ERP systems – automation effects

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Abstract

Nowadays, the competitivity between companies, enterprises, industries and countries is accelerating much faster than yesterday. This work explains what the reason of this accelerating is and how new IT systems make a new Revolution where human resources are used much more efficiently. The main way to increase the efficiency of the work process, which could combine financial, materials, human and other resources of the organization, is to automate it and let manual and routine work to robot.

Content

CHAPTER 1

Introduction

The goal of every enterprise is to take a high position in the market, but for this, it needs to be able to efficiently manage its resources and be highly adaptive to any changes. Effective management is a valuable resource for an organization today. The main way to increase the efficiency of the work process, which could combine financial, materials, human and other resources of the organization, is to automate it.

Of course, each enterprise is unique in its way in its activities; however, along with the specifics, it is always possible to identify tasks common to enterprises representing various fields of activity. These general tasks include managing material and financial resources, procurement, sales, customer and vendor orders, management of personnel, fixed assets, warehouses; business planning and accounting; budgeting; settlements with buyers and suppliers; maintaining bank accounts. It is on this principle that all ERP systems development is based.

ERP system is a way of how the business is structured and organized. Nowadays, there is no company without any ERP system. It is impossible to be competitive with a fully manual company, without the system which helps to save time on routine tasks and to be aligned with technological progress. This work tries to understand and identify the positive or negative effect of automation based on the implementation of ERP systems. Also, try to identify bottlenecks and formulate requirements for the automated business process and information system.

Due to ERP systems which are used in Russia and those effects are weakly studied comparing with European or American cases. The object of the research is the automation effect of ERP systems in Russia. The goals of this research are to identify the positive and negative effects of automation based on ERP systems in Russian industry and economy.

This work uses SPSS as a statistical tool and Generalized Linear Models (GLMs), which allow working with a large amount of data, including surveys and financial results. Therefore, references to other works and literature that this work is based on is mostly Russian, to do not avoid specificities of the country.

The practical result of this work is a set of instructions for describing a business process, as well as an analysis of the consequences of implementing an ERP system in an industry, which can be further applied to create an industry solution.

This work uses different steps to find the answer to the question identified above. The first step is observation. This work observes activities of companies, as well as key business processes and their impact on the company's results. The observation is made before and after the moment when the company implement the ERP system - Go-Live. Next step is Comparison. A comparison of several ERP systems. This work carefully identifies the comparison criteria among different ERP systems in different industries. And after any comparison - Analysis. The work analyses the impact of the business transformation and provides the conclusion.

CHAPTER 2

Literature Review

2.1. Definition and main areas of application of ERP systems

Constantly changing market conditions, high speed of decision making, multilevel asset management, and the need to reduce risks require modern approaches to organizing business activities (Waldron M., Vsanthakumar J., Arulraj S. 2020). The solution for an increasingly complex internal and external business environment is the complete automation of business processes. It frees up valuable resources for strategic planning and management consolidation in key areas of the company.

More and more businesses of all sizes are trying to incorporate a powerful management tool into their work. Its use is intended to establish effective control and planning of all strategic business processes of the organization, to optimize the work of the main production and auxiliary facilities (Kovalev, V.V. 2019).

Today companies are actively introducing information technology into business, and the demand for ERP products is very high. Large companies have realized the importance of information technology in their business through ERP products as they play a very important role in improving the quality of business processes. ERP products help a company to continuously analyze its activities to serve as business management and business process automation tool.

Business processes are a series of events that are generated, as a result, of the creation of a product or are used for other internal business workflows. Business processes can go through different segments and often affect business results.

Business process automation is a strategy in which companies use technology to organize their activities. The technology can include specialized information systems or hardware and software systems. Processes are groups of actions that a company performs independently. Many literature and academic articles predict that automation can reduce operating costs by 90% through automation.

Automation allows the company to control various issues such as relationships with contractors, analytics, planning, sales, standardization and development, helping to minimize operating costs, freeing up staff to perform higher-level tasks.

Manufacturing automation began in 1913 with Henry Ford and the production of the T Model automobile (Batchelor R. 1994). With the first mobile assembly line to mass-produce an entire vehicle, Henry Ford revolutionized the manufacturing process and the automotive industry. With this radical change, assembly lines have allowed each employee to improve their soft and hard skills, resulting in huge cost savings for each product.

Business process automation is now an essential tool for continuous business improvement. Companies are actively using technology integration, business resource planning and workflow processes.

As technology advanced in the 1970s and 1980s, businesses began using computers for minimal automation. Routine, repetitive tasks and processes turned into machines, and people were given the opportunity to do more creative work, and new high-level jobs began to emerge (Vronsky A.I. 2018).

The business must be very responsible in researching its processes. First, one needs to examine its strategic needs and ask himself what makes them more competitive in the market. Companies then need to identify the processes that have the highest priority. These are processes that take a lot of time, resources and cause human error. Each organization will be different in terms of automation, depending on its strategic and operational needs. It highlight the following typical business functions that may require automation (Mazur, I.I., Shapiro V.D., Olderogge N.G., Polkovnikov A.V. 2018) financial transactions, document approval, maintaining regulatory and reference information, purchasing procedures, sales and marketing, working with contractors, warehouse and transport logistics, personnel.

The idea of ERP systems was introduced in 1990 by Gartner Consulting analyst Lee Wiley to define large integrated systems that control sales, manufacturing, purchasing, and customer accounting (Gartner W. 1990). The development of business process automation systems followed the path of consistent complexity and integration of various systems into a single package. The ERP market was developed as integrated packages for large companies. The most famous solutions were offered by SAP, Oracle, Baan, PeopleSoft, JDEdwards. In the 2000s, small and medium business systems emerged, with Microsoft and the Sage Group being among the most popular vendors (Dybskaya V.V., Zaitsev E.I., Sergeev V.I., Sterligova A.N. 2018).

ERP systems are designed to manage all business and financial activities of an enterprise. They are used to quickly provide business management with the information needed to make management decisions, as well as to create an infrastructure for the electronic exchange of business data with suppliers and consumers. The following main components are implemented in ERP systems:

1. Design for sale and production. The result of the block is the development of a production plant for the main types of products.

2. Demand management. This block is designed to predict future demand for products, determine the volume of orders that can be delivered to a customer at a certain point in time, determine the demand of the distributor, demand within the business.

3. Complete capacity planning. It is used to define production plans and determine their feasibility.

4. Basic production plan (production schedule). Products are defined in final units (products) in terms of production and quantity.

5. Planning material needs. The types of material resources (prefabricated units, finished units, purchased products, raw materials, semi-finished products) are analyzed, and specific terms of delivery to complete the project.

6. Product specifications. It determines the composition of the finished product, the material resources required to create it. In fact, the specification is the relationship between the general production plan and the plan for material requirements.

7. Capacity planning. At this stage of planning, production capacity is determined in more detail than at previous levels.

8. Route/work offices. Using this block, both the capacity of various levels of production and the paths along which products are produced is determined.

9. Management of purchases, promotions, sales.

10. Financial management (general ledger, settlements with debtors and creditors, fixed assets accounting, cash management, financial planning).

11. Cost management (accounting of all commercial expenses and costing of finished products or services).

As practice shows, ERP systems designed to manage transaction chains perform only part of the usual business tasks. Nevertheless, they successfully solve problems related to the management of current activities and provide control over operating costs.

An ERP is an integrated business management system that spans the operational areas of a business such as logistics, industry, finance, accounting, and human resources. An ERP system is a global, tightly integrated, closed-loop business suite, yet versatile at the same time. Simply put, business resource planning requires a database, application, and user interface for the entire business. ERP serves as a tool to help employees and managers design, control the business, increase productivity, make full use of capacity, reduce inventory, and meet delivery times (Blank I. 2017).

Each system must have enough key features to qualify for a true ERP solution, namely flexibility, transparency, integration, and possibility to be in the cloud. An ERP system must be flexible to meet changing business needs. Transparency means that the ERP system must have an open system architecture. This means that each unit can be connected or disconnected as needed without affecting other units. It also needs to support some external plugins depending on the specificities of each market, country or industry. Integration implies that an ERP system must be able to support a variety of organizational structures and must be able to carry out organizations with a wide range of functions. And finally, hierarchy implies that the ERP system should not be limited by the organizational structure of the company and the units in the system should interact with each other.

The choice of a specific ERP system for implementation is a complex and multi-criteria process for the following key reasons: the high cost of the purchased product (reaching several million dollars), a wide range of offered ERP systems. The duration of the training of specialists on the imported product, the pre-sale cycle (from several months to several years) and the implementation cycle itself (the introduction of an ERP system, even in a productive business area, can take several years).

When choosing one or another ERP system, it needs to understand that automation for automation purposes does not make sense. It should be clarified that the best ERP system in the world cannot solve all business problems. Each ERP system is, first, a tool for increasing the efficiency and quality of business management by making the right strategic and tactical decisions based on the automated processing of relevant and reliable information. At the same time, an ERP system is not only a tool for business but also a technology for this. The correct choice of ERP-system should be, first, the management of the respective company. The ERP system implementation plan should be viewed by enterprise management as a strategic investment. Of course, every business would prefer to implement an approved, reliable and affordable ERP system for this.

But before choosing an ERP system, one of the key prerequisites for business automation is the implementation of a business approach process. This term refers to an approach that defines the valuation of a company as a network of business processes that are inextricably linked to its core goals, objectives and mission. The process approach, in contrast to the structured approach in many companies, focuses not on the existing organizational structure of the business, but on real business processes, the result of which is the creation of a service or product (Balabanov I.T. 2018).

Each business process in a company consists of a set of separate operations with an executive team, a specific technology or instructions. Essential attributes of a business process include paths and rules, as well as inputs, outputs, supplies, members, and owners.

Before start automating business processes, it needs to complete the tasks of isolating and describing them, as well as assign them to a group of primary or secondary processes. This is a rather lengthy process; in practice, it requires close cooperation of all divisions of the company.

2.2. The structure and elements of ERP systems

According to industry analysts, there are currently several hundred ERP systems in the global marketplace that have acquired a certain reputation.

An ERP system is a global, tightly integrated, closed-loop business suite, yet versatile at the same time. Simply put, business resource planning requires a database, application, and user interface for the entire business. ERP serves as a tool to help employees and managers design, control the business, increase productivity, make full use of capacity, reduce inventory, and meet delivery times (Vasina N.A. 2018).

The ERP systems are one of the most complex products in terms of functionality between business systems. Platforms include at least twelve blocks that automate all key areas of the company. This leads to the fact that projects that use 100% full functionality are very rare. Companies very rarely install all devices offered by the manufacturer. Typically, only a fraction of the functionality is used, usually 30-50%.

The 1C (Russian ERP system) says the most used schemes include distribution, production and financing. At least, according to 1C experts, such a functional block as salary and personnel is used. "This is because companies often either have different payroll systems or already maintain records using a specialized, usually home application. And this is true because Western systems are difficult to maintain and manage human resources and payroll in Russia, "the company explains (Sitnov A.A. 2017).

According to Tadviser (the biggest Russian IT media platform), the volume of the Russian market of ERP systems (licenses, deployment, maintenance services and cloud services) in 2016 increased by 10% and reached the level of about 119 billion rubles. The forecast for 2017-2018 is positive. But at the end of 2017, TAdviser noted that the balance of power in the Russian market of business management systems for the year has not changed compared to 2016. The impact on this sector is associated with the slowdown in the Russian economy. The investment budgets of many companies for 2016-2017 have been significantly reduced. Some contracts with ERP consulting companies are concluded - terminated.

Besides this, the exchange rates EUR/RUB growth has increased the cost of foreign ERP systems. As a result, large end-to-end ERP projects have become more expensive.

Next, consider the market share of the major ERP vendors. According to the TAdviser database, over the observation period from 2005 to October 2019, the 1C home business automation system is the leader in the number of applications. Last year, 167 new projects were registered to implement this software. The market share of ERP systems based on the 1C: Enterprise platform is 31%. Galaxy ERP is in second place with a 7.5% share and three new projects per year. Bronze in SAP. The most popular ERP system in the world occupies 6% of the Russian market. The profit for the year is seven projects. The Oracle gave up the fight. Nonetheless, Microsoft's decisions strengthen the position. MS Dynamics AX occupies 5.8% of the market with growth of 13 projects per year, MS Dynamics NAV - 5.2% of the market with three new projects. Microsoft ERP solutions together account for 11% of the market (Titorenko G.A. 2015).

From 2005 to 2019, the largest number of ERP applications was in the commercial sector (15.9% of the total number of projects). Integrated control systems are also in demand in the engineering, construction, food, chemical, medical and financial sectors.

Table 1 - Industry division for the implementation of ERP systems

Industry	Number of projects	% of the total
Trade	1410	15,9
Mechanical engineering	881	10,0
Building	699	7,9
Food industry	562	6,4
Chemical industry	322	3,6
Health care	318	3,6
Financial services	315	3,6
Energy	290	3,3
Transport	272	3,1
Utilities	260	2,9
Others	3517	39,8

The main trend of the internal ERP market in 2016 - 2017 is import substitution. For political and economic reasons, the number of 1C: ERP applications in large state and commercial companies have grown significantly. Enterprises are actively switching to 1C: ERP from already implemented software products and are also choosing a domestic solution for the implementation of new projects.

The second trend is the transition to cloud ERP. This is a global trend covering the entire information technology market. If it needs months and huge amounts of implementation before it needs to buy an ERP package release, a business can buy a subscription to a pre-installed cloud ERP system today. The SaaS (software as a service) model is very convenient for midsize businesses. This allows sharing the company's financial costs over time, in addition to purchasing IT equipment and services. Large companies are also migrating ERP solutions in the cloud, but not publicly, but privately, to provide universal access to the system for their employees (Zaginailov Y.N. 2015).

Another trend is integration with smart devices: IoT sensors, laptops, smartphones and tablets for employees, data collection terminals, automated storage systems, laser marking systems and needles, information shelves installed in ER laboratory systems. Process control and smart devices are one of the key areas of the IT industry in the domestic industry. According to experts, "Manufacturing is getting smarter, different automated devices are producing more information, and the ERP system's job is to help us use that data to make better management decisions on the Internet".

There is still a high demand for ERP consulting. This service is the most popular among large engineering firms.

Another constant trend is the growing demand for ERP for specific sectors, which considers the specifics of business processes, standards and regulatory aspects of specific industries. In addition, organizations of all disciplines from "automated patchwork" are gradually moving to integrated solutions on a single software platform (type 1C).

TAdviser Analytics published the supplier shares in the Russian market of ERP systems not by revenue, but by the number of completed projects, data on which are available in the TAdviser Center database. As of November 2017, there are about 8.3 thousand projects, most of which were implemented in Russia. It should be noted that not all projects get into the TAdviser database, but only those whose data is publicly available (Grekul V.I., Denischenko G.N., Korovkina N.L. 2017).

If the number of projects (penetration of the ERP platform into the Russian market), then, according to TAdviser, 1C is the absolute leader. For example, only in Russia in Russia on 1C: Enterprise 8.0 more than 11.6 thousand complex projects were implemented (when the full functionality of the platform was introduced). And this is not considered in cases where only financial and accounting margins were introduced or only the HR and payroll department.

The statistics collected by TAdviser allows us to talk about the frequency of use of various platforms in Russia. In November 2017, throughout the history of observations of TAdviser Center, the most frequently used platforms could be called Galaxy ERP, Microsoft Dynamics AX, Microsoft Dynamics NAV, SAP ERP, except for 1C: Enterprise 8.0.

ERP implementation is a special event in an organization. On one platform, various business functions, processes, ideologies are combined to combine information for effective business operation. ERP implementation is a risky business as it requires significant time, effort and valuable resources. Despite all this, implementation success is not guaranteed. Implementation success depends largely on how closely the implementation consultants, users, and vendors work together to achieve the overall goals of the organization. Implementation consultants must understand user needs, prevailing business realities and the design of the entire solution, taking all these factors into account (Firsov A.S., Hobotov E.N. 2015).

User participation throughout all phases of implementation is critical to the overall success of the implementation. The ERP package, once implemented, is expected to improve information flow, formalize and standardize all business processes in the business. However, the user's workload may not decrease. Remember that ERP is a tool for improving business processes, which, of course, requires additional effort. The roles and responsibilities of employees should be clearly defined and articulated in the system. Employees must learn new, improved processes and procedures described in the ERP system. The ability of an ERP package to manage and support a dynamically changing business process is a critical requirement for an organization, and therefore the package must be scalable and adaptable to accommodate these changes. A well-organized and implemented ERP program can provide a 200% return on investment.

On average, the number of unsuccessful computer projects in Russia today is about a quarter of the total.

Reasons for the failure of business automation projects:

1) lack of a clear goal set by the customer;

2) erroneous choice of ERP solution;

3) poorly formulated TK;

4) low qualification of specialists implementing the solution, both on the part of the customer and on the part of the contractor;

5) insufficient administrative resources on the part of the customer.

Before start looking for an ERP system, need to answer the question "Why is this necessary clearly?" In other words, a clear statement of the goal to be achieved.

The choice of an ERP system can be entrusted not only to system administrators, or only to sales managers. Each of them will choose a system based solely on the criteria that interest him in the first place. Also, everyone can have disagreements. At the same time, the ERP system must meet the requirements of the entire enterprise. Therefore, the choice of an ERP system is a task, if not from the first person of the company (but in small and medium-sized businesses only from the first person), then from at least one of the first persons. Only the head (or executive director) of the company can clearly and consistently formulate objectives and goals. An ERP system reflects a business, and its structure must be understandable to a person who knows the laws of business (and by no means the IT market). It needs to approach the choice of ERP-systems, clearly knowing what requirements they must meet and what functions they must have (Chikunova B. P. 2017).

The system should be simple and obvious because the employees of the company should work with it. So, if the ERP system is not clear and obvious, then this is an opportunity to think.

The purpose of the implementation plan should also be presented. The goal should not be vague but quite clear. The goal cannot be "business process optimization", "business improvement". These goals cannot be measured, so once the system is up and running, it will be impossible to understand whether the goals have been achieved or not. For example, the goal may be to build consolidated financial statements (very specific financial statements) based on the automation of specific business processes. The goal may be to introduce a resource planning system (and again specialists) and indicators. If the supply chain and financing are automated, but there are no clear financial and management reports, then there will be no result, since feedback will not, and it is very difficult to influence the process. The situation in the company will be incomprehensible, making it difficult to make timely decisions.

Ideally, it should have requirements at hand (description of business processes with reporting requirements and system capabilities), but this is extremely rare. In many companies, there is not only a document describing business processes but even an understanding of how they usually work and who is responsible for what. Therefore, before choosing an ERP solution, it is important to formulate clear criteria for evaluating an application in order to be able to achieve a positive result from its results. It is worth noting that when starting the ERP system implementation process, in any case, it should describe the business processes. It is not worth automating business processes without technical specifications, since in this case, the risks of unsuccessful implementation increase significantly since there is no document that could accept or accept the final project (Yugsvarov R.K 2017).

Each ERP solution is, first, a decision-making tool. What decisions are made? Based on reports. This means that one of the types of criteria is mentioned. The system should provide complete reports on the company's activities, such as Profit and Loss, Cash Flow, Balance Sheet and many other management reports. If these reports reflect the true picture of the situation, it will be very easy to understand the company's problems, and it will also be possible to influence the situation. Reports should contain not only numbers but also tools for their analysis. The main thing is that it is possible to control all the numbers directly from the report, that is, to detail each digit down to the primary data directly from the report. Otherwise, the data will not be trusted. Reporting must be transparent. In addition to all the above, the report should reflect the main aspects of the company's activities, be simple and understandable. It must be fully and automatically built from the ERP system. If the reporting data of the company's activities comes from abroad, through the export/import process or, even worse, manually, then someone in the company has to do it all the time (retention of form, changes), ideal choice - when all the company's activities are carried out in the ERP system, and the system itself generates reports based on this data.

The system should allow accounting for goods in all the necessary parameters. What does it mean? This means that it should be possible to track the history of any submission. The goods are shipped to the buyer, and the system must indicate which lot this lot is from, who the supplier is, and where the rest of the lot is (Hall, R.H. 2016).

Business is the circulation of money, goods and documents, orders, contracts, offers, invoices, invoices, transactions, inquiries. The system must allow all these documents to become not only fast but also operational. It's one thing when a document exists in the system and only the document can be printed, and quite another when it can save it in various formats (pdf, doc, jpeg, xls) and send it to the client via e-mail. Thus, the system must have a modern built-in report processor. Each document must have a route that must pass without interruption (for example, a contract for the supply of goods must go through a lawyer, a commercial manager, and only then reach the CEO for signature). What is very important, along this path, the system must, according to certain rules, restrict user access to a document or process (to avoid information leakage by the company, to be protected from changes after coordination) and the document path itself must be flexible.

The client card should be informative, that is, contain not only the client's contact information but also all information about mutual agreements and documents. In other words, knowing the customer, it is necessary to view all invoices, payments on them, shipments, without making complex (and sometimes incomprehensible) reports about it.

All corporate information is a single set of interconnected data, so it is extremely inconvenient when information about work with customers in one system and information about transport management in another. An ERP system is, first, a single business information space. Business processes are inseparable, which means that their management must be inextricably linked. A situation constantly arises when it is necessary to control the transaction from the moment of the conclusion of the contract to the delivery of the goods to the buyer, and the system must be able to control this chain.

Supplier partnerships include creating orders for suppliers, tracking supplier invoices, invoices and other documents. In addition, the system should be able to identify supplier orders for orders (in order to be able to select the best supplier according to various parameters). However, this option is convenient when it comes to high standards, and if the order consists of many elements, it is not only financially feasible to enter all the proposals into the system, as this work also takes time. When working with suppliers, it is important to be able to track every transaction from the moment of ordering to the moment the goods arrive at the warehouse: when the goods were ordered, which invoices (or invoices) were issued in response to the order, when and how they were paid, which invoices and when the goods were delivered. The system should be able to determine the position of the cargo when it comes to large shipments. And, of course, he controls all additional shipping costs and includes them in the cost of the cargo. From a planning point of view, the right supply planning tool will significantly reduce sales volumes without losing sales and therefore free up working capital (Titorenko G.A. 2015).

From a financial planning perspective, the system should include design performance metrics not only in gross equivalents, but also across departments, transactions, and customers. The cashless check system will help prevent situations when money is needed but not available. However, introducing such a system into a business is not easy, because literally every payment must be planned, and this is not always possible. About planning the supply of products (raw materials), this problem is an order of magnitude more complicated than financial planning, both in terms of requirements and in terms of the complexity of implementation. In this case, when the rest of the profits are in insurance reserves, but about actual planning, where planning algorithms consider delivery times, transport, seasonality, current deliveries and other criteria. Only one in twenty companies that have undertaken supply planning will come to this reasonable conclusion. But let me repeat: Implementing fully operational procurement planning in enterprises (especially large companies) is a challenging task that often takes years to complete.

With production, everything is quite individual, since each production company has its own characteristics, which are very difficult to formulate. But at least the software product should allow for volumetric programming, shape change tasks, consider raw materials, change the product cost, change product paths. The remaining functionality must be studied separately and carefully for each case.

2.3. The main functional modules of ERP systems

Digital technologies are becoming an integral part of the economic, political and cultural units of Russia and society. Russia is in an advanced stage of development of modern civilization, which is characterized by the predominance of knowledge, science, technology and information in all spheres of life. In the context of global trends, Russia is facing the problem of global competitiveness and national security, and the development of the digital economy in the country plays an important role in solving this problem. Some elements of the digital economy are already working successfully. Considering the transfer of many documents and messages to digital media, permission for electronic signatures, communication with the state is also carried out on an electronic platform.

SAP systems are a useful and necessary toolkit that greatly facilitates the interaction between managed and control structures in any business, especially large and complex ones. With their help, it can exchange information with partners, integrate new conditions and solutions with existing ones. Among other advantages of the system, it is necessary to name the reduction of costs - warehouse, labor (accounting/personnel control), capital construction and others; acceleration of procurement cycles and debt turnover; simplification of the work of the accounting department, other departments; full localization; the ability to combine with third-party solutions; availability of solutions for mobile business (Travin V.V. 2018).

The SAP system is software that can be used to automate the professional activities of representatives of different specializations. Such applications are "sharpened" for a specific industry and greatly simplify work in it and communication with other structural units. SAP consists of several functional blocks, includes management, integration and solution of all tasks for accounting and finance; trade, customer relations (CRM systems); budgeting, treasury; personnel, administrative activities; production, supply, warehouses, logistics (SCM, EWM); risk and strategic planning (GRC); system administration, data control and web services.

The SAP ERP consists of several modules.

1. The boundaries of the modules are largely arbitrary, data is exchanged between them, general settings and reports can be made, sharing of the same part of the solution on ABAP / 4 are supported.

2. Finance (FI). The module is designed to organize basic accounting, accounts receivable, creditors and auxiliary accounting.

3. Controlling (CO). The module provides an accounting of costs and profits of the enterprise.

4. Management of fixed assets (AM). The module is designed for accounting and management of fixed assets.

5. Project Management (PS). The PS application module supports the planning, management and monitoring of long-term projects with a high level of complexity.

6. Production planning (PP). The module is used to organize the planning and control of the production activities of the enterprise.

7. Materials Management (MM). The module supports the functions of supply and inventory management used in various business operations.

8. Sales (SD). The module solves the problems of distribution, sales, delivery and invoicing.

9. Quality Management (QM). This module provides support for quality planning, inspection and quality control in manufacturing and purchasing.

10. Maintenance and repair of equipment (PM). The module helps to account for costs and plan resources for maintenance and repair.

11. Personnel management (HR). Fully integrated system for planning and managing personnel work.

12. Management of information flows (WF). Workflow management automates business processes in accordance with predefined procedures and rules. The module includes a multifunctional office system with built-in e-mail, a document management system, a universal classifier and a CAD integration system.

Budgeting within SAP involves the use of the following financial instruments (Greenberg, A.S 2015):

1. Creation of a flexible and transparent system of budget management in the company;

2. Maintaining unified budget analysts (financial responsibility centers - CFD, budget items, line of business);

3. Implementation of long-term and operational planning of the distribution of monetary resources;

4. Ensuring the solution of problems of vertical financial management at organizational levels;

5. Reflection of planned indicators of receipts and expenditures of the company's funds: in the context of one financial year, broken down by months, in the context of structured budget items, responsible units and other analytical items (funds, programs, projects);

6. Collection of actual data on cash flow;

7. Formation of limits of the cash flow budget (BDDS) by the responsible units; coordination and approval of BDDS limits by financial services;

8. Coordination and approval of the cash plan; making payments within the cash plan;

9. Operational control of balances on the company's settlement accounts;

10. Making forecasts of possible dates for cash gaps.

Table 2 - Comparative analysis of SAP and 1C systems

Benefits for choosing SAP	Advantages in favor of choosing 1C
It is a proven solution that implements the world's best practices in the field of organizing business processes. Suitable for an international company for which it is important that divisions work according to uniform standards	full adaptation to the requirements of Russian legislation does not require modifications in this area
SAP is excellent at handling logistics, production planning and processing large amounts of data. Unfortunately, due to the abundance of functions, implementation of the system in an enterprise is a difficult and expensive task. Also, almost always work is required to adapt SAP to Russian standards	1C is the industry standard for accounting and ERP
covers all key areas of the company's activity, may include embedded CRM and MRP systems	the system can be deployed relatively quickly and inexpensively
	easy to find personnel who already know how to work with 1C

Comparison of SAP ERP and 1C ERP, table 2, shows that the solution based on the 1C platform is more focused on RAS (Russian Accounting System), which differ from international ones. It can get 1C reporting according to IFRS standards based on Russian accounting data, but this will require much manual labor. There are additional add-ons to automate this process; But the SAP supports IFRS by default and allows to maintain parallel charts of accounts in accordance with IFRS and RAS, create standard reports.

In accordance with the characteristics of the digital economy, it is necessary to highlight the principles of budgeting in the digital economy (Kuznetsov, S. 2016):

1. The principle of unity - financial planning should be complex and systemic in nature, including a set of interrelated and interdependent elements. These elements must be displayed in a digital environment.

2. The principle of coordinating plans in a digital environment - considering the requirements of all departments in the process of financial planning and entering them into an automated system.

3. The principle of continuity - financial planning as a continuous process with a relationship between elements.

4. The principle of accuracy - for the accuracy and specification of financial planning in a digital environment.

5. The principle of profitability of financial investments - automated technologies of financial planning should be profitable and payback.

All this suggests that budgeting functions are changing in the digital economy; all business processes related to budgeting are subject to automation. It is necessary to automate such important budgeting processes as project budgeting, calculation of return on investment. All these functions must be automated within SAP.

The budgeting process is a unified system for planning, monitoring and analyzing cash flows and financial results. The most important element of budgeting is financial planning - managing the process of creating, distributing and using financial resources for a business. And a budget is a financial plan; in other words, a business plan for a certain period, expressed in monetary form.

As a result of budgeting, several financial plans are drawn up, agreed upon:

- cash flow budget (BDS);

- budget revenues and expenditures (BDR);

- balance forecast;

- rotational budgets for individual departments and for certain types of business activities.

Budgets can be prepared both for the coming months (current or refined planning) and for longer periods (strategic or extended planning).

Budgeting performs the following functions:

- economic forecast;

- monitoring the results of the enterprise;

- means of coordination of business with business units;

The basis for making decisions about the development of the company.

The Manufacturing Enterprise configuration includes a set of financial planning tools for the business that follows the generic budget model. Using the configuration, the following functions are implemented (Baldin, K.V. 2017):

plan the cash flow to the enterprise for any period associated with time slots, business units, projects, contractors, nomenclature;

financial planning for several scenarios; formation of current budgets based on strategic budgets and considering the actual execution of the budget during the completed period;

- monitoring the actual activities of the business in the same sections as planning;

- preparation of consolidated reporting based on monitoring results;

- monitor compliance with applications for spending funds with a work plan for the period;

- economic analysis;

- cash analysis;

- analysis of discrepancies between planned and actual data.

Company cash flows are planned by entering budget transactions similar to accounting records. The main difference between them is that an accounting item accurately reflects an event that has already occurred in the financial life of a company, while a budget transaction reflects a future event or several future events with less precision.

The budget transaction records the values of the following analysis sections: planning scenario; article in turn; currency operations; Center for Financial Responsibility (CFD); project; copy; nomenclature.

The configuration provides a practical means for the automated generation of budget transactions. New budget transactions can be formed based on previously registered budget transactions and based on actual management and accounting data.

Planning in the budget subsystem is carried out using budget transactions. Financial planning results can be shown using different budgets.

A budget is a report on individual budget transactions in a special way.

The reports included in the configuration are intended for planning the economy of the company as a whole. In addition, the configuration provides simple tools to create any budget. It is easy to build an entire budgeting system for both separate areas of activity (procurement budget, sales budget, cost budget) and for individual business units (Karpova, T.S. 2016).

Each budget is characterized by the following parameters:

- the name of the budget;

- title (for printing);

- type of budget (BDSDS, BDR, other rotational budgets);

- a set of budget items.

The configuration provides convenient ways to move from viewing a budget to set up individual budget transactions. It can do the following with the following mouse clicks: on the generated balance sheet, open the list of turnovers for a specific budget item and, already at the top of this list, open the budget operation responsible for a specific income.

One of the tasks of budgeting is to control the indicators of economic and economic activity at the enterprise. In addition, monitored indicators can be of two types: target and limiting.

Goals are benchmarks to achieve. The main target indicator for financial and economic activities can be considered the total amount of income received from the main activities of the enterprise.

Limits are the limits of a company's resources. Similar restrictions can be set for cash flows from an enterprise.

When creating a report, both budget data and management and accounting data are used.

2.4. Overview of the most common ERP systems

According to silicon.com, European companies have begun to realize the importance of customer-centric ERP solutions, which has led to a significant increase in their investments in related projects over the next two years. The report, co-produced by Oracle and ERP vendor Bull, claims European companies will increase their ERP projects by 50%, double their business intelligence (BI) and data warehouse (DW) volumes, and triple their CRM usage over the next few months two years. Two-thirds of companies viewed the integration of established ERP systems with new CRM solutions as a critical business strategy. The IDC survey was based on an examination of the IT strategies of 1,000 enterprises across Europe (Arkhangelsky G.A2018).

According to Peter Reed, marketing manager for enterprise solutions at Bull, application focus on customers is increasing with the rise of e-commerce and the freeing of enterprise resources from the Y2K problem. While the results were generally positive, the report showed an alarming trend for European companies to use CRM applications to reduce costs, while in the US, there is a trend to use them to attract customers.

The current situation rather confirms a long-standing trend than a surprise. Recently, all the major "players" in the business applications market have realized the need to shift the focus from internal problems to cooperation issues, especially after Y2K's fears were exaggerated. Over the past few years, major players have been actively developing internally or entering into partnership agreements to create solutions that enable organizations to collaborate more effectively. Also, while the vast majority of vendors have moved away from using the unpopular, outdated ERP term in their marketing efforts, they have gradually increased the traditional back-office functionality and provided additional capabilities for external advanced e-business applications (Karpova, T.S. 2016).

In fact, the boundaries between ERP, CRM, e-commerce, BI and supply chain management have gradually blurred. If the main goal is to win and retain customers, need to provide a complete solution that includes traditional ERP and SCM functionality, as well as a more promising CRM and e-commerce. In this case, a prerequisite is the flow of useful information to all levels of management using BI.

The ERP system remains the backbone of the supply chain. It defines the structure that a company must have in order to operate and to interact with other companies. The combination of ERP, supply chain and the Internet, or collaborative commerce, is integration for faster and easier access to business transactions, as well as to supplier and customer data. This combination does not mean that ERP systems will suddenly become outdated. While the traditionally inward-looking view of ERP is becoming history, its functionality remains critical. The "new economy" will not render obsolete, for example, the general ledger, accounts payable, accounts receivable. On the contrary, it can only emphasize the importance of their effective use. Therefore, integration and interconnection are a matter of the future.

There is no doubt that implementing CRM and e-Commerce just to cut costs and simplify the process is a rather short-sighted strategic decision. The significantly increased demand for advanced ERP components compared to the ERP system itself is also not unexpected. This is mainly the result of marketing policy and the saturation of the ERP market, comparable to other modern areas.

Users need to understand that they need reliable back-office systems to manage e-commerce and customer service. While these functions can be performed to a minimum by the legacy system at an acceptable level, recommend that organizations keep abreast of the latest vendor offerings, perform cost-benefits exercise, and negotiate contract terms (Sokolov A.V. 2016)

E-commerce is not only about e-retailing on a website. This means the ability to coordinate the entire logistics chain (supply), fulfil orders and serve customers quickly and efficiently. Therefore, pay close attention to the vendor's extended ERP offerings and distinguish between deception and reality. Question: at $ 64,000 - how rich is the functionality of these new modules and how tightly they are integrated with (applications) back-office. Also, how feasible would be integration with third-party products? Vendor reliability and their service and support capabilities are additional important factors when choosing.

In 2019, the global ERP software market volume reached $ 35 billion, an increase of 10% over the previous year. This is evidenced by data from analysts at Gartner.

Experts explained the growth in sales of ERP systems by the ongoing digital transformation of business in companies, the development of SaaS solutions and the demand for new versions of products.

Figure 1 - ERP market leaders in 2019, data from Gartner Consulting

Source: https://www.tadviser.ru/images/2/2b/Gartner01.jpg

The study notes that the market for ERP products is mature (some vendors have been in it for about 40 years), but there is still great potential for growth.

The largest manufacturer of such software is still SAP, which in 2019 earned about $ 7.7 billion on such solutions. Oracle is located with a large lag the German company, which recorded $ 3.9 billion in revenues.

The leading three were closed by Workday with ERP revenue of $ 2.33 billion at the end of 2019. The fifth position is occupied by Infor, whose sales in the market under consideration were equal to $ 1.72 billion.

In the top 5, there was only one change in 2019 relative to 2018: Workday moved up from the fourth position to the third. For the first time, a cloud company has entered the top three in the ERP market, experts say.

SAP is unconditionally leading not only in the entire ERP market but also in its largest segment - financial accounting systems. In 2019, SAP's revenue from the sale of such solutions reached $ 2.98 billion. The German company earned $ 2.7 billion from human capital management (HCM) software, and $ 1.79 billion from industrial process control systems.

Oracle lags SAP in all segments. Moreover, the American corporation is also inferior to Workday in terms of the volume of implementation of human capital management systems: the company's revenues here at the end of 2019 were equal to $ 1.9 billion and $ 2.02 billion, respectively.

In the financial accounting category, Sage outpaces Oracle with $ 1.53 billion in revenue versus $ 1.43 billion for a competitor. And in the segment of software for production management, Oracle falls short of Infor, according to data from Gartner Consulting for 2019.

Among the manufacturers of systems for managing fixed assets, there is no equal SAP and Infor, which gained about $ 244 million and $ 164 million from the sale of such solutions in 2019, respectively.

According to analysts, the market remains fragmented: the five largest manufacturers account for only 51% of software sales.

This suggests that the biggest does not always mean that it is the best in terms of product functionality, industry, geography. And there is a huge demand for alternatives to big names. hundreds of small vendors every year, often targeting specific markets with loyal customers, but with a small footprint outside of their area," said Deborah Wilson, Gartner Consulting analyst, managing vice president at the analyst firm. ERP Market Research.

She noted that the market for ERP systems is expanding as new vendors seek to explore emerging areas such as financial planning and employee engagement. In these areas, small suppliers are often more flexible than large competitors.

Cloud services in 2019 remained a prominent segment in the ERP market, but on-premises solutions are not disappearing - especially about operational solutions and use cases related to confidential data or a high level of legal regulation.

The popularity of cloud-based cloud ERP products is largely due to the convenience of their implementation, since, firstly, such systems can be tested in combat conditions without paying large sums for implementation.

If follow the path of the local infrastructure, then it needs to be configured: buy licenses for the server operating system, for the SQL server, for the ERP server itself. Plus, it may happen that it must upgrade the company's equipment. All these expenses are not justified if it only needs to evaluate the work of an ERP system.

Another thing is the virtual server. The cost of the operating system is often included in the rental price. The SQL server can also be rented (like many other licenses), and then, when it becomes unnecessary, it can be abandoned. This is not the case with purchased licenses, so they often become dead weight when they are no longer needed.

The flexibility of virtual servers allows companies to evaluate an ERP system without the cost of hardware and choose the one that is best suited to manage the enterprise on an ongoing basis.

The market for ERP systems remains growing despite the political and economic uncertainties that took place in 2019.

Rationalization, modernization and transformation are driving this acceleration as companies move to innovative cloud-based ERP solutions, the report says.

Figure 2 - ERP market leaders in 2018, data from Gartner Consulting

Source: https://www.tadviser.ru/images/thumb/2/27/Gartner02.png/840px-Gartner02.png

IDC confirms the rise of the global ERP market at the end of 2019 but does not disclose the dynamics in its free samples for research. Analysts only point to "steady growth" and accelerated changes in the market thanks to the so-called third platform (which in IDC includes cloud, analytical and mobile technologies, social networks and Big Data solutions) and the engines of innovation in the field of cognitive systems, such as machine learning and the internet of things.

CHAPTER 3

Research

3.1. Research method

This work uses the most common and one of the most powerful statistical instruments Statistical Package for the Social Sciences (SPSS). And the most popular statistical method used to make in the SPSS for this kind of analyses is - Generalized Linear Models (GLMs), which allow working with a large amount of unavailable information. This method allows calculating variance and calculating averages and other Comparison needed and useful for this work.

Regarding the first criterion, the starting point was the need to obtain information on a range of views in a short time. Specifically, needed collective feedback on our proposed package of practices, and needed this feedback to come from a dialog between the participating practitioners themselves, and not between the researcher and each of the participants individually (which would have been the case with the Delphi approach and the survey method, in which each expert fills out a survey questionnaire, and the case with the in-depth interview approach in which the researcher converses with the experts on a one-on-one basis). To find out a correlation between surveys results, this work used the correlation coefficients of Pearson-Brave and Spearman's rho to avoid outliers. This work consider it as essential to be able to observe the extent and nature of participants' agreements and disagreements regarding the contexts in which our RE practices apply, as these observations would presumably bring us an understanding of the kind of follow-up research that would warrant further efforts. Indicate that it is this type of interaction that gives the method a high level of validity, because the thoughts and views that each participant expresses can be confirmed or refuted during the group discussion itself. As a qualitative research technique, focus groups can serve the purpose of both exploratory and confirmatory studies.

The purpose of our focus group study is study advantages and disadvantages of ERP automation. Our plan also includes the evaluation of our focus group experiences with a view to understanding the limitations of this early validation study itself. Our focus group study is a confirmatory in nature, and represents an early assessment exercise in which set out to clarify suck a question:

1. Access real-time reports of processes? Instead of searching through piles of documents to find a information, with an ERP software you can automatically extract the data in just a few clicks.

2. Increase productivity of resources? ERP systems integrate disparate business processes to make data error free and more efficient.

3. Process automation builds a better workplace? Allocating employees to higher-level tasks makes them happy and more productive, leading to additional efficiency gains.

4. Attain more flexibility in process management? When information is automatically recorded into your ERP software, it reduces the need for laborious manual data entry tasks to bare minimal.

5. Impose better control on operating costs? Investing on perfect ERP software curbs operating costs.

6. Cost of ERP? Depending on how much your business can spend budget-wise, a disadvantage of ERP can be the pricing.

7. ERP Success Depending on Software Experience? If you choose to forgo the training process or if your chosen ERP vendor does not offer ERP software training, that can put your entire workforce in a vulnerable position.

8. Not Purchasing a Customizable System? It is important to purchase an ERP solution that has all the suites, modules and applications that will help your business with its daily activities and processes.

9. ERP Resistance? It may take some time for employees to get used to a new ERP software, which can lead to it not being used to its full extent.

The inquiry was divided distribution was divided into two parts: Group 1: Satisfactory of employees and those team leads and Group 2: Top management (HR managers) overall result comparison.

Focus Group 1:

Company	Number of inquirers	
	Employee	Team Leads
Hafele Russia	8	1
Marelli Russia	10	3
Porsche Russia	4	1
Alrosa	5	1
R-Pharm	4	1
SberBank (Service department)	15	2

Inquiry Focus Group 1 template – attachment 1

Focus Group 2 (Some of Companies from group 1, did not agreed with Financial results sharing and some of them already do not have the results which they had before transition to ERP system, thus is not possible to study those. Companies of focus group 2 provided financial results (operative costs, fix costs, EBITDA and EBT) the same ERP system – Oracle, by e-mail directly to the Itelligence HR Manager Marina Malykhina. Companies (located in Russia):

IBM   ONLANTA   ALROSA

GRINAT   SberBank Agencies

The work compares Application Performance Index (APDEX) by using Passing–Bablok regression The APDEX is an open standard developed by an alliance of companies that defines a standardized method to report, benchmark, and track application performance. Passing-Bablok It is a non-parametric regression for comparing two methods (especially two measurement techniques) to see whether they yield similar results.

The Adizes methodology or PAEI is used in this work to study the focus group employee's relationship with the implementation of an ERP system. This Methodology is to study the way of how to build mutual trust and respect in a company's decision so that the company can better handle risk and uncertainty, and change.

And at last, Belbin test to identify team roles of the modern ERP system compony and that employee distribution. The identification shows the strength and weakness sides of the team.

3.2. Research method on the effects of survey-based automation

The correlation of the answers on the collected surveys from different Russian companies which use ERP system, including the following:

- correlation is capable of characterizing only linear relationships, i.e. such that is expressed by the equation of a linear function. If there is a nonlinear relationship between varying features, other communication indicators should be used;

- the values of the correlation coefficients are abstract numbers lying in the range from -1 to +1, i.e. -1 <r <1;

- with independent variation of features, when there is no connection between them, r = 0;

- with a positive, or direct, relationship, when with an increase in the values of one attribute, the values of another increase, the correlation coefficient acquires a positive sign and is in the range from 0 to +1, i.e. 0 <r <1;

- with a negative, or feedback, relationship, when with an increase in the values of one attribute, the values of the other decrease accordingly, the correlation coefficient is accompanied by a negative sign and is in the range from 0 to −1, i.e. -1 <r <0;

- the stronger the connection between the features, the closer the value of the correlation coefficient is to 1. If r = ± 1, then the correlation becomes functional, i.e. each value of the attribute X will correspond to one or more strictly defined values of the attribute Y;

- only by the magnitude of the correlation coefficients, it is impossible to judge the reliability of the correlation between the signs. This parameter depends on the number of degrees of freedom f = n −2, where n is the number of correlated pairs of indicators X and Y. The larger n, the higher the reliability of the relationship at the same value of the correlation coefficient.

To test the significance of the correlation coefficients, the Student distribution and the condition:

$$\frac{\left| r_{XiXj} \right| \sqrt{N-2}}{\sqrt{1 - r_{XiXj}^2}} \langle\, t_T \qquad \text{, f = N − 2, α = 0,05.}$$

If the condition is satisfied, then the hypothesis of the absence of a correlation is accepted.

Table 3 - Critical values of the pair correlation coefficient at α = 0.05

Number of degrees of freedom f	Critical value r	Number of degrees of freedom f	Critical value r	Number of degrees of freedom f	Critical value r
1	0,997	9	0,602	17	0,456
2	0,950	10	0,576	18	0,444
3	0,878	11	0,553	19	0,433
4	0,811	12	0,532	20	0,423
5	0,754	13	0,514	30	0,349
6	0,707	14	0,497	50	0,273
7	0,666	15	0,482	80	0,217
8	0,632	16	0,468	100	0,195

To check the significance of the pair correlation coefficient, need to compare its value with the tabular (critical) value r, which is given in Table 3. To use this table, need to know the number of degrees of freedom f = N - 2 and select a certain level of significance, for example, equal to 0.05. This value of the significance level is also called the 5% risk level, which corresponds to the probability of a correct answer when testing our hypothesis P = 1 - α = 0.95, or 95%. This means that, on average, only in 5% of cases an error is possible when testing a hypothesis.

1. Calculation of Spearman's rank correlation coefficient is performed by the formula:

$$r_{xy}^{S} = 1 - \frac{6 \cdot \sum (d_x - d_y)^2}{n \cdot (n^2 - 1)},$$

where: dx and dy are the ranks of the indicators x and y and n is the number of correlated pairs or studied.

2. Enter the test data into a worksheet and make the necessary calculations.

Table 4 - Test data

x_i	d_x	y_i	d_y	$(d_x - d_y)$	$(d_x - d_y)^2$
55	9	26	9	0	0
45	2	20	4	-2	4
43	1	25	7	-6	36
47	3.5	22	5	-1.5	2.25
47	3.5	7	8	-4.5	20.25
51	7	28	10	-3	9
48	5	16	2	3	9
60	10	15	1	9	81
53	8	18	3	5	25
50	6	24	6	0	0
				$\sum (d_x - d_y) = 0$	$\sum (d_x - d_y)^2 =$ 186,5

3. Compare the calculated value of the rank correlation coefficient (rf = -0.13) with the table value for n = 10 at α = 5% and draw a conclusion.

Output:

1) since rf = -0.13 <0, then there is a direct negative relationship between the sample data, i.e. an increase in weight indicators causes a decrease in the maximum number of flexion and extension of the arms in the lying position in the group of the studied;

2) since rf = -0.13 <rst = 0.64 for n = 10 at α = 5%, then with confidence P = 95% can say that the revealed dependence is unreliable.

The Brave-Pearson correlation coefficient r is used as an estimate of the general correlation coefficient p. To determine it, an assumption is made about a two-dimensional normal distribution of the general population from which the experimental data are obtained. This assumption can be tested using appropriate significance tests. It should be noted that if separately, the one-dimensional empirical distributions of the values xi and yi agree with the normal distribution, then it does not yet follow that the two-dimensional distribution will be normal. For such a conclusion, it is also necessary to verify the assumption about the linearity of the relationship between the random variables X and Y. Strictly speaking, to calculate the correlation coefficient, it is enough only to accept the assumption of the linearity of the relationship between the random variables, and the calculated correlation coefficient will be a measure of this linear relationship.

Correlation coefficient Brave – Pierce Confidence () refers to parametric coefficients.

The formula shows that for the calculation, it is necessary to find the average values of the X and Y characteristics, as well as the deviation of each statistical data from its mean. Knowing these values, the amounts are found. Then, having calculated the value, it is necessary to determine the reliability of the found correlation coefficient by comparing its actual value with the tabular value for f = n –2. If, then can say that there is a reliable relationship between the signs. If, then there is an unreliable correlation between the signs.

Variable X - denotes the average time for solving visual-figurative, and variable Y - the average time for solving verbal tasks of tests.

Decision. Present the initially collected data by surveys in the form of table 5, in which additional columns are introduced, which are necessary for the calculation by the formula.

Table 5 - Problem conditions

No. of subjects	x	y	$x_i - \overline{x}$	$(x_i - \overline{x})^2$	$y_i - \overline{y}$	$(y_i - \overline{y})^2$	$(x_i - \overline{x}) \cdot (y_i - \overline{y})$
1	19	17	-16,7	278,89	-7,2	51,84	120,24
2	32	7	-3,7	13,69	-17,2	295,84	63,64
3	33	17	-2,7	7,29	-7,2	51,84	19,44
4	44	28	8,3	68,89	3,8	14,44	31,54
5	28	27	-7,7	59,29	2,8	7,84	-21,56
6	35	31	-0,7	0,49	6,8	46,24	-4,76
7	39	20	3,3	10,89	-4,2	17,64	-13,86
8	39	17	3,3	10,89	-7,2	51,84	-23,76
9	44	35	8,3	68,89	10,8	116,64	89,64
10	44	43	8,3	68,89	18,8	353,44	156,04
Sum	357	242		588,1		1007,6	416,6
Average	35,7	24,2					

Calculate the empirical value of the correlation coefficient according to the formula for calculating the Bravais-Pearson correlation coefficient:

$$r_{xy} = \frac{416,6}{\sqrt{588,1 \cdot 1007,6}} = \frac{416,6}{769,8} = 0,54$$

Determine the critical values for the obtained correlation coefficient according to the table. When finding critical values for the calculated Peirce Confidence linear correlation coefficient, the number of degrees of freedom is calculated as f = n - 2 = 8.rcrit = 0.72> 0.54, therefore, hypothesis H1 is rejected and hypothesis H0 is accepted, in other words, the relationship between the decision time visual-figurative and verbal tasks of the test has not been proven.

If it is required to establish a connection between two characteristics, the values of which in the general population are not distributed according to the normal law, i.e., the assumption that the two-dimensional sample (xi and yi) is obtained from a two-dimensional normal general population are not accepted, then can use the rank coefficient Spearman's correlations (r_{xy}^{S}):

$$r_{xy}^{S} = 1 - \frac{6 \cdot \sum (d_{x} - d_{y})^{2}}{n \cdot (n^{2} - 1)},$$

Where dx and dy are the ranks of the indicators xi and yi; n is the number of correlated pairs.

The rank correlation coefficient also has limits of 1 and −1. If the ranks are the same for all values xi and yi, then all rank differences (dx - dy) = 0 and = 1. If the ranks xi and yi are in reverse order, then = -1. Thus, the rank correlation coefficient is a measure of the coincidence of the ranks of the values xi and yi.

When the ranks of all values xi and yi strictly coincide or are in reverse order, there is a functional dependence between the random variables X and Y, and this dependence is not necessarily linear, as in the case of the Bravais-Pearson linear correlation coefficient, but can be any monotonic dependence (i.e. constantly increasing or constantly decreasing dependence). If the dependence is monotonically increasing, then the ranks of the values xi and yi coincide and = 1; if the dependence is monotonically decreasing, then the ranks are reversed and = −1. Consequently, the rank correlation coefficient is a measure of any monotonic dependence between random variables X and Y.

It can be seen from the formula that for the calculation it is necessary first to put down the ranks (dx and dy) of the indicators xi and yi, find the differences in the ranks (dx - dy) for each pair of indicators and the squares of these differences (dx - dy) 2. Knowing these values, the sums are found, taking into account that it is always zero. Then, having calculated the value, it is necessary to determine the reliability of the found correlation coefficient by comparing its actual value with the tabular one. If, then we can say that there is a reliable relationship between the signs. If, then there is an unreliable correlation between the signs.

Spearman's rank correlation coefficient is much easier to calculate than the Bravais-Pearce Confidence correlation coefficient for the same initial data since the calculation uses ranks that are usually integers.

3.3. Focus group research on the effects of automation

After to share surveys within HR managers and team Leads, was collect additional information from the final users of ERP systems. Collected data is a comparison of satisfaction with the products "Oracle" (the product of the main competitor) and "SAP" (the product of the considered division).

Table 6 - The results of a study of focus group companies about the advantages and disadvantages of ERP automation:

	VAR00001	VAR00002	VAR00003	VAR00004	VAR00005	VAR00006	VAR00007	VAR00008	VAR00009
IBM	75,00	65,00	75,00	66,00	68,00	69,00	25,00	35,00	40,00
GRINAT	60,00	63,00	64,00	70,00	65,00	70,00	20,00	40,00	35,00
Banks	75,00	66,00	68,00	69,00	75,00	75,00	25,00	35,00	40,00
ALROSA	65,00	75,00	66,00	65,00	65,00	75,00	35,00	35,00	40,00
ONLANTA	68,00	69,00	75,00	68,00	69,00	75,00	35,00	35,00	40,00

VAR00001	-	Access real-time reports of processes?
VAR00002	-	Increase productivity of resources?
VAR00003	-	Process automation builds a better workplace?
VAR00004	-	Attain more flexibility in process management?
VAR00005	-	Impose better control on operating costs?
VAR00006	-	Cost of ERP?
VAR00007	-	ERP Success Depending on Software Experience?
VAR00008	-	Not Purchasing a Customizable System?
VAR00009	-	ERP Resistance?

Below the tables 7-8 presents the results of Statistics for a one- sample t- test in IBM 2.0 SPSS

Table 7 - The results of Statistics for a one- sample t- test in IBM 2.0 SPSS

	N	Average	Std . deviation	Std . error mean
VAR00002	5	68.6000	6.50385	2.90861
VAR00003	5	67.6000	4.66905	2.08806
VAR00004	5	69.6000	5.12835	2.29347
VAR00005	5	67.6000	2.07364	, 92736
VAR00006	5	68.4000	4.09878	1.83303
VAR00007	5	72.8000	3.03315	1.35647
VAR00008	5	28.0000	6.70820	3.00000
VAR00009	5	36.0000	2.23607	1.00000
VAR00010	5	39.0000	2.23607	1.00000

Table 8 - The results of Statistics for a one- sample t- test in IBM 2.0 SPSS

	Checked value = 0					
	t	Art. St.	Considerable bridges (2- sided)	Average difference	95% confidence interval of the difference of means	
					Lower bound	Upper bound
VAR00002	23,585	4	, 000	68.60000	60.5244	76.6756
VAR00003	32,375	4	, 000	67.60000	61,8026	73.3974
VAR00004	30,347	4	, 000	69.60000	63.2323	75.9677
VAR00005	72,895	4	, 000	67.60000	65.0252	70.1748
VAR00006	37,315	4	, 000	68.40000	63.3107	73.4893
VAR00007	53,669	4	, 000	72.80000	69.0338	76.5662
VAR00008	9,333	4	, 001	28,00000	19.6707	36.3293
VAR00009	36,000	4	, 000	36.00000	33.2236	38.7764
VAR00010	39,000	4	, 000	39.00000	36.2236	41.7764

Comparison of satisfaction with the products "Oracle". Testing in large companies in Russia showed the following satisfaction with the testing equipment among a group of experts who conducted stress tests:

Table 9 – Results of companies satisfaction with SAP and Oracle ERP systems

Company	Users	Satisfaction with the Oracle product	Satisfaction with the SAP product
IBM	1000	3	N/D
GRINAT	100	5	N/D
Banks	1041	3	N/D
ALROSA	1600	2	4
ONLANTA	10800	1	5

The table shows that satisfaction with the Oracle product is acceptable only at low and medium loads. At high loads, satisfaction drops sharply, in contrast to the «SAP» product. However, it should be noted that at low load with a stable data center, satisfaction with the Oracle product is high.

Efficiency calculation by the Passing–Bablok regression (BABLOKS method). The calculation was made based on the data on labor costs of load testing for company ALROSA (one of the biggest diamond mining company in the world).

Table 10 - Calculation of efficiency by the BABLOX method

Test for 200 users for 1 hour, two times a day	Oracle	SAP	Gross hour rate *
Daily labour costs	1 person for 2.1 h	1 person for 2.1 h	€ 0.002 million
Series for 1 day, 2 runs, BABLOX	€ 0.0042 million	€ 0.004 million	
Series for 2 months, BABLOX	€ 0.17 million	€ 0.16 million	
Test for 1600 users for 1 hour, 2 times a day	Oracle	SAP	Gross hour rate *
Daily labour costs	2 persons 5 h	1 person for 2 h	€ 0.002 million
Series for 1 day, 2 runs, BABLOX	€ 0.02 million	€ 0.004 million	
Series for 2 months, BABLOX	€ 0.8 million	€ 0.16 million	

* The entire cost is known and not only the payroll, therefore the calculation has a systemic shift relative to the "classic" BABLOKS method, but this calculation is more accurate.

The table shows that the efficiency of using the Oracle product (if the tester is considered as a user of the system) according to the BABLOKS method at high load is five times lower than that of the SAP product, but at a low one - their efficiency is comparable within the measurement error or organization error experiments.

Output. A change in the approach to positioning the SAP product may consist in positioning it as a specialized tool only for high and ultra-high loads, where Oracle is not a full-fledged replacement for it. This will allow to distance both in terms of the consumer and in pricing and to carry out marketing in an extremely targeted manner.

Comparison of average satisfaction with the product SAP before and after optimization work.

Table 11 – Results of comparison of satisfaction with the product SAP

Users	APDEX before optimization		APDEX after optimization	
13	0,87	well	0,99	excellent
40	0,89	well	0,78	satisfactorily
100	0,68	badly	1	excellent
100	1	excellent	1	excellent
100	0,54	badly	0,93	well
150	0,89	well	0,97	excellent
168	0,72	badly	0,91	well
195	0,98	excellent	0,95	excellent
630	0,33	unacceptably	0,97	excellent
668	0,65	badly	0,99	excellent

From this comparison, it follows that with an increase in the number of users, satisfaction with the product on average decreases, which requires work to optimize the system.

Changes may include the following:

1. Give up the idea of tying the NT product to SAP product, the product is not operated on those volumes where the NT product is effective in comparison with the Oracle product.

2. For high and super high loads need a different product for regulated accounting. The market for such a product is, by definition, larger than the market for optimization services for poorly performing productive installations.

As indicated in the introduction, the formulation of the mission of the structural unit is seen as achieving technological leadership in the industry by developing the professional and creative potential of employees in R&D, investing in human capital in order to achieve a competitive advantage in the emerging market of IT services.

To do this, it needs to understand what the people with whom work made. For these purposes, a cross-section study of the characteristics of the HR department was carried out using the Adizes methodology. The results are presented in Figures 3 and 4. Where P – Producer, A – Administrator, E – Entrepreneur, I – Integrator.
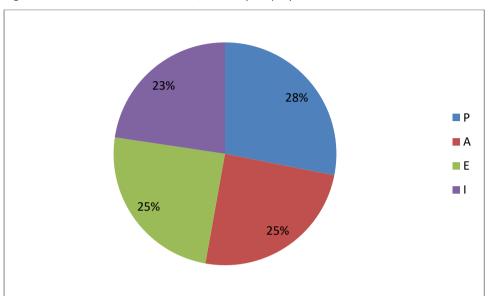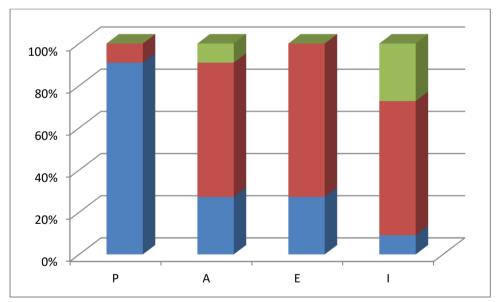
Figure 3 – Result of distribution of P, A, E, I by employees of the structural unit based on surveys.

Figure 4 - Result shares of high (for example, P), unexpressed (for example, p) and zero (0) indicators P, A, E, I among employees of a structural unit

Decoding the result: The strength of the unit is the high personal efficiency of key employees (P), good discipline in the execution of regulations and in the generation of ideas (A and E). The weak side is the interaction of people with each other and with the environment (I), but the situation is not critical and can be corrected.
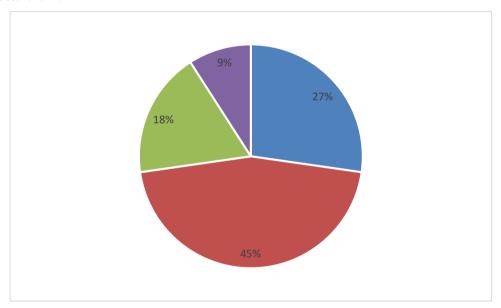
Conclusion: the leader should direct part of his efforts and ideas:

- towards the organization of team (group) development, and other forms of collective work, for example, mutual learning, cross-control. To do this, he has workable resources that will help him create the necessary technological base for such work. The task is to tighten the zeros in column I.

- towards the organization of interaction with the external environment. This task requires the attraction of additional resources focused on external communication outside the unit.

Both directions of these efforts will help the unit to fulfil its mission and are in line with the strategy, which is really what will need to be done.

Research by E.S. Zharikov based on the data of the questionnaires according to Adizes. To identify the proportions of the employee satisfactory, the data formed in Table 1 study with a different key. The relative proportions of certain types of behavior are shown in Fig. 5.

Figure 5 – Results of distribution of types of behavior in relation to innovations among key employees of the structural unit

As a result of the study, was found that three types of behavior dominate among the key employees of the structural unit:

A) Neutrals (45%)

B) Employees who support change (27%)

D) Retrogrades (18%)

C) Employees who resist change but accept it (9%)

Those who support and who do not support changes are equally divided. Conclusion: adequate readiness for changes, the core of the unit can carry out changes relying only on its own forces if it acts in concert.
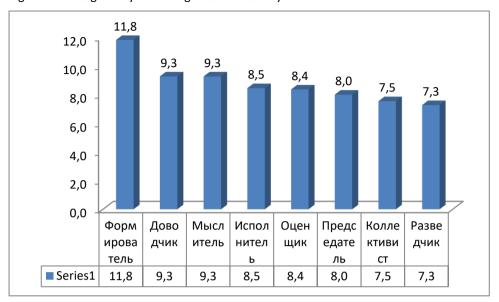
The table shows the average results of the structural unit. Fill highlighted roles in the team characteristic of the employees of the unit. The table is sorted in descending order of the average score.

Table 12 - Belbin test result based on surveys

Translated title	Original (original) title	Low	Average	High	Very high	Average score
		0 – 33%	33 – 66%	66 – 85%	85 – 100%	
Shaper (Creator)	Shaper	0--8	9--13	14--17	18--36	11,8
Closer (implementer, executor (in the second meaning - as "Completing work"))	Completer Finisher	0--3	4--6	7--9	10--17	9,3
The Thinker (Idea Generator, Idea Factory)	Plant	0--4	5--8	9--12	13--29	9,3
Contractor (distributor, "company employee")	Implementer	0--6	7--11	12--16	17--23	8,5
Appraiser (Monitor, Expert)	Monitor Evaluator	0--5	6--9	10--12	13--19	8,4
Chairman (coordinator)	Co-ordinator	0--6	7--10	11--13	14--18	8
Collectivist, Diplomat, "Team Worker"	Teamworker	0--8	9--12	13--16	17--25	7,5
Scout (Explorer, Resource Explorer)	Resource Investigator	0--6	7--9	10--11	12--21	7,3

The graphical diagram for the average score is shown in Fig. 6. When considering the table and Fig. 6, it should be borne in mind that, in accordance with the test methodology, indicators for different roles are not equivalent.

Figure 6 - Histogram by an average score of surveys

	Форм ирова тель	Дово дчик	Мысл итель	Испол нитель ь	Оцен щик	Предс едате ль	Колле ктиви ст	Разве дчик
■ Series1	11,8	9,3	9,3	8,5	8,4	8,0	7,5	7,3

Shaper — - 11,8

Completer Finisher — - 9,3

Plant — - 9,3

Implementer — - 8,5

Monitor Evaluator — - 8,4

Co-ordinator — - 8,0

Teamworker — - 7,5

Resource Investigator — - 7,3

The technique is quite new and does not have an established translation of terms into Russian. Therefore, together with the Russian translation in the table above and in the description below, the original English-language term is given.

Table 13 - Description of roles

Role	Description	Strengths	Weak sides	Don't be surprised if
Shaper	Provides the necessary drive to keep the team moving and not lose focus or momentum.	The ability to challenge, dynamism, thrive through pressure. Has the drive and courage to overcome obstacles.	Maybe prone to provocations, and sometimes can offend people's feelings.	Be at risk of becoming aggressive and angry in their attempts to get things done.

Completer Finisher	Most effectively used at the end of sanding tasks and thoroughly checking work for errors to the highest quality standards.	Meticulousness, conscientiousness, anxiety. Searches for errors. Grinds and improves	It was maybe inclined to worry unnecessarily. Reluctantly delegates.	They could be accused of taking their perfectionism to the extreme.
Plant	Tends to be very creative and good at problem-solving in unconventional ways.	The ability to be creative, imagination, freedom of thought. Generates ideas and solves complex problems.	They can ignore some unforeseen things. May be too busy to communicate effectively.	They will be distracted or forgetful.
Implementer	It is needed to plan a workable strategy and implement it as efficiently as possible.	Practicality, reliability, efficiency. Turns ideas into actions and organizes work.	Maybe a little inflexible and slow to respond to new opportunities.	Will slowly abandon their plans, even in favour of positive changes.
Monitor Evaluator	Provides logical oversight, making impartial judgments where necessary, and impartially weighing the options the team suggests.	Sobriety, "strategic" and insight. Sees all opinions and judges them accurately.	Sometimes there is a lack of drive and ability to inspire others. Maybe overly critical.	Can make decisions slowly.

The current version of the roles in the Belbin team also contains the role of "specialist", but this was not disclosed in the original study because no special knowledge was required for modelling.

Conclusions: The Belbin study confirms the main trends and conclusions of the Adizes study. Strengths - personal efficiency and the ability to generate ideas (the roles of "closer" and "shaper"). Weaknesses - collectivist, communicative activity (roles "collectivist" and "scout").

3.4. Processing results

Overall, the ERP automation software brings significant improvement in operational efficiencies. And this is evident even in small businesses. Focus Softnet offers power-packed ERP systems for small businesses, which have capabilities to enhance the functionalities of all your business operations.

1. Access real-time reports of processes? Instead of searching through piles of documents to find a information, with an ERP software can automatically extract the data in just a few clicks. The system scans through all the records to instantly generate real-time reports, analyze the business processes, and organize them in efficient manner. This, in turn, helps organizations identify the events or conditions and taking suitable actions.

2. Increase productivity of resources? ERP systems integrate disparate business processes to make data error free and more efficient. This coherence induces information uniformity among departments, which eliminates any discontinuity and duplication. Decision makers would have access to the complete data at any point of time, which removes the time lag and therefore increases the productivity.

3. Process automation builds a better workplace? Allocating employees to higher-level tasks makes them happy and more productive, leading to additional efficiency gains.

4. Attain more flexibility in process management? When information is automatically recorded into your ERP software, it reduces the need for laborious manual data entry tasks to bare minimal. These systems allow indexing and retrieving of info from any electronic device. When your access to the business operations are no more restricted to the device, it empowers to attain more flexibility in process management.

5. Impose better control on operating costs? Investing on perfect ERP software curbs operating costs. The systems` functionalities allow automate data entries, which reduces investment on manpower whilst ruling out the risk of manual errors. Besides, when the key business processes are automated, it empowers your company to become more agile and efficient in controlling expense and improving profits.

6. Cost of ERP? Depending on how much your business can spend budget-wise, a disadvantage of ERP can be the pricing. With most ERP solutions, there are multiple fees that are applied, which can lead to higher costs. From licenses to upfront cost, implementation and recurring potential monthly fees, some ERP solutions may be too expensive. Researching ERP solutions within your price point can help spare from spending more money than originally anticipated.

7. ERP Success Depending on Software Experience? If choose to forgo the training process or if your chosen ERP vendor does not offer ERP software training, that can put your entire workforce in a vulnerable position. Not knowing exactly how the software works means there is a greater risk of making costly mistakes and spending long lengths of time trying to make the software work for you, which leads to a lack of productivity. Finding a vendor that offers ERP training will ultimately make the software easier to use and helps to build a knowledgeable workforce.

8. Not Purchasing a Customizable System? It is important to purchase an ERP solution that has all of the suites, modules and applications that will help your business with its daily activities and processes. Spending money on a system that does not have all the bells and whistles that your business needs is essentially a bad

investment. Businesses also want to make sure that your ERP software doesn't include more than what need, so that applications aren't sitting idle by with no use to your business – that is a potential waste of company money.

9. ERP Resistance? It may take some time for employees to get used to a new ERP software, which can lead to it not being used to its full extent. Other members of the workforce may also struggle with placing information into the software, which makes it hard for ERP software to truly serve all departments that make up a business.

However, it's equally as important to understand the disadvantages of this type of software to make sure ERP is the right system for your business. Let's look at four of the most common disadvantages of ERP that companies have reported after implementation.

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Ultimately, even with these disadvantages, ERP software is still a key ingredient toward building a successful business. The benefits of implementing an ERP system in your organization outweighs the negatives because ERP gives your company a competitive and financial boost while improving company productivity, collaboration and communication. The upside to the listed disadvantages is that with thorough research, your business can avoid making any of these mistakes. According to a recent report by Panorama Consulting Solutions, 88% of the surveyed company representatives consider the processes of implementing ERP systems in their organizations

successful. Only 44% of the cases were about a completed project. In addition, in 45% of cases, the implementation was over-budget, and in 58% - over-time.

Let's figure out what mistakes are often made when implementing ERP systems, what problems they lead to and how they can be avoided.

Let's consider three typical mistakes that can arise during the preparatory stage.

1. Insufficient elaboration and description of existing business processes. After completing development, testing, and even training, it turned out that ERP modules could not work together due to poorly described business processes. Later, the system was nevertheless implemented, but this required high additional costs.

To avoid such problems, it is necessary to describe the existing business processes, highlight the key ones and give them the greatest attention.

2. Wrong choice of ERP-system. According to the Mint Jutras report, 67% of respondents would like to see the ERP systems in their organizations better tailored to industry specificities. Another study found that 53% of those surveyed consider ERP systems in their companies not flexible enough.

Making the wrong decision at this stage is one of the most expensive mistakes. Therefore, if the choice of software in a company is not due to political reasons (there is no rigid installation, to introduce software of domestic companies), together with a deep analysis of current business processes, it is necessary to study and compare the capabilities of available ERP systems carefully:

- whether their functionality allows automating all key departments of the company;
- how flexible these systems are in terms of customization options for the needs of the organization;
- whether they take into account the specifics of the field of activity;
- can they be integrated with other software of the company.

3. Insufficient or too detailed terms of reference. If the ToR is too general, then it is easy to miss the processes without which the transition to ERP cannot take place, and for their inclusion in the ToR after the signing of the documents, it may have to pay extra to the vendor company.

The second problem with insufficiently detailed terms of reference is the complexity of developing criteria for the effectiveness of implementation. Bad KPIs do not allow for revising the strategy in time, which lead to budget overruns and the threat of project failure.

The TOR should describe in detail the typical scenarios of users' work in the ERP system, indicate their roles, and specify the restrictions for roles. For each scenario, including the need to specify the formats of the source data and templates for output printing forms. If there are third-party systems, the documentation describes the protocols for interacting with them.

Production documents should be regularly reviewed for errors and inconsistencies. If necessary, they should be updated and, accordingly, the project plan should be adjusted.

Planning errors.

Planning is about more than budget and deadlines. It is also about the distribution of resources, including the appointment of responsible persons.

For a complex and lengthy task, such as ERP implementation, it is impossible to consider all the nuances and predict all the obstacles. Therefore, mistakes are inevitably made at this stage.

1. Underestimation of budget and timing.

Can be fatal to implementation. If actual costs and timelines are exceeded beyond expectations, those in charge may find it impractical to continue the project.

In 2009, Axon exceeded its budget by $ 11 million, leading the City of San Diego to terminate its partnership.

The main reasons for over-budgeting in the Panorama study are:

- increasing the volume of the project;

- underestimated preliminary estimates of the executing company;

- unforeseen organizational expenses.

The most frequently cited reason for exceeding deadlines was their initially unrealistic assessment. According to ArcherPoint (Big consulting company - Microsoft Dynamics Gold ERP Partner) experts, an ERP system implementation project lasts on average from six months to two years, depending on the size of the enterprise. Panorama's survey results show a 14.1-month period - the actual implementation period - as opposed to 12.7 months expected by respondents.

To reduce the likelihood of inadequate forecasts, it is necessary to involve in the planning process key employees of departments who will be affected by automation and use the services of consulting companies on ERP implementation.

2. Lack of a dedicated team of employees within the company.

A common practice is that employees combine current tasks with implementation tasks: for example, accountants communicate with analysts from a vendor company, agree on documentation, simultaneously conduct financial transactions and prepare current reports.

Such multitasking is harmful both for the company's finances (the probability of errors increases) and for the implementation of ERP (analysts will not receive prompt and complete information from an employee who objectively has higher priority tasks).

The best solution here is to designate a group of dedicated employees and free them from other tasks during implementation. Another bonus will be that these people will be more loyal to changes, as well as have a good understanding of the specifics of the new system even before the start of its commissioning and will be able to train other personnel later.

3. Wrong choice of the implementation strategy.

There is no universal implementation strategy that is right for everyone. The decision will largely depend on the size of the enterprise, the field of activity, and possible territorial disunity.

The options are as follows:

Modular implementation, that is, the commissioning of not the entire ERP at the same time, but only part of its modules. For example, at first, only personnel management is implemented.

Implementation by business unit, that is, at the first stage, the system is introduced in one or more related departments.

Branch implementation: ERP implementation in one or more branch offices.

Implementing everything at once (the so-called Big Bang variant - the big bang): a risky venture, but if the volume of automation is small, and the costs of simultaneously supporting the old and new systems are too high, they choose such an implementation.

Hybrid implementation - a combination of the first three options.

Need to decide a strategy before starting development in order to prioritize correctly when setting up and finalizing various modules, as well as correctly allocate resources.

Errors during development and commissioning.

After the TK is developed and agreed upon, the stage of implementation of the functions declared in the documentation begins: some of them will be in the basic software package, others will require the system to be improved.

The contracting company will need to ensure that the implementation meets the exact requirements. In this case, the following errors are possible.

1. Insufficient testing.

To check the health of the system, it is not enough to test several private scripts under one or two users. An important stage of verification is load testing under realistic conditions.

It is also important to plan for a trial run transition period. During the trial operation, users work in the system in a limited mode, but on real data: for example, only a part of the employees of one branch deals with ERP.

At the same time, the operability of all functions is checked, errors are recorded, which the contractor is obliged to correct within a predetermined time frame. The term of the stage depends on the scale of the project, but it is advisable to plan at least 1–1.5 months in order to fix possible critical problems before the system is fully launched.

2. Errors during data migration.

In the XXI century, it is difficult to imagine the situation of ERP implementation in a completely non-automated enterprise. Usually, companies already have one or even several systems operating on different data. Some of this data will have to get into the new ERP system database. In this case, conflicts, duplicates or loss of information are possible.

The British mobile operator Vodafone was forced to pay the telecommunications regulator a fine of 4.6 million pounds. As a result of incorrect data migration, information about a part of client accounts did not get into the new database; therefore, subscription payments were not credited to them. These users lost a total of £ 150,000 in 17 months.

To reduce the likelihood of migration errors, it is better to analyze and correct existing data sources at the very beginning of the project: remove duplicates, unnecessary information, sort out inconsistencies. Reconciliation procedures need to be developed.

3. Poorly organized learning process.

By saving on training, employees will spend more time performing their usual tasks simply because they will not know how to perform the appropriate actions in the new system. As a result, not only will the efficiency of their work decrease, but also the irritation will grow. This, in turn, can lead to sabotage and unwanted layoffs.

In addition to training, it is necessary to provide ERP users with detailed instructions on how to operate the new software.

4. Insufficient support after implementation.

The implementation process does not end the day employees start working with the new ERP system. They will have questions, along the way, problems will emerge that were not found during test operation.

Over time, the company can change its internal processes. With the development of technologies, a decision may be made to switch to more advanced integration protocols with other software used along with ERP.

To make the implementation process more comfortable for employees, to reduce risks after critical errors are discovered, and to lay the foundation for future system improvements, it is important to conclude a support agreement with the vendor company.

Among other things, the contract must specify the criteria for delineating the level of criticality of problems and indicate the maximum terms for their elimination.

ERP system implementation is a complex process, at each stage of which problems are possible. Thorough analysis, competent planning and the choice of the least risky implementation strategy will help to reduce the likelihood of their occurrence.

CHAPTER 4

Anticipated Results

4.1. Overcoming the negative effects of automation

The strategy of promoting a service product by SAP assumes offering to its existing and potential customers a set of measures that ensure the solution of problems of effective management of information and information technologies, organizational and technological processes of operating their regionally distributed IT infrastructure in a more efficient and cost-effective way.

The essence of the set of measures is to transfer managerial, main and auxiliary processes to a specialized company together with responsibility for the result of these processes. After restructuring management, main and auxiliary processes, they will be able to reach a level of core activity that requires the organization's management to focus on business strategy and transfer some of the processes that do not affect the strategic interests of the organization to SAP, which will carry out these processes for more a high professional level and at lower costs.

The basis for the success of each project will be a preliminary analysis of the current activities of organizations, consideration of the main directions of business development and develop proposals for improving the work of IT departments of clients based on the implementation of a service product.

As Russian and foreign practice shows, the best option to streamline and optimize these business processes in the maintenance and operation of IT infrastructure systems is to transfer these processes to a single center for systems operation. The transfer of processes to a separate structure of the organization will improve the quality of services, because for the service support center this activity is the main, and not auxiliary. This, in turn, will allow:

1) introduce uniform standards for business processes;

2) eliminate duplication of functions;

3) streamline information flows of the organization;

4) promptly prepare all types of reporting, including consolidated;

5) ensure a clear document flow;

6) increase the market value of the organization.

Understanding the importance of supported organizational and management processes, the company's proposal is based on practical experience in providing operational services to large commercial organizations and Russian government agencies and using the most modern technologies and tools in this area.

The overall goal of the promotion strategy can be formulated as optimization of the management of the development of the IT infrastructure of the organization - clients in order to achieve the following results over a certain period:

1. Improving business support,

2. Improving the quality of service,

3. Reducing the cost of IT ownership,

4. Reducing risks in the operation of IS,

5. Reducing the time required to commission new services.

6. The need to eliminate the current deficiencies and ensure readiness for effective solution of problems together with clients

In accordance with modern world practice, the achievement of these goals can be facilitated by a service approach to organizing the activities of IT departments of client organizations with an emphasis on monitoring and coordinating the use of information technologies. It is assumed that a significant part of the operation of the application of information systems and information technologies, as well as the audit and development of these processes, will be provided by the company "SAP".

This approach requires a clear organization of the scheme of relationships between organizations, and given the size of the problem under consideration and the desire to reduce the possible risks of IT activities of organizations; its solution can be implemented in several stages: from pilot implementation on a limited list of functions to further full-scale deployment for each client.

The company "SAP" in modern reality acts as a specific social institution that implements a purposeful process of activity on a specific material and technical basis and with specific employees. It functions optimally in today's rapidly changing world if their culture and management systems are based on all the achievements of modern socio-philosophical, cultural and sociological knowledge. At the same time, for the development of corporate culture or modern social and humanitarian knowledge within the framework of a single company, it is necessary to carry out a constant analysis of its activities, because it is more than other elements of modern social systems subject to changes and in them, innovative processes occurring in society are most quickly traced.

The company's activities in the labor market, goods and services are formed on the basis of new strategies, taking into account the specific historical and demographic characteristics of the modern Russian Federation, as well as taking into account the achievements of modern social and humanitarian knowledge, which asserts the growing role of human capital in radical transformations of modern Russian society.

A small number of carefully selected and formulated goals define the overall direction of efforts to achieve the desired state. The correct formulation of goals is necessary to select the appropriate performance criteria (KPI), which will be used in daily practice as key indicators in the process of monitoring the status and progress of achieving goals so that managers can timely make adjustments, either in the work processes to achieve them or into the goals themselves. Performance criteria should be based on metrics that will affect all the company's business processes.

The mission of the company that underlies the activities of the division guarantees the common values of the Company and the production division. The Guiding Principles capture these values to purposefully shape an organizational culture that guides all future IT management activities to achieve these goals.

1. The principles of activity of the production unit do not contradict the value system, but supplement in its area of responsibility.

2. The determining factor in the activities of the Production Department is the desire to meet the reasonable requirements of the functional departments in the necessary information support.

3. The production unit strives to:

- Provision of technological and organizational IT solutions of the required quality level.

- Creation of a team of professionals capable of adequately solving problems and realizing the company's goals by means of IT.

- Creation of mutually acceptable and effective forms of cooperation with customers and partners for planning, creating, operating, maintaining and evaluating IT solutions.

- Aligning the value of IT employees with the values of the company.

Taking into account the fact that the organizational structure of the Production Unit should ensure the functioning of all its business processes, the decision on the need, the functioning of which should be a consequence of previously made decisions on the target information architecture, developed IT infrastructure. The proposed organizational structures should only be considered preliminary and deliberately simplified discussion materials.

This type is the most common today and serves as the basis for most other types of IT org structures. The considered types of IT organizational structures are typical, and they have a disadvantage associated with low adaptability and slow response to changes in the business. If it is necessary not only to ensure the operability of the IT infrastructure but also to constantly develop it in accordance with the rapidly changing business needs, then the company must use adaptive organizational structures of the IT departments.

The classical approach identifies two types of adaptive organizational structures: project and matrix. As applied to the IT department, the project structure means that the company engages external specialists in solving certain development problems - for example, the selection and implementation of an information system. After the completion of the project, these specialists leave the company or take part in new projects. Such a structure is very effective during the period of intensive development of the company's IT infrastructure.

The development of the project approach is the matrix approach. The matrix diagram of the organization of the IT organizational structure presupposes the presence of functional units, from whose employee's project teams (project organizational structures) are periodically formed with the possible involvement of external specialists. Such an organization is the most effective way to use all the available competencies of employees to achieve the assigned tasks of developing the IT infrastructure. Its disadvantage is the requirement for a clear regulation of interactions between members of the project team and line employees, since conflicts of "subordination" may arise, when, on the one hand, an employee must fulfil the instructions of his line manager, and on the other hand, actively participate in the project. Also, a prerequisite for the successful use of a matrix organizational structure is a high qualification of project managers and effective schemes for motivating employees to complete projects. The disadvantage of the matrix approach to IT organization is that it is aimed specifically at the implementation of projects for the development of IT infrastructure and is poorly applicable to the tasks of its constant support and analysis (these tasks are well implemented within the framework of a functional organizational structure).

Both divisional and functional structure in its pure form cannot be optimal enough if the company consists of several large geographically distributed branches. In this case, the use of a centralized functional structure can slow down the speed of solving problems of individual branches, and decentralization reduces the efficiency of utilization of the existing infrastructure.

Considering all of the above, it can be assumed that from the general list of goals of IT departments, the goals of a centralized structure should be the coordination of decentralized IT services and information support of the company's central office. The goal of decentralized structures is to provide information support for "their" functional units, that is, to provide the required IT services, support hardware and software.

Special attention should also be paid to deep standardization, and minimization of the labor intensity of the provided IT services, the development of emergency and preventive regulations.

To solve these problems, a thorough study of such issues as the maximum unification of the used equipment and applications and training of all users on the independent implementation of preventive and restorative IT regulations is required.

In contrast to the existing and "clean" divisional structure, the head office should be assigned such functions as:

- development and control over the implementation of standards for the development and support of IT services;

- compliance analysis, development and support of the overall IT infrastructure;

-general coordination of the work of all local IT departments;

-organization within the Service Department of the Head Office (or in the place of the greatest concentration of qualified specialists), which is the custodian of all key IT competencies and takes upon itself the solution of the most complex and conflict issues of IT support.

The final choice of the optimal organizational structure of the IT service and a more detailed description of the functional responsibilities and relationships of its components should result from the development and consistent implementation of the provisions of the package of regulatory and methodological documentation into the activities of IT departments.

The principles and methodological foundations that determine the content and characteristics of the processes of IT departments, as well as the criteria and metrics for their assessment, can be developed in accordance with the needs of the tasks of the Production Department by choosing the adequate practices set out in the standards and their adaptation to the real conditions of activity. The distribution of duties and responsibilities of participants in the development of regulatory documents from the side of the organization should be made, considering the following factors identified in the research process:

- Limited human resources of the Production Division and their high employment with current work;

- a high level of qualifications of personnel in the areas of specialized activities of the Production Division;

- insufficient qualification of the existing personnel in the field of methodological developments;

- Lack of formalized communications between IT and functional units;

CHAPTER 5

Conclusion

Constantly changing market, a crucial need in high speed of decision-making, multilevel asset management, and high level of risks are modern approaches of modern Russia. The solution for an increasingly complex internal and external business environment is to have smart business processes.

Since the industrial revolution, general-purpose technologies like the steam engine and electricity have driven economic growth and higher living standards. The most important general-purpose technology of our era is AI, especially Machine Learning. A key feature of general-purpose technologies is that they enable complementary innovations and investments.

The implementation of an ERP system has positive and negative effects:

The adverse effects of ERP systems for business are the fact that the installation of the ERP system is a big investment. The license is 40% of the investment; other 60% are consultants. The system needs continuous maintenance and license prolongation. However, the success of ERP implementation depends on the skills and experience of the workforce, including training and coaching personnel to make the system work properly. Some final users need from 1 to 12 month to start working confidently. Existence of a modern ERP system in the company requires fast decision making, what can be the reason for issues.

The competitive reality of global economy demand efficiency and modernization and ERP system may provide it. Modern ERP system provides a business optimization by the elimination of unnecessary processes or automatization of the routine ones. Also, it allows accurate and online access to reliable information. Provides the ability to instantly and verify share information between all components of the organization—reduction of time and costs of reaction. When the company assign a new business units assignment or new processes or even integrate external software, the ERP system is already prepared and provide friendly tools to do it in the short period with reduced amounts of costings. As each module of the ERP system enters the same real-time database, another advantage is that no duplicate records or playback operations.

For the Russian economy, ERP systems brought more than for business itself. Nowadays, ERP systems are a guarantee of the transparency and standardization of results. Before the ERP system, the Ministry of Finance of the Russian Federation could not find a unique standard of financial results of foreign, Russian and companies with almost manual accounting. For economy, ERP is a synonym of transparency and control. For other agents, the ERP systems as SAP or Oracle allows for investors or companies to reduce the risks and reach common understanding and alignments between IFRS and RAS.

Nowadays, in the biggest economies, such as the USA, implemented an advanced ERP system is one of the requisites to be represented on the stock market.

It is necessary to know what the development and implementation of a specific information management technology affect, namely: on the effectiveness of the work of individual managers, the effectiveness of the management unit, the effectiveness of the management process in the preparation of a specific management decision, the effectiveness of a separate link in the hierarchical management system, the effectiveness of management methods, the efficiency of the business process, the effectiveness of the management system as a whole.

Optimists suggest that technology may substitute for some types of labor but that efficiency gains from technological augmentation outweigh transition costs, and, in many cases, technology increases employment for workers who are in not direct competition with it. Furthermore, the skill requirements of each job title are not static and evolve over time to reflect evolving labor needs.

For example, workers may require more social skills because those skills remain difficult to automate. Even if technology depresses employment for some types of labor, it can create new needs and new opportunities through "creative destruction". For instance, the replacement of equestrian travel with automobiles spurred demand for new roadside amenities, such as motels, gas stations, and fast food.

They are unifying Perspectives. On the one hand, multiple dynamics accompany technological change and create uncertainty about the future of work. On the other hand, experts agree that occupations are best understood as abstract bundles of skills and that technology directly impacts demand for specific skills instead of acting on whole occupations all at once.

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