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INTEGRATED INFORMATION SYSTEMS IN INDUSTRIAL ENTERPRISES AND BUSINESS ACTIVITIES

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ABSTRACT

This article presents the views of industry scholars on the concept of information systems, the reasons and stages of the introduction of information systems in industries and business. The research covered seven stages of information systems development and the specifics of each stage. The latest information on the models of business activities carried out on the Internet was also provided. The definition of an integration information system, types of integration processes, possible problems in the integration of information systems and the advantages of system integration were also provided.

Keywords: Information system, business information system, B2B, Alibaba, Amazon, Google services, evolution of information systems, integrated information system, types of integrated information system, Internet entrepreneurship

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INTRODUCTION

It is safe to say that small business is the lifeblood of the economies of developed countries today. This form of business needs information systems more than ever today to develop and improve its operations. Every day, various information systems are being developed to facilitate business, increase efficiency and income of business owners. An important factor in this is the simultaneous integration of these systems into a single system - integrated information systems.

The following is a description of some of the terms used in this field.[1]

An information system (IT) is a formal, socio-technical, organizational system designed to collect, process, store and disseminate information. From a sociotechnical perspective, information systems consist of four components: task, people, structure (or roles), and technology. Information systems are digital products that provide information, contribute to enterprise knowledge, and facilitate decision making.[2]

A business information system is a set of processes, hardware, skilled personnel, software, infrastructure, and standards designed to create, modify, store, manage, and disseminate information to propose new business strategies and new products.[3] IT allows for effective work and communication to make better decisions in the organization. Information systems serve to help enterprises and organizations achieve their goals, actions, products in a competitive environment.

[1]М.Бутабоев, Ф.Мулайдинов, Ғ.Захидов, Х.Саттарова. Рақамлииқтисодиёт. Дарслик, 2-тўлдирилган нашр. Инновационривожланишнашриёт-матбаауйи. Тошкент, 2021. 606 бет.
[2]https://en.wikipedia.org/wiki/Information_system
[3]Тарасова К. И. Эволюция информационных систем в экономике. БІЗНЕСІНФОРМ № 4, 2020. 289-295 стр.

Systems with such results can even radically change the business structure. The evolution of information technology is closely linked with the development of new strategic models of corporate business. The desire of enterprises to increase the efficiency of information systems encourages the emergence of more advanced hardware and software, which in turn encourages users to modernize and automate systems. This cyclical process is done to respond more adequately to changing market conditions and to maximize profits with minimal risk. In the current situation, small business and entrepreneurship are inextricably linked with information systems, because the success of the enterprise and its competitiveness largely depends on the characteristics of the use of modern technologies. The study examines the evolution of information systems in general and the specifics of their use for the needs of companies.

MAIN BODY

Seven stages of information systems development are identified, each of which is briefly described: the main types of activities, the purpose of using information systems are described; the concept of information use is explained and the type of information system is determined for each stage of its development. The stages of development of automated information systems in national enterprises will be considered. The current state of information systems in business entities is described.

The transition from an industrial society to an information society is having an impact on the social, economic and cultural aspects of life. In recent years, IT technologies have become crucial in society, playing a major role in human development and radically changing the economy and business sectors. Entrepreneurship takes place in a global Internet environment, and without computer-based information systems, the process simply cannot be solved by service. The use of these systems changes the way businesses operate and helps managers reduce uncertainty in decision making.[4]

Businesses and organizations rely on information systems to manage their activities, interact with customers and suppliers; they use IT as a means of competing in the marketplace. Information systems are used to manage inter-organizational supply chains and electronic markets. Thus, with the help of IT, corporations process financial accounts, manage human resources, and attract potential customers through Internet advertising companies.

Many large companies today are built entirely around information systems. Examples include: eBay - an auction platform; Amazon is an e-commerce platform and provider of cloud computing services; Alibaba - B2B electronic market; Google is a search engine corporation that gets most of its revenue from keyword advertising.

The governments of different countries are introducing information systems to provide cost-effective services to citizens and creating a system called “e-government”. Individuals devote most of their personal time to information systems: communication, education, shopping, banking, entertainment, and so on.

The work of many national and foreign scientists has been devoted to the study of the nature, classification, types and stages of development of information systems, including Salvatore Mart, Gerald Smith, Hevner Mart, Park Ram, I. Benbasat, R. Zmud, S. Avgeru, R. Agarwal, X.Lukas, O.ElSavi, O.Mansur, A.Gazavneh, N.Kok, P.Grey, R.Xoving, X.Klein, M.Mers, J.Roskart, A.Golitsin, I.Gutenberg, I It is expedient to study the works of Ushakova, G. Fedorov, V. Kobulov, SS Gulyamov, KH Abdurahmonov, RH Ayupov, OM Abdullaev, GR Baltabaeva, O. Umarov. . At the same time, despite the growing number of scientific papers on the identified topics, some questions about the nature of IT and its

[4]Тарасова К. И. Эволюция информационных систем в экономике. БІЗНЕСІНФОРМ № 4, 2020. 289-295 стр.

role in entrepreneurial activity remain unresolved.

An information system is a set of processes, hardware, skilled personnel, software, infrastructure, and standards designed to create, modify, store, manage, and disseminate information to propose new business strategies and new products. This ensures effective work and effective communication to make better decisions in the organization.

RESEARCH

Many scientists hold the view that the first automated IT appeared in the 1950s.[5][6][7] During this period, the creation of new organizational structures and the improvement of management mechanisms did not allow to overcome the growing difficulties in regulating the economy and, accordingly, the growth of losses. The solution to this situation was made possible by a radical increase in labor productivity in the field of information processing.

V. Nijnik, D. Terexova, G. According to Fedorova and others,8910it was during this period that the development of automated information systems began, which were designed for the issuance of invoices, invoices, payroll, calculation, payroll and other accounting operations. This allowed you to save costs and reduce time for preparing paper documents. One of the first computers used to process such data was UNIVAC I, set up for administrative use by the U.S. Census Bureau in 1951, and computers set up for commercial use by General Electric in 1954.

In turn, we support a slightly different view, which is that of Ferlie Dickinson

University's renowned professor of computer science and information management, W.J. Represented by Swazs. V. Swazs points out that the elements of automation of information systems date back to long before the mid-15th century. Gutenberg appeared with the invention of the printing press, and in the 17th century B.C. Pascal continued with the invention of the mechanical calculator. These inventions led to a profound revolution in the recording, processing, distribution, and acquisition of information and knowledge. The first major automated information system was invented in 1890 for the U.S. census. Hollerith had a census table. G. The Hollerit machine has been a major step in the process of automating information systems, as well as a source of inspiration for the development of computerized IT.[11]

Thus, in our view, the first period of IT automation development began in the mid-15th century to the mid-20th century, and the second period of automation began in the 1950s.

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[5] Грицунов О. В. Інформаційнісистеми та технології :навч. посіб. для студентів за напрямомпідготовки «Транспортнітехнології». Харків : ХНАМГ, 2010. 222 с.

[6]Навчально-методичнийпосібник для самостійноїроботи та практичних занять з навчальноїдисципліни «Сучаснііінформаційнісистеми та технології» (галузьзнань 0302 «Міжнароднівідносини», освітньокваліфікаційнийрівень «Бакалавр», напрямпідготовки 6.030202 «Міжнародне право») / уклад.: В. Г. Іванов,
С. М. Іванов, та ін. Харків: Нац. юрид. ун-т ім. Ярослава Мудрого, 2014. 129 с

[7]Ушакова І. О., Плеханова Г. О. Інформаційнісистеми та технології на підприємстві : конспект лекцій. Харків : Вид-во ХНЕУ, 2009. 128 с.

[8]Оспанова С. Б., Кайгородцев А. А. Проектирование систем управления. *Вестник КАСУ.* 2006. № 4. С. 32– 38.

[9]Голицына О. Л., Максимов Н. В. Информационные системы. М.: ММИЭИФП, 2004. 329 с.

[10] Нижник В. М., Терехов Д. С. Еволюціярозвиткуінформаційних систем та інформаційнихтехнологій в управлінніпідприємствами. *ВісникХмельницькогонаціональногоуніверситету*. 2009. № 5. С. 220–223.

[11]Informationsystem. EncyclopediaBritannica. URL: https://www.britannica.com/topic/information-system

The third stage in the development of information systems was the 1960s, during which computer technology further developed: programming languages were improved, operating systems and disk technologies emerged. Due to the development of automation, various processes in the enterprise, including document preparation processes, have been optimized. Attitudes toward IT have changed radically, and data obtained through information systems have been widely used for periodic reporting. Special reporting systems have been developed for decision makers.[12]

From the third stage of evolution, managers and business leaders began to reap economic benefits, which was reflected in lower information processing costs and increased data analysis capabilities.

The next - the fourth stage in the development of automated information systems is the 1970s, when database technology and tools for their interactive processing were developed. The development of new information technologies has created the conditions for the emergence of decision support systems. Many host computers began to connect to the network to perform increasingly complex tasks, which led to the need to communicate between computer centers through a less laborious process than mail tapes. In response to this need, the U.S. Department of Defense's Advanced Research Projects Agency (DARRA) began exploring the possibility of creating a network communication system to support military data exchange, and L.A. Roberts was developing a project called ARPANET, which was the first step towards the emergence of the Internet.[13]

The fifth stage of development dates back to the 80s. The twentieth century, when small businesses, offices of enterprises and organizations began to use various

computer and telecommunications technologies, expanded the scope of information systems. They began to be widely used as a tool to control and control the activities of small businesses, enterprises, support and accelerate the decision-making process. This period can also be characterized by the fact that information technology is beginning to play a new role for businesses: information systems have been adopted as a strategic weapon. The IT of this period provided the necessary information in a timely manner, helping the organization to succeed in its activities, create new products and services, find new markets, cooperate with suitable partners, organize the release of products at low prices, and more.

It is at this stage that the above G. Fedorova, O. Golitsyna and N. Described by Maksimov, it is said to be the latest in the development of automated IT, which did not end in the 90s, but continues to this day. I. Ushakova believes that the last stage of IT development is the period from the 90s to the present. During this period, modern generation information systems based on the achievements of information distribution technology were created.

In our opinion, in turn, the rapid changes in information technology continue to the gradual development of IT to this day. Thus, we consider the period from 1990 to 2000 as the sixth stage in the development of automated information systems: in 1991 the restriction on commercial use of the Internet in the United States was lifted and already in 1994 the two first players in the new digital market eBay and Amazon launched websites. The huge influx of investment in internet business will lead to a dot com boom at the end of the century. Information systems of this period provide the necessary information in a timely manner, helping the company to succeed in its activities, provide itself with reliable partners, create new products, find new markets and more. The goal of IT is not simply to increase data processing efficiency and help the

[12] Федорова Г. Н. Информационные системы: учебник для студ. учреждений сред. проф. образования. М.: Академия, 2013. 208 с.

[13] Introduction to information security. URL: http://www. cengage.com/resource_uploads/downloads/ 1111138214_259146.pdf

manager; these systems help businesses compete and gain an advantage.[14]

The seventh and final stage, in our opinion, dates back to the early 2000s. and continues to this day.

The systematization of the stages of development of information systems and their main features are reflected in the following table.

Table 1.1: Stages of Development of Automated Information Systems[15]

Period	Maintypes of activities	Purposesf oruseby entrepreneurs	The concept of information use	Types of information systems
- The middle of the XX century	Communication is carried out by delivery of letters, packages, shipments by horse mail.	Transmitting information in the right way	Basicmanualcalculationtools	Elementary data transmission information systems
1950–1960 yy.	"Mechanical" technologies: typewriter, attachment machine, telegraph, telephone, voice recorder, mail equipped with more advancedmeansofdelivery	Increase the speed of document processing. Simplification of standard accounting procedures	Paper circulation of accounting documents	Information systems for processing accounting documents on electromechanical accounting machines
1960–1970 yy.	"Electric" technologies: the first tube computers, electric typewriters, teletypes, photocopiers, portable tape recorders	Speed up the accounting and reporting process	Basic support in the preparation of reports	Management information systems for information processing

[14] Information systems for business and beyond. URL: https://resources.saylor.org/wwwresources/archived/site/textbooks/Information%20Systems%20for%20 Business%20and%20Beyond.pdf

[15] K.I.Tarasova's table

Cont : Table 1.1

1970–1980 yy.	Use of mainframe computers. Computers and data centering. The main focus is on automation of existing processes	Management control over the sale of products	Энгоқилонақарорқабулқилиш	Makingthesmartestdecision
1980–1990 yy.	Embedded personal computers and local networks. Departments create their own computer systems.	Managingbusinessopportunities	Management of enterprise development strategy	Topmanagementsystems
1990–2000 yy.	Wideband networks (WANs) have become corporate standards. Top management found ways to integrate systems and data. Autonomous systems	Finding the right information, partners, new markets and more.	Gain an advantage in the market	Topmanagementsystems
	are terminated. The main focus is on centralized control and corporate training			
2000–present	Wide palo-sali networks have expanded through the Internet, including global enterprises and business partners. Top management has provided ways to share information between systems. Emphasis was placed on efficiency and speed in production and distribution.	Maintaining the company's position and developing its competitive advantages	Information as a strategic resource providing competitiveadvantage	Strategic information systems, automated offices

The development of management information systems in the CIS and Western countries has a significant difference due to historical conditions, and the reason for this is that the processes are implemented in different ways.

The planning system of the countries of the former Soviet Union carried out a strict regulation and distribution of human, material, financial and other resources, as a result of which the heads of enterprises did not have any incentive to save and optimize material and financial flows. It is known that capitalist society has completely different characteristics, and the task of rational use is in the first place. Thus, the development of IT in the West began with clear rationality and inventory management systems.

The introduction of information systems in the CIS began with the accounting and personnel departments of enterprises, and the beginning of this process coincided with the 50s of the XX century. However, a decade later, the data began to be used for periodic reporting on many parameters, which required computer programs. It was at that time that work was carried out on the creation of automated IT based on local universal digital computers. The first system for enterprises was the Automated Control System (ABT) of the Lviv Automated Control System, developed in 1965-1967 and introduced at the Lviv Electronic Plant.

Other major works in the field of creation of AT and ABT were carried out at the Institute of Cybernetics under the leadership of academician of the Academy of Sciences of Uzbekistan V. Q. Qabulov and led to the creation of the national school of optimization methods. Their work is recognized not only in the country, but also abroad. The results of researches in the field of algorithms and digital technologies created by V. Q. Qabulov are known worldwide. His scientific works in the field of algorithmization are currently being taught in higher and secondary educational institutions and general education schools of our republic. With the initiative of this scientist, departments and faculties related to digital technology and artificial thinking were established in a number of higher educational institutions of our republic and are currently operating.[16]

In the 1970s and 1980s, IT was widely used as a management control tool, complex automated management systems were created in the enterprise, which solved the tasks of automated design of new products, technological preparation of the production process, automation of testing of finished products, and automation of organizational management processes.

By the end of the 80s. the concept of using information systems is gradually changing: IT is used as a strategic source of information in the operation and management of all economic entities, regardless of their profile. The information systems of this period help to enter new markets, create new goods and services, provide information about counterparties and evaluate their reliability, and help to organize production at low prices.[17]

However, the transfer of ABT methodology from large and small computers to personal computers has hardly happened. This was a time when the financial resources of economic entities were very limited, and the economic conditions of the 1980s and 1990s required large expenditures. Therefore, the complex of tasks of the automated control system, even in cases where it was technically possible, was not fully demanded by the market for a long time, which led to the moral obsolescence of the existing national software. After the collapse of the Soviet Union, more advanced foreign

[16]https://nuz.uz/uz/zhamoat/1196103-munosib-ba%D2%B3o

[17] Этапы развития информационных систем // Хелпикс.Орг – Интернет помощник. URL: https://helpiks. org/5-32285.html

technologies appeared and began to be used.

The current state of IT development in our country can be described as follows: human capital factors (adult literacy and coverage of higher education), mobile communication and Internet affordability, which certainly contribute to IT development, are among the strengths. At the same time, the domestic market is underdeveloped, financing of the ICT sector is far below the level of demand, the legal system is ineffective, business entities and state bodies are not inclined to introduce information technologies.[18]

The latest stage in the development of information systems in modern enterprises is the introduction of an integrated automated system of financial and economic management - a corporate information system (KAT) that ensures informed decision-making based on reliable and high-quality data obtained using modern technologies. Corporate information systems are built on the basis of a unified information space and provide all types of accounting, thus coordinating the entire set of enterprise management processes.[19]

Corporate information systems cover all operational, functional and strategic levels of enterprise management. CIS has started to develop from the accounting service of all KAT business entities in the market. The most common software products in this area are 1C programs (accounting, payroll, personnel, sales, enterprise). During this period of development, software products of other manufacturers - "BEST", "Parus" and "Galaxy" were also realized. Today, there is a large selection of national management software for enterprise implementation, such as Oracle Applications, JD Edwards, MFG-Pro, Axapta, Concorde XAL, BEST, INFIN, etc. At the same time, despite the rapid development of information systems in our country, local products are still not introduced in most national enterprises.

Unlike other countries, the main reasons for the delay in the introduction of KAT at the last stage of IT evolution in our country are:

- incompatibility of the selected IT with the needs of the enterprise compared to the intended needs;
- choosing an information system without taking into account the network characteristics of the business entity;
- lagging behind the development of information technology rather than the development of production.

Thus, according to the research conducted by the State Statistics Service in Uzbekistan, in 2020, only 57% of republican enterprises used computer technologies in their activities, 21.1% of those who have a computer use the Internet, [20]and only 0.3% of economic entities used cloud computing services, 0.1% used licensed KAT programs, 0.7% used social networks.

For comparison, in most countries of the European Union, the share of computer use in enterprise activity is 100.0%, of which 97.0% have access to the network, 77.0% use social networks, and 26.0% use KAT software. [21]Such a delay in using the opportunities of IT evolution in the activities of national companies is the reason for the low efficiency of enterprise management compared to Western partners and leads to the conclusion that the development of information

[18] Информационные технологии в Украине: колос на глиняных ногах // Duo.URL: https://dou.ua/lenta/ articles/it-in-ukraine/

[19] Беликов Ю. В. Обзор современных подходов к бизнес-процессам в организации. *Молодой ученый.* 2017. № 43 (177). С. 137–139. URL: https://moluch.ru/ archive/177/46087/

[20]https://stat.uz/uz/rasmiy-statistika/raqamli-iqtisodiyot

[21]Eurostat. URL: https://ec.europa.eu/eurostat/web/ main/home

systems in national territories is not the final, but the last stage, and this means that doing business will continue taking into account the national characteristics.

Understanding of integrated information systems

We learned about information systems and conditional evolution of information systems in information systems and business. Well, let's answer the question of what an integrated information system is.

System integration is defined in engineering as the process of combining component subsystems into a single system (a collection of subsystems that work together to provide comprehensive functionality of the system) and of ensuring that the subsystems work together as a system, and in information technology as the physical or functional integration of disparate computing systems and software applications. acting as a coordinated whole is understood as a process of linking together aspects.[22]

Therefore, **an integrated information system** is a synchronously working information system that combines various information systems used in the enterprise as a single information system.[23]

In a very broad sense, system integration is the process of connecting different subsystems (components) into a single larger system that functions as one. With regard to software solutions, system integration is generally understood as the process of linking different IT systems, services, and/or software together to ensure that they all work together functionally.

The main reason that organizations use system integration is the need to improve the efficiency and quality of their operations. The goal is to enable organizations to "talk to each other" through the integration of different IT systems, speed up the flow of information, and reduce operational costs for the organization. But system integration is used to connect not only internal systems of the organization, but also third parties working with the organization.

Systems Integration Methods

Typical methods of system integration are divided into the following categories:

Point-to-Point Integration

It can be argued that point-to-point integration (or point-to-point connection) is not system integration because there are only two system components involved. However, while it lacks the complexity of "true" system integration, it connects one system to another so they can work together. Typically, such point-to-point integration performs only one function and does not involve any complex business logic. Many cloud-based applications offer this type of point-to-point integration as "out-of-the-box" integration modules built for the most common IT systems.

Vertical Integration

In the vertical integration method, system components (subsystems) are integrated by creating functional "bunkers" from the main sub-function upwards. This is usually a relatively simple and easy method that involves only a limited number of systems (more than two), but on the other hand, this integration method is strict and more difficult to manage in the long run, because any new functionality requires its own functional "bunker". does. However, this method can be used

[22]https://en.wikipedia.org/wiki/System_integration [23]
Author description.

effectively to create simple integrations that only need to refer to a single function.

Star Integration

Star integration refers to a system in which each subsystem is connected to other subsystems using point-to-point connections. This provides more functionality, but as the number of integrated systems increases, so does the number of integrations, and managing integrations becomes more demanding. As an example, connecting ten systems using this method would require 45 separate integrations, and each time a single system changes, nine connections may need to be redone. Star integration is sometimes called "spaghetti integration" because it resembles "spaghetti code".

Horizontal Integration

In horizontal integration, a separate subsystem is used as a common interface layer between all subsystems. This layer is often called the Enterprise Service Bus (ESB). This method allows each subsystem to have only one interface to communicate with all other subsystems connected to the common interface layer (that is, there are only ten connections with ten systems). The advantage of this method is that each subsystem can be modified or even replaced without reworking the interfaces of other systems.

Integration of Common Data Formats

Integrating different IT systems together usually requires converting data from one system into a different data format used by the receiving system. If each transformation has to be performed system-wise, as in star integration, the number of data transformations increases significantly and becomes high maintenance. To solve this problem, the common data format approach allows each system to convert only one piece of data from its local format to the common format (and vice versa). Thus, the number of required data changes is greater than the number of subsystems.[23]

DISCUSSION

Integration Problems

System integration can be challenging for organizations, and these challenges can reduce their overall return on investment after implementing new software solutions. Some of these challenges include lack of trust and desire to share data with other companies, reluctance to outsource various operations to a third party, lack of clear communication and accountability, disagreement among partners on where functionality should be located, data warehouse and common API standards, high cost of integration, difficulty in finding good staff includes.[24] These challenges create barriers that "prevent or slow the implementation of business systems integration within and across companies." [25]Clear communication and streamlined information exchange are key elements in creating long-term system integration that supports business requirements.

Advantages of Integration

On the other hand, systems integration projects can be very rewarding. For legacy, legacy systems, various forms of

[23]Karri Lehtonen. What is system integration? Youredi, 2018. https://www.youredi.com/blog/what-is-systemintegration
[24]Gulledge, Thomas (September 2002). "B2B eMarketplaces and small- and medium-sized enterprises". Computers in Industry. 49 (1): 47–58. doi:10.1016/s0166-3615(02)00058-1. ISSN 0166-3615
[25]Hvolby, Hans-Henrik; Trienekens, Jacques H. (December 2010). "Challenges in business systems integration". ComputersinIndustry. 61 (9): 808–812. doi:10.1016/j.compind.2010.07.006. ISSN 0166-3615

integration allow for real-time data sharing. This can, for example, enable publisher and subscriber data distribution models, consolidated databases, event-driven architectures, reduce manual user input (which helps reduce errors), update or modernize the front-end of the application, and old expensive operating systems. enables the migration of query and reporting workloads from existing systems to new low-cost standard systems. Typically, an extensive cost-benefit analysis is performed to help determine whether an integration project is worth the effort.

CONCLUSIONS AND SUGGESTIONS

Today's small business is very different from yesterdays. In the past, the business environment has been doing steady business for a long time in one place and there has been almost no sudden change of customers. The business environment does not choose a place and place, and it has the opportunity to earn a lot of income by attracting customers through various modern information and communication technologies (ICT) tools. Only, the effective use of these opportunities is evaluated depending on the level of knowledge and awareness of business leaders and modern tools.

As mentioned above, the entry of information systems into the small business and entrepreneurship in our country, as a whole, started relatively late. In the early years of our independence, these processes began to develop slowly based on the state of current technologies and business environment. However, in recent years, as a result of increased attention to ICT at the government level and the granting of various benefits, as well as active promotion to business owners, ICT in our country has entered a phase of rapid development. IT-Parks in regional centers and ITCenters in districts were introduced. This center has been doing a lot of work on the development of ICT. Among other things, it is necessary to mention the improvement of computer literacy of the population, the granting of tax incentives by obtaining residency of companies operating in the field of ICT in the regions, assistance in the export of domestic ICT services abroad, and other activities.

Based on our research, the following suggestions are made:

1. Implementation of activities aimed at increasing the modern ICT literacy of small business owners and managers, including organizing special educational courses and trainings for those operating in business, publishing videos and presentation materials on the effectiveness of using business information systems in social networks.
2. Development of suggestions for implementation in our country, after thoroughly studying the world experience, especially the Chinese experience of running a small business.
3. Continuation of the policy of support for developers of local information systems and its further simplification, as well as expansion of preferential mechanisms.
4. Implementation of an online consultation system for small business representatives on the use of information systems in business.

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