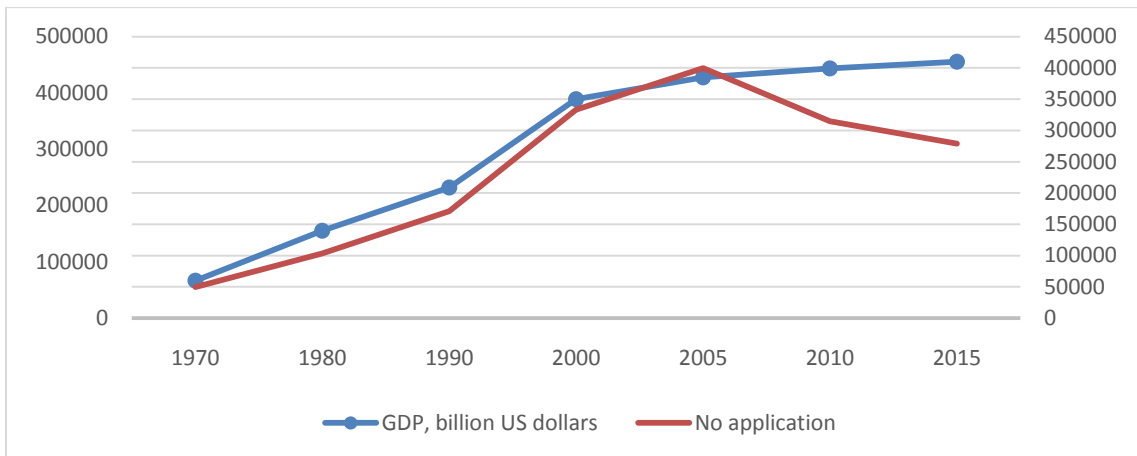


Figure 2. GDP and submitted applications for inventions in Japan.

Obviously, this dependence may reflect the economic development of the country [10]. However, with regard to the Russian Federation, here the correlation coefficient is about 0.7, which shows a low connection between innovation and GDP.

For the Republic of Tatarstan, one of the innovative regions of Russia, the correlation coefficient is about 0.76, but this does not mean that today intellectual property plays a significant role in the development of the region and in the development of the country as a whole. However, a similar situation is observed in other regions of the country.

3. Results

Consider examples of the use of ERP systems and their economic efficiency in the public sector and in large companies of the Russian Federation. The authors give a special role to the management of

intellectual property, while the high importance of this issue is confirmed by the existing practical examples of the article's authors.

3.1. *The use of the intellectual property management module of the ERP system in oil producing and oil refining companies in Russia*

For the purpose of analyzing production efficiency when introducing an intellectual property management system at an enterprise, the authors studied the experience of managing the innovative development of a number of large enterprises such as Tatneft PJSC, TANECO JSC and some other Russian oil and gas enterprises. In many enterprises, if there is a seemingly already existing innovation infrastructure, the process of intellectual property flows formation is gaining some power not in one or two years, but more often, over many years. Consider the formation of a stream of rationalization proposals at such enterprises (Figure 3).

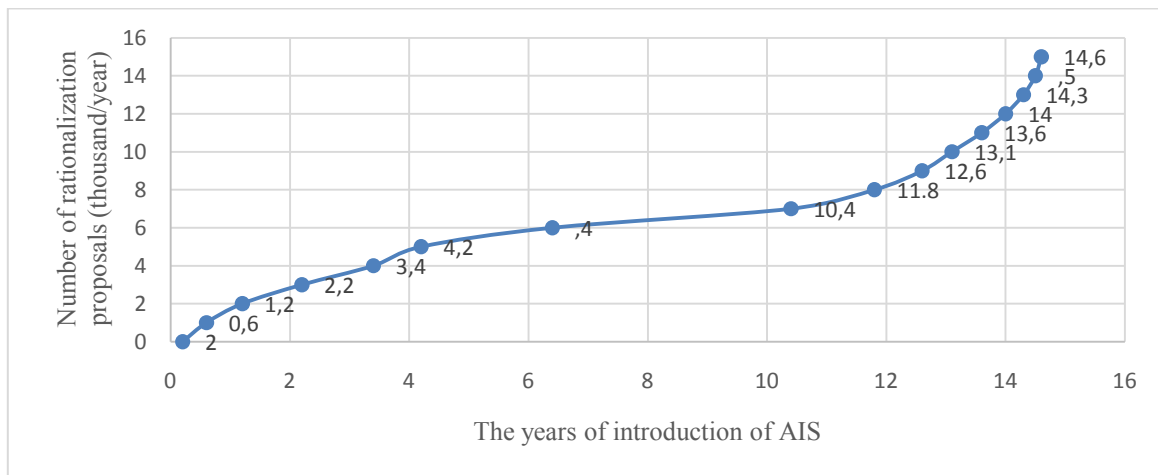


Figure 3. The dynamics of the growth in the number of rationalization proposals when introducing an enterprise ERP system of innovation activity management.

As you can see, before the ERP system for managing innovative development was put into trial operation (year 0), the number of rationalization proposals submitted for consideration did not exceed 200 per year. But as the ERP system is introduced into production (the first 5 years), their number begins to grow gradually and as of the 5th year of operation it reaches 400 rationalization proposals per year, that is, it increases by 20 times. At the same time, over these 5 years the number of rationalizers has significantly increased, among which not only middle managers, but just workers have become more and more often featured. Over the next 2 years, the stream of rationalization proposals began to grow rapidly and then went to a certain "hospital". The share allocated by enterprises to encourage rationalizers amounted to 3-10% of the profits at different enterprises. But this, as can be seen, was quite enough so that the stream of rationalization proposals would only increase from year to year.

3.2. *The use of the intellectual property management module of the ERP system with state accounting of the results of scientific and technical activities in the Republic of Tatarstan*

The first and necessary step in creating a regional intellectual property management system is a full-scale analysis of the area in which the results of intellectual activity are created, that is, the field of R&D. Given that in the territorial subjects of the Russian Federation significant allocations are allocated for research and development from regional budgets, by the standards of the region, it is quite logical to know how these allocations are spent, how much the results of such work are adequate to costs. In other words, it is necessary to create a tool for analysis, planning and monitoring the use of R&D results in the same way as in the Republic of Tatarstan.

The ERP system of state accounting and storage of R&D results of the Republic of Tatarstan (ERP system of R&D accounting) was created by degree of the Cabinet of Ministers of the Republic of Tatarstan dated 12.03.2010 No. 133 [11] in order to accumulate, systematize and improve the efficiency of using R&D results, as well as further optimize the system state regulation of the scientific and technical area of the Republic of Tatarstan. The ERP system of R&D accounting is an organizationally ordered set of interconnected elements of information exchange and includes the following main components:

- regulatory framework governing the activities of the Unified System;
- participants in the information exchange of the Unified System;
- automated information and analytical system;
- information resources, including but not limited to a single registry and a database of R&D results.

The participants in the information exchange of the R&D accounting ERP system are: state customers, R&D executors, coordinator is the Ministry of Economy of the Republic of Tatarstan, the authorized organization is the Tatarstan Center for Scientific and Technical Information, the financing organization is the Ministry of Finance of the Republic of Tatarstan, and other authorities and other participants in the information exchange. Practical implementation of actions in the ERP system of R&D accounting was carried out using an automated information-analytical system, protected by certificates of the Federal Intellectual Property Service on state registration of computers' programs No. 2012613454 (AIAS RRRD stands for Automated Information and Analytical System for Recording, Storing and Using the Results of R&D) and database No. 2012620198 (DB R&D RT) The AIAS RRRD system includes:

- a server subsystem, the main functions of which are the analytical processing and storage of information entered into a unified database, the provision of printed forms, the administration of the database "R&D RT" and the maintenance of system directories;
- a web-based subsystem for remote input and viewing information;
- an Internet portal for providing open information.

The R&D accounting system, created in 2010, has become a powerful tool for analyzing the status of issues related to R&D in the Republic of Tatarstan. The subjects of work, including in priority areas for the development of science, engineering and technology, the main state customers, contractors, amounts of funding, results of work, including issues of their use, have been Identified. So, in the Unified System of State Accounting for the Results of R&D of the Republic of Tatarstan from 2007 to 2018, 1,506 R&D for a total of 1.41 billion rubles have been recorded, of which 903 R&D financed from the budget of the Republic of Tatarstan in the amount of 1.23 billion rubles.

3.3. The use of the intellectual property management module of the ERP system in the management of intellectual property by small and medium enterprises in the Republic of Tatarstan

Automation of innovation development management begins with the interest of top managers in the development of the intellectual potential of the enterprise. Software is needed to support the management of full-cycle innovation processes: from an idea to introducing innovations, preparing for the commercialization of new equipment and advanced technologies. For high-tech industries, which include enterprises of the petrochemical complex, the development of intellectual potential plays a key role. Operational management of intellectual resources is an effective tool for introducing scientific and technological achievements into practice.

In this case, one cannot do without a comprehensive ERP system, which includes a set of specialized software modules that solve the interrelated tasks of the development of innovative activities of the enterprise. Volkov Yu.A. and others proposed to develop such a system on the basis of a model of real-life and interacting business processes of all structural divisions associated with innovation [12, 13]. And most importantly, the ERP system improves, optimizes this model and automatically builds the infrastructure for managing intellectual resources. An example of a successful integration of such an automated system into the production process is the development and

implementation of an integrated ERP system consisting of 4 subsystems: Patents, Contracts, Rationalization, and Emerging Technology. All these subsystems work in a unified information space and form a unique knowledge base of the enterprise.

4. Conclusion

During the economic transformation, the Russian Federation has been not able to enter the path of sustainable growth. In this situation, the urgency of the problem of forming a new, science-based paradigm of strategic management of economic dynamics at the regional level. The unfavorable situation in the development of Russian regional economies is due to the following factors: a decrease in the share of investments, primarily foreign ones, and a reduction in the costs of innovative and technological development. The current situation in the field of innovation does not provide a technological breakthrough and, accordingly, a cardinal acceleration of the economic development of the regions and the country as a whole.

The solution to the problem of modernization and innovative development of the economy, as decided by the country's leadership, is a new economic policy, reindustrialization. This is the development of key areas of high-tech industrial production, scientific and educational complexes of Russia, the creation of new industries and industries with high labor productivity and high added property based on fundamentally new technologies that are competitive in the world market.

Thus, the significant advantage of introducing ERP systems is considered as saving the enterprise's expenses by optimizing the number of its employees, and the status of the Russian market allows us to talk about the significant potential for its growth, provided the country's economy is stabilized.

References

- [1] Trutneva A A, Trutnev V V, Mingaleev G F, Babushkin V M 2017 The effectiveness of the use of labor resources at an industrial enterprise *Bulletin of Kazan State Technical University. A.N. Tupolev* vol 73 4 pp 96-101
- [2] Choi Donggyou 2016 Economic Development and Intellectual Property: from Korea's experience. The Korean Intellectual Property Office (KIPO) International Conference "Development of the Intellectual Property System in Russia" (Moscow)
- [3] Koichi Matsushita 2016 Japan's Experience in Establishing Legal and Institutional Frameworks on Intellectual Property The Japan Patent Office (JPO) International Conference "Development of the Intellectual Property System in Russia" (Moscow)
- [4] Salimov R I, Mingaleev G F 2011 The Regional Policy of Industrial IPM Services for the Development of Knowledge Potential in Russia Implementing International Services A Tailorable Method for Market Assessment, Modularization, and Process Transfer (Eds. T. Böhmann, W. Burr, T. Herrmann, H. Krmar) Gabler Verlag *Springer Fachmedien Wiesbaden GmbH* pp 423-435 ISBN 978-3-8349-1577-1
- [5] Salimov R, Goryachkin V 2017 Regional Experience of the Republic of Tatarstan on the Development of the Intellectual Property Market: Accounting for R&D Results *Intellectual Property. Industrial Property* (M.) 7 pp 7-14
- [6] Salimov R I, Goryachkin V P, Volkov Yu A, Vinokurov A A, Mukhamedov A G 2018 Intellectual Property Management of the Cluster Development of the Regional Economy International Conference "Innovative Solutions for the Effective Development of Petrochemicals", September 4, 2018 Kazan Collection of Abstracts (Kazan: Open Joint-Stock Company 'Tatneftekhinvest Holding') pp 48-51
- [7] Trutnev V V, Aleshina N I, Kashapova A F, Gataullina A I, Galimova A I 2017 Management of the Economy of Quality *Issues of Science and Education* 5(6) pp 61-63
- [8] Kurinko R 2018 Social Responsibility of Business *Sustainable Business* URL: <http://csrjournal.com/839-cto-takoe-sob-cto-takoesocialnaja.html>
- [9] O'Leary D 2014 ERP Systems Modern Enterprise Resource Planning and Management Selection, Implementation, Operation (M.: Vershina) P 110

- [10] Bergeaud A, Gette G, Lecat R 2015 GDP per capita in advanced countries over the 20th century *Banque de France Working Papers* **549**
- [11] Regulation Act of the Council of Ministers of the Republic of Tatarstan from March, 12, 2010 No 133 "On approval of the regulations on the unified system of state accounting and storage of the results of R&D in the Republic of Tatarstan"
- [12] Volkov Yu A, Goryachkin V P, Ozerova A G, Salimov R I 2018 Innovative Development Management Automation for Enterprises of the petrochemical complex of the Republic of Tatarstan International Conference "Innovative Solutions for the Effective Development of Petrochemicals", September 4, 2018 Kazan Collection of Abstracts (Kazan: Open Joint-Stock Company 'Tatneftekhinvest Holding') pp 35-37
- [13] Kutsenko M, Ovcharuk V, Solovev D B 2019 Application of Singular Value Decomposition Method for Acoustic Emission Data Analysis *2019 International Science and Technology Conference "EastConf", International Conference on*. [Online]. Available: <http://dx.doi.org/10.1109/EastConf.2019.8725314>