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Development of an information model of personnel development in the process of training at the workplace

Abstract. The improvement of competences in relation to the solution of everyday tasks of production practice is best carried out in the process of training at the workplace due to the combination of acquired theoretical knowledge with practical experience. An urgent task of evaluating the effectiveness of training at the workplace is the diagnosis of the level of preparedness of the personnel of a multimedia company for scientific and technical activities, which can be carried out on the basis of the use of an appropriate information model of personnel development. The purpose of the article was to implement the development of a system model for the formation of professional skills in specialists of multimedia technologies of the polygraphic profile. The article proposes a method of informational support for personnel development through on-the-job training. As a framework that explains the knowledge and skills for the effective implementation of training in the workplace, the current content of competencies is considered. The key areas of personnel qualities related to multimedia technologies are systematized. As part of the conducted research, an information model was created and competence formation was tested within the framework of the relevant modules. The impact of engineering and organizational skills on improving the competencies of multimedia technology specialists is considered. The main components of success in the formation of professional skills of personnel as a result of training at the workplace are considered and analysed. As a result of the work carried out, recommendations were made on the diagnosis of the levels of training of personnel of multimedia and computer companies to improve their own scientific and technical activities, the choice of the content of professional training of specialists in the multimedia profile, the application of a systematic approach to the formation of relevant skills and abilities. A morphological matrix of the formation of technical creativity skills of the personnel of a multimedia company in the process of training at the workplace was created. With the help of Shannon's information system, a mathematical model of the formation of relevant special modules of competences was obtained. Emphasizing the technical component, the influence of engineering and organizational skills in the process of training at the workplace is considered. The entropy level of the learning system was calculated before and after receiving information. The dependence of entropy on the level of acquired knowledge was analysed. The practical

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significance of the obtained results lies in the formation of practical recommendations for the management of computer and multimedia companies for the organization of training at the workplace, as a result of which employees receive positive incentives for the development of relevant competencies

INTRODUCTION

An important component of the development processes of computer and multimedia companies is the development of personnel competencies through on-the-job training. This is due to the change in information processing technologies and the improvement of software. On-the-job training in modern conditions is an integral part of the development processes of computer and multimedia companies, as a result of which the competences of personnel are improved in relation to solving everyday tasks of production practice. Such training at the workplace can be provided both by the internal labour resources of the organization led by top management, and by involving dual education.

The practice of high-tech computer and multimedia companies involves the evaluation of the effectiveness of training at the workplace in order to diagnose the level of preparedness of personnel for scientific and technical activities. Optimizing the process of conducting such a diagnosis is possible based on the use of appropriate information support, which provides opportunities to assess the quality of the formation of professional skills in the process of mastering a special module of competencies.

K. Bhushan *et al.* (2023) consider innovative models of learning systems development. But their work lacks a description of the process of acquiring competency modules in the process of training at the workplace. Contemporary curriculum policies in the context of globalization, recontextualization, and hybridization of pedagogical models are analysed in a study by M. Cécile (2023). The content and form of the pedagogical models proposed in this study can be useful for improving the modules' competencies. However, this study does not take into account the specifics of workplace learning.

Training at the workplace is given in the scientific work by V.T. Dang *et al.* (2023). The developed system is focused on the publishing and printing industry. However, in this study, there is no mathematical model of the formation of the corresponding special modules competencies. The training of multimedia specialists should take into account the economic situation of the labour market at the end of training. The study of L. Grimal *et al.* (2020) illustrates localized pedagogical situations for enhancing global sustainable skills in engineering education and universities. However, this study does not allow providing a comprehensive view of the process of acquisition of competencies of personnel of computer and multimedia companies through on-the-job training. A pedagogical framework for the development of interactive virtual tools for teaching and learning dynamic systems in control

engineering is proposed in the work of E.E. Vidal Rosas and C. Galván Fernández (2022). But there is no description of specific modules' competencies in this work.

Research by Ye. Hrabovskyi *et al.* (2022) makes it possible to trace the influence of various economic factors on the effectiveness of the learning process. However, this study does not take into account the specifics of the technical creativity of the personnel of multimedia companies. The trends of modern smart mobile pedagogy for engineering education are systematized in the scientific work of P. Punithavathi and S. Geetha (2020). Relevant competences, which are achieved due to the implementation of mobile learning technologies, are analysed. But this study does not take into account the mechanisms of informational support for personnel development.

R. Sikström *et al.* (2022) conducted a two-stage systematic review of how pedagogical agents communicate with students. The analysis of these pedagogical aspects allows achieving a general idea of the mechanisms of information exchange in the modern pedagogical environment of learning processes at the workplace. However, this work does not provide an opportunity to highlight the main components in the haste of formation of professional skills of personnel as a result of training at the workplace. The study of the pedagogical experience of the learning process at the workplace is given in the scientific work of F. Norm (2023). This experience can be interesting for the formation of the appropriate content of competencies in the process of dual education. But this work does not take into account the key areas of personnel qualities related to multimedia technologies.

The analysis of literary sources showed that the study of modern problems of competence formation can be considered through the complex methodology of the system approach, which includes procedures at different epistemological levels (from the selection of an epistemic object to the construction of a real system in specific conditions). Despite the fact that aspects of modern trends in workplace training, as well as the creation and use of multimedia tools for dual education, have been studied in detail today, there is no systematic information model for the formation of professional competencies of personnel in the process of workplace training in the specialized literature.

The purpose of the work is to develop a system model of formation of professional skills among specialists of multimedia and computer companies in the process of training at the workplace.

MATERIALS AND METHODS

The competence development was considered using the method of generalization. Based on the use of the reproductive method of problem-based learning, an analysis of existing learning technologies at the workplace was conducted. The method of reproductive problem-based learning is based on the explanation of the material and its reproductive development.

Reproductive and research approaches were used to create an informational matrix of competence formation. These approaches develop individual qualities within the framework of the field studied by specialists of multimedia and computer companies in the process of training at the workplace. Special attention was paid to the optimal combination of reproductive and research elements and to reveal the maximum potential of the research approach to learning at the workplace. A number of laws apply in the learning process. The manifestation of each law represents certain requirements for the construction of the educational process. These requirements were taken into account for the formation of a model for the training of multimedia professionals.

With the help of the classification method, the key directions of the most important qualities of specialists were revealed. Also, this method was used to select competency modules in the process of creating a model of engineering and organizational skills of technical creativity. With the help of the deduction method, a study of personality qualities and components of each of the competence modules was carried out for the development of a model for the formation of engineering and organizational skills of technical creativity. Thanks to the use of the decomposition method, a morphological matrix of skill formation was created for each competency module.

The methods of expert assessments and statistical data processing were used to rank the relevant data sets in the process of filling the model of engineering and organizational skills of technical creativity. The introduction of quantitative evaluation points (by importance) for each of the qualities made it possible to evaluate an array of educational methods to rank them.

The calculation of the possible level of entropy by modules of competencies was carried out based on information theory. Information theory is widely used in technical and social systems, especially in the construction of optimal diagnostic processes. It originated as a mathematical theory of communication in the work of C.E. Shannon (1993). Information theory began to be applied in various fields of science as a general theory of the connection of statistical systems.

According to this theory, information is the difference in entropy of the system before and after receiving information:

$$\Delta I = H_0(A) - H_1(A), \tag{1}$$

where $H_0(A)$ is the initial entropy of the system; $H_1(A)$ is the entropy of the system after receiving information.

Information entropy was determined by the formula

$$H(A) = -\sum P_i ln P_i, \tag{2}$$

where P_i is the probability of finding the system in the i-th state. All stages of the research, in which people were involved, were carried out with their consent and in compliance with ethical standards, in particular the recommendations of the European Commission (2021) on ethics and personal data protection.

RESULTS

To improve the qualities of a person in relation to the realization of his creative potential, a flexible methodology of the development process of multimedia companies by training personnel at the workplace is needed, based on the laws of the psychology of education and creativity, taking into account the historical approach to the development of science, technology, and technology. This requires changing and adjusting the concept of dual education and its substantive components.

A significant part of the research is devoted to the development of meaningful aspects of the development of multimedia companies through training of personnel at the workplace as a factor in increasing the creative potential of the personality of young specialists, in particular specialists in the multimedia direction.

Analysis of the natural foundations and components of the creative activity of an individual, a socio-psychological approach to the formation of motives for the creative activity of personnel, the study of aspects of the acquisition of special modules competences, the influence of interpersonal relations of participants in the learning process at the workplace on the development of creative activity of specialists of multimedia firms is also included in the scope of problem development.

During the study of the creative potential of specialists in multimedia technologies, the most important qualities of specialists in the following areas were identified:

• that characterize the attitude to work: diligence, attention to work, creative approach to the implementation of the tasks of production practice;

• that demonstrate the culture of production behaviour and performance of current work: diligence, independence, faithfulness to one's word, reliability, energy;

• technical, mathematical and physical knowledge in the field of specialization, general education, awareness of the goals of the company, its tasks and plans;

• the ability to overcome current routine problems, skills related to the processing of literary technical sources and reference books, skills of general vision of the problem, skills of research and operational orientation in tasks, practical experience, skills of optimizing the solution of routine tasks of production practice, skills of interacting with other departments, the ability to explain technical issues, competence in creating a strategic plan for solving production practice tasks;

• skills of creating a psychologically attractive working atmosphere, personnel management skills, team building skills, the ability to formulate ideas, the ability to understand people, the ability to convince people.

The indicated skills and competences of a specialist (or an employee of a company) made it possible to simulate the process of creating knowledge in the personnel of multimedia companies in the conditions of training at the workplace. Focusing on the technical aspects of training at the workplace, the key skills that influence the formation of multimedia technology specialists were considered. In the original matrix (Table 1), the key modules of competencies are distributed according to the corresponding personality qualities. In each competence module (general scientific, general technical, special) a specialist of a multimedia company acquires certain skills and abilities. The question of raising the assessment of the degree of realization of creative skills in the process of solving current tasks correlates with the level of systemology modules competencies.

Table 1. Model of formation of engineering and organizational skills of technical creativity

Personality qualities	Competence modules		
	General scientific	General technical	Special
A) the ability to overcome current routine problems	Mathematical statistics and data processing	Computer graphics and visualization	Pre-print processing of information
B) skills related to processing literary technical sources and reference books	System analysis	Information and communication technologies	WEB resource development technologies
C) skills of general vision of the problem			Design of databases and knowledge bases
D) skills of optimizing the solution of routine tasks of production practice		Modelling of technical systems	Colour theory
E) competence in creating a strategic plan for solving production practice tasks			Multimedia programming

Source: author's development

The intellectual and creative orientation of the development of the company through training at the workplace can be achieved by increasing the level of intellectualization of the content of the module competencies that are the basis of the development of creative thinking. This is with module saturation competencies with modern scientific concepts and hypotheses. The formation of a modern system of competencies, which can be given such characteristics as orderliness, dynamism, complexity, and high cognitive orientations, is determined by the development of thinking mechanisms that stimulate intellectual development and consolidate the foundations of the methodology of scientific knowledge: the selection and setting of goals, ideas about their achievement.

Scientific knowledge introduced into the practice of personnel management should meet informational goals, as well as developmental goals. These should include the broad relevance and generalizability of the problem being studied, as well as the transfer of acquired knowledge and work methods to new issues. A promising and effective direction of intellectualization of the content of training at the workplace should be the use of modern methodologies that reflect the integration of a systemic style of thinking and modelling cognition, i.e. penetration into all aspects of education of available forms and methods of material and mathematical modelling, including geometric, analogue, etc.

At the current stage of digitalization of society, the methods of creating an information model from idea to programming and implementation of development at the consumer should form the basis of professional training of specialists in the IT industry. The formation of the main goal and contours of the pedagogical system determines the need to agree and take into account the requests of all participants in the learning process at the workplace. This task is multivariate, which requires the implementation of a number of steps.

Step 1. Forming a list of factors. The evaluation of the level of technical creativity of the personnel of a multimedia company in the process of training at the workplace should be considered from the example of a special module of competencies. Table 1 contains the key competences of the personnel of the multimedia firm in the process of training in the workplace. A morphological matrix for a special module of competencies is obtained (Table 2). Here, the coefficients P_{ij} express the weighting coefficients of the influence of the studied competence modules on the realization of professional skills.

Table 2. Morphological matrix of the formation of technical creativity skills
of the personnel of a multimedia company in the process of training at the workplace

		Multimedia programming	WEB resource development technologies	Design of databases and knowledge bases	Theory colour	Basics of designing WEB publications
A	Ability to overcome current routine problems	R_{A1}	R_{A2}	R_{A3}	R_{A4}	R_{A5}
B	Skills related to processing literary technical sources and reference books	R_{B1}	R_{B2}	R_{B3}	R_{B4}	R_{B5}
C	Skills of general vision of the problem	R_{C1}	R_{C2}	R_{C3}	R_{C4}	R_{C5}
D	Skills of optimizing the solution of routine tasks of production practice	R_{D1}	R_{D2}	R_{D3}	R_{D4}	R_{D5}
E	Competencies regarding the creation of a strategic plan for solving production practice tasks	R_{E1}	R_{E2}	R_{E3}	R_{E4}	R_{E5}

Source: author's development

The evaluation and measurement of the given coefficients are achieved through the decomposition of the studied module into the studied topics. The decomposition from the example of the competence module "Theory of colour" has the following form (Table 3). Table 3 shows the topics studied in columns.

Table 3. Morphological matrix of skill formation for the competency module "Colour Theory"

		Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	...	Topic 13
A	Ability to overcome current routine problems	RA_{41}	RA_{42}	RA_{43}	R_{A44}	R_{A45}	...	RA_{413}
B	Skills related to processing literary technical sources and reference books	R_{B41}	R_{B42}	R_{B43}	R_{B44}	R_{B45}	...	R_{B413}
C	Skills of general vision of the problem	R_{C41}	R_{Z42}	R_{Z43}	R_{C44}	R_{C45}	...	R_{Z413}
D	Skills of optimizing the solution of routine tasks of production practice	R_{D41}	R_{D42}	R_{D43}	R_{D44}	R_{D45}	...	R_{D413}
E	Competencies regarding the creation of a strategic plan for solving production practice tasks	R_{E41}	R_{E42}	R_{E43}	R_{E44}	R_{E45}	...	RE_{413}

Source: author's development

Step 2. Assigning weights to factors and subfactors. Each of the skills must be evaluated by a certain weighting factor. An example of weighting factors and subfactors for the first theme is given in Table 4.

Table 4. Provision of weighting factors

	Skill	An example of assigned weights
A	Ability to overcome current routine problems	$PA_{41} = 0.25$
B	Skills related to processing literary technical sources and reference books	$RB_{41} = 0.20$
C	Skills of general vision of the problem	$RZ_{41} = 0.30$
D	Skills of optimizing the solution of routine tasks of production practice	$R_{D41} = 0.15$
E	Competencies regarding the creation of a strategic plan for solving production practice tasks	$R_{E41} = 0.10$

Source: author's development

Step 3. Normalization of weight coefficients. The weights of factors and subfactors must be normalized. This is done by multiplying the scales obtained for each factor and the scales related to the subfactors. This is how the final weight for each subfactor is obtained:

$$P_{A4} = P_{A41} \cdot P_{A42} \cdot P_{A43} \cdot P_{A44} \cdot P_{A45} \cdot \ldots \cdot P_{A413}.$$

Step 4. Summary by points. In the example under consideration, a certain method of formation of professional skills is evaluated (Table 5). The best method is the

one that receives the highest rating. Comparing the weighted points assigned to different options makes it possible to rank the latter. Based on the use of information theory (Shannon, 1993) the possible entropy level for the first theme was calculated (Table 5). If the specialist successfully masters all skills, the entropy value will be $H_0(A) = 7.39$. If other topics are successfully mastered, the level of entropy will decrease and ideally tend to zero.

Table 5. Calculation of the level of possible entropy

		Topic 1		
		P_i	$Ln\ P_i$	Σ
A	Ability to overcome current routine problems	0.25	-1.39	-1.14
B	Skills related to processing literary technical sources and reference books	0.20	-1.61	-1.41
C	Skills of general vision of the problem	0.30	-1.20	-0.90
D	Skills of optimizing the solution of routine tasks of production practice	0.15	-1.89	-1.74
E	Competencies regarding the creation of a strategic plan for solving production practice tasks	0.10	-2.30	-2.20
				-7.39

Source: author's development

So, as knowledge increases, entropy will decrease. Indeed, for an unlikely event ($P \rightarrow 0$), the entropy will decay to infinity ($H(A) \rightarrow \infty$). For a credible event ($P \rightarrow 1$), the entropy will decay to zero ($H(A) \rightarrow 0$). This approach makes it possible to evaluate the applied methodology for the formation of professional skills of personnel in the process of training at the workplace and to quickly adjust the methodology.

DISCUSSION

The scientific research carried out within the framework of this work was based on taking into account the following results of the works of leading scientists. Thus, consideration of communication mechanisms in organizational systems of training at the workplace is presented in the works of T.T. Sulaiman *et al.* (2022), Y. Cleovoulou *et al.* (2022). However, the problem of these studies is the fact that the process of personnel development through on-the-job training is carried out from the point of view of the sustainable development of society, that is, without taking into account its evolution. Mechanisms of formation of informal and formalized knowledge, as well as their use in learning processes at the workplace, are proposed in the scientific studies of C.E. Shannon (1993), O.I. Pushkar and Ye. Hrabovskyi (2020). At the same time, these studies do not give clear recommendations to the management of computer and multimedia companies regarding the organization of training at the workplace.

Scientific work of S.M. Zinchenko and A.L. Zinchenko (2021) contains an analysis and systematization of the use of multimedia tools of dual education, which provide opportunities for digitalization of the educational process and an effective combination of theory and practice of using modern information technologies in pedagogical processes. However, the mathematical model of the formation of the corresponding special modules is missing in the mentioned works competencies. The specifics of creating multimedia learning tools in the workplace are analysed in a study by D. Kukushkin and V. Kolesnikova (2022).

However, this study lacks recommendations for diagnosing the levels of training of personnel of multimedia and computer companies to improve their own scientific and technical activities. An innovative strategy for the introduction of information technologies as a tool for improving the quality of training at the workplace is considered in the works of J. Lim (2021), L. Slipchyshyn (2022). However, these studies do not allow obtaining a general systemic view of the processes of formation of skills of the personnel of a multimedia firm in the process of training at the workplace. In a scientific article by R. Alakbarov (2022) proposed an optimization model for task planning in dual education. At the same time, this work does not take into account the influence of engineering and organizational skills on the formation of specialists in multimedia technologies.

The proposed results of this work on the development of a system model for the formation of professional skills among specialists of multimedia and computer companies in the process of training at the workplace are a continuation of research (Pushkar & Hrabovskyi, 2020; Pushkar, 2023) on the issues of informational support of pedagogical processes. The developed system model can be used to analyse the results of the formation of technical creativity skills of the personnel of a multimedia company in the process of training at the workplace.

The results of this study close the problematic part of informational support of pedagogical processes in terms of assessing the impact of studied competence modules on the formation of certain professional skills. This is achieved thanks to the morphological matrix developed by the authors of the formation of technical creativity skills of the personnel of a multimedia company in the process of training at the workplace (Table 2).

In this work, as in the studies of K. Bhushan *et al.* (2023), F. Norm (2023), the explanation of knowledge and skills for effective learning at the workplace is based on the analysis of the modern content of competencies. After all, the modern content of competencies is a reliable basis

that explains the knowledge and skills for effective implementation of training in the workplace. However, the mentioned studies, in contrast to this work, do not take into account such an aspect as the key areas of personnel qualities related to multimedia technologies.

In the conducted research, an information model was developed and the approbation of competence formation within the framework of the relevant modules was carried out. In the studies of T.T. Sulaiman *et al.* (2022), V.T. Dang *et al.* (2023), E. Mohammadpour and Y. Maroof (2023) offer a variety of ready-made information systems for the implementation of the task of supporting the formation of certain skills and abilities of employees in the process of training at the workplace. However, in this work, in contrast to the mentioned studies, based on the consideration and analysis of the main components in the urgency of the formation of professional skills of personnel as a result of training at the workplace, recommendations are offered for diagnosing the levels of training of personnel of multimedia and computer companies to improve their own scientific and technical activities. These recommendations provide opportunities for the management of companies in the IT industry to choose the content of professional training of multimedia specialists based on the application of a systematic approach to the formation of relevant skills and abilities.

The results of the conducted research enable the selection and assignment of factors, which will be used to compare various options for the process of training at the workplace for the personnel of multimedia and computer companies. The presentation of such factors (or properties or criteria) in this work is carried out in the form of a morphological matrix that illustrates the interdependence between factors. In the scientific article J. Malek *et al.* (2019), in contrast to this study, an overview of the practical aspects of dual education is presented without taking into account the factors of comparison of alternative options of the educational process.

In this work, as well as in the study, M. Cécile (2023) emphasizes the influence of engineering and organizational skills in the workplace learning process. However, a distinctive feature of this work is the use of information theory, which is effective for building optimal diagnostic processes. As a result, this study made it possible to calculate the level of entropy of the learning system before and after receiving information, as well as to analyse the dependence of entropy on the level of acquired knowledge.

Modern methods of building creative systems should be related to the integration of research results into the general concept of the workplace training system, and not to the evaluation and selection of a plausible version. Determining the specifics of the training system at the workplace is impossible without consistent application of the procedures of the system approach. At the same time, in the studies of L. Grimal *et al.* (2020), E.E. Vidal Rosas and C. Galván Fernandez (2022) promising ways to solve the problem of the specifics of the training system at the workplace extend from the properties of the entire system of the educational object (composition, structure, functions, system-creative

relations, characteristics, etc.) to the actual content of the corresponding competency modules. However, these studies do not provide a mathematical apparatus for evaluating the effectiveness of the formation of skills and abilities of personnel. Therefore, in this paper, based on the system approach presented in the above studies, a mathematical model of the formation of relevant special modules of competences is proposed using Shannon's information system.

The obtained research results regarding the development of a system model of formation of professional skills among specialists of multimedia and computer companies in the process of training at the workplace are adequate within the limits of the competence approach to the organization of the educational process.

CONCLUSIONS

The conduct of this study was based on the fact that the constant improvement of the competencies of the staff of computer and multimedia companies is the guarantee and basis of effective management in the IT industry. As a result, an urgent need within the framework of this work was to diagnose the level of preparedness of the personnel of the multimedia company for scientific and technical activities. In turn, such a diagnosis is impossible without the appropriate mathematical tools, as a result of which the basics of information theory were involved.

As a result of the work carried out, recommendations were developed regarding the diagnosis of the levels of preparedness of the personnel of a multimedia company for scientific and technical activities, the selection of the content of professional training, the methodology of training at the workplace was revealed, which in the complex contributes to the stimulation of positive motives for scientific and technical activities in the company's personnel, their formation system approach to the formation of relevant competences. The given list of the most important qualities of a person served as the basis for compiling a model of knowledge formation among multimedia technology specialists in the process of acquiring special competencies. Highlighting the technical component, the influence of engineering and organizational skills on the formation of specialists in multimedia technologies was considered. A mathematical model of the formation of professional skills in the process of mastering a special module of competencies based on Shannon's information system was obtained.

The scientific result of the work was the method of informational support for personnel development through on-the-job training, which makes it possible to diagnose the results of the formation of technical creativity skills of employees to solve applied tasks in the IT industry. The practical result of this research is recommendations to the management system of computer and multimedia companies to improve the quality of formation of technical creativity skills of multimedia company personnel in the process of on-the-job training. The possibility of providing such recommendations allows the morphological matrix of the formation of technical creativity skills of the staff pro-

posed by the authors. The direction of further research can be the development of a comprehensive assessment of the quality of the results of the formation of professional competencies in the process of learning at the workplace. Conducting such a comprehensive assessment will be possible based on the involvement of experts from IT companies to determine the level of improvement in the processes of forming the relevant module competencies.

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CONFLICT OF INTEREST

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Розробка інформаційної моделі розвитку персоналу в процесі навчання на робочому місці

Анотація. Щоб оцінити результативність навчання на робочому місці, необхідно діагностувати рівень підготовленості персоналу мультимедійної фірми до науково-технічної діяльності, саме тому актуально створювати відповідні інформаційні моделі розвитку персоналу. Метою статті було розробити системну модель формування професійних навичок у фахівців мультимедійних технологій поліграфічного профілю. У статті запропоновано методику інформаційної підтримки розвитку персоналу шляхом навчання на робочому місці. У якості основи, яка пояснює знання та навички для ефективного здійснення навчання на робочому місці, розглядається сучасний зміст компетентностей. Систематизовано ключові якості персоналу, які стосуються мультимедійних технологій. Створено інформаційну модель і проведено апробацію формування компетентностей у межах відповідних модулів. Розглянуто вплив інженерно-організаційних умінь на вдосконалення компетентностей фахівців мультимедійних технологій. Проаналізовано основні складники успішного формування професійних навичок персоналу. Складено рекомендації щодо діагностики рівнів підготовки персоналу мультимедійних і комп'ютерних фірм до вдосконалення власної науково-технічної діяльності, вибору змісту професійної підготовки фахівців мультимедійного профілю, застосування системного підходу до формування відповідних умінь та навичок. Створено морфологічну матрицю формування навичок технічної творчості персоналу мультимедійної фірми в процесі навчання на робочому місці. За допомогою інформаційної системи Шеннона отримано математичну модель формування відповідних спеціальних модулів компетентностей. Вивчено роль інженерно-організаційних навичок у процесі навчання на робочому місці. Проведено розрахунок рівня ентропії системи навчання до та після отримання інформації. Проаналізовано залежність ентропії від рівня отриманих знань. Практичне значення отриманих результатів полягає у формуванні рекомендацій керівництву комп'ютерних і мультимедійних фірм для організації навчання на робочому місці, внаслідок чого працівники отримують позитивні стимули до розвитку відповідних компетентностей

Ключові слова: технічна творчість; системний підхід; поліграфія; технічна інформація; епістемологічні рівні; мультимедійні технології