

Technological Processes of Working with Documented Information in the Organization as an Indicator of Corporate Information Subculture

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Abstract

The study found that in the conditions of global informatization, modern information and communication technologies including the most optimal methods of information processing, which ensure effective corporate management, are the crucial factor of social development and a method of increasing the effectiveness of organizations as subjects of social management. However, the problems of their implementation through the development of a generalized information sub-culture of an organization as an integral part of its corporate culture require complex and integrated scientific understanding. The study considered the technological processes of working with documented information in an organization as an indicator of corporate information subculture, determined the concept of "informational culture of the organization", analyzed its components, proposed mathematical and statistical instrument to determine the tightness of the relationship between the level of corporate information culture and the level of application of information technologies, and outlined the directions for further researches on the aspects of corporate culture development. The scientific novelty of the work consists in the application of scientific and methodological principles of system analytics to determine the impact of the information technologies using indicators (according to alternative signs) in the organization on the level of its information culture, which is a continuation of scientific research in the field of the organizations information culture building. It has been established that the systematic analysis of information processes based on the scientific and methodological principle of intellectual data analysis offers a qualitatively new way to implement the main functions and tasks of research, allows to change the influence of the information support indicators of the organization on its information culture (including divisions), which is an important condition for effective management by her

Keywords 1

Information culture, management entity, the result of joint activity, information and communication technologies

1. Introduction

The XXI century is characterized by the continuous implementation of information and communication technologies, rapidly developing in all spheres of business and every organization as a subject of social management, regardless of the form of ownership of the organization. This requires thorough information support for corporate management, use of the latest technologies for working with

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documented information, as well as the appropriate competencies of the employees, i.e. the existence of developed information subculture of all personnel of the organization as part of its corporate culture.

The study highlights the issues of implementing modern information and communication technologies of working with documented information aimed at creating a perfect information product as a result of personnel joint activity, its general and professional competencies, as well as a system of methods of cooperation and interaction to ensure the effective corporate management and achieve certain goals in the development of corporate culture.

2. Analysis of literature data and problem definition

The first to appeal to the issues of information culture were the developers of information society concepts, who considered it as a necessary mechanism for the formation of information civilization [1], [2], [3]. Initially, the researches had methodological and metaphysical focus. Then, with the development of computer science, studies that consider information culture as a set of knowledge and skills of working with information by means of computer technology have emerged [4].

Sociological scientific papers analyze the issues of information culture as a socio-cultural phenomenon of information civilization and study the features of information culture of different groups and virtual communities. Within the information approach to information as a scientific and philosophical category, researchers pay special attention to the concept of "social information", which further becomes the basis for the development of the concept of "information culture". The papers devoted to the development of a unified multi-level typology of information culture have emerged, and the scientists tried to conduct its typological analysis.

Foreign scientists pay considerable attention to the issues of information culture. Thus, some authors considers information culture as a strategic goal, planning of which is as important as a planning of the transformation of physical resources. The scientist defined information culture as a culture in which the transformation of intellectual resources is supported along with the transformation of material resources [5]. Another authors interpret information culture as a culture that recognizes the value and usefulness of information for operational and strategic success, where information forms the basis for decision-making in the organization, and information technology is easily used as a tool to create effective information systems [6]. Some researches explore how an understanding of corporate information culture provides the knowledge needed to develop and promote robust methods of record-keeping [7], [8].

Some pedagogical and psychological studies are devoted to the formation of individual information culture, such as a student, teacher, or lecturer [9]. The problem of forming the information culture of specialists and professionals, determining its content and components are widely considered in the works of both foreign and domestic scientists [10], [11]. In some works, given the rapid growth of information flows, the role of managerial culture of the leader is widely considered, which consists in the skillful differentiation of tasks and their distribution among the executors [12].

However, the accumulation of theoretical and empirical material, as well as the development of information and communication sciences put forward the need to develop a new scientific direction of research of information culture of the subjects of social management of organizations, institutions, or enterprises (hereinafter organizations) as an organizational form of individual activity of social communities, which are the main objects of cultural creativity. Individual efforts of every employee are the conditions of their "entry" into these communities.

The point at issue is the culturological aspect of providing the organization with certain information. It is possible to extend this concept to the definition of modern achievements of collective (team) work with information, and hence the perfect information provision of the organization, i.e. the integrated ability of its staff and management to share their competencies in developing high-quality technological processes of working with documented information following the requirements of current legislation, the conditions of development of information systems, the introduction of information and communication technologies, i.e. ensuring the highest level of information culture of the organization and its effective management.

Now, there is every ground to talk about the development of information subculture of the management entity (organization, enterprise, or institution) as a component of its corporate culture in

terms of documentation and information provision for its management. Such a subculture is an information product of joint activities of people, a system of ways of their collective existence and interaction, aimed at achieving common goals in the information environment. Knowledge of technological processes of creating an information product, the ability to navigate in information flows, systems and technologies that are implemented in the form of achieving the objectives set by the management entity, make it possible to achieve a synergy effect.

The analysis of the level of information literacy, as one of the key indicators of the information culture level, is important for the researched question study. The analysis of the information literacy level, as one of the key indicators of the information culture level, is important for the study of the researched question. Researchers of such information literacy (from the point of view of its necessity for local self-government bodies and other state structures employees) claim that the staff's information culture will make their ability to carry out information activities, including atypical ones. Such activity can be expected according to the concept of "good governance". According to the researchers, the information culture of such institutions employees is characterized by optimistic perceptions of their skills and their professional usefulness, but it remains at the possessing stage only basic information literacy skills and using only familiar resources [15].

3. Purpose and objectives of the study

The purpose of the study is to solve the problems of technological processes of creating, processing, transferring, and use of documented information, aspects of its storage and protection in terms of the development of information culture.

To achieve this purpose, the following objectives were set:

- to consider technological processes of working with documented information as a reflection of the corporate information subculture, to give the definition of subculture, and to reveal the reasons of its study;
- to describe theoretical and methodological grounds for the development of corporate information culture, to highlight its basic elements and components, and to analyze technological processes of working with documented information;
- to offer a mathematical and statistical instrument for determining the tightness of the relationship between the level of corporate information culture and the level of application of information technology, to outline areas for further research and prospects for further exploration in terms of a corporate culture of the organization as a subject of the information society

4. Technological processes of working with documented information in the organization as a reflection of corporate information culture

Documented information refers to information created by public authorities and local governments, judicial bodies, public organizations, corporations, enterprises and institutions, regardless of the form of their ownership, in accordance with their status and the procedure of implementation of their functions. This is the infrastructural and professional documentation of the organization, which is a materialized result of information activity, designed to ensure effective management of the organization. In the current information society, which is characterized by the existence of a modern market of information systems and technologies, documented information is a particularly valuable commodity.

The term "technology of working with documented information" is based on the concept of "technology", which is quite stable and appeared in business communications regarding the problems that have arisen on the way to improve the organization of production. Thus, if the technology (from Greek *techne*, "art, skill, cunning of hand"; and *-logia*) is a set of methods of processing, manufacturing, changing the state, properties, shape of raw materials, materials or semi-finished products carried out in the production process, then the technology of working with documented information can be defined as a process that uses a set of tools and methods for collecting, processing, protecting and transmitting information to ensure perfect performance of management entity.

Any technology involves the subject of labor (subject of technological influence, technological object), means of labor (technological means), the bearer of technological functions (employee, team), and the level of technological development of society. Technology is directly manifested in the structure of the production process, technological operations, as they are always associated with scientific and technological progress, labor organization and production experience, which largely determines the quality and in many cases the number of products, costs, productivity, etc.

According to the information approach to cultural development, the development of communication and information technologies, production, and use of documented information is determined by the classification of information as one of the critical factors of social, corporate and human evolution, and this development is conditioned by the use of efficient, technological processes, the introduction of advanced techniques, systems of mathematical analysis and forecasting, the latest tools of electronic and computer technology.

The technology of working with documented information in the institution can be considered as purposefully organized sets of processes using computer technology that provide rapid creation of documented information, including access to sources of information regardless of their location, rapid search for relevant information, organization of information, information processing, information flow management, protection against unauthorized access, etc., aimed at creating a quality information product, its storage, as well as a description of these processes in the form of instructions for their implementation, technological rules, requirements, schedules, maps, regulations and modes of their implementation as a reflection of the competencies of all staff in the implementation of these processes, the information culture of the organization as a component of corporate (organizational) culture.

Let's try to define the concept of "corporate information culture" (CIC):

- it is a combination of employees' existing competencies in providing information for corporate management, using specific technologies, techniques and methods of collecting, processing, transmitting, storing and protecting information, as well as their abilities and skills to effectively use the experience gained for ensuring the performance of a particular management entity from the top link to the lower;
- it is a system of knowledge and skills, norms and rules for streamlining the technological processes of management of all corporate information systems for improving the quality of corporate management, timely provision of its management with relevant information necessary for sound decision-making under conditions of operations improvement, application of modern means of information engineering and introduction of the newest information systems and technologies

By identifying the concept of "corporate information culture" with the concept of "culture of information provision for the corporate management", we need to determine what exactly should be provided. First of all, it is necessary to explain the meaning of the term "provision", which means action, as well as the execution or storage of something and is a guarantee of the perfect implementation of a process. When it comes to the level of perfect corporate management, given its specific quality aspect, it is about the whole set of tools, conditions and actions for timely and impeccable provision of information and documentation support for the implementation of all technological processes in corporate management.

If ensuring the organized nature of the management entity is considered as an orderly interaction and integrity of its components, then the provision should be understood as a perfect material, organizational and legal framework and technology for information processing, appropriate management structure, competencies and communication of employees of different levels. If the organization does not have adequate information potential, then as a result, management becomes worse, which indicates a low level of information culture of the management entity.

The information culture of the management entity as a scientific integrated direction is formed in the process of interaction of personnel and joint problem-solving technologies. It includes a set of interrelated activities, methods and tools (scientific and methodological, technical and economic, social, organizational and legal) for the joint working with information. This can be ensured through the implementation of the processes of adoption of documentation and information technologies, the creation and high-quality performance of modern information systems, i.e. through the perfect development of the corporate management instrument for efficient corporate management

5. Theoretical and methodological principles of the development of corporate information culture, its elements and components

According to the information approach to cultural development, the development of communication and information technologies, production and use of documented information is determined by the classification of information as one of the critical factors of social, corporate and human evolution, and this development is conditioned by the use of efficient, technological processes, the introduction of advanced techniques, systems of mathematical analysis and forecasting, the latest tools of electronic and computer technology.

Our methodology of studying the technologies of working with documented information as an indicator of the level of corporate information culture consists in the application of “conceptual modeling” and “concrete to abstract” methods, as well as terminological and comparative methods.

The end result of the teamwork is the creation of perfect information culture of an organization, its corporate culture, which allows involving of all departments of the organization and individuals in the process of achieving a common goal, mobilizing employee initiative, cultivating a commitment to the organization, improving communication processes and correcting their behavior.

On the way to achieve the main strategic goal, the manager and employees of the organization meet with specific tasks, such as selection and analysis of available information, definition of the ultimate goal, evaluation and selection of alternative solutions, taking into account the transition period, plan check and revision. At the same time, a manager must form a value-oriented unity of team members, motivate personnel, develop a team approach to working with information, and determine the style of mutual communication.

The formation of CIC and its sustainable development provide a new quality of management based on knowledge, skills and experience of staff in the effective use of all elements of information potential, the latest information and telecommunications technologies, the use of science-intensive products, modern information systems, and appropriate information chains.

It is the state of information technology provision for corporate management as an indicator of efficiency and quality of management is a value that reflects the appropriate level of CIC. The main components and elements that ensure the CIC are shown in Fig.1.

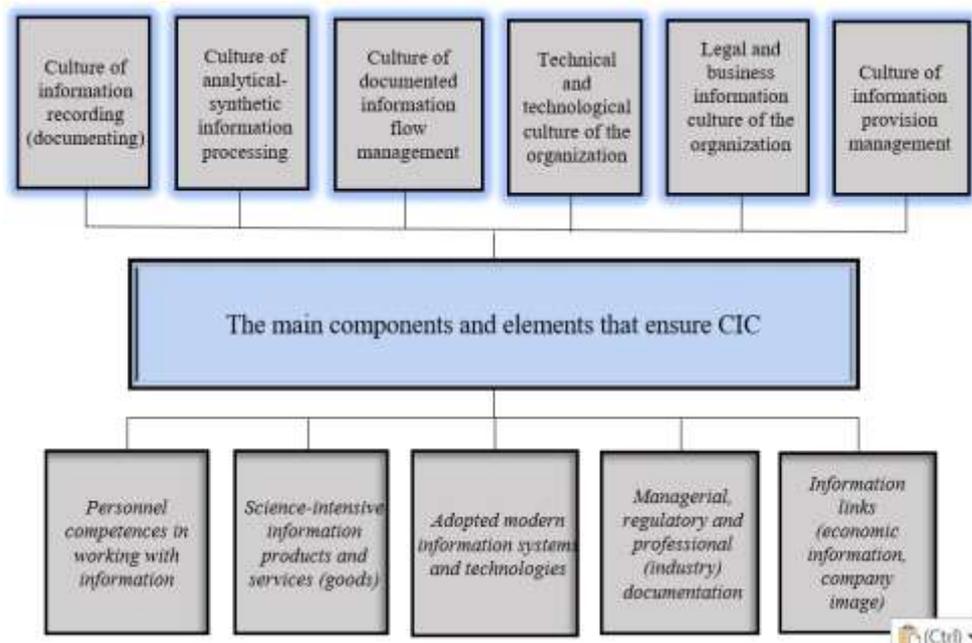


Figure 1: The main components and elements that ensure the CIC

Each of CIC components shown in Figure 1 is relevant and inseparable from the others, and needs separate consideration and detailed explanation.

Thus, the culture of information recording involves knowledge of the requirements for the preparation of the text of the document (speech culture), knowledge of the regulatory framework for the creation and execution of documents (compliance with current rules and instructions), knowledge of national, international and terminological standards, skills to create documented information.

In its turn, the culture of analytical-synthetic information processing includes the ability to perform information retrieval, the ability to create electronic databases, knowledge of information retrieval systems, the latest methods of information retrieval, skills of structuring documented information, the ability to abstract information and draw up secondary documentation.

The culture of documented information flow management includes the ability to manage the technological processes of attaching information to the document in-information system, receipt of ED by the executor, preparation of its project, approval, legal examination, review of the document by the manager, its signing by the manager and registration of the outgoing document, knowledge and skills in data collection, documenting information systems modeling and modeling of their resources, the ability to store information and find it quickly, the ability to protect information from unauthorized access.

As an example, the technological processes of transferring documents from the System of Electronic Interaction of Executive Bodies (SEI EB) to the Documenting in-information systems (DIS) of the institution are presented in Fig. 2.

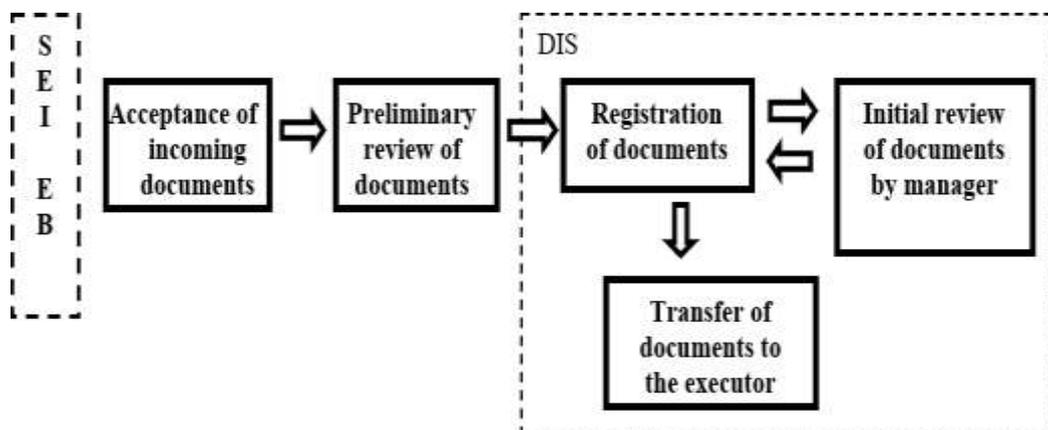


Figure 2: The main components and elements that ensure the CIC

Technological processes of working with documents in the documenting information system of the institution are shown in Fig.3.

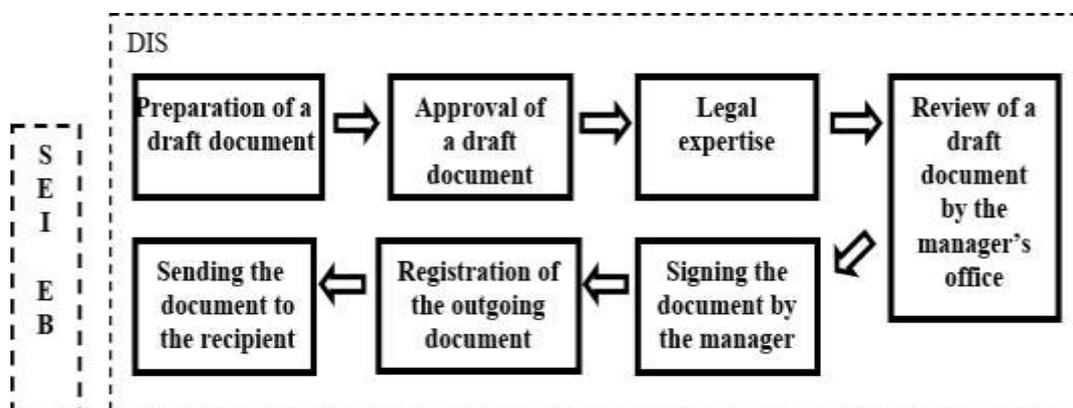


Figure 3: Technological processes of working with documents in DIS

Technical and technological culture includes the ability to use application software to solve management problems based on the combination of human intellectual abilities with the functionality of information systems, the ability to implement appropriate information technologies.

Legal and business information culture comprises the knowledge of legislation in the field of information, legal acts of documenting and circulation of information, normative documents, regulations and instructions, the ability to ensure legal literacy of documents. As one of the most important components, the culture of information provision management requires the manager to have a systematic outlook and specific professional knowledge, competencies, ability to summarize, analyze and synthesize information, use it effectively, store it and protect it.

These components are the objects of CIC study, but it is not limited to them, as it investigates similar processes related to the creation and circulation in the institution of special types of documented information, implementation and use of information analysis, telecommunications, integrated, automated systems beyond work with management documentation.

The aforementioned components of CIC contain knowledge of the main technological processes that must be carried out in all stages, and the stages themselves are divided into smaller parts – work operations, which are characterized by the appropriate composition of executors, techniques, technologies and tools. Each operation contains closely related actions and techniques applied by all employees, and their ability to use the latest information technologies and systems, the integration of which according to the laws of synergy forms the information culture of the organization.

CIC should be considered not as a certain constant, but as an organic combination of information cultures of its structural units, individual groups and individual professionals who are constantly interacting, developing, and have different levels of CIC formation

6. Discussion of the results of studying the technologies of working with documented information in the process of development of corporate information culture

The effectiveness of the technological processes associated with documented information in terms of forming the corporate culture largely depends on the appropriate level of the information culture of an organization. An organization with a high level of information culture is more competitive, democratic and stable, less centralized, more able to meet the needs of market consumers, can better navigate the environment.

To identify the relationship between the level of information culture and technologies of working with documented information, i.e. to determine the relationship between two qualitative (attributive) features based on the methods of interconnectedness, let's use the contingency coefficient and the coefficient of association.

To calculate them, let's construct a four-cell correlation table showing the relationship between two phenomena, each of which is alternative, i.e. consists of two qualitative-ly different feature values, for example, "high" and "low" (see Table 1).

Table 1

Study of the relationship between the level of CIC and the level of application of information technologies (alternative attributes)

Level of CIC	Information technology utilization capacity, %		
	<50	>50	Total
High	a	b	a+b
Low	c	d	c+d
Total	a+c	b+d	

The Coefficient of Association (C_a) allows to investigate the connection between alternative attributes and is calculated using the following formula:

$$C_a = \frac{a * d - b * c}{a * d + b * c} \quad (1)$$

where a, b, c, d are frequencies of the «four-cell table».

The coefficient of association is measured in the range from (-1) to (+1). The closer this indicator to 1 or (-1), the more strongly the studied attributes are interconnected.

The Contingency Coefficient (C_c) is calculated using the following formula:

$$C_c = \frac{a * d - b * c}{\sqrt{(a + b) + (a + c) * (b + d) * (d + c)}} \quad (2)$$

Contingency coefficient is always less than C_a and is measured in the range from (-1) to (1). The connection is considered confirmed if $C_a \geq 0,5$ or $C_c \geq 0,3$.

To illustrate the work of this formula, let's consider an example with specific data: sample number – 100 employees, a = 20, b = 30, c = 35, d = 15.

The calculated $C_c = -0.3$ indicates the presence of a significant relationship between the level of information culture and the level of technologies utilization for processing documented information, and this relationship is multidirectional.

In case of more than two possible values of each interrelated attribute, appropriate methods of measuring the tightness of the connection are used. The chi-square criterion can be used as a criterion for the relationship between qualitative indicators with a large number of gradations. If the attribute, on the basis of which there was grouping by rows in the table, does not depend on the attribute, on the basis of which there was grouping by columns, then in each row (column) the frequency distribution should be proportional to their distribution in the final row (columns).

This distribution can be considered to some extent as theoretical, the frequencies of which are calculated under the assumption of the lack of connection between the studied attributes.

According to the statistical tables, it is possible to establish either the probability of occurrence of the calculated value according to a given number of degrees of free-dom in assuming the independence of attributes, or the tabular value of the chi-square criterion, which corresponds to the significance level. The indicators of the degree of tightness of the connection, i.e. the coefficients of interconnectedness, are calculated based on the chi-square criterion, for example, Chuprov's C_{ch} [13] and Pearson's C_p [14]. To assess the relationship in cases where each qualitative attribute consists of more than two groups, the following Chuprov's formula is used:

$$C_{ch} = \sqrt{\frac{x^2}{\sqrt{(m_1 - 1) * (m_2 - 1)}}} \quad (3)$$

where x^2 is χ^2 -square;

$$x^2 = \left(\sum_1^{m_1} \sum_1^{m_2} \frac{f_{ij}^2}{f_i * f_j} \right) - 1 \quad (4)$$

where f_i, f_j are empirical frequencies in the i-th row of the j-th column; m is the number of groups for each attribute.

Pearson's Coefficient of Correlation C_p is calculated by the following formula:

$$C_p = \sqrt{\frac{x^2}{x^2 + n}} \quad (5)$$

where n is the number of observations.

The numerical value of Pearson's coefficient varies from 0 to 1. The closer it is to 1, the closer the relationship between them, but even at a value of 0.3 we can talk about the relationship between variations of the studied qualitative characteristics (see Table 2).

Table 2

Study of the relationship between the level of CIC and the level of application of information technologies (with several groups of variations)

Level of CIC	Level of application of information technologies			Total
	<30	30-50	>50	

High	f_{11}	f_{12}	f_{13}	f_{10}
Medium	f_{21}	f_{22}	f_{23}	f_{20}
Low	f_{31}	f_{32}	f_{33}	f_{30}
Total	f_{01}	f_{02}	f_{03}	f_{00}

When studying the formula for calculating contingency coefficient (C_c), for the analysis of alternative attributes were selected departments of the Faculty of Transport and Information Technology of NTU, namely: Department of Philosophy, Department of Foreign Languages, Department of Information Analysis and Department of Information Technologies.

The practical results obtained using C_c calculation formula are given in table. (Table 3). As values of a, b, c and d parameters, percentages of the level of CIC are taken, and the level of information technologies – with alternative groups of variations: <50 % and> 50 % that is shown in tab. 2.

Table 3

Study of the relationship between the level of CIC and the level of application of information technologies (with alternative groups of variations) in the departments of NTU

NTU departments	Level of CIC (in %)				K_k
	A	B	C	D	
Department of Philosophy	10	15	35	40	-0.1
Department of Foreign Languages	20	15	35	30	0.0
Department of Information Analysis	80	10	5	3	0.3
Department of Information Technologies	90	3	2	2	0.4

A graphical representation of the relationship between column 'a' and column (C_c) illustrates the practice of applying formulas.

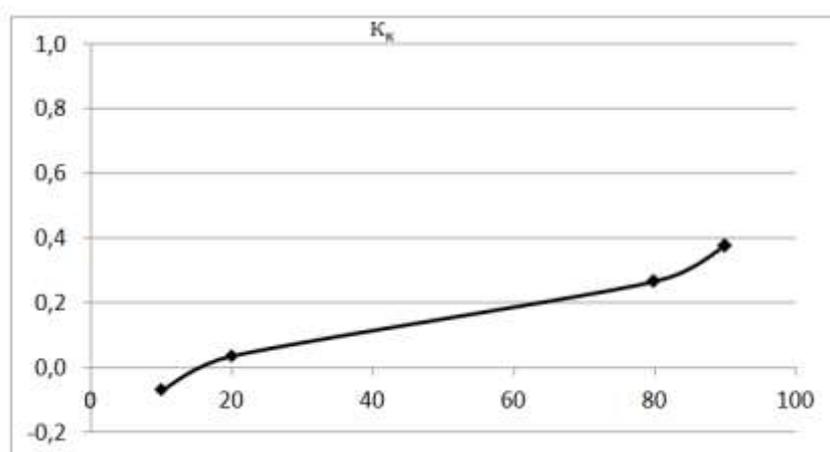


Figure 4: The practice of applying formulas

The above examples show that the mathematical and statistical instrument can be used to determine the tightness of the relationship between the level of application of information technologies and the level of CIC.

However, in the process of CIC development, one cannot be satisfied with the study of scientific principles of implementing information and technological processes for management support. In particular, general theoretical problems become important, as they are the basis for solving applied problems of information provision for management in terms of modern concepts of management, sociology, law, informology, document science, linguistics, psychology, culturology etc.

Thus, corporate management is implemented among employees with already formed ideals, traditions, norms, rules, including habits and methods of working with information, information systems and technologies, all available material, energy, human, financial and information resources.

Cooperation or confrontation of employees depends on their interaction or opposition, as well as on the degree of their alliance into one team. If the manager has the will to create a professional team of employees, then the end result of his management will be factorial social-psychological effects, i.e. those "cumulations" that can be defined as a product of completed management work, as a new level of information culture of the management entity, as the degree of fusion of cultures of each employee into a single one.

The development of CIC is important both for employees and for building a unified management strategy by their manager. It must become the key to the effective and successful operation of the institution as part of its corporate culture and the culture of the information society as a whole. The higher the level of CIC as a social community and the main object of the overall cultural creativity of the staff, the higher image and competitiveness of the organization.

The task of the head of an organization is to identify factors and conditions that contribute to both the coincidence and differences of cultures of social groups and individuals, to select such systems of norms and values that would most adequately express the needs of its further development. CIC must become the key to its effective and successful performance as a subject of culture, part of the social structure and the information society as a whole.

7. Study findings and prospects for further exploration

Summing up the results of the study, we can conclude the following:

1. The study of stages of technological process of working with information, beginning with the culture of documenting, search, selection, estimation of relevance, assurance of the quality of transferring documented information, as well as the abilities to apply modern technologies and procedures of analytical and synthetic information processing, data storage and protection as components of CIC showed that in the domestic scientific literature, these issues are not yet sufficiently developed, which may be the subject of further research.
2. Modern scientific studies mainly consider the information culture of the individual and society. At the same time, there are very few works dedicated to developing the information culture of communities. In this study, an attempt to analyze the information culture of the organization as a subject of social management was made, and the possibility and necessity to determine the essence of this concept and to reveal the reasons for its development, consideration of its varieties were shown.
3. The importance of considering the information culture of an organization as a product of joint activity of its staff and the main object of creativity is dictated by the need to systematize the accumulated knowledge in this subject with the help of information and cultural approaches, to analyze its elements and components and to identify research areas in terms of forming information society.
4. The high level of information culture correlates with the appropriate level of the development of information technologies – a purposeful organized set of information processes, which provides high- speed data processing and information retrieval, data dissemination, quick access to primary sources regardless of their location.
5. The level of CIC and, as a result, the corporate culture of an organization, depends on how the head of the organization combines existing competencies, information outlook, knowledge and skills of employees, consolidates abilities and skills, ensures focused and effective teamwork, implements the latest technologies and tools to solve practical, managerial, research and forecasting tasks.

Further studies of the information culture of management entity should include the following areas:

- analysis of the development of information and communication technologies in inseparable connection with the development of information management, improvement of technological means of realization of documenting and information processes, introduction of the most rational methods of work with documented information in management entities;

- determining the role of modern information and communication technologies in the system of social and industrial relations that have developed in the systematic and activity-related management process, and their correlation with the level of CIC;
- study of approaches and methods of socio-economic assessment of information resources, the safe storage of resources, the impact of economic factors on the implementation of innovative information systems and technologies in current conditions;
- formation of a theoretical framework for perfect information provision, establishment of the unified rules and methods of information processing in the organizations irrespective of their departmental subordination;
- analysis of employees' level of motivation in proper information provision for the management of the organization, its sustainable development, monitoring and control over compliance with applicable rules, norms and standards through the study of CIC components.

For the development of CIC it is also important to determine the role and place of the head of an organization in the implementation of information management tasks, his responsibility for achieving perfection in the technological process of document management, recruitment, appointment, training and retraining, i.e. the level of its management culture, including personal information culture.

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