

# Smart Technologies and IoT

# Development of the Company's Logistics Process Management System

Gulbakyt Sembina<sup>1</sup>, and Aigerim Aitim<sup>1</sup>

<sup>1</sup> International Information Technology University, Almaty, Kazakhstan

## Abstract

Nowadays, there are many logistics companies in the market of the Republic of Kazakhstan that routinely carry out business processes for the delivery of goods using specialized information systems. However, most of these systems are not designed to the latest concepts and standards. As you know, the field of information technology is rapidly developing, and along with it, development methods and technologies are developing. One solution to this problem is to improve the functionality of existing systems with the latest technologies that provide easy scalability and flexible system support.

As a result of this paper, a comparative analysis of existing systems was made, an algorithm for planning the delivery of small batch cargo was described. Methods of system analysis of software development processes were also studied and applied. Research and analysis of business processes of the enterprise were carried out. All the tasks set have been solved, that is, the existing business processes for the delivery of goods have been automated, the productivity of employees has been increased, and the needs of customers have been satisfied. The business processes of the logistics company were optimized by developing and implementing a system for monitoring cargo delivery data.

## Keywords

Information system, logistics, business process, automation, management system, optimization

## 1. Introduction

Logistics began to develop around the 50s of the XX century. It is from this period that the theoretical foundations of logistics and the possibilities of its practical use in the economy are being comprehended in foreign economic literature, and the conceptual and categorical system of this science is being formed. The introduction of the term "logistics" into scientific dictionaries (since the 70s - in foreign ones, and only since the 90s - in the CIS countries) indicates the expansion of the use of this concept, the trend towards the development of a logistics system in the activities of companies in foreign countries and Kazakhstan.

The relevance of the topic is expressed in the fact that foreign companies have created sufficiently developed logistics systems of activities related to procurement, supply, information, transport, that is, with the management of wide commodity flows, and analysis of their rich experience is necessary for Kazakhstan companies. Kazakhstan firms build market relations, for their effective functioning, the clarity of interaction of all commodity flows, information linkage of the internal and external environment, rational distribution of goods, interaction of management bodies of material and technical supply, transportation, planning of raw materials flows and finished products, stocks, work in progress and final products from production to consumption. Thus, logistics solves the problems of developing and implementing an integrated system for managing material and information flows in production, transport in the process of distributing goods and services to meet market demand in a timely and complete manner. By the fact that the analysis of logistics fits well into the development of national and international markets, which are acute for Kazakh companies. In the leading countries with developed economies, approximately 93% of the time of movement of goods from primary sources of raw materials to the final consumer falls on its movement through channels and storage. Direct production accounts for only 2% of the total time, transportation - about 5%. In addition, over 20% of the GNP of advanced economies is merchandising. At the same time, in the structure of expenses, about 44% account for the costs of maintaining stocks of raw materials, semi-finished products and finished

products, 16% for warehousing and forwarding, 23% and 9% for trunk and technological transportation, respectively, and 8% go to the costs of ensuring the sale of finished products [1].

## **2. Analysis of existing information systems**

A logistics information system is nothing more than a part of a management information system for managing, controlling, and measuring logistics activities. These activities take place within the organization or across the supply chain.

Logistics information systems are essential to achieve the efficiency and effectiveness of logistics. At the enterprise, the logistics information system is aimed at achieving the following:

- It turns the functional operations of logistics into a process aimed at satisfying customer needs at the lowest overall cost.
- The information system facilitates the planning and control of logistics activities related to order fulfillment.
- It makes the firm more competitive by making better tactical and strategic decisions for the benefit of the firm and its clients.
- Helps provide customers with information about product availability, order status, and delivery schedules to promote customer service.
- It reduces inventory and manpower requirements, allowing requirements to be planned.
- It interacts with marketing, financial and production information systems and provides information to senior management to help formulate strategic decisions for the entire firm.
- The use of information technology in information systems has made it possible to respond quickly to demand, making forecasting redundant. It also helped introduce "pull" systems such as "just in time" which made the firm more competitive.
- It promotes systems that link a firm's operations, such as production and distribution, with those of suppliers on the one hand and customers on the other.
- In other cases, organizations find that they can use the information to manage dispersed inventory as if it were a single inventory. The benefits of this can be significant. If stock management is centralized and decisions about replenishment and other quantities are made, or a single stock is taken as the basis, then only one safety stock is required instead of many. The stock itself can be moved anywhere in the system, either near the point of production or near the point of consumption. This is the concept of "virtual" stock management or electronic stock management.

High requirements for the quality of the final product of industrial production, the continuous rise in the cost of fuel and raw materials, a large share in the cost of production of energy resources spent at the production stage determine the need to introduce new technologies, both in direct production and in solving organizational issues affecting the entire infrastructure of the enterprise. Industrial production is characterized by the movement of large volumes of heavy and specific physical and chemical characteristics of cargo, a variety of operations and technical means used. Several industries, for example, metallurgical, are distinguished by high requirements for the temperature regime, certain requirements are imposed by the continuity of the technological process. The specifics of metallurgical and machine-building enterprises also include the detailing of production logistics on the inter-shop and workshop (within the workshop), which in turn imposes its own requirements, both for the organization of supply and for production planning. As a result, a significant dependence of the production time and the cost of products on transport, storage costs and other logistics-related costs is formed.

If the areas of the tasks to be solved, there are types of logistics: procurement, transport, sales (distribution), production, warehouse. In addition, in the light of high-quality requirements, service and information logistics are singled out. In addition to considering individual areas of logistics as independent at various stages, it is necessary to integrate them into a common management system.

For a comparative analysis of information systems in the field of logistics, the following software products were selected: IBM software solutions for supply chain management, which includes:

1. Supply chain of planning block - includes modules for network optimization, design and strategic planning; route planning; inventory optimization; management of responsible business decisions in new industries;

2. Supply chain of maintenance unit - includes automation modules for incoming and outgoing transport processes; optimization of business processes in distribution networks; optimization of incoming and outgoing supply processes based on end-to-end observability; distribution of B2B capabilities to each supplier:

- Roadnet Transportation Suite - a package of software products aimed at optimizing transport logistics in the field of trade;
- iSolutions-Logistics - a system for advanced warehouse management based on Microsoft Dynamics AX [2];
- Logistics programs of the company "First BIT" - transport and warehouse logistics [3];
- Solvo – automation of warehouse complexes, automation of ports and container terminals, supply chain management [4];
- DNA evolutions - online services for various optimization tasks of transport planning: JOpt.NET, JOpt.ASP, Jopt.J2EE [5];
- Axapta Retail is a system designed to automate management at large and medium-sized enterprises, related to ERP II class systems [6];
- Epicor is a complex of industry-specific ERP systems based on service-oriented architecture and web services.

The list of ERP systems can be continued, but these systems mainly implement logistics functions related to the automation of purchase and sale applications, given the objectives of this study, it is enough to consider a few selected examples.

To present the results of a comparative analysis of IS according to the following criteria:

- provision of logistics types (Table 1);
- provision of functional levels of logistics within one enterprise, organization (Table 2).

In Tables 1 and 2, the types/ levels are marked, the presence of which is clearly indicated by the description of the relevant software products.

**Table 1**  
Provision of information systems for various types of logistics

Types of logistics	Information systems						
	IBM	Roadnet Transportation	iSolutions	DNA evolutions	JDA	Axapta Retail	Epicor
Purchasing	+				+	+	+
Production	±						+
Distribution					+	±	±
Warehouse	+		+			+	+
Transport	+	+		+	+		
Service	±	+					+

**Table 2**  
Providing IS levels of logistics

System level	Information systems						
	IBM	Roadnet Transportation	iSolutions	DNA evolutions	JDA	Axapta Retail	Epicor
Operational	+	+	+			+	±
Control Room	+	+	+		+	+	+
Planned	+			+		+	+

The solutions of procurement, warehouse tasks are the most reflected in the IS (while not all warehouse logistics systems are included in this comparison from the sample), transport. The functions of production and distribution logistics are the least provided.

From the above tables of comparison of IS by types of logistics and system levels, large-scale systems containing several diverse software modules provide most types of logistics, as a rule, at the

level of forecasting, searching for complex effective solutions for the organization, determining the development strategy. Specialized software products of warehouse and transport logistics are focused on providing operational and dispatching level [7].

Table 3 shows the data of a comparative analysis of the functionality of IS (Table 3).

**Table 3**  
 Comparison of software in the field of transport logistics

Evaluation criteria	Information systems			
	Roadnet Transportation Suite	IS "The first BIT"	DNA evolutions	Asia Freight Delivery
Dividing the territory into service areas	yes	yes	yes	yes
The ability to select the parameters of balancing the division of the territory	yes			
Scenario analysis	yes			yes
Automatic reconstruction of territories	yes			
Creating plans for different situations	yes			yes
Construction of routes, planning (criteria: a set of orders for delivery, availability of vehicles, balancing the use of resources, agreed delivery time, minimization of routes and working day)		yes	yes	yes
Formation of optimal schemes for loading goods into a vehicle	yes	yes (for one vehicle)	yes	yes
Monitoring the movement of vehicles and personnel (using GPS)	yes			yes
Accounting for deviations from a given route	yes	yes		yes
Order fulfillment control	yes		yes	
Accounting for fuel consumption	yes	yes		yes
Online interaction of the driver with the logistician		yes		yes
Collection of statistical data on movement, time spent at the destination		yes		yes
WEB-reporting, remote processing of documents	yes			yes
Construction of routes, planning (criteria: a set of orders for delivery, availability of vehicles, balancing the use of resources, agreed delivery time, minimization of routes and working day)	yes			yes

After the analysis, it can be concluded that the proposed system has the necessary functionality.

As mentioned above, the block of intra-production (including shop and inter-shop) logistics is poorly represented in the IS. At the same time, it is of particular importance for industrial production. For example, solving the problems of calendar planning with steel casting and rolling determines the efficiency of steel cutting production.

The organization of internal supplies optimizes the time spent on the main operations of transportation, storage and ensures the continuity of the production process, synchronizes the production cycle, and reduces the production of defective products [8].

The organization of intra-production logistics allows you to optimize the time spent on basic, transport and warehouse operations, ensure the continuity of the production process, synchronize production cycles, reduce the production of defective products. All these combinations provide production flexibility and allow you to adapt the work to current and market needs. At the same time, the specifics of the production process in each technological network determines the reason for the low prevalence of connected information systems.

Thus, the logistical and organizational tasks of enterprise management are very diverse. A comparison of software operations and capabilities in the field of enterprise logistics management shows the following.

Most of the developments are focused on automated processes (through the creation of databases and constant updating of data). Automation-based solutions reduce time, simplify data processing, protect storage, and allow us to find the information we need at any time.

Automation is a prerequisite for moving to the next stage of business process management optimization based on the use of a specific method. The use of optimization methods allows you to flexibly design in various development scenarios, not only in the current situation, but also in the ability to make the right decisions in changing circumstances [9].

The specifics and range of logistics tasks of large enterprises (for example, metallurgical) requires the use of a modular system consisting of the following elements:

1. model designer;
2. a data warehouse containing both model data and primary enterprise data on processes, aggregates, product units, vehicles, and so on;
3. an optimizer implementing multi-agent simulation (simulation modeling to build adequate models of technological and logistics processes, an agent approach - to formalize heuristics on the elements of the process model). Based on the analysis carried out above, it was decided to develop an information system based on modern web technologies. After all, modern problems require modern solutions [10].

## **2.1. Algorithm for planning the delivery of small-batch goods**

In the supply chain management of large companies, including dozens of suppliers, several distribution centers and thousands of consumers, much attention is paid to optimizing the delivery of small-batch goods in a large city. Optimization implies the solution of two interrelated tasks: firstly, the optimal assignment of consumers to suppliers, and secondly, the division of consumers, i.e., markets, into service areas. Optimization in both cases should lead to a minimum of transportation costs in the distribution network.

The first problem, known as the classical transport problem, is considered in detail in the specialized literature on transport logistics and operations research. The second problem has no strict solution. As a rule, in practice, customer service areas are formed according to the geographical principle, according to which customers who are geographically close to each other fall into one service area. If the service network is large, includes hundreds or thousands of customers, then the service areas can be grouped by levels. At the first level, the entire service network is divided into regions, the boundaries of which, as a rule, coincide with the administrative boundaries of urban or rural areas. At the second level, regions are divided into delivery sectors so that it is possible to form one delivery route in each sector, considering all restrictions. This simplifies the formation of routes, but does not guarantee a minimum of transport costs, since the procedure for dividing into sectors is not optimized. The division of a certain region into delivery sectors is usually carried out for reasons of common sense, for example, one city block (micro district) – one delivery sector [11].

A meaningful statement of the task of planning the delivery of small-batch goods in a large city can be formulated as follows.

To organize the dispatch of small shipments to many customers, in such a way as to obtain optimal routes for trucks with minimal transport costs.

When planning the delivery of small-batch goods by road, it is necessary to consider many restrictions imposed: on the carrying capacity of vehicles, but the delivery time, but the duration of the working day, road maintenance and others [12].

Currently, specialized GIS-class software is widely used for the formation of vehicle routes. The analysis of functional software products designed for planning routes of road delivery shows that they have several significant drawbacks. Firstly, it is impossible to form routes in automatic mode if delivery is carried out from several warehouses (shippers). In this case, it is necessary to manually assign consignees to warehouses (shippers). Secondly, there are restrictions on the number of simultaneously processed customer orders (requests), as a rule, no more than 1000 per day. It is often these restrictions that do not allow us to effectively solve the problem of planning the routes of road delivery, therefore it is proposed to decompose the general problem of routing the transportation of small-batch goods.

It is advisable to divide the general (global) problem of optimizing the delivery of small-lot cargoes in a large city into several local ones, in which not the entire set of warehouses, customers and possible routes is considered, but only a part of them, which we will call the local delivery system.

A local delivery system is a system in which customers are located close to each other, and they are provided from one place (base, warehouse).

For localization, i.e., reducing the general task of optimizing the delivery of small-lot cargoes to a local one, it is necessary to solve the problem of assigning customers to warehouses and dividing the entire service area into delivery sectors or client groups.

First, a database is formed (block 1), which includes information about the number of vehicles, their type and carrying capacity; the number of consignors and consignees; on the restrictions imposed by the consignor and consignee on the consignment that can be sent and received by the relevant entity; on temporary restrictions on the delivery of goods to destinations and their export from points of departure; costs for the flight (or for the delivery of a consignment to a specific consignee), etc.

Based on the information received, the transport and technological system (TTS) for the delivery of goods is determined (block 2). It is proposed to single out two TTSs for cargo delivery: global and local. The local delivery system is defined above.

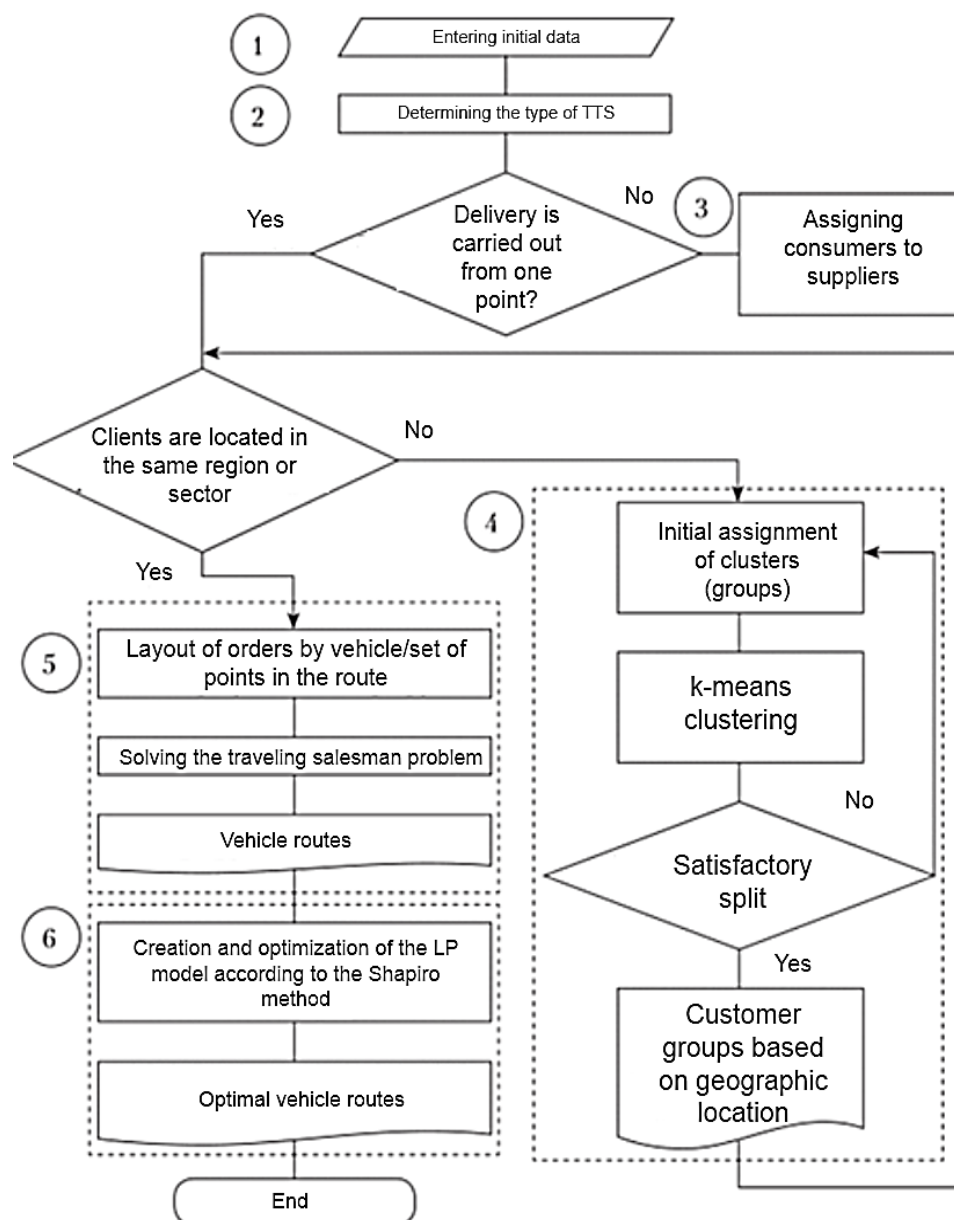
Otherwise, i.e., if the delivery is carried out from several points and (or) customers are located far from each other, this system is a global delivery system on the scale of a given city. Therefore, it is necessary to decompose the general task into a few subtasks, each of which is local.

Firstly, the problem of optimal assignment of consumers of homogeneous products (customers) to suppliers (warehouses) is solved. This problem is formulated and solved as a classical transport problem (block 3). It is obvious that the solution of this problem makes sense if each order of a particular client can be shipped from any warehouse, i.e., warehouses are multi-item, there is no specialization [13].

Secondly, separately for each service area (i.e., a group of customers assigned to a certain warehouse), the problem of clustering is solved - dividing customers into groups according to the principle of proximity of their territorial location to each other (block 4). Then the problem of routing road delivery is solved (block 5), and at the final stage of planning, route optimization is carried out according to the method of J. Shapiro (Figure 1).

Thus, the decomposition of the general (global) task of planning the delivery of small-lot cargoes into several local subtasks in accordance with the above algorithm will allow us to find an effective solution in cases where orders are delivered from several warehouses to hundreds or even thousands of customers daily.

In the supply chain management of large companies, including dozens of suppliers, several distribution centers and thousands of consumers, much attention is paid to optimizing the delivery of small-lot cargo in a large city. Optimization implies the solution of two interrelated tasks: firstly, the optimal assignment of consumers to suppliers, and secondly, the division of consumers, i.e., markets, into service areas. Optimization in both cases should lead to a minimum of transport costs in the distribution network [14].



**Figure 1:** Algorithm for planning the delivery of small-lot cargo

It is advisable to divide the general (global) problem of optimizing the delivery of small-lot cargoes in a large city into a few local ones, in which not the entire set of warehouses, customers and possible routes is considered, but only a part of them, which we will call the local delivery system.

A local delivery system is a system in which customers are located close to each other, and they are provided from one place (base, warehouse).

For localization, i.e., reducing the general task of optimizing the delivery of small-lot cargoes to a local one, it is necessary to solve the problem of assigning customers to warehouses and dividing the entire service area into delivery sectors or client groups [15].

Consider the algorithm for planning the delivery of small-lot cargo. This algorithm includes six planning stages, each of the stages is represented by the corresponding block or group of blocks in Fig. 1.

First, a database is formed (block 1), which includes information about the number of vehicles, their type and carrying capacity; the number of consignors and consignees; on the restrictions imposed by the consignor and consignee on the consignment that can be sent and received by the relevant entity;



on temporary restrictions on the delivery of goods to destinations and their export from points of departure; costs for the flight (or for the delivery of a consignment to a specific consignee), etc.

Based on the information received, the transport and technological system (TTS) for the delivery of goods is determined (block 2). It is proposed to single out two TTSs for cargo delivery: global and local. The local delivery system is defined above.

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### 3. Practical implementation

The database of the information system consists of 13 tables.

The USER table is designed to store information about the user's ID, his username (login), email, phone number, information about the creation and changes of the user, information about the user's role, as well as a hash password for logging in.

The CLIENT table is designed to store information about the client, the client ID, the client's first and last name, the time of creation of the client record and changes.

The ADDRESS table is designed to store information about customer addresses, city ID, street ID, latitude, longitude, customer ID, and information about zipcode.

The PHONES table is designed to store information about the customer numbers, the customer ID to which they relate.

The DRIVER table is designed to store information about drivers, driver ID, first and last name of the driver.

The PRODUCT\_TYPE table is intended for storing information about product types, the identifier, and the name of the product type.

The REQUEST table is designed to store information about applications, types of applications, application identifier, such data as full name, phone number, recipient, or sender address.

The PICKUP table is designed to store information about the sender of the cargo, that is, all the necessary information for drivers who collect cargo.

Before creating any page for our system, it is necessary to determine the location of the Vue components. After all, this is the whole point of Vue JS, the ability to work with a component approach.

The layout should consist of four main blocks:

Main container (main container);

- Toolbar (site header);
- Drawer (Navigation bar);
- Content block (a block for content).

The main container represents one large container in which child blocks and components will be located. For example, a navigation bar for an application, a block for the main content.

Navbar is the header of the site. It is located on the same level as the navigation bar and the block for the main content.

Drawer is a block for the navigation bar, it plays an important role in the system. It contains all the available pages. Usually, the navigation bar is located on the left edge of the page and should have the property of reducing its width.

Content block is a block for the main content and this block occupies the largest space in the layout of the system.

Figure 2 shows how these components form the interface of the "Applications" page.

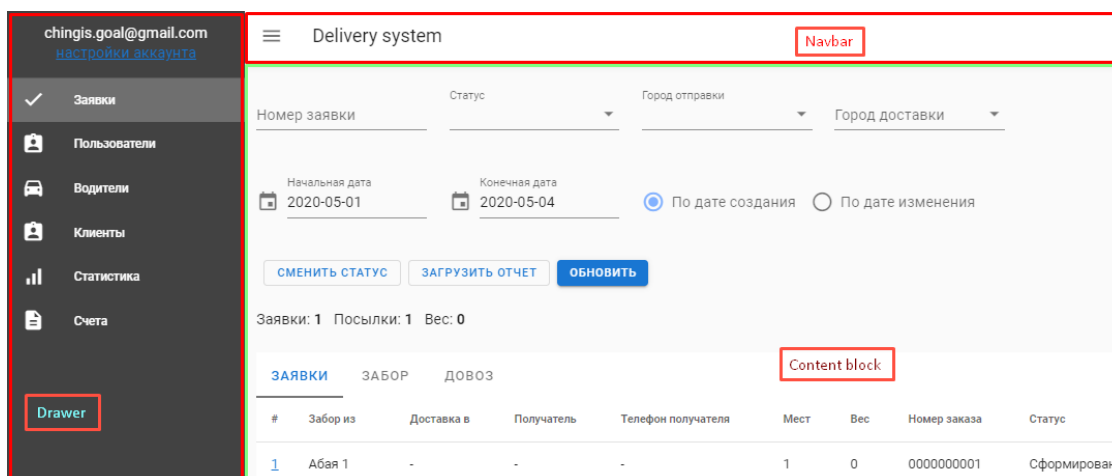


Figure 2: Planned location of components

The hierarchy of views for the Main Activity layout, which is shown in Figure 3.

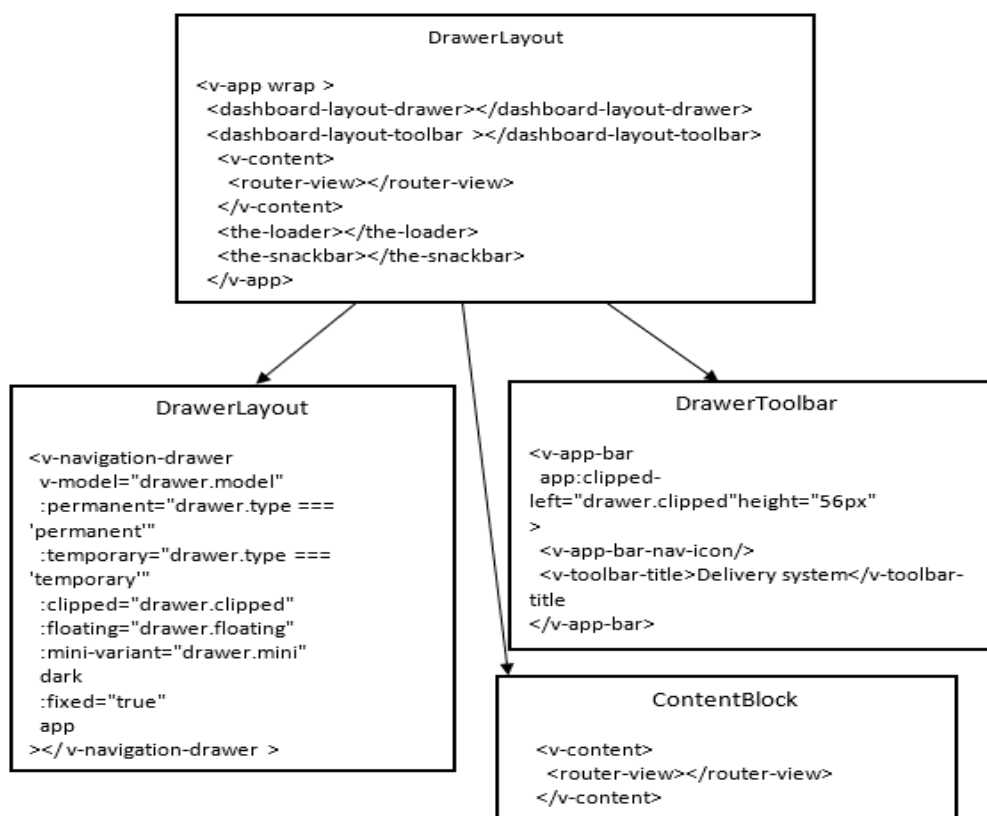


Figure 3: Hierarchy of layout views

The main attributes that are used in the above components are shown below:

- `v-model="drawer.model"`. Used for bidirectional binding of data with elements of the input, textarea and select forms. The method of updating the element is selected automatically depending on the type of element;
- `:permanent="drawer.type === 'permanent'"`. Accepts boolean type, navigation bar remains visible regardless of screen size;

- `:temporary="drawer.type === 'temporary'"`. Is an attribute of the Navigation Drawer component. Accepts a boolean type, the temporary panel is located above its application and uses a canvas (overlay) to darken the background;
- `:clipped="drawer.clipped"`. Is an attribute of the Navigation Drawer component. Accepts boolean type, the cropped box is located under the application toolbar;
- `:floating="drawer.floating"`. Is an attribute of the Navigation Drawer component. Accepts boolean type, floating panel has no visible container (without borders);
- `:mini-variant="drawer.mini"`. Is an attribute of the Navigation Drawer component. Accepts boolean type, navigation bar width, also accepts `*.sync*` modifier. In this case, the panel will open again when you press.

In the developed system, you can see all applications, you can sort and filter them (Figure 4).

	Order	Fence	Delivery								
#	Fence from	Delivery to	Recipient	Recipient's phone number	Places	Weight	Order number	Status	Order Date	Delivery date	Delivery to
1	Manas str 41	Satpayev str 30	Omarov S.	+77471556997	1	0	000000014	Formed	2022-08-30		2022-09-20
2	Manas str 41	Satpayev str 30	Omarov S.	+77051222222	1	0	000000013	Adopted	2022-08-30		2022-09-20
3	Manas str 41	Satpayev str 30	Omarov S.	+77471556997	1	0	000000012	Passed	2022-08-30		2022-09-20

Figure 4: Table of all orders

The system can generate a certificate of acceptance and transfer of goods (Figure 5).

The act of acceptance and transfer of goods							
Sender:		Company Name					
Supplier:		Name					
Date		08.02.2022					
No	City	Recipient	Order number	Departure number	Weight	Fact weight	Note
1			000000011-1	000000011001	1		
2			000000010-1	000000010001	2	3	
Passed						Signature	
Has accepted						Signature	

Figure 5: Generated certificate of acceptance and transfer of goods

Thus, the developed system allows you to control the process of cargo delivery from start to finish, create new applications, and track the status of cargo, generate acceptance certificates and upload reports on applications.

#### 4. Conclusion

As a result of this paper, the rationale for the development of a logistics information system is given, a comparative analysis of existing systems was carried out, and an algorithm for planning the delivery

of small-batch cargo was described. Methods of system analysis of software development processes were also studied and applied. Research and analysis of business processes of the enterprise were carried out. All the tasks have been solved, that is, the actual business processes for cargo delivery have been automated, the productivity of employees has been increased, the needs of customers have been met. The business processes of the logistics company have been optimized by developing and implementing a system for monitoring cargo delivery data. Upon completion of the implementation, the system was tested on a test server to identify errors.

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# SMART Technologies in Higher Education: Perspectives and Reality

Saltanat E. Myrzaliyeva<sup>1</sup>, Almira Zh. Kulbaeva<sup>1</sup>, Akbope N. Akhmet<sup>1</sup>, Karina N. Galay<sup>2</sup>,  
Kuralay O. Tattimbetova<sup>1</sup>, and Serik K. Mizanbekov<sup>1</sup>

<sup>1</sup> *Al-Farabi Kazakh National University, Almaty, Kazakhstan*

<sup>2</sup> *Peoples' Friendship University of Russia, Moscow, Russia*

## Abstract

The XXI century poses new goals and tasks to the system of higher education. The main transforming force is information and knowledge, so information technology takes the leading place and is a strategic resource of society. The society of the XXI century is an information and dynamic society. In this article the authors consider Smart - technologies in the system of higher education, which are designed not only to form a competitive professional, but also to make his training in the most comfortable environment. In this case, the authors point to the fact that the implementation of innovative forms of education encounters not only the rejection of the academic environment, but also entails many problems, requires considerable expense and, moreover, can create some inequality within the educational space.

## Keywords

Smart technology, online education, independent work, e-learning, innovative technologies

## 1. Introduction

The conditions of digitalization of the educational space lead to the formation of a new educational environment focused both on training specialists and increasing the competitiveness of young teachers, teachers of rural schools, gifted young people, teachers and young scientists who will have multifunctional (supra-subject and interdisciplinary) competence necessary to participate in the interactive educational space, i.e. we need specialists of a new "digital format", and therefore the professional competences in digital technologies must become a dominant vector in humanitarian sciences. Thus, according to the authors, the resolution of this contradiction is facilitated by a detailed description of the theoretical and methodological foundations of Smart technologies, scientific and practical substantiation of its basic categories for the adequate organization of innovative language education, its optimal management and achievement of the planned objectives. The open, intensive, communicative and activity-based nature of modern language education (a set of various educational forms of organization of educational work, namely: electronic lessons, workshops, quizzes, virtual excursions, professional development courses, methodical workshops, master classes, teleconferences, online and field seminars, pedagogical excellence contests), which will give a new development vector to the modern educational space, offer a new system of education in the framework of pedagogical innovation.

Practical significance: new language educational environment of the university, network learning system, development of educational and methodological complexes, methodological media library. The proposed conclusions can be used in training for activate the communicative capabilities of the individual as well as in training courses.

## 2. Analytical statement of the problem

"SMART is a well-known and effective technology for setting and formulating goals. The acronym SMART means Smart Goal and combines capital letters from the English words for what a real goal should be: Specific - Measurable - Attainable - Relevant - Time-bound. Smart technology involves the use of computer systems and microprocessors, to perform daily tasks and information exchange" [1].

The methodological basis for the present study was the modern socio-pedagogical concepts in the field of secondary and higher Kazakh education, the provisions and ideas about the active, creative essence of personality, the provisions of pedagogy and psychology on the development of human consciousness and activity, the interaction and interdependence of teacher and learner, as well as fundamental works in the following areas: modern concepts in the field of higher school didactics and theory of Russian language teaching; language teaching methodology and formation of communicative competence of the subjects of professional education; theories of speech communication, discourse, ethnopsychology, psychological and pedagogical studies devoted to the aspects of Smart-technology (T. V. Gerlay, I. N. Gorelov, N. I. Zhinkin, V. V. Krasnykh, A. A. Leontiev, A. R. Luria, etc.).

The methodological basis of smart-technology has huge reserves in the field of pedagogical design of the digital learning environment and allows you to summarize all the available learning information, clearly define the timing, resources and formulate the tasks of each participant of training. Thereby it allows to implement the ideas of peer-to-peer learning (peer-to-peer, P2P) to solve pedagogical problems and objectives of communicative and active nature of modern language education.

Analysis of scientific and methodological materials, domestic and foreign experience in the application of modern organizational forms of learning, built on the basis of smart-technology and contributing to the pace, individualization and differentiation of learning, allowed to identify the experience of digital didactics in vocational education and training.

Thus, 32 teachers of Russian language and literature, working in high schools of Almaty, 18 teachers of the department of Russian philology and world literature at Al-Farabi Kazakh National University, and also 120 students of the Faculty of Philology (who played the role of schoolchildren during the final diagnostic pedagogical situations and tasks) participated in the pedagogical experiment.

**Table 1**

The use of pedagogical design of the digital educational environment

Name of indicator	Level			
	Short	Average	Base	High
Level indicator in the field of theoretical knowledge and skills in the creation and use of electronic educational content	8%	29%	50%	13%
Level indicator in the field of practical skills in the use of electronic tools in professional activities	12%	19%	60%	9%
Level indicator in the field of use pedagogical design of the digital educational environment	15%	36%	29%	20%

Analysis of the results of the level of respondents in the use of new types of learning tasks, modern organizational forms of learning based on smart-technology showed that there is limited existing practice of using digital didactics of professional education and training; also revealed unpreparedness of respondents to implement the learning process using pedagogical design of digital learning environment; occasional use of electronic educational resources in the learning process and monitoring of its results.

However, we believe that the introduction of smart-technologies in education and the implementation of the methodology of such innovative education provides a special construction of information and educational space based on the following principles: integration, openness, mobility, interactivity. One cannot but say that in this perspective the didactic principles are filled with new content - introduction of methods and formats (contact and non-contact) of work with students. These can be both methods of asynchronous communication and means of synchronous communication. [2]

Currently, society is in the midst of a new technological wave based on nano-, cyber-, and other innovative technologies. And just Smart technologies are one of the components of this wave [3] We believe that Smart-technologies in education will give many advantages to the educational process, as it generates the use of teaching methods and formats using embedded electronic professionally oriented components (lecture notes and presentations, video lessons, wikis, interactive intelligence maps, the

amount of authentic scientific literature offered for compulsory study). The prospect and significance of such an implementation lies in the fact that the research teams will conduct research into the maximum use of the achievements of digital humanities for professional development of young teachers, teachers of rural schools, gifted young people through multimedia resources created by the author team: social networks; multimedia services (Youtube), allowing free placement, viewing, exchange of educational information. As well as to discuss video lectures; wikis to provide targeted search and free network access.

We cannot exclude a huge share of probability that Smart-technologies can completely change the whole system of education and in the near future, we will come to the transition to such education, which will lead to a reorganization of the "architecture" of the educational space and optimization of some academic educational structures. And this will lead to challenges for teachers and students alike:

- lack of educational-methodical complexes oriented to modern information and educational environment;
- lack of a systematized theory of training in information environments;
- an insufficient level of formation of the conceptual and categorical framework in the field of education informatization;
- poorly developed professional training and retraining in this sphere;
- informational and educational inequality [4].

That said, Ken Robinson, one of the well-known Western educational development specialists, an educator, speaker, and consultant on the development of creative thinking, educational systems, and innovation in government and public organizations, has emphasized that information and educational technology will not change much. In his lectures, he says that "far more important than all these forms and channels is how audiences in different societies perceive education."... "The problem is that the existing educational system was designed and created for a different era. It was created under the spiritual culture of the Enlightenment and under the economic conditions of the Industrial Revolution."

Thus, he proves in his lectures that the existing model of education is fundamentally outdated and does not meet the challenges of the times.

The aim of the study is to determine the aims, content, methods, forms, means and tools of smart-technology in order to substantiate the regularities and determine effective ways of language learning with the help of infocommunication resources.

### **3. Discussions and offers**

In our opinion, the modern system of education needs the introduction of smart-technology, which will be aimed at modernizing the educational space. A.A. Aletdinova and A.A. Melnichenko analyzed the approaches to the interpretation of the concept of smart-education, highlighting the following directions:

- SMART as an educational, intellectual environment;
- SMART as a set of educational institutions and faculty (which is difficult to agree with, rather it should be seen as a kind of educational infrastructure, in this case at the university);
- SMART as a new kind, a new approach to education, enabling either better results or more effective ways;
- SMART as the development of a person's personality in the context of forming new smart competencies [5].

Modern education must solve a dual problem: on the one hand, it should promote personal fulfillment of teachers of different categories (including young teachers, teachers of rural schools, gifted youth) in the rapidly changing conditions of modern society, on the other hand - to ensure improvement of professional skills (retraining of teachers, increasing their professional mobility) and demand for personal potential (active position) through the use of modern knowledge-intensive technologies and information products.

There is a need for partial digitalization of education, contributing to the remote format of exchange of educational content. First of all, it is the creation of an Internet resource that provides an increased

density of educational and methodological material developed by leading domestic and foreign scientists.

Educational institutions, in our opinion, need to comprehend the increasing role of electronic learning tools and the project plans to create, send and receive educational content in digital form, which is removed from the sphere of static reproduction of textbooks and teaching aids and transferred to the field of software (for interactive education and online learning products).

The basic tools in education are software products that allow you to get acquainted with web-based courses, webinars, as well as media tutorials, text documents, tables, files (in pdf format), presentations, etc. There are many advantages to this kind of education. In particular, the introduction of smart technology in education implies that all teaching materials will be delivered to students in a formed and structured form through accessible means, for example, will be posted in open or closed access on educational online platforms. Such resources will facilitate remote knowledge exchange and collaborative, non-contact work, which will allow to summarize the methodological experience and current knowledge in any scientific field. Modules for such training, in our opinion, should be short and concentrated, exhaustive and complete, presenting the material in an optimal mode for the user, intermittent, adaptive, competitive.

This kind of educational project involves two types of tasks: short-term, methodological, and long-term, methodological.

The first includes solving a number of methodological problems: formation of systematic and complex knowledge in the field of philology; issues of raising the level of professionalism, mastering and introducing methodological developments of colleagues from all over Kazakhstan in the context of the updated content of secondary education.

The second set of tasks includes forming a team to create original solutions to educational problems (finding new forms of interaction in media space, the ability to include students in the creative process both in the classroom and remotely), and the development and implementation of joint educational programs, including textbooks, creating network courses (from indivisible courses to microformats; from unified textbooks to personalized trajectories; from collaborative listening to collaborative projects, etc.).

Thus, in our view, we have come close to the need to create distance courses in various fields, which will become a hallmark, a brand of the university, will create a positive image of the university and will contribute to the implementation of the social mission of the university, the development of human resources potential. The purpose of such courses will be to develop and implement an open, intensive, communicatively active model of modern language education, aimed at summarizing the best practices of the best teachers. Creation of elective courses, electronic educational resources (including textbooks, distance courses for professional development, mobile learning, etc.).

Such distance courses do not go beyond the existing trends of creating a digital learning environment (DLE), which is, one might say, the key trend in modern education. This will first of all make it possible to expand the range of educational and even scientific programs. Moreover, it should be noted that the "digitalization" of education can attract a greater number of interesting speakers and people of science than the classical education to which we are accustomed.

Functionally, this is expressed as follows: "Smart is a property of a system or process that manifests itself in interaction with the environment, and endows the systems and/or process with the ability to:

- Immediate response to changes in the external environment;
- adaptation to transforming conditions;
- self-development and self-control;
- effective achievement of results" [6].

Therefore, the main form of training when building a methodological system using SMART-technologies are workshops, review seminars, focus groups, learning design, project presentations, etc. For the presentation of theoretical foundations lectures and discussions are used, accompanied by demonstration, commentary, analysis of specific pedagogical situations (the time ratio between lecture and applied forms of work is 1/10).



**Table 2**

Model of the concept of smart education for Russian language teachers

Informational resources	Methodical material	Concept and smart education	Ads, professional community news
	Educational language material		Videoconferencing
	useful links		Forum
Exchange of methodological experience	Lessons		Chat
	Projects		Email
	Articles		Blogs
Expert advice	Forum		

#### 4. Advantages and Prospects of Smart-Education

Let us elaborate on the advantages:

The main idea of smart-technology education is, first of all, the recognition of new sources of knowledge. For a long time, the only source of knowledge for students was a lecturer, a teacher, a teacher who shared his knowledge. Now it is possible to share information regardless of distances and time zones. The creation of the informational-educational space, which the authors of this article propose, will enable us to connect the knowledge, skills and competences of many educators and scientists who will be able to share new developments and scientific research with each other. This kind of information community can become the main source of knowledge for any learner. Moreover, the technologies will be individually oriented and directed toward the creation of new knowledge.

Speaking of Smart education, the main emphasis is on technology. Educational content involves the introduction of new technologies into the learning process:

- 1) mobile learning;
- 2) integration of cloud services into the system of educational institutions (SAAS-technologies with the functions of storage and file exchange of methodical materials);
- 3) links to the file through a mail service or social network (WhatsApp, Telegram, Facebook, Twitter, etc.);
- 4) maximum visualization of educational and language material (access to videos, interactive tasks, podcasts (Kundelik; Bilimlend.kz; Mektep.edu.kz; I-mektep; E-learning portal Kazakhstan; Russian podcast);
- 5) creation of augmented reality (virtual information to lexemes): virtual tours of world museums - Googleearth; Google ArtProject; Google Maps - set of maps; Google Calendar - online tool for managing and planning students' independent work, etc.

This educational content is freely accessible to learners and provides feedback between lecturer and listener. This way of learning - active content - is designed to provide the highest level of education possible to meet the challenges and opportunities of today's world.

Smart-learning will increase the availability of education "always, everywhere, anytime. Within the framework of such training, it is possible to organize the learning process regardless of the place and time of stay of both the lecturer and the listener. Physical presence at the lecture loses its relevance, as the lecture can be laid out in video format, audio format or an ordinary document (the possibility of accumulating and structuring information) on a virtual cloud, to which all listeners have access. This provides a tremendous advantage in the continuity of education, which is very important, in our opinion, for the entire educational system. In today's world, various "gadgets" are always at hand, which allows listeners and students to do independent work at any convenient time, using cell phones or tablets, while

teachers can take the passive part of learning outside the classroom. Moreover, we are getting closer to such a process as teacher and student autonomy through the use of mobile devices to access learning information.

The use of Smart technology is changing the education system. As part of this education we have the so-called flexible learning, or the individual route, which is built through training in online courses.

A wide variety of methods of studying learning materials is necessary, which optimizes the process of learning knowledge and acquiring competencies. As an example, it is possible for learners to master information at their own pace. When giving a lecture, the instructor is guided by the majority and usually does not stop to repeat the explanation. With flexible learning, the student can listen to the same lecture until he or she has fully absorbed it. Moreover, the student can choose the level of difficulty of assignments and content, advancing in learning at his or her own pace. In addition, educational programs are characterized by the variability of presentation of the material. It can be ordinary texts, charts, images, presentations, tables, video, audio and so on. It all depends on the creativity of the teacher. The important point of such education is that it pushes students to self-development. It is, in fact, an involvement in the educational process.

We can also highlight the dynamism of such education: updating the material without having to download the textbook all over again. Students have full access to the information they need for specific work, which increases each student's productivity. Moreover, information for learning can be constantly updated more quickly than with "paper-based" learning, since current and new material can be added to the learning content almost as soon as it is released. Moreover, with this form of learning, the teacher engages all students and everyone has the opportunity to do something, have a say, take part in a joint project, unlike the system of classroom work, where not everyone works.

Prospects for the use of smart technologies in education:

1. Creation of digital resources similar to textbooks and teaching complexes that include practicums, textbook materials on modern educational processes in philology.

2. Visualization of modern humanities knowledge in learning multimedia systems, which is focused on the professional and personal development of students (young teachers, teachers of rural schools, gifted youth, teachers and young scientists).

3. Organization and implementation of the model of remote knowledge exchange and collaboration (visualization of modern philological material in multimedia learning systems), which is focused on the professional and personal development of students (students, young teachers, teachers of rural schools, gifted youth, teachers and young scientists).

4. Creation of a scientific laboratory for the generalization of knowledge on a variety of materials on the theory and practice of teaching and professional development of teachers of different categories (including young teachers, rural school teachers, gifted youth).

5. Creation of innovative digital author's courses on the project's theme for teaching and professional development.

6. Identifying and supporting the creative potential of young teachers, rural school teachers, and gifted youth and providing the opportunity to apply and use their own developments in teaching practices (organize contact and non-contact work of students and teachers in the electronic information and educational environment).

However, it should be noted that in order to form such an educational system, the following conditions must be created:

1. Provide all students with access to e-learning material.
2. Organize online lessons and online grading activities.
3. Create an environment that allows safe and free use of educational content.
4. Enhance the professionalism of teachers leading SMART education.
5. To lay the groundwork in cloud technology [7].

Thus, we cannot ignore certain difficulties and problems that are associated with the introduction of smart-technology.

On the one hand, it is necessary to note the difficulties of a social nature. Unfortunately, not everyone has the technical means for such training, not always there is access to the Internet. The problem related to the security of the content itself (protection of intellectual property) and of personal information has not yet been solved. We can also say that there is still no developed pedagogical concept for mobile

learning. So far, developers and teachers rely on traditional pedagogical theory, "adjusting" it to innovative technologies.

The relevance of adopting Smart technology also depends on the discipline itself. There are disciplines in which information is updated slowly, and there are disciplines with very fast changes in information. Nor should we forget about the theoretical foundations of the humanities, which for the most part remain unchanged. The methodology of learning when using electronic technology, differs depending on the course in which the students are studying or in which they participate. An important factor is also the possibility of transferring information to each other, and getting a quick consultation.

This form of training makes it possible to implement various electronic aids: placing audio, video material, animations, drawings, adding formulas, etc.

## 5. Conclusions

In our opinion, in the near future, smart technologies reflecting educational trends, such as digitalization, smart (intelligent) environments, personalization of learning, have all chances for pedagogization and consolidation in the terminological vocabulary of education, for development in pedagogical research and practice of educational activities. The use of this kind of digital technology in learning will allow students to think independently, search for the necessary information and understand the vast flow of this information, analyze the acquired knowledge, which increases motivation for education, moreover, it will be continuous learning.

Creation of resources and application of smart-technologies will facilitate remote exchange of knowledge and joint non-contact work, which will allow to generalize methodical experience and modern knowledge in the field of a certain science. Modules for such training, in our opinion, should be short and concentrated, exhaustive and complete, presenting educational and linguistic material in an optimal mode for the user, intermittent, adaptive, competitive. Also, the creation of distance and online education model promotes productive learning by students, and electronic content of practical research on humanities with the breadth and completeness of coverage of modern branches of knowledge will be available to a wide audience. This fills a significant gap in the model of professional development (retraining of teachers, increasing their professional mobility) and the demand for personal potential (active position) through the use of modern knowledge-intensive technologies and information products.

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# Research of Systems for Providing Electronic Document Management in Higher Education Institutions

Khudaiberger B. Nurlybekov<sup>1</sup>, Laura M. Alimzhanova<sup>1</sup>, Aidar T. Jantikov<sup>1</sup>, and  
Rustem A. Malybayev<sup>1</sup>

<sup>1</sup> International Information Technology University, Almaty, Kazakhstan

## Abstract

The publication provides a thorough and detailed analysis of the methods of electronic document management systems and algorithms for data processing and documentation management. The article reveals in detail the topic of the effectiveness of the use of EDMS, as well as the automation of business processes of enterprises. As a result of the research, a system based on the use of algorithms of data processing and document management systems was proposed and developed, which will help automate business processes in educational institutions and increase the level of efficiency of the educational process for both teachers and students.

## Keywords

Document management, Electronic Document, Electronic Document Management, Document management, Machine-readable document, Electronic Document Management System, Electronic Signature

## 1. Introduction

A rapidly evolving technology, the Electronic Document Management System (EDMS), is seen as a potential answer for businesses in need of efficient information management. Applications for EDMS are designed to manage electronic documents at every stage of their existence, from creation through archiving. Document generation, storage, and retrieval, administration, version control, workflow, and several distribution formats are among its features.

As described in the article by Joseph P. Sathiadass and G.N. Wikramanayake, "Methods and technologies of document management" [1], document management is a collection of components rather than a single thing or piece of technology. This involves the use of technology that enables interaction together with a variety of people and information in a business process. The technologies that make up the EDMS are separated into many functional categories. We introduce them and discuss the techniques for managing electronic documents in this post. We also look into the EDMS market's near future and come to the conclusion that it is at a crossroads in its own life cycle and is made up of a highly fragmented set of products without a single integrated provider or platform for automating the complete document lifecycle from start to finish.

Most organizations have a huge amount of information needed for their current projects or for their future projects in the form of knowledge of their employees or in documents. But the lack of information exchange between people and various project groups, the lack of proper management of information resources and the lack of support from knowledge workers make this information inaccessible and useless. Consequently, there was a need for a system that could meet this requirement and solve these problems.

The Electronic Document Management System (EDMS) solves most of these problems and is considered as a solution for organizations that need a solution for effective information management. According to an article published on the international information agency "kazinform" dated October 7, 2014 [2], the "Unified Electronic Document Management System" (UEDMS), which was introduced in 2006 in order to improve the efficiency and quality of managerial decision-making, allowed to structure document databases, reduce the time for providing a response, creating a request and ensured transparency the effectiveness of managers' activities. "Currently, the UEDMS is used in 93 central and 1711 territorial state bodies," the Ministry of Investment and Development of the Republic of Kazakhstan cites data. Although data management has been around for about 30 years or so, document

management only appeared about 10 years ago. EDMS became popular with the advent of technology and computers.

There is a need to create a system that provides electronic document management in universities. To facilitate the process of forming personal documentation of teaching staff and automating the learning process among students. Also, the study of electronic document management systems to improve the efficiency of business processes in the activities of universities.

## **2. Modern methods and technologies of electronic document management systems**

Applications for EDMS are designed to manage electronic documents at every stage of their existence, from creation through archiving. Document generation, storage, and retrieval, administration, version control, workflow, and a variety of distribution formats are among its features.

- Document Creation: A document is a container that combines information from various sources in several formats on a specific topic to meet the needs of a particular person or organization.
- Storage and retrieval: This includes storing and retrieving documents on a storage device such as a hard drive, magnetic tape, etc.
- Management: This covers a wide area of effective management of all documents to meet the needs of the organization and individuals.
- Version control: This is a way to track changes made to a document and the ability to extract old versions of the document.
- Workflow: This is a way to track the status of the document and who is responsible for this step.
- Multiple delivery formats: Ways to deliver document content in various formats, such as PDF, Word, images, according to the requirements of end users.

Basic principles of electronic document management:

- One-time registration of the document, which allows you to uniquely identify the document.
- The possibility of parallel execution of operations, which allows to reduce the time of movement of documents and increase the efficiency of their execution
- The continuity of the document movement, which allows identifying the person responsible for the execution of the document (task) at each moment in the life of the document (process).
- A single (or coordinated distributed) database of document information, which makes it possible to eliminate the possibility of duplication of documents.
- An efficiently organized document search system that allows you to find a document with minimal information about it.
- A developed system of reporting on various statuses and attributes of documents, which allows you to control the movement of documents through document management processes and make management decisions based on data from reports.

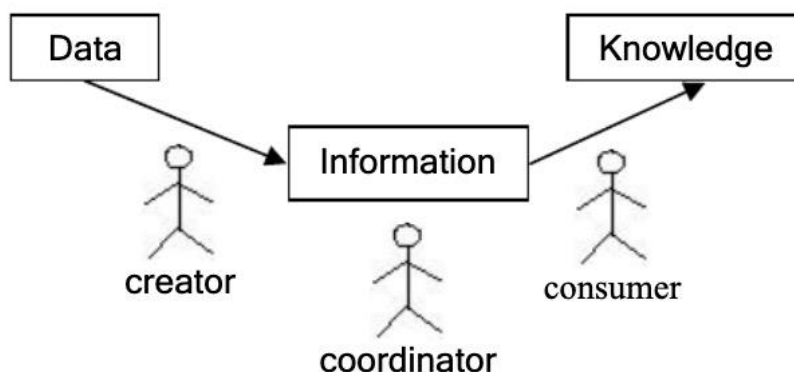
Document management is not a single technology, but rather a combination of elements. This is the use of information and various users in a business process combined with technology that allows interaction. Thus, the Document Management Space can be divided into four main areas, namely: documents, people, processes and technologies.

Documents: The wealth of an organization is the information it has. Approximately 20% of this information is contained in the form of data, and the remaining 80% is in documents. 20% of the data is usually well managed and stored in databases. A lot of effort has been spent on managing and using this data, without paying much attention to the documents containing most of the information.

People: Like any other systems, the document management system also serves many different users. Users can be Creators, Coordinators, or Consumers. One person can also play multiple roles. The creator is the author and generates the contents of the document. The coordinators ensure that the document is properly reviewed and approved for publication. They are responsible for allocating tasks for other participants to perform on the document. They are responsible for delivering the document to

the Consumer. Consumers are the real end users of documents who read or study them. Consumers rely on a Coordinator to deliver them what they want in the appropriate format.

Processes: When a document goes from concept to consumption, a process must be established to ensure that everything goes according to plan and in accordance with expectations. Figure 1 shows the process of converting data into Knowledge.



**Figure 1:** Process of converting data

Technology: With the rapid development of technology, a powerful computer with a graphical interface has become commonplace in most offices. Image creation, databases, networking, and desktop applications are some examples of technologies related to a document management system.

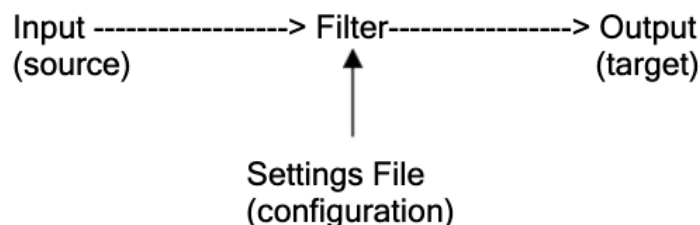
The technologies that make up the EDMS can be divided into several different functional groups, namely:

Conversion: Most documents consist of text, images, and multimedia objects. Since each of these formats is fundamentally different, they must be converted using different tools and methods. Conversion is usually considered as a process that does not bring added value. But conversion, which helps improve search and retrieval performance, is seen as a value-adding process.

Some of the common standard formats are:

- Text – ASCII, SGML, HTML
- Graphics – CGM, IGES, TIFF, GIF, JPEG
- Multimedia – MPEG

The document conversion process is described in Figure 2. Here, the source format is the format of the source documents, and the target format is the format required/preferred by end users. A filter is used in the middle to find the best way to perform this conversion.



**Figure 2:** Document conversion

Indexing: With the growing number of document repositories and online document sets, the speed of information retrieval becomes critical. Indexing allows you to do this by splitting the document into more detailed parts down to the word level. Inversion of terms is one of the popular ways of indexing. This method will have a sorted list of all the keywords in the file with pointers pointing to the actual location. Usually, documents are initially transferred to the indexing process. Some of the most popular indexing systems, such as Open Text, Verity, Fulcrum, can accept most basic text documents.

Search: Any EDMS should provide the user with the ability to search. The user should be able to search for a specific document or a document containing certain information without delay. The effectiveness of information retrieval is measured by feedback and accuracy. Recall is the proportion of relative extracted materials, and accuracy is the proportion of extracted materials that are relevant.

### **3. Use and efficiency of electronic document management systems in business process automation**

As stated in the article from Maslov, A.V., "The role of the electronic document management system in the automation of business processes" [3], the business process in the company's activities is a system of consistent, purposeful and regulated activities that achieve results that are significant for the organization. The introduction of EDMS allows all time-consuming data processing procedures to be carried out automatically, which greatly simplifies the work of performers. The system can automate the following processes.

Registration of documents: all incoming correspondence is registered in the system, taking into account its purpose and type. After receiving the registration number, the document goes into operation. With the help of the functionality, the system generates control cards, which can be used to track the progress of the execution of the document, indicating the deadlines and performers. To simplify the search, all documents receive their own barcodes. An electronic digital analogue is replacing the usual signature.

Assignment of orders: the automatic system provides for the creation of a draft resolution on any document that specifies the performers. After that, the documents are automatically sent to specific performers. At the same time, the executors can unsubscribe the assigned documents to the lower level with automatic accounting of all the resulting branches. The management has access to the whole picture of assignments, as well as to reports on the implementation of documents.

Organization of document execution control: control over the execution of documents is carried out automatically. In the system, it is possible to set control dates for each document in accordance with the legislation of the Republic of Kazakhstan. Sending notifications from the accounting card and setting reminders about the need to return to work with the document helps to avoid a situation when the contractor, due to forgetfulness, does not have time to finish the work on time. For higher-level structures, various reports are generated for a certain period.

Document search: simplification of the search for the necessary documents is achieved by a set of details for each document for which the selection is carried out. The most frequently used search queries are remembered by the system, which offers access to them to the direct executor. There is also a contextual search with further printing or saving in various office formats.

Administration: all user actions are automatically recorded in logs. The user is provided with his access rights, which are assigned by the system administrator during registration according to the structure of the enterprise. At the same time, the user can independently configure the settings of his desktop and personal folders.

In the current competitive environment, the winner is often not the one who makes the best product, but the one who can work faster and manages to capture the market. An employee who works with documents spends about one hour searching for the necessary data. From which we can conclude that approximately 2.5 days are obtained in a month. If we take into account all the costs per employee, then the use of an automated document management system will give an excellent reserve for saving the company's funds.

### **4. Electronic document management systems in educational institutions of Kazakhstan**

The article from Sokolov E.A. and Sereda S.N. "Electronic document management of the university" [4] discusses the implementation of electronic document management systems in educational institutions. The analysis of the subject area of the offer of ready-made software products is carried out.



A variant of solving the problem of organizing electronic document management as an information service in the automated information system of the university is given.

Effective management of an organization in an information society is largely determined by the development of the corporate information infrastructure in general and the perfection of the enterprise's document management system in particular. The transition from paper to electronic document management is one of the urgent priorities of automation. The promptness of access, security and relevance of information about the company's activities necessary for decision-making on the part of management are the necessary requirements for electronic document management systems (EDMS).

1. There are four approaches to the automation of the university's document flow:
2. Purchase of a ready-made EDMS. To date, several dozen different systems are offered on the market, differing in functionality, cost and technical solutions.
3. Implementation of an electronic document management subsystem as part of the purchase of a corporate information system, or its add-on.
4. Development of own EDMS optimized for the structure and features of each specific enterprise.
5. Rent of information services (document storage, software tools for working with documents, etc.) on the Internet based on outsourcing and cloud technologies.

Each of the approaches has its own advantages and disadvantages. So, when purchasing an autonomous system, you should take into account possible additional costs for optimization and modernization of the organization, technical support and client licenses.

To compare the EDMS presented on the market of Kazakhstan, the most popular systems were selected by the number of implementations: 1C: (Russia), E1 Euphrates (Russia), Documentolog (Kazakhstan), ESEDO (Kazakhstan), TENGRIDOK (Kazakhstan), ARTA SYNERGY (Kazakhstan), Docsvision EDMS (Russia), DIRECTUM (Russia). Table 1 shows a detailed analysis of the various functionality of each system, such as localization capabilities, integration with other systems, support for local software, etc.

**Table 1**  
Analysis of systems

Functional requirement	1C: Document management	E1 Euphrates	Docume- ntolog	ESEDO	TENGRIDOK	ARTA SYNERGY	Docs- vision	DIRECTUM
Availability of a full- featured web interface for the user's workplaces	-	-	+	-	+	+	-	-
Administrator	-	-	+	-	+	+	-	-
Multilingual interface:								
Russian	+	+	+	+	+	+	+	+
English	+	-	-	-	+	?	+	?
Kazakh	+	-	+	+	+	+	-	-
The possibility of localization	+	?	+	+	+	+	+	+
Integration with SharePoint	?	+	-	-	+	-	+	-
Integration with other systems	+	+	+	+	+	?	+	+

According to the resolution published on the official information resource of the Prime Minister of the Republic of Kazakhstan dated October 31, 2018, No. 703 "On approval of the Rules of documentation, documentation management and use of electronic document management systems in state and non-state organizations" [5], in state organizations, the specifics of documentation, documentation management and use of electronic document management systems will be determined by the administration. In accordance with this resolution, a general form and a general template for

filling out documentation will be developed, as well as algorithms for electronic document management systems for various government organizations, including universities.

According to an article published on the international news agency “sputnik” dated April 8, 2022 [6], the Ministry of Education and Science recommends that universities not create their own paper types of reporting but switch to a digital version of document management. The Ministry of Education and Science has reduced the list of documents for the reporting of Kazakhstani universities. A number of documents for reporting universities have been reduced:

- the statement of accounting of teaching hours of work of teachers for each month;
- a statement of teachers' study time for the year;
- examination sheet;
- minutes of the meetings of the commissions for the final certification of students. Minutes of the meeting of the commission for the final certification of students on passing the final certification exams;
- minutes of the meeting of the commission for the final certification of students on the assignment of qualifications;
- minutes of the meeting of the commission for the final certification of the student's final work;
- examination sheet;
- the work plan of the department.

Electronic document management systems in its high-quality execution, using modern methods of processing various data and documentation management algorithms can automate business processes.

## 5. Development of EDMS for higher educational institutions on the example of IITU

When starting to create an electronic document management system, you need to determine the functionality of the system itself. Make those. the task takes into account all the features of the enterprise. Choose the optimal method and the appropriate algorithm for processing the necessary data and managing all documentation. After determining the technical part, it is necessary to develop a design concept and the name of the system. The system being developed is called “OnayDOCs”, which literally translates as “Documents Easily” or “Easy Documents”, which fully conveys the essence of the system. The design concept consists of the following parts:

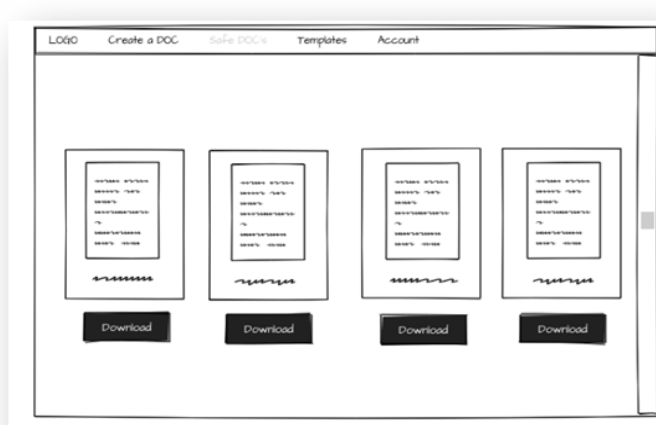
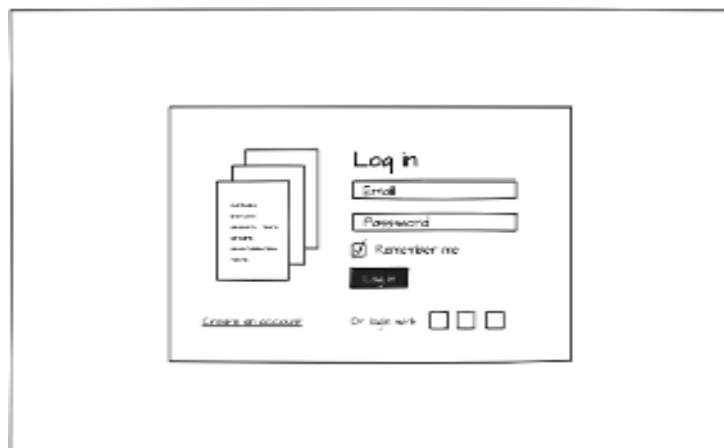


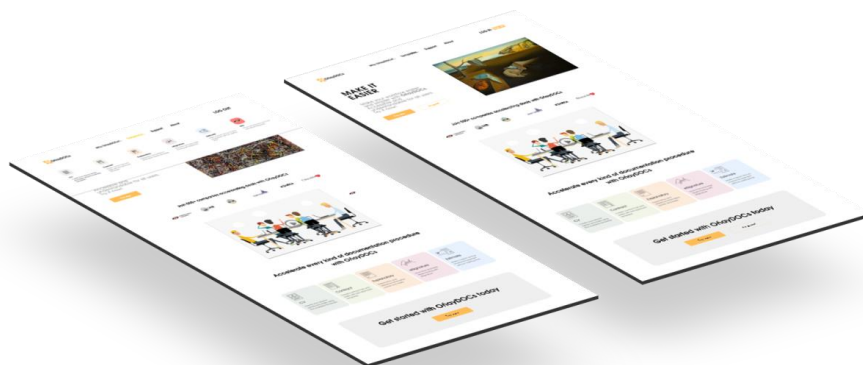
Figure 3: Wireframe of system

Wireframe – A website wireframe, also known as a page outline or screen plan, is a visual guide that represents a website wireframe. The term wireframe is taken from other fields in which a wireframe is used to represent a three-dimensional shape and volume (Fig. 3,4).

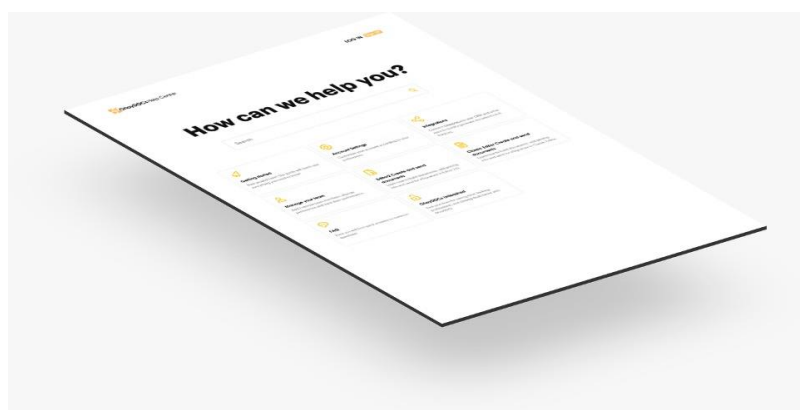


**Figure 4:** Wireframe of system

Mockup – this is a product layout with a design solution placed on it. Using mockup, you can see the product "in action". Mock-up can be both electronic and physical. The electronic version of the layouts is used to demonstrate products (Fig. 5, 6)



**Figure 5:** Mockup of system



**Figure 6:** Mockup of system

When creating a demonstration material, not just a picture is created, but a three-dimensional image, which brings the electronic layout even closer to realism.

As described in the article from Johnny Levanier, “4 techniques for creating mockups” [7], describes 4 techniques for creating layouts for more efficient use. Having made a comparative analysis, it was decided to use a more suitable technique. for use in the project.

All data of each user will be linked to the database of the organization system. On the example of IITU, these are dl.iitu and platonus. It will be possible to log in from the account of both the teacher and the student, Figure 7, 8. Depending on which one or another functionality of the system will be available. In the profile where all the data necessary for full-fledged work in the system is available. For teachers: Department, position, degree, scientific articles, etc. and for students as: course of study, group, Dean's office, disciplines, etc.

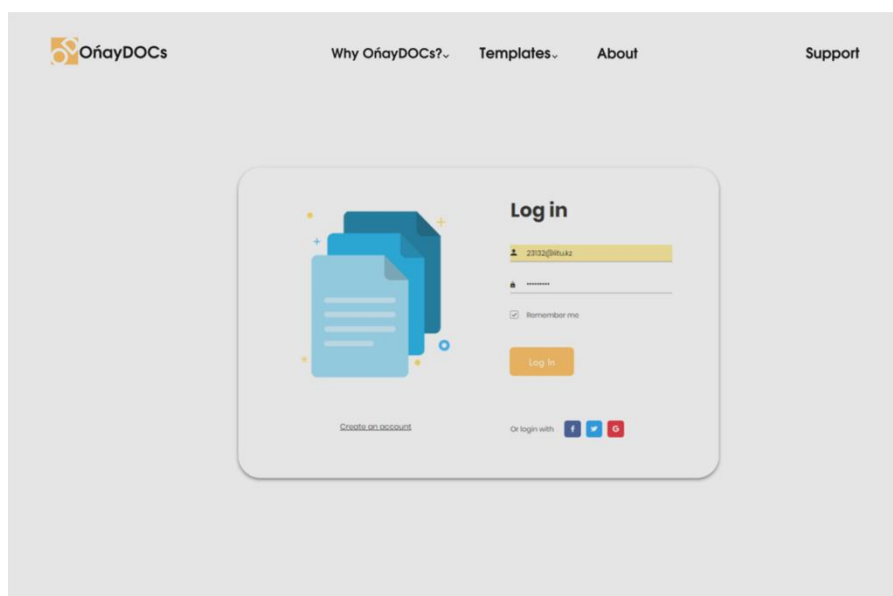


Figure 7: Authorization page

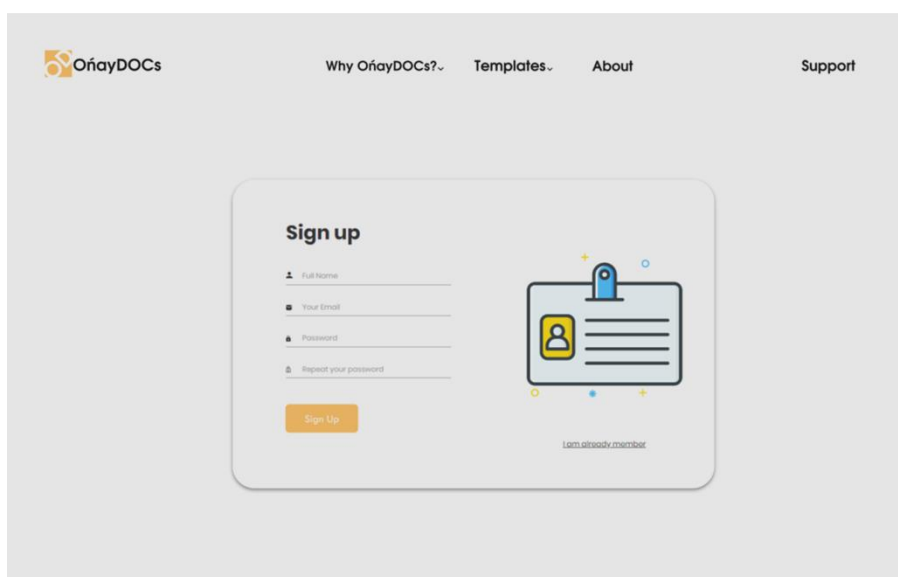


Figure 8: Authorization page

The menu is a specific list of sections of the site, clicking on which the user navigates to them. In other words, this is a list of links to the categories of the site. Figure 9.

The main functionality of the automated system will be available in the main menu. Where the formation and monitoring of personal documentation of teaching staff on the basis of the university

department will be available. Automated and systematized electronic document flow between various departments of organizations (university). Downloading ready-made document templates for each user to facilitate the learning process.

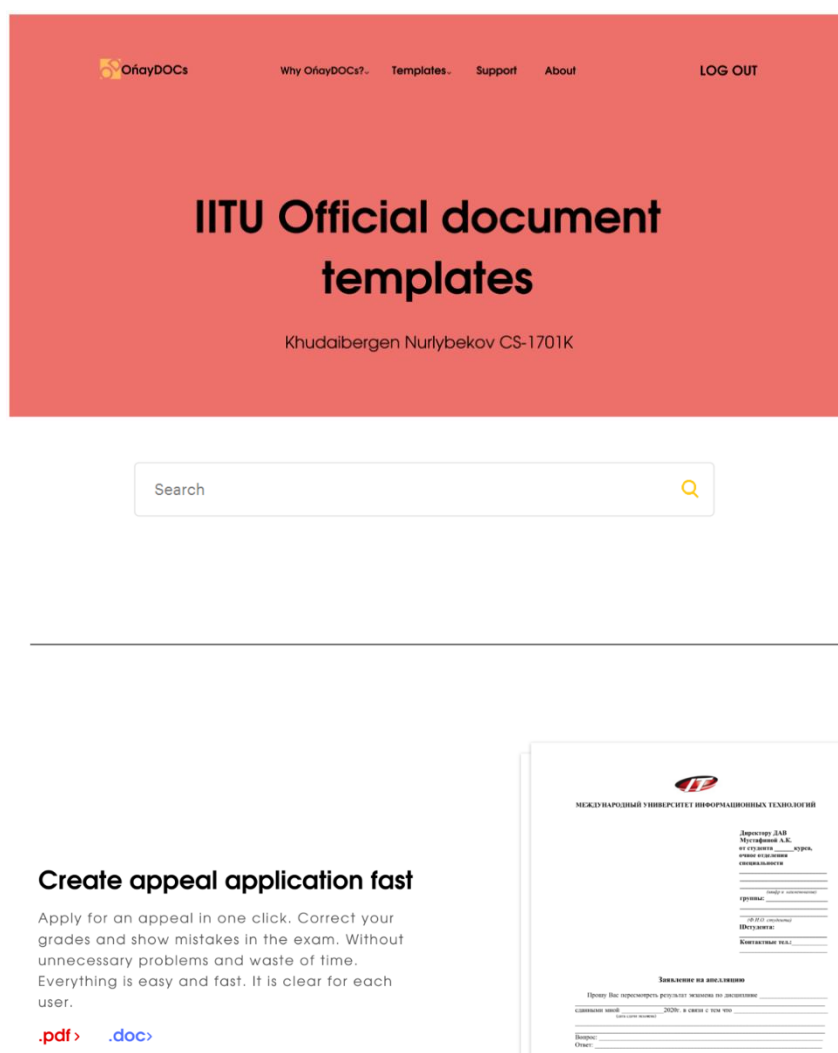


Figure 9: Main page

## 6. Conclusion

Automation of document flow as a direction of office work is a consequence of the growing number of official documentations accompanying the activities of any company. The automation system or electronic document management system (EDMS) provides support for management processes, allows you to automate work with documents. Its objects are not only electronic and paper documents, but also business processes reflected in their movement.

Research of the latest methods in the generation and control of electronic documents and their use in an automated electronic document management system will help to optimize the educational process.

Electronic document management systems in its high-quality execution, using modern methods of processing various data and documentation management algorithms can automate business processes and improve the efficiency of universities.

OrayDOC is an automated system designed for storing and creating electronic documents of the organization, forming and monitoring personal documentation of the teaching staff. The system will help to establish document flow between all departments of the university, speed up the process of

obtaining documents, eliminate problems such as queues of students in front of each department, the need to fill in manually, which will increase efficiency and facilitate the learning process.

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# Research and Improvement of Digitalization of Business Processes in Organizations Using Big Data

Alisher Telman<sup>1</sup>, Zhansaya Kaidarova<sup>1</sup>, Lyazat Naizabayeva<sup>1</sup>, and Aitolkyn Sametova<sup>1</sup>

<sup>1</sup> International University of Information Technologies, Almaty, Kazakhstan

## Abstract

In this article, we have considered the main provisions that reveal the essence of digitalization as an important factor in the development of a modern organization. It is established that the modern period requires constant digital transformations not only at the level of industries but also at the level of business processes of organizations and enterprises, provided that the world annually sees the growth of new digital technologies in economics by 25%.

It is determined that the prerequisites and reasons for digitalization at the organizational level are competitive conditions that force the improvement of the main processes of activity based on constant digital transformation. The main directions of implementing digital transformation of business processes of the organization are defined: as digitalization of business processes; management of large information data banks; digital partnership; introduction of digital innovations; value management.

The article aims to demonstrate the results of the study of the main problems in the digitalization of business processes and the designation of particular areas and their improvement.

As a result of the study, a recommendatory system for adapting an organization to the constant changes in the modern digital economy has been developed, which allows organizations to ensure the growth of labor productivity and reduce costs; improve the quality of planning and business process management; improve the level of customer service through more convenient and perfect products; create a positive image of the organization and ensure a leadership position in its market.

An improved business process management model in the context of digitalization is proposed using the example of the Digital transformation of business processes in the field of Big Data.

## Keywords

Digitalization, Digital Technologies, Big Data, organization, Business processes, improvement

## 1. Introduction

Digitalization at the present stage of development of the world economy is considered one of the latest trends that are rapidly replacing the processes of computerization and informatization [1]. This indicates that digitalization every year will have an increasingly significant significance and impact on the development of the world economy and the economic and social development of all countries, subject to its constant improvement at the level of individual organizations [2].

The modern period is characterized by cardinal digital transformations not only in the social and economic spheres but also by a steady trend in the development of digitalization at the level of the main business processes of organizations and enterprises [3]. Organizations that are not connected to modern digital technologies lag behind in their development.

Global economic crises pose new challenges and lead to greater participation of the state in the economy due to the orientation of state policy to ensure the necessary social protection of the population. A side effect the high activity of the state is the unwillingness of the population and business to take risks and the need to change their behavior as economic agents in the face of modern challenges. Nevertheless, the digital revolution taking place before our eyes leads to the fact that Kazakhstan needs to include digitalization as a state policy in its development plans.

A business process management system's implementation can be challenging because it simultaneously affects several organizational levels and demands time, money, and human resources.

More advanced digital models of business processes create conditions for faster and better development of organizations and the economy. The study of the main problems of digitalization of

business processes and their improvement is the *purpose* of this work.

To achieve the goal, such *tasks* were set as identifying the features of digitalization as technological and economic indicators, determining the conditions for improving business processes in organizations, and highlighting improved business process management models.

And according to the results of the study, *novelty* was revealed in the development of a business process management model in the context of digitalization based on the digital transformation of business processes in the field of Big Data [4].

The subject of the study is the digitalization of business processes in organizations. The following *methods* of general scientific cognition were used in the course of the study: comparison; synthesis and analysis; deduction and induction; logical, historical analyses. Private methods based on the analysis of literary sources with elements of system, comparative and factor analysis were also used.

## 2. Related work

In a changing world, organizations in Kazakhstan face many problems, expressed in low competitiveness arising from the low level of digitalization of existing business processes, compared with organizations operating in more digitized countries of the world (there is an annual increase in the digitalization of the economy by 25% in the world).

As a result of digitization, numerous business and IT coordination strategies have emerged, such as concepts for technology implementation, methods for choosing software, and methods for integrating data and information through information systems. To deal with digitization, businesses must adopt new viewpoints, which enable them to properly align all of their plans, operations, and IT systems.

The *materials* determined earlier studies by other authors, as well as legislative and regulatory acts. Digitalization is usually understood as the previously existing physical (analog) systems for collecting information and processing it with increased technological activity, which detect that signals generate, anticipate, and process information and report these processes to all cases of their activity.

Digitalization refers to the use of innovation technologies to change the business model and provide new opportunities for generating income and creating value. According to experts, UNCTAD, speaking of "digitalization" as a process (digitization or digitalization) in its general sense regarding the economy or a particular society, it should be indicated that it is a transformation of the socio-economic orientation, which was started by the massive introduction and mastery of digital technologies aimed at the creation, processing, exchange, and dissemination of large amounts of information [5]. Many academics from around the world have studied and used a collection of scientific topics called business process management. Since business processes are the foundation of every firm, managing them effectively is crucial in daily operations [6].

Organizations must, however, adjust to changing circumstances as rapidly as possible in order to survive in the market as a result of changes in the global market. One option they have is to alter their corporate procedures [7]. Its appearance is determined by the emergence of new technical digital tools and software solutions and the possibilities of their application both at the state level and at the level of an individual organization.

For many years, business process management has been the subject of research. However, despite not being products or services, business processes are fundamental to all organizations and serve as their foundation. The business processes of the organization are management processes (planning, goal setting, monitoring, budgeting); production processes (design, production, provision of services, installation); supporting processes (procurement, personnel, infrastructure).

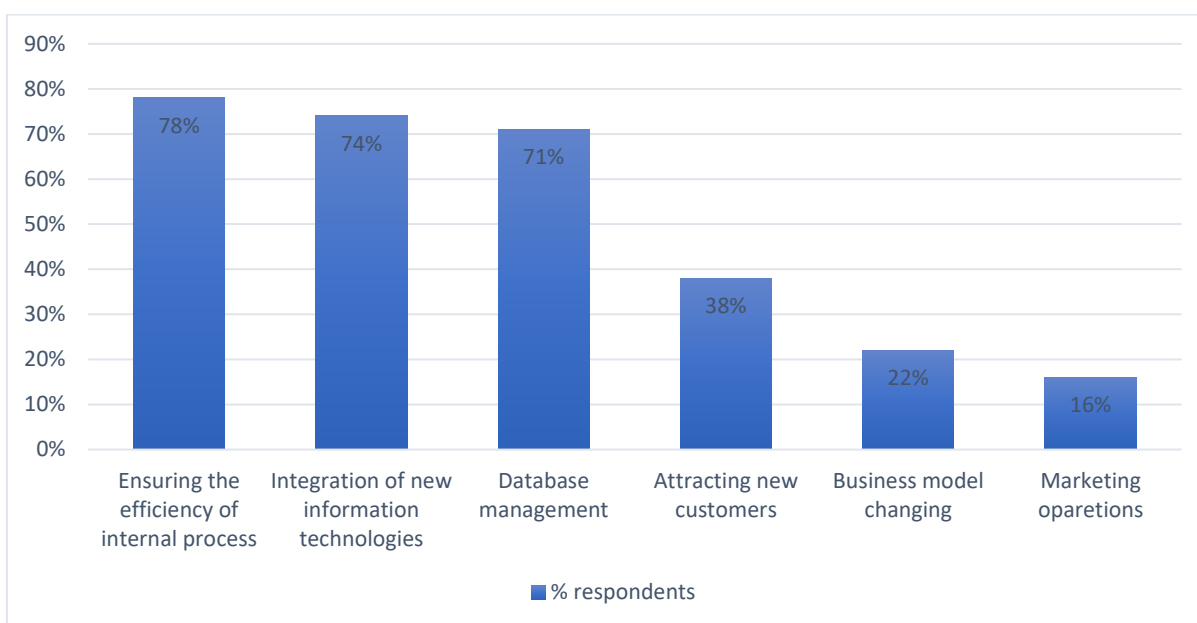
In the context of the development of the digital economy, all the designated processes are subject to digitalization, which allows an enterprise or organization to connect to the digital system of the country and industry and ensures the efficiency of activities in the main areas of activity [8]. Usually, such definitions of the digital economy are based on its virtual part, the digital, computer, and new methods of education, processing, storage, and transmission of information data. In the Republic of Kazakhstan, this concept has not yet been officially defined by law, but it is provided for in the state program "Digital Kazakhstan" as a target.

The prerequisites for digitalization regarding the development of the digital economy in general and



individual organizations, in particular, are usually considered at the state, industry, and enterprise levels. This is due to the fact that to ensure digitalization in an organization, the will of the state is required since it is it that determines the opportunities for its development in the country. This requires the creation of the necessary legal framework and the provision of favorable conditions for the development of the digital economy, and the creation of an opportunity for the implementation of digitalization at the level of an individual organization [9],[10].

The main business processes that need improvement in information technology concerning digitalization shown in Diagram 1.



**Diagram 1:** Rating of business processes in need of improvement

Statistics show how important digitalization is in various industries. It is impossible to cover all industries in one study, so this article applies the results from the point of view of the use of big data in the digitalization process.

As the research showed, the main problem of digitalization of business processes is the problems of integration and building the system work of each department, the lack of functionality in the automation system, which is very important for the operation of the company.

The lack of a step-by-step description of the process leads to the impossibility of implementing the system already at the initial stage.

The solution of system problems of managing the performance of a distributed computing system was proposed by the authors [11].

They investigated the speed and properties of corporate information systems of enterprises and organizations, which are complex organizational and technical complexes. They also built a conceptual management model with the functionality of corporate information system components that support the corporation's business processes. Research is related to a system designed to automatically balance the load of a contributor by analyzing the load of computing nodes and the subsequent migration of virtual machines from loaded nodes to less loaded ones [12].

The system under study improves the performance of cluster nodes and helps speed up timely data processing. The results of a practical experiment on the development and implementation of an iterative MapReduce framework based on Hadoop technology are analyzed and studied [13].

Further, the prediction of information from the data warehouse is manifested in the form of patterns and trends using data mining tools. In this article [14], the authors show methods of data mining and optimization in practical application. The current business market is more complex, surrounded by high risk models.

How the application of new technologies and the introduction of innovations becomes an important

and decisive issue for eliminating the complexity of the decision-making process, the authors describe [15].

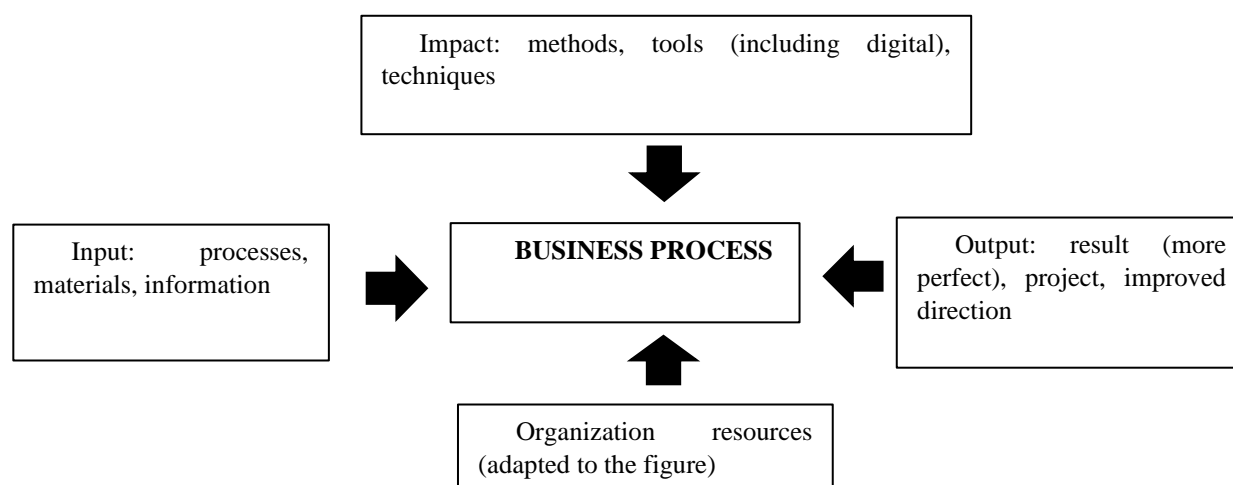
Thus, according to the results of the study, it is possible to identify a number of key problems of automating business processes and offer appropriate recommendations:

- understanding and awareness on the part of management of the need to ensure the improvement of the main processes of activity (production and economic);
- adaptation to the new conditions of the current business model in terms of the use of information and communication technologies based on digital transformation as the only way that will improve the efficiency of the enterprise and its corporate culture;
- understanding of the obligation to conduct all business processes in electronic form.

To conduct all or the main business processes in the business activities of an organization in digital or electronic form, the following conditions are required:

- a high level of automation of all business processes;
- availability of automated systems to carry out digitalization on their basis;
- the availability of electronic storage and the use of a large database of reliable data;
- the availability of reliable and up-to-date information and the availability of modern technologies for their receipt, processing and transfer;
- the use of a single platform for Internet marketing, service and sales to ensure time savings and compatibility of all business processes;
- access to high-speed Internet;
- application of innovative IT (information technologies);
- the presence of their social networks.

In modern conditions, in terms of improving the organization's business processes, their constant modeling is used, which includes the following elements: input; exit; resources; forms of exposure according to the marking scheme shown in Figure 1.



**Figure 1:** Modeling of an organization's business process

To ensure the effectiveness of business process management, organizations in modern conditions use materials and information as input, and all advanced digital technologies act as a means of influence, which allow creating a more rational digital management model at the output, provided that internal resources are ready for this.

When developing a flowchart using digital tools that greatly simplify all the indicated procedures and make them more efficient and in line with modern industry development trends, it should be borne in mind that the use of modern digital technologies provides organizations with unlimited opportunities to improve business processes using special systems, which at the same time constantly, without delay change and improve them [16].

When modeling business processes, digital tools contribute to the growth of process efficiency. The

main digital tools to improve the efficiency of an organization's business processes in digitalization are usually presented in the form of various kinds of software aimed at information support and security, changing the mission and forming a more progressive vision, managing knowledge and supply chains.

To implement the digital transformation of the organization's business processes, the following perfect areas of development are proposed:

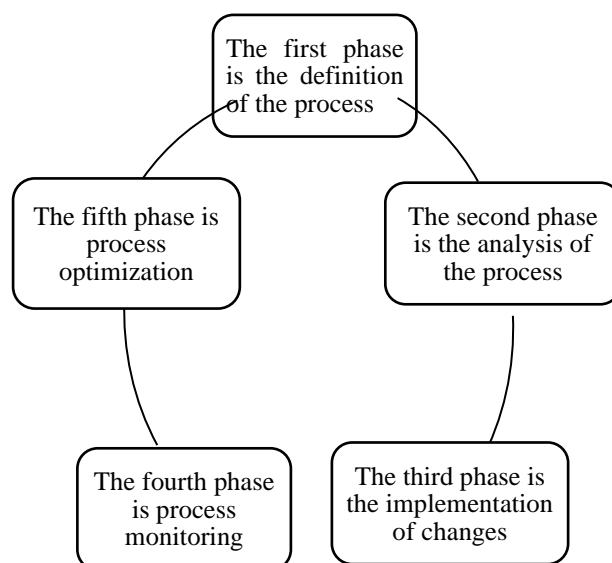
- digitalization of business processes, based on the transition of the organization's activities to electronic platforms (allows you to reduce the number of production steps for the implementation of a specific task, replacing the activities of the organization's personnel with software solutions);
- management of big information data (Big Data, Data Science, Data Analytics technologies) using neural networks and other technologies with the participation of artificial intelligence (allows you to create customer behavior models based on a forecast of preferences and demand for product and service adaptation to customer needs);
- customer-centricity - based on building a business model while focusing on the needs of the client and his values;
- digital partnership - the creation of a model according to which the organization is engaged in digitalization and solving the set business tasks together with its partners in the scope of a common digital complex (technologies, network, telecommunications and computing capacities);
- implementation of digital innovations - based on the constant study of new digital business models and their testing in the scope of their products and business solutions;
- value management is a digital strategy for adapting and personalizing the organization's products, taking into account the constant transformation of user requirements for them (the main values for customers remain in the context of digitalization: ease of use, a wide range of required services, continuous product improvement and convenient and changing service) [17].

To implement more advanced Big Data technologies, any company must propose a model for using Big Data in personnel management to manage the client base. The company also needs to determine the specific task of its business, which will be based on Big Data technologies, since this task should become the main indicator for determining the correctness of the chosen development concept in digitalization. When improving, the organization's team will have to focus on collecting and analyzing data related to the task. Concept development and proof-of-concept need to use various processes, tools, and management practices that will enable informed decision-making in the future. The value of Big Data technologies lies in insight (sudden understanding, insight, insight into the essence of information, “grasping” and the structure of a problem situation and relationships).

Business process management should be in line with the organization's overarching strategy. A close relationship between organizational priorities and corporate processes is referred to as strategic coordination (or synchronization), and it guarantees ongoing and efficient company efficiency improvements. The design, implementation, management, and measurement of processes should be done in accordance with strategic priorities and particular strategic conditions. Specific technology capabilities can provide chances to guide strategy formulation, which results in process-enabled strategies. For instance, a competitive advantage in terms of time to complete or change a process.

### **3. Results of research**

The study showed that digital improvement of business processes is carried out most often in e-commerce, IT technologies, and the financial industry. It is increasingly being used in industry and other social and economic sectors. Features of modeling business processes in current conditions made it possible to establish a general cycle for managing organizations' business processes, which is subject to digitalization. This process consists of the following phases, indicated in Figure 2.



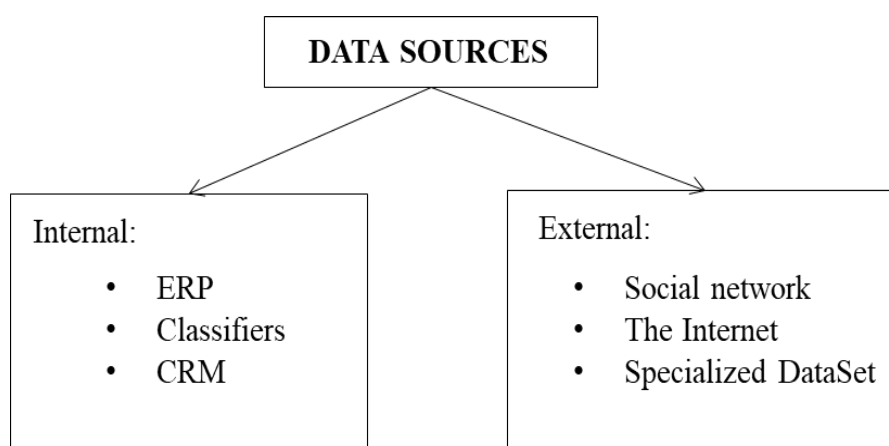
**Figure 2:** The process of managing business processes in the context of digitalization

In the first phase, the simulation is performed in the initial state (the first is "as is") and in the desired state (the second is "as it should be"). In the second phase, simulations are carried out from different options, and optimal methods are established to improve business processes. The third stage is the implementation of the best changes in the business process. The fourth stage monitors the business process according to individual indicators. In the fifth phase, the actual results obtained in the course of changing the business process are compared with the model and the desired model. Then the next cycle should begin, aiming to improve individual elements or processes.

To work with continuous collection and storage of large amounts of data, it is essential to find exciting relationships in a large number of transaction records for many business decisions and forecasting processes, such as catalog development, cross-marketing, and customer analysis [18].

The research found that it is possible to introduce more advanced information technologies for business processes in the digital technologies available at enterprises. For this, Big Data technology was used.

When working with big data, the result is obtained in the process of cleaning them through sequential modeling: first, a hypothesis is put forward, a statistical, visual, or semantic model is built, and the correctness of the put forward hypothesis is checked on its basis. Data can be obtained from internal or external sources (Figure 3).



**Figure 3:** Types of data sources

Figure 3 proposes a data sorting model for use in business process improvement.

Technologies related to big data mainly include data warehouses, data marts, NoSQL and in-memory databases, Hadoop, and MapReduce frameworks. As recognized by all serious research, Big Data is an opportunity more than a problem [19].

NoSQL provides a number of approaches that are aimed at implementing large databases for collecting, processing, and storing information on social networks on the Internet; MapReduce - is designed for the distribution of calculations; the Hadoop model allows you to use the implementation of contextual and search mechanisms for sites that are highly loaded (Amazon, Facebook, eBay); SAP HANA model, which gives high speed for searching and processing requests and reduces the cost of service support for analytical systems.

At the same time, the cost of implementing such technologies, according to an Accenture survey, in more than 50% of companies using Big Data technologies, ranges from 21% to 30% of the total costs.

The effect of the implementation is confirmed by the results of the Economist Intelligence Unit survey, as there is a positive effect from the implementation of Big Data:

- 46% of companies note that with the help of Big Data technologies, they were able to improve customer service by 10% or more;
- 41% improved customer response;
- 36% note an increase in the efficiency of processing information on user questions,
- 33% of companies were able to optimize stocks, note the productivity of key assets,
- 32% of companies were able to improve planning processes;
- 31% - improving the company's planning processes;
- 28% - optimization of service costs;
- 28% - improved interaction with customers [20].

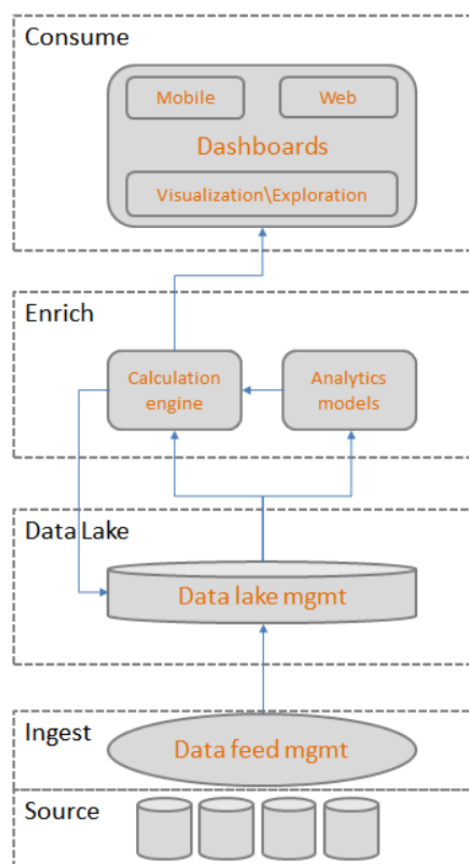


Figure 4: Data sorting model in Big Data

In this model, shown in Figure 4, the data is processed as follows: the selected data from the source is fed to the Data feed, after which it goes to the Data lake in a raw format, then the raw data goes to enrich, where it is combined with similar data points in a larger database, after which the processed data that has passed all the stages of cleaning is ready for use.

To determine the final performance indicators from the transformation of the Big Data model or other digital technology, an assessment of key performance indicators from its implementation is carried out according to the following final indicators, in points: achieving the goals of all levels, elements, and processes; growth rates of output; labor productivity growth rates; increase in profitability of production; reduction in the cost of working capital; reducing the cycle time for order fulfillment (other researchers actively use the technique).

The article assesses the effectiveness of business process management on the example of Kcell JSC from the introduction of a more advanced Big Data model according to the following regulatory indicators (indicated in the Analytical Review of the Big Data Market [20] according to this industry (see Table 1)).

**Table 1**  
 Indicators of the effectiveness of enterprise business process management

Indicator	Result	Standard
Increase in sales volume	from 5 to 15%	from 5 to 15%
Reduction of order execution time	up to 35%	up to 35%
Reduced storage and relocation costs (from the current level)	10-25%	10-25%
Reducing environmental and safety risks	up to 50%	up to 50%
Reduction of planning time	up to 10%	up to 10%

Indicators of Kcell JSC correspond to the standards: sales volumes correspond to the norm; the terms of order fulfillment were reduced by 2 times and they began to respond to consumer demand 2 times faster; all processes for storage and movement are optimized up to 20%, the reduction of environmental and safety risks in the performance of all operations is included in the company's development strategy by no more than 30%, otherwise it will be unattainable.

When introducing new technologies, for employees to correctly understand their new tasks, the organization needs to develop and describe all business processes, set new goals, form and bring a new strategy to achieve goals, plan the main tasks, and set them for employees. It is necessary to bring to the employees' attention the tasks that are divided into understandable blocks, in the required digital form, which will ensure control over the passage and perception of information and allow more efficient work with the client base. Digitization provides a solution to organizational problems, allowing business owners to gain more control over their business operations. Processes that require a large amount of paper can mean more time, effort and money that could be better used elsewhere, as well as an increased risk of accidental loss or destruction of records. The transition to digital technology can also have a positive impact on the environment by reducing the use of paper.

Thanks to the introduction of digital technologies, work processes are becoming more orderly, and human errors are becoming fewer. All operations are performed more efficiently thanks to these optimized workflows, which allow enterprises to reduce operating costs.

We also note similar approaches to managing business processes in the context of digitalization in the works of the authors, who note that at the organization level, it is necessary to constantly update technologies and customer requests.

## 4. Conclusion

The industrial Internet of Things is shaping the future of manufacturing industries, using the possibilities of flexible and smart production, and provides revolutionary productivity growth. Artificial intelligence is being introduced, among other things, in conservative industries such as financial

services and medicine. 3D printing technology is already contributing to the transformation of such industries as aviation, logistics, biomedicine and the automotive industry. The chain block has all the prerequisites to make a global transformation of the monetary system.

Global changes and digitalization have affected many countries, including Kazakhstan. Therefore, the development of digital competencies of the population, especially in the regions, is one of the main tasks of the socio-economic development of the country. Rational and innovative application of digital skills will contribute to the acceleration of digitalization, the creation of a single digital space and the transition to Industry 4.0.

During the following tasks was set: to reveal the features of digitalization as a technological and economic indicator; identify conditions for improving business processes in organizations; highlight the business processes management model.

Features of digitalization of business processes of organizations allow companies to: ensure the growth of labor productivity and reduce costs; improve the quality of planning and business process management; improve the level of customer service through more convenient and perfect products; create a positive image of the organization and ensure a leadership position in its market. Using the example of Kcell JSC, after the introduction of digitalization into business processes, the indicators of Kcell JSC corresponded to the following standards: sales volumes began to correspond to the norm; order execution times were reduced by two times and began to respond to consumer demand two times faster; all storage and handling processes have been optimized by up to 20%, environmental and safety risks have been reduced in the performance of all operations - no more than 30% is included in the company's development strategy. Otherwise, it will be unattainable.

To create sustainable and updated business models of organizations that in modern conditions can carry out more efficient activities and adapt to constant changes, the modern digital economy offers the following conditions for improving business processes in organizations: developing business promotion strategies based on an integrated Internet marketing; introduction of mobile applications that can be included in various electronic platforms; implementation of new CRM-systems that allow you to interact with customers and constantly manage content. At the same time, it is important not to copy other enterprises but to take into account their capabilities and customer needs.

A model (Figure 4) for managing business processes using Big Data was established during the study. The effectiveness of the proposed management model is shown in Table 1. According to an Accenture survey, the cost of implementing such technologies ranges from 21% to 30% of total costs. The effect of implementation is confirmed by the results of the Economist Intelligence Unit survey: 46% of companies note that with the help of Big Data technologies, they were able to improve customer service by 10% or more; 41% improved customer response; 36% note an increase in the efficiency of processing information on user questions, 33% of companies were able to optimize stocks, note the productivity of key assets, 32% of companies were able to improve planning processes; 31% - improving the company's planning processes; 28% - optimization of service costs; 28% - improved interaction with customers. As research has shown, big data marketing boosts profits and goes a long way in understanding potential value, predicting future trends, and developing new customer groups.

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# Development of Digital Tools to Ensure Remote Business Management During Lockdowns

Laura Alimzhanova<sup>1</sup>, Nailya Kurbanova<sup>2</sup>, and Rustem Malybayev<sup>1</sup>

<sup>1</sup> International Information Technology University, Almaty, Kazakhstan

<sup>2</sup> Al-Farabi Kazakh National University, Almaty, Kazakhstan

## Abstract

In connection with the onset of the COVID-19 pandemic, economic, financial, and social spheres have suffered. The unpreparedness of educational institutions, enterprises, companies to transfer processes to a remote work format was revealed. The world economy has been hit, according to experts, the growth of the global loss of GDP could reach 9 trillion. dollars. The positive effect of the pandemic was a decrease in emissions, an increase in the air quality index. The forced transition to a remote work format gave an opportunity and a new impetus to the development of remote tools to ensure contact and communication within the company. At an active pace, work is underway to add innovations to tools for remote work. The pandemic period has shown how important digitalization is for humanity, the introduction of work automation in possible areas, as well as the availability of qualified personnel in all areas. However, there are areas that were less affected by the onset of the pandemic, such as horticulture, traditional industry, construction, and agriculture. The COVID-19 pandemic has become the main reason for the introduction of digitalization in many companies that have not previously experienced this process. Companies providing services for transferring the company's business processes to a remote work format began to appear rapidly. Products and services appeared on the world stage, which became available on the online platform, with the goal of ensuring the non-proliferation of coronavirus infection at that time and maintaining the health of the population. Also, products and services on online platforms have become relevant due to ease of use, time savings, and speed of application processing.

## Keywords

Pandemic, remote work, workflow management systems, digitalization, digital literacy, GDP

## Research methods

Pan comparative analysis, statistical analysis, observation, experiment, deduction, testing

## 1. Introduction

The pandemic caused by the COVID-19 coronavirus has offered a significant impetus for the development of solutions that make it possible for employees of companies to do their jobs either from their homes or from another place. During the pandemic, it became urgently necessary for firms to begin the process of transforming their business operations to a model that allowed for remote work; nevertheless, industrial enterprises were less affected by these changes than other kinds of organizations. It was determined that global companies lacked the resources necessary to transform their business processes into a format that could be carried out electronically.

As it has become abundantly evident that the COVID-19 coronavirus pandemic is one of the most critical crises taking place on a global scale, a vast amount of resources have been assembled in order to combat it. One of the most critical sociological and economic concerns that the whole world has been working together to overcome is the pandemic. This historical period illustrated how companies and educational institutions were not prepared for what is referred to as "digitalization", and as a direct result of this lack of preparedness, the process of digitalization itself began to proceed at a rapid speed.

## 2. A positive aspect of the impact of COVID-19. Impact of the COVID-19 pandemic on air quality

The COVID-19 pandemic was unquestionably a global issue for humanity, yet it had a positive impact on the results of air pollution in locations with a high population density. As a direct result of the epidemic, the air pollution index was relatively low, despite the fact that the quality of the air in many locations was subpar. One of the unintended consequences of the strategy that was developed to slow the progression of the virus was that it caused the suspension of operations at governmental institutions, commercial firms, enterprises, and factories, the latter of which were the primary objectives for contributing to a decline in air quality. Other unintended consequences included the following: The evidence that the air quality index has, in point of fact, grown can be found in the data with the results of measurements of the air quality that were conducted in a number of countries throughout the time period that spans from 2019 to 2020 [1].

The following information pertains to the years 2019 and 2020. According to Figure 1, there were 62 locations in Europe in 2019 that had the greatest amount of pollution as assessed by the quantity of nitrogen dioxide on the maximum scale. This was the case when comparing these locations to the global average. However, by the year 2020, there would be a reduction to 23 of the locations that had the highest levels of nitrogen dioxide in the air [2].

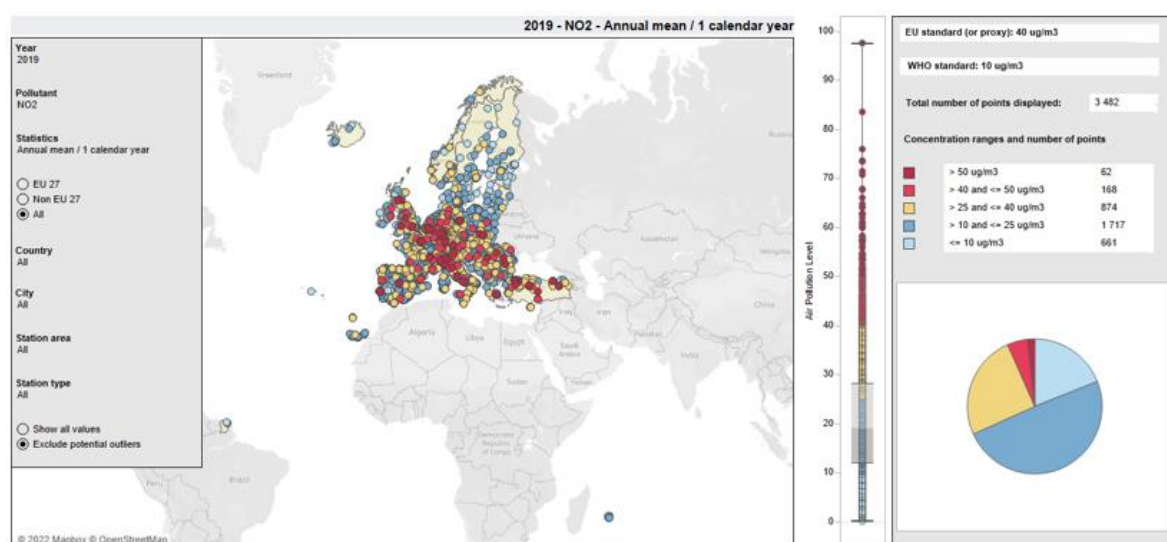


Figure 1 : Air quality statistics on the main parameter of air pollutant - nitrogen dioxide for 2019

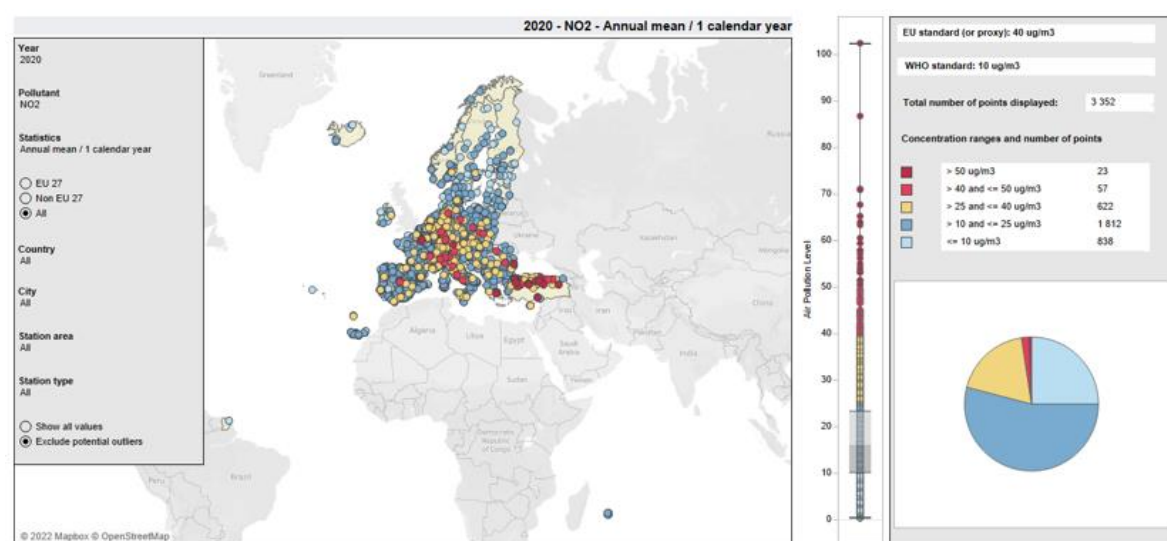


Figure 2 : Air quality statistics on the main parameter of air pollutant - nitrogen dioxide for 2020

### **3. Impact of the pandemic on the world**

The lockdown caused a significant reduction in the amount of information that the students were able to get throughout the period of the lockdown. During the lockdown, there were significant challenges with the process of information transmission since there had been no preparation to develop a system for the administration of remote schooling. In order for staff members of educational institutions, children, and students to connect to remote courses, there were challenges with the availability of required organizational equipment. Traffic was also an issue. As a consequence of the fact that it was not intended to provide students with the appropriate resources, the transition from the traditional form of education to the more recent form of education known as distance education meant that many students would no longer be receiving information, also known as studying. This was a consequence of the fact that the traditional form of education was not intended to provide students with the appropriate resources. There was a time period during the pandemic in which there was a situation in which there was a rise in the number of individuals who were illiterate, as well as a degradation; the cause for this was also the unequal possibilities for children to study while the school was on lockdown. In addition, there were educational institutions that, although having the ability to supply the essential hardware, were unable to additionally give instruction in the principles of digital literacy. Students would be able to manage this with ease and be able to completely immerse themselves in the process of obtaining information via remote learning provided the required organizational equipment was made accessible to them. In order for students to be able to learn new information, they required not only a connection to a high-speed Internet service but also organizational technology, a classroom atmosphere that was quiet and conducive to the acquisition of knowledge, a foundation in digital literacy, and the preparedness of the teaching staff. The United Nations claimed that one out of every five children throughout the world did not participate in any type of formal schooling prior to the start of the coronavirus pandemic [3].

However, at that time, the most essential goal for many countries was to prevent the spread of the coronavirus infection and save as many lives as possible. The pandemic's impacts were felt over a large number of geographic areas [4].

Not only did the area of education suffer major harm throughout the duration of the pandemic, but the economy on a global scale suffered as well. As a direct consequence of COVID-19, there has been a substantial increase of debt, notably in poor countries and industrialized nations. Economic performance following the shocks of the 2008-2009 global crisis and 2018-2015 market price developments indicated that the economic and cyclical growth trajectories that had characterized most countries in the region had begun to decline even before the pandemic: gross domestic product growth slowed down, productivity growth has declined, inequality has worsened, and convergence with OECD and EU countries has dragged on convergence with countries in the OECD and EU has dragged on. The process of convergence with nations that are members of the OECD and EU has been stretched out [5].

As a consequence of structural shortcomings pertaining to the capacities of both the public and private sectors, the countries of Central Asia are particularly sensitive to the economic and health challenges that affect the globe as a whole. The possibility of an economic comeback in the countries that make up Central Asia will be directly proportional to the ability of national governments within those countries to capitalize on the ongoing economic downturn and bring about more structural adjustments [6].

Germany was one of the first EU nations to suffer the detrimental impacts of the corona virus infection. This may be attributed to the fact that the country has an open economy, which is related with the import and export of services and products. This occurred because Germany was one of the nations that was afflicted with the virus, which was the cause of this situation. Unfortunately, the measures that the government has taken to stop the spread of the coronavirus have had a severe effect on the economy. The difficulties that have arisen as a result of the disruptions that have taken place in the global industrial value chain have resulted in a number of businesses suffering from setbacks in their manufacturing operations. In order to halt production, measures were taken to cut down on the amount of hours that employees were expected to put in each week [7].

However, the lessons that were learnt from this experience were the incentive for building a plan for ongoing action that takes into account the circumstances that presently exist. The coronavirus did not evade Russia either, and the pandemic generated considerable disruptions in the labor market. The findings of COVID-19 have shown that there is a shortage of properly educated professionals working in the fields of information technology and medicine. The salaries of medical experts have recently grown in response to the present labor shortage in the healthcare industry [8].

According to the findings of the study, companies that had already been making extensive use of digital technologies in their operations prior to the pandemic were able to easily transition to a remote work format during the pandemic. This was the case despite the fact that many people were unable to leave their homes as a result of the pandemic. On the other hand, the change was fraught with considerable challenges for companies that had not yet computerized their business procedures. Companies were in demand to automate the business processes of companies, transfer existing processes to a remote format, support workplaces, and conduct training courses for employees in connection with the active work that was being done to transfer work processes to a remote format. This work was being done in conjunction with the active work that was being done to transfer work processes to a remote format. In addition, efforts were being made to migrate working procedures to a format that could be carried out remotely. The lack of fundamental digital literacy was a big barrier, as was the unreadiness of the personnel, the absence of essential equipment, and the absence of an integrated system for the conversion of business operations to a remote format. Additionally, there was no required equipment [9].

The findings of a study that was carried out by the International Monetary Fund (IMF) suggest that the entire loss of global GDP at the period of contact with the coronavirus sickness might be as high as 9 trillion dollars. The market system that is supposed to determine the equilibrium between supply and demand did not perform up to its expectations, which is another reason why there were consistent and rapid shifts in the price of oil throughout the world. These shifts were caused by a combination of factors, including supply and demand. The current situation is in no way analogous to anything that has ever taken place in the past, as has been determined by experts from all across the globe. The outbreak has brought to light how acute the current systemic crisis is, especially in terms of how it affects international politics and money in general [10].

Many of the most successful companies in the world, such as UniCredit, Twitter, Apple, Nestlé, Microsoft, Hitachi, Facebook, Ericsson, LG, Chevron, Oracle, and Amazon, have been making efforts to transition their employees to working from home in order to prevent the spread of the Covid-19 virus. These efforts are being made in an effort to combat the spread of the virus. As a result of the fact that individuals were mandated to remain in quarantine throughout the duration of the epidemic, the total number of moviegoers around the world has increased by 18% over the course of the last few years, and the number of people who have subscriptions to Netflix has increased by 47% during this time period [11].

#### **4. The impact of the COVID-19 pandemic on the development of platforms for remote forms of work**

Microsoft has realized as a result of COVID-19 that employees would need to make the transition to working from home. This conclusion came about as a result of the virus. Microsoft acted quickly to put in place procedures to guarantee that its 166,000 staff had a smooth transition, and they moved quickly to implement these steps. They projected, in addition, that the number of individuals using Microsoft software and hardware would grow. As part of its Zero Trust initiative, Microsoft has begun using a technique known as split tunneling. Migration of employee workloads from a company's virtual private network (VPN) to the cloud may be accomplished with the help of this technology. Users were able to unload VPNs by using split tunneling, which also provided employees with other options for safeguarding workflows and allowed access to important apps using Microsoft over the internet. Users were able to do all of this without having to worry about compromising security.

The usage of split tunneling served as an effective substitute for conventional VPNs. At the moment, Microsoft has a list of opportunities that are available to employees working for both large and small

firms, as well as employees working for organizations that are just getting started. When it comes to linking a corporate subscription, the management of the firm has the ability to join whatever number of accounts they see fit. Additionally, the management of the organization has the ability to form groups, regulate the provisioning of access, and apply limits on connecting other services. This firm provides a comprehensive array of product features, none of which are comparable to anything else available on the digital market.

Microsoft revealed in June 2020 that Microsoft Teams has more than 200 million daily users, 200 million daily meeting participants, and 4.1 billion daily meeting minutes. This information was shared through an announcement issued by Microsoft. All of these things led to an overall rise in cloud traffic, which Microsoft maintained was the consequence of more people using Microsoft Teams. All of these things contributed to an overall increase in cloud traffic [12].

Zoom Video Communications, Inc. (Zoom), a company based in the United States, has made it easier for both its employees and its customers to make the transition to working from a remote location. Zoom now offers a comprehensive set of capabilities for controlling technology, giving you the tools you need to ensure that your users are comfortable as well as productive. In addition to the option of logging in with a single sign-on (SSO), which is both easy and secure for groups that are working together, the organization also provides the potential of adding a connected domain. Integration with a variety of different technologies, such as Skype, Cisco, and Polycom, is available in addition to a large number of newly added functionalities for consumers. Users are able to avoid switching between programs thanks to this connection, which saves customers a substantial amount of time.

The following are additional features: the company has brought to the market a solution that excels as a workflow management tool, not only for the more traditional form of work, but also for the format of work that is carried out remotely. This solution serves both the more traditional form of work as well as the format of work that is carried out remotely. Since the advent of the coronavirus, the protection of sensitive data has quickly become one of the most urgent issues. In response to this difficulty, Zoom Video Communications has implemented a data security system that safeguards sensitive information using 256-bit AES-GCM encryption technology. This technology is enabled in every meeting for all kinds of users, including paid users and free users. Those who pay for the service may access it. The company has made it possible to access security settings, options for encrypting meetings, support for two-factor authentication, and end-to-end encryption, but meeting participants are often the only ones who can make use of these features [13].

As a direct consequence of the COVID-19 pandemic, many executives in charge of business operations have discovered that it is difficult to fast migrate their employees to remote work. To this day, "remote work" is the only strategy that has proven to be effective in preventing the interruption of work operations for an undetermined amount of time while also protecting the health of the entire team. This is because "remote work" allows employees to continue working from their homes. On the other hand, not everyone is aware of how to carry out this sort of job in a way that is quick, efficient, safe, and, most importantly, effective. The employees of this organization encounter a range of good and bad aspects over the course of their job. There are several advantages to working from home, some of which are listed below:

If a user has freedom of access, it indicates that they may do their job duties almost anywhere, so long as the prerequisites are satisfied. These prerequisites may include having access to a reliable internet connection and a location that is conducive to productive work. Those who are employed by companies that let them to keep their employment even while they are pursuing further education are in a position to continue their education without interfering with either their jobs or their studies.

The following is a list of some of the disadvantages that come along with working from home: when there is a breakdown in communication between employees, it is difficult to exert direct control over the process of completing work assignments and much more challenging to evaluate the results of these efforts.

A strong technical basis is essential for the effective implementation of a workflow management system. Employees need to be willing to make adjustments to their daily work habits in order for the company to be able to support telecommuting. The following five platforms are now regarded to be the most effective and frequently utilized by enterprises in order to organize personnel that work remotely. These platforms are as follows: There are many other solutions available, including Zoom, Microsoft

Teams, Slack, Jira, and Bitrix24.

The authors of this article (Laura Alimzhanova, Nailya Kurbanova, Rustem Malybaev) conducted a study of a wide range of resources, as a result of which the tables presented below in this section of the article, Table 1 and Table 2, were created.

**Table 1**

Analysis of the technical characteristics of the workflow management system

Name	Zoom	MS Teams	Slack	Jira	Bitrix24
Website address	<a href="https://zoom.us/">https://zoom.us/</a>	<a href="https://www.microsoft.com/en-us/microsoft-teams/group-chat-software">https://www.microsoft.com/en-us/microsoft-teams/group-chat-software</a>	<a href="https://slack.com/in/tl/ru-kz/">https://slack.com/in/tl/ru-kz/</a>	<a href="https://www.atlassian.com/ru/software/jira">https://www.atlassian.com/ru/software/jira</a>	<a href="https://www.bitrix24.kz/">https://www.bitrix24.kz/</a>
Site loading speed	1,8 s	2,5 s	1,8 s	1,9 s	1,9 s
Responsible	Zoom Video Communications	Microsoft Corp.	Slack Technologies, Salesforce	Atlassian	«1С-Битрикс»
Developer	2011	2016	2016	2002	2012
Page size(KB)	99.03	139.01	97.15	141.39	4224.93
Website score	63/100	93/100	85/100	31/100	48/100
website traffic	2 059 950 000	1 015 550 000	128 470 000	24 960 000	76 707
website views	5 969 450 000	4 161 580 000	833 060 000	86 570 000	306 817
Devices Supported	Windows, Android, ios	Android, iPhone/iPad, Web-based	Android, iPhone/iPad, Web-based	Android, iPhone/iPad, Web-based	Android, iPhone/iPad, Web-based
Support	Email, Phone, Live Support, Tickets	Email, Phone, Live Support, Tickets	Online, Chat, Business Hours	Email, Phone, Live Support, Tickets	Knowledge Base, 24/7 (Live rep), Phone Support, Email/Help Desk, Chat

**Table 2**

Analysis of functional characteristics

Name	Zoom	MS Teams	Slack	Jira	Bitrix24
Sign Up	+ /-	+	+	+	+
My profile	+	+	+	+	+
About company	+	+	+	+	+
Multi languages	+	+	+	+	+
Pricing Model	Free Monthly payment, Annual Subscription, Quote-based	Free Monthly payment, Annual Subscription, Quote-based	Free Monthly payment, Annual Subscription, Quote-based	Free Monthly payment, Annual Subscription, Quote-based	Free Monthly payment, Annual Subscription, Quote-based

Free Trial	+	+	+	+	+
search function	-	+	+	+	+
Mobile application	+	+	+	+	-
Search user of your company	-	+	+	+	+

Following the completion of a study that compared several platforms, it was discovered that each one of the ones that are included in these tables has an attractive layout, in addition to being user-friendly, thorough, and comprehensive, in addition to having a well-structured layout. In addition, one of the sites is offered totally devoid of any financial obligations. It was found that Zoom was the platform that had the biggest quantity of potential users interested in using it. According to the available statistics, the platform that has seen the most amount of use is Zoom, while Microsoft Teams comes in second place [14].

Because of how simple it is to use, Zoom is now being employed in more than one hundred unique languages all around the world. This is due to the fact that Zoom is so user-friendly. This is the single most important factor that multi-national firms that have employees hailing from a variety of countries need to take into account when making a decision on which global platform to use. In addition to this, the cost of using Zoom is reasonable, and if you so want, you are free to make use of the platform without paying anything at all. If this is something that interests you, you can access it here. Access to a security system that features AES-GCM 256-bit encryption technology is one of the numerous benefits that are made available by the platform. This is only one of the many advantages. This is only one of the numerous benefits that may be gained by using the platform. If one so wishes, they are able to make adjustments to the settings of the security system. However, the usage of the free edition of Zoom is not suggested for use by big enterprises. This is due to the fact that the use of the free version does not give any options for connecting internal workers to one another inside the firm. When you link premium plans, further options for broad use will become available. However, every program features a trial period during which it is possible to use the program at no cost [15].

During the development phase of the Slack platform, Slack was designed to replace corporate e-mail as well as Skype and other instant messengers that are used by businesses to facilitate communication between workers. Slack was also designed to take the place of Slack itself, which was designed to take the place of Slack. This was done in order to make Slack a one-stop shop for all of these communication requirements, and it was successful in doing so. The ability of the messenger to integrate with other services, such as Google Drive, MailChimp, Google Docs, Twitter, Trello, Google Hangouts, DropBox, and GitHub, is an additional benefit of using the messenger. Other services include Google Hangouts. These are just some of the services that may be improved by using this link. There are likely many more [16].

Even at the height of the COVID-19 outbreak, progress was being made at a rapid pace on each of the platforms that were being considered, and each of those platforms had its own unique set of characteristics and functions. Even during the height of the outbreak, progress was being made on each of the platforms that were being considered. There is a mobile version that can be utilized on each of the four major platforms that have been mentioned up to this point in the conversation. As a result of the appearance of the Covid-19 outbreak, the developers of these systems have made significant efforts to overhaul the platforms in order to guarantee security, usability, accessibility, and ease of finding. In addition, they have adapted the systems so that they can better accommodate new circumstances. In order to fulfill these requirements, this was carried out.

The COVID-19 coronavirus pandemic was the primary driver behind the rapid development of technologies that enable employees of companies to perform their jobs remotely, the rapid expansion of the digitalization process, and the rise in the level of digital literacy among members of the general public.

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