

IMPLEMENTATION OF MODERN MANAGERIAL INFORMATION AND COMMUNICATION TECHNOLOGIES FOR THE PROVISION OF BUSINESS PROCESSES AT THE ENTERPRISE

ВПРОВАДЖЕННЯ СУЧАСНИХ УПРАВЛІНСЬКИХ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ ДЛЯ ЗАБЕЗПЕЧЕННЯ БІЗНЕС-ПРОЦЕСІВ НА ПІДПРИЄМСТВІ

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The article examines the peculiarities of the implementation of modern management information and communication technologies to ensure business processes at the enterprise. The concept of «managerial information and communication technologies» is clarified, their place and role in the activity of modern industrial enterprises is analyzed from the standpoint of anthropocentric, technocentric and pragmatic approaches and various economic theories. An evaluation of the ICT offered on the market was carried out in terms of their significance for the effective management and provision of business of companies. It has been proven that only companies that will be able to optimally use the potential of ICT for the development of their business will be able to survive in the new market realities. At the same time, mistakes in choosing one or another path of ICT development at the enterprise can result not only in material and temporary losses, but even in the collapse of the company. The problem is exacerbated by the extremely rapid evolution of ICT itself. Under such conditions, developments in the field of enterprise management based on information and communication technologies are extremely important.

Key words: management; managerial information and communication technologies; information technologies; info-communicational technologies; management information support; information society.

В статті розглянуто особливості впровадження сучасних управлінських інформаційно-комунікаційних технологій (ІКТ) для забезпечення бізнес-процесів на підприємстві. Актуальність дослідження обумовлена тим, що в умовах ринкової конкуренції дедалі більшу роль починає відігравати здатність компанії економічно адаптуватися до зовнішніх факторів, ринкових умов, нових технологій та послуг. Інформаційно-комунікаційні технології сьогодні здатні кардинально змінити механізми функціонування багатьох інститутів, зокрема й держави. Інтеграція телекомунікаційних та інформаційних систем веде до перетворення традиційних галузей, до появи нових галузей економіки, нових продуктів та послуг, задоволенню нових потреб суспільства. Дані технології є інструментом розробки нових способів ведення бізнесу, що дають якісно інші результати, не тільки на рівні підприємства, а й на рівні економіки загалом. Мета цього дослідження полягає у розробці методичних засад системного управління підприємством, орієнтованого на процес перманентних покращень ділових процесів підприємства у реалізації його стратегічної мети, підвищення ефективності менеджменту компанії на основі максимального використання можливостей сучасних інформаційно-комунікаційних технологій. У статті уточнено поняття «управлінські інформаційно-комунікаційні технології», проаналізовано їх місце та роль у діяльності сучасних підприємств з позицій антропоцентричного, техноцентричного та прагматичного підходів та різних економічних теорій. Проведено оцінку запропонованих на ринку інформаційно-комунікаційних технологій на предмет їхньої значущості для ефективного управління та забезпечення бізнесу компаній. Доведено, що тільки компанії, які зможуть в оптимальному режимі використовувати потенціал ІКТ для розвитку свого бізнесу, зможуть вижити в нових ринкових реаліях. У той же час помилки у виборі того чи іншого шляху розвитку ІКТ на підприємстві можуть обернутися не тільки суттєвими матеріальними та тимчасовими втратами, але навіть крахом компанії. Проблема посилюється надзвичайно швидкою еволюцією самих ІКТ. За таких умов розробки у сфері управління підприємством на основі інформаційно-комунікаційних технологій вкрай важливі.

Ключові слова: управління; управлінські інформаційно-комунікаційні технології; інформаційні технології; інформаційно-комунікаційні технології; інформаційне забезпечення управління; інформаційне суспільство.

Statement of the problem in a general form and its connection with important scientific or practical tasks. In the modern world, information and communication technologies have become one of the most important factors influencing the development of society. Their constant influence affects all institutions of civil society, permeating all spheres of human life. Global trends in the use of information and communication technologies (ICT) in management, economy, and social areas are characterized by extremely high dynamism. The use of ICT has become a factor that determines not only technological, but also social progress, economic competitiveness in general. The future of human civilization is the information society.

Analysis of the latest research and publications in which the solution to this problem was initiated and on which the author relies. The theory and methodology of designing organization management systems using information and communication technologies is being developed quite actively by both foreign and domestic science. Among the specialists who made a significant contribution to the research of the specified scientific direction are Applegate L. M., Goldratt E. M., Laudon K. S., Laudon J. P., Mayor T., McFarlan F.W., McKenney J.L., O'Brien J.A., Ross J. W., Strassmann P.A., Weill P. and others. In the development of scientific and methodological support for information management, domestic scientists Savchuk L. M., Lisovenko N. N., Ivashenko V. P., Shvachich G. G.

Highlighting previously unresolved parts of the overall problem. The analysis of the current state of study of the problems of managing the processes of implementation and application of ICT shows its insufficient development both in general and in individual aspects, in particular regarding the issues of managing the processes of selection, implementation and support of ICT in the management system of the enterprise in order to obtain a measurable effect from the use of such technologies.

Формулювання цілей статті (постановка завдання). The purpose of this study is to develop the methodological principles of system management of the enterprise based on the maximum use of the possibilities of modern ICT.

Presentation of the main research material. Information society is a society in which the majority of workers are engaged in the production, storage, processing and implementation of information, especially its highest form – knowledge [1; 2; 9, p. 33]. The importance of the decisive role of ICT in the creation of new social relations is recognized in our country, since the use of ICT is of crucial importance for increasing the competitiveness of the Ukrainian economy, expanding the possibilities of its integration into the global economic system,

and improving the efficiency of state administration and local self-government.

Since ICT is inextricably linked with information, first this concept should be defined. Different scientific directions give their own interpretation of this concept. From a regulatory and legal point of view, information is any information about persons, objects, facts, events, phenomena and processes, regardless of the form of their presentation. That is, in this case, an anthropocentric approach is used, according to which information is identified with information that can theoretically be transformed into knowledge. In technical scientific fields, a technocentric approach to the concept of information is used, which is equated with data stored in computer databases.

However, in the organizational and economic aspect, information is not at all «raw» data and any information, but in a certain way understood, processed and presented in a convenient form for use. That is, the pragmatic approach prevails in economic theory – information is characterized by its value for the user when making decisions. In this sense, information can be considered as knowledge. That is, information means data transformed in a certain context, which are meaningful and useful for specific users [5, p. 84].

It is undeniable that in modern business conditions, information has turned into a valuable asset, without proper management of which it is impossible to manage business effectively, and most managers of Ukrainian enterprises understand this. Scientists engaged in research in this field use several different terms (tab. 1).

It is obvious that the fundamental difference between the content, embedded by the named scientists in the listed concepts, there is no – in fact, they are synonyms. However, given that the processes of collecting, processing and using information are inextricably linked with telecommunications – remote data transmission using computer networks and means of communication [3] – the use of the articulated term «information and communication technologies», in our opinion, is more accurate.

«Information and communication technologies with a sufficient degree of convention can be divided into basic, i.e., those implemented only at the level of interaction of computer system elements, and applied technologies that implement typical procedures in specific subject areas» [7, p.158].

Basic technologies include:

- computer and network operating systems (Windows, Linux, Cisco IOS XR7, Cisco IOS etc.);
- programming languages (JavaScript, Python, C++, Java, etc.);
- telecommunication technologies that ensure the transmission of information over networks based on uniform standards (Emerging Network Technologies, IoT, Emerging & Future IP Networks etc.);

- cryptographic technologies (AES, RSA, Twofish, 3DES);

- database management systems (MySQL, PostgreSQL, SQLite, Oracle), etc.

Table 1

Approaches to defining the main concepts of ICT

Notion	Characteristic
Information technologies (IT)	Hardware and software provision, telecommunications, database management systems and other technological means of storage, processing and transmission information.
Info-communicational technologies (ICT)	A process that uses a set of methods and means of implementing operations of collection, registration, transfer, accumulation and processing of information on the basis of software and hardware to solve the management tasks of an economic object.
Information and communication technologies (ICT)	A set of methods, production processes and software and technical means integrated for the purpose of collecting, processing, storing, distributing, displaying and using information for the benefit of its users.

Source: compiled by the author according to [3, 4, 5].

Examples of applied ICT can be:

- automated control systems;
- management decision support systems;
- electronic document management systems, etc.

Since the subject of the research is applied information and communication technologies in their organizational and economic aspect, for the purposes of this study it is suggested to clarify this concept as follows: «Management information and communication technologies (ICT) is a complex of software and hardware tools built into the management system of the enterprise for the purposes of effectiveness identification of useful information and provision of access to it interested users who make management decisions» [9, p. 31; 10, p. 42-44]. The scientific novelty of this definition is:

- a visual demonstration of the differences between anthropocentric and technocentric approaches to information (any information, arrays of data) from a pragmatic approach (understood and processed information – knowledge) and their relationship – transformation of «raw» data into management information through ICT;

- reflections of the economic purpose of ICT creation – support processes of making and implementing management decisions;

- determining the place and role of ICT in the company’s activities – the organization’s management system supporting the role.

Therefore, management information support can be implemented in the form of information and communication technologies, which in this case is one of the elements of the enterprise’s information system.

An information system is an organizational and ordered collection of information (data arrays), information technologies, computing and communication tools, which implements information processes: the processes of collection, processing, accumulation, storage, search and dissemination of information.

However, from an organizational and economic point of view, «the information system (IS) is a means of organizing the information support of the management process, which contributes to the timely delivery of necessary and reliable information to all links of the management system that need it» [3].

Information and communication technologies perform the role of management, coordinate the interaction of various bodies of the organization and connect them with the outside world. Different economic theories consider information and communication technologies and information systems from different points of view, but they all recognize their importance and the need to apply ICT and build IS in the organization (tab. 2).

In practice, a properly built IS actually permeates all spheres of the company’s activity, as it is designed to perform a variety of operational, organizational and management tasks, including.

- acceleration of work processes due to automation of routine operations;
- acceleration and support of decision-making processes;
- planning and management of company resources;
- cost reduction;
- analysis and assessment of individual areas of activity of the enterprise and business as a whole;
- search and selection of promising markets, partners and clients;
- coordination of various activities;
- development and creation of new products and services;
- changes in labor organization;
- integration into the global information space, etc.

As a result, ICT significantly changes business processes, allows gain competitive advantages, open up new opportunities for business. Proper use of ICT allows the company to increase operational productivity, successfully adapt to the constantly changing conditions of the external environment, and contributes to increasing business profitability.

The influence of information and communication technology and the information system from the standpoint of various economic theories

Economic theory	A point of view on IT and IS
Microeconomics	Information technology is the same production resource as capital and labor.
Theory of transaction costs	At the expense of information systems, firms seek to minimize external and internal transaction costs.
Agency theory	A firm is viewed as a set of contracts between decision-making agents. Information systems are used to reduce the number of agents and reduce costs.
Behavioral theories	Organizations and information technologies mutually influence each other.
Decision and control theory	Decisions are made under conditions of risk and uncertainty. Information systems make it possible to reduce uncertainty.
Sociological theory	Bureaucracy and standard operating procedures inherent in information systems help stabilize the organization but slow down the ability to change.
Post-industrial theory	Information systems contribute to decentralization, decentralized decision-making, the number of workers employed in the field of knowledge creation prevails.
Cultural theory	Information technology must match the culture of the organization.
Political theory	Information systems are the result of political competition for policies, resources, and procedures.

Source: compiled by the author according to [7, 9, p. 32].

Today, barriers such as time and distance are disappearing: thanks to information and communication technologies, employees of companies, being at any point on the planet, can work on a joint project at any time of the day, and managers can monitor the company's activities, even when they are far away from the office. This certainly improves the coordination of the company's activities and the flexibility of its organizational structure.

The market of existing information and communication technologies is very diverse and huge. They differ in terms of management levels, degree of integration, and functional role in enterprise activity.

«There are several types of classification of applied ICT:

- by management levels;
- by the level of integration into the management system;
- by subject branch of solved tasks;
- according to the method of building information flows, etc.» [2].

«According to management levels, ICT systems are divided into:

- decision support systems for top management (strategic level);
- automated control systems and support systems
- decision-making (management level);
- professional and office systems (level of knowledge);
- transaction processing systems (operational level)» [2].

Characteristics of information systems used on listed above levels of management, summarized in the tab. 3.

Different systems can exist at the enterprise in parallel equal. In this, they directly interact with each other. From the table 3 shows that higher-level systems are consumers of source information from lower-level systems. At the same time, systems of different levels can be both separate modules of a single integrated software product, and represent a set of different ICT solutions from different developers, integrated into a single information system with the help of special tools.

According to the subject area of solved tasks, ICT can be divided into accounting automation systems, reference and legal systems, banking information systems, automated design systems, educational systems, etc.

According to the method of construction of information flows, local, distributed, and hierarchical ICTs are distinguished. However, the use of the same ICT in the activities of different companies can affect the achievement of the company's business goals in different ways. For example, the online banking system for a bank is one of the types of products (services) sold by it and, accordingly, has strategic importance for the bank, at the same time, for an industrial enterprise, this system only facilitates the process of interaction with the bank, acting as a technology, which supports the operational activities of the company's financial service.

So, information and communication technologies can be divided according to the degree of influence on the main business of the company, for example, the following categories:

- strategic – ICT plays the most important role in the company's activities, the achievement of the company's strategic goals directly depends on them;

ICT classification by management levels

Level of management	Types of systems	Information inputs	Processing	Information outputs	Users
Strategic level	Management decision-making system	Aggregated data, external and internal	Graphics, simulation, dialogue	Predictions, answers to questions	Top level of management
Managerial level	Decision-making support systems	Data are small in volume, analytical models	Dialogue, imitation, analysis	Special reports, analysis of decisions, answers to questions	Middle managers, professionals
	Automated control systems	Aggregated transaction data	Repeatable reports, simple models, analysis	Generalization and selections	
Level of knowledge	Professional systems	Project specifications, knowledge bases	Modeling, imitation	Models, graphics	Professionals
	Office systems	Documents, schemes	Document management, scheme development, communications	Document management, scheme development, communication, documents, e-mail	Technical staff
Operational level	Transaction processing systems	Transactions, events	Sorting, making lists, merging	Detailed reports, lists, summaries	Operational staff

Source: compiled by the author according to [1, 6, 9].

- reinforcing – ICT certainly brings competitive advantages to the company, but the benefits obtained from them are not decisive in achieving the company's business goals;

- operational – certain business processes and operations of the company are very critical to the uninterrupted and reliable operation of ICT systems. ICT failures cause significant losses;

- supporting – the impact of ICT on the results of activities and achievement of set tasks is not significant. According to research carried out in the West, the share of companies for which ICT plays a strategic role is constantly growing, while the share of technologies in the supporting and enhancing categories is decreasing, and this trend will continue in the near future. Companies use global information networks mainly to find and exchange information electronically:

- information search, exchange of information in electronic form and e-mail;
- providing information about your organization and its products;
- obtaining information about suppliers and their products;
- placing orders for products;
- training;
- personnel selection.

Evaluation by the management of enterprises of the results obtained or expected from the use of the Internet and other global information networks is characterized by the following data:

- reduction of costs for production and sale of products;

- improvement of product quality;
- expanding the range of products;
- attraction of new suppliers;
- creation of new product sales markets, attraction of new consumers;
- preservation of traditional product sales markets;
- improving the quality of interaction with partners.

Basically, in the practice of Ukrainian enterprises, ICT plays a supporting and operational role, unlike Western companies.

Conclusions from this study and prospects for further research in this direction.

Under the conditions of globalization of the economy, intensifying competition, rapidly changing market environment, domestic enterprises are forced to look for new ways of improving their business, increasing its efficiency, and economic adaptation of the enterprise to the conditions of an unstable environment. Only companies that will be able to optimally use the potential of ICT for the development of their business will be able to survive in the new market realities. The problem is exacerbated by the rapid evolution of ICT itself. Obviously, under such conditions, developments in the field of enterprise management based on information and communication technologies are extremely necessary. As the main or decisive reasons for insufficient use of ICT in their practice, most enterprises indicate economic reasons, mostly lack of funds, as well as production factors, such as a lack of qualified ICT specialists and a lack of knowledge in this field among the organization's employees.

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