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Станьковська І.М.¹, Кочкодан В.Б.², Дроздовська Е.³

УПРАВЛІННЯ РОЗВИТКОМ ПЕРСОНАЛУ ІНТЕЛЕКТУАЛЬНОГО НАФТОГАЗОВОГО РОДОВИЩА

¹Івано-Франківський національний технічний університет нафти і газу,
Міністерство освіти і науки України,
кафедра менеджменту та адміністрування,
вул. Карпатська, 15, м. Івано-Франківськ,
76019, Україна,
тел.: 0667776777,
e-mail: irinastankovska@i.ua
ORCID ID: 0000-0001-7298-4449

²Івано-Франківський національний технічний університет нафти і газу,
Міністерство освіти і науки України,
кафедра менеджменту та адміністрування,
вул. Карпатська, 15, м. Івано-Франківськ,
76019, Україна,
тел.: 0508004505,

e-mail: k.volodya@gmail.com
ORCID ID: 0000-0001-5962-9741

³ Університет Адама Міцкевича в Познані
кафедра економічних наук,
Проспект Незалежності, 53, Познань,
61-714, Польща,
e-mail: ejanton@02.pl,
ORCID: 0000-0002-5404-6026

Анотація. Стаття спрямована на дослідження проблем пов'язаних з розвитком персоналу інтелектуального нафтогазового родовища. Метою статті є дослідження управління розвитком персоналу інтелектуального нафтогазового родовища.

В процесі дослідження нами використано методи теоретичного узагальнення – для формування визначень понять та загальних підходів та принципів; аналізу та синтезу; системного та комплексного аналізу, моделювання – для формування моделі управління розвитком персоналу інтелектуального нафтогазового родовища.

Для реалізації поставленої мети розглянуто напрями інтелектуалізації нафтогазового родовища, проблеми з якими зіштовхується управлінський та інженерний персонал в процесі виробництва. Досліджено, що для ефективного функціонування інтелектуального родовища потрібен висококваліфікований персонал з належним рівнем знань та набутим досвідом. Визначено складові, управління якими повинна забезпечити організація для розвитку персоналу та ефективного використання його результатів.

Наукова новизна проведеного дослідження полягає у вирішенні завдань, які мають теоретичне та практичне значення в сфері управління розвитком персоналу інтелектуального нафтогазового родовища. Для досягнення поставленої мети було вирішено такі завдання:

- визначено складові інтелектуалізації нафтогазового родовища;
- ідентифіковано проблеми, які виникають в процесі управління нафтогазовим родовищем;
- визначено поняття управління розвитком персоналу з метою обґрунтування подальших дій пов'язаних з вибором відповідних напрямів, методів, технологій та форм навчання;
- сформовано модель управління розвитком персоналу інтелектуального нафтогазового родовища та проаналізовано її складові;
- виділено характерні особливості розвитку персоналу при механістичній моделі управління підприємством;
- визначено мотиватори професійного розвитку працівників, зокрема, для підвищення кваліфікації працівників нафтогазових підприємств за результатами, якого видається міжнародний сертифікат IWCF;
- проаналізовано компетентнісний та метакомпетентнісний підхід розвитку персоналу, які доцільно застосовувати для покращення діяльності підприємства.

Ключові слова: управління розвитком персоналу, інтелектуальне нафтогазове родовище, механістична модель управління, компетентнісний та метакомпетентнісний підхід

Stankovska I. M.¹, Kochkodan V.B.², Yanton-Drozdovska E.³

DIGITAL OILFIELD PERSONNEL DEVELOPMENT MANAGEMENT

¹Ivano-Frankivsk National Technical University of Oil and Gas,
Ministry of Education and Science of Ukraine,
Department of Management and Administration,
Carpatska str., 15, Ivano-Frankivsk,
76019, Ukraine,
tel.: 0667776777,
e-mail: irinastankovska@i.ua

ORCID ID: 0000-0001-7298-4449

²Ivano-Frankivsk National Technical University of Oil and Gas,
Ministry of Education and Science of Ukraine,
Department of Management and Administration,
Carpatska str., 15, Ivano-Frankivsk,
76019, Ukraine,
tel.: 0508004505,
e-mail: k.volodya@gmail.com,
ORCID: 0000-0001-5962-9741

³ Department of Economic Sciences,
Adam Mickiewicz University in Poznan,
Independence avenue, 53, Poznan,
61-714, Poland,
e-mail: ejanton@02.pl,
ORCID: 0000-0002-5404-6026

Abstract. The article is aimed at studying the problems associated with the digital oilfield personnel development. The purpose of the article is to study the digital oilfield personnel development management.

During the research we used the methods of theoretical generalization - to form definitions of concepts and general approaches and principles; of analysis and synthesis; of system and complex analysis, modeling - for management model formation of digital oilfield personnel development.

To achieve this goal, the directions of oil and gas field digitalization are considered; the production process problems faced by managerial and engineering personnel are surveyed. It is shown that for the effective functioning of digital oilfield the highly qualified personnel with the appropriate level of knowledge and experience is needed. The components that should be managed by the organization for staff development and its effective use are identified.

The scientific novelty of the study is to solve problems that have theoretical and practical significance in the field of digital oilfield personnel development management. To achieve this goal, the following tasks were solved:

- the components of digital oilfield are determined;
- the problems that arise during the oil and gas field management are identified;
- the concept of personnel development management is defined in order to justify further actions related to the choice of appropriate areas, methods, technologies and forms of training;
- the model of digital oilfield personnel development management is formed and its components are analyzed;
- the characteristic features of staff development in the mechanistic model of enterprise management are highlighted;
- the motivators of professional development of employees are determined, in particular, for advanced training of oil and gas enterprises' employees resulting in the international IWCF certificate acquisition;
- the competence and meta-competence approach of personnel development is analyzed, which should be used to improve the enterprise's activity.

Keywords: personnel development management, digital oilfield, mechanistic management model, competence and meta-competence approach

Introduction. The growth of demand and, accordingly, prices for hydrocarbons, depletion of oil and gas fields (the rate of hydrocarbon production is reduced by 4% annually) [1, p. 3], the increase of labor protection requirements, mandatory processes of greening oil and gas production encourage the world's leading oil and gas companies to focus their

investments on the development and implementation of modern hydrocarbon production technologies using digitalization and information technologies.

One of the examples of IT-solutions application in the oil and gas industry is the digital oilfield, which makes it possible to drill wells, conduct constant real time remote monitoring of the oil and gas fields, and which increases the efficiency of field operations. Accordingly, the efficient oil and gas field exploitation includes opportunities to increase production rates, reduce operating costs, reduce equipment downtime, and carry out enhanced oil recovery.

Digital oilfield is a system of control and management of oil and gas operations in real time, which provides continuous optimization of the integrated reservoir model and production management model to increase hydrocarbon production, as well as reduces operating and capital costs [2, p. 187].

The global digital oilfield market size was valued at \$ 27.4 billion in 2020, and is projected to reach \$ 54.4 billion by 2030, growing at a CAGR of 7.2% from 2021 to 2030 [3].

The consulting company IHS CERA noted that for the first year of digital oilfield operation, the oil and gas companies are prone to get:

- up to 25% savings in operating costs;
- 8% higher production rates;
- 2-4% lower project costs;
- up to 6% increase in hydrocarbon extraction [4].

The introduction of modern digital oilfield technologies requires from enterprises, their top management and other personnel new knowledge, skills, management technologies, forms of motivation, the formation of competence requirements for the modern employee. Therefore, one of the priority tasks is staff development, and its quality component level increase. In turn, personnel's knowledge and skills development provides the increase the productivity and efficiency of the organization [5, p. 33].

The work of such foreign and domestic scientists as R. Soma, A. Bakshi, V. Prasanna, W. J. DaSie, B. C. Bourgeois, M. Mehta, A. N. Dmitrievskiy, N. A. Eryomin and others is devoted to the study of oil and gas enterprises modernization, digitalization of their activities, and the digital technologies impact assessment on the performance indicators of oil and gas enterprises.

Such foreign and domestic scientists as J. Joy-Matthews, P. Senge, T. R. Zbrytska, H. O. Savchenko, M. S. Tatarevska, O. O. Hetman and others studied the problems related to staff development. However, the issues of digital oilfield personnel development management, as well as methods, tools and directions of personnel development require constant monitoring and research, due to ceaseless change of external and internal environment of the organization along with shifts in staff's motivation for development.

Setting objectives. The purpose of the article is to study the digital oilfield personnel development management.

Methods of analysis and synthesis, theoretical generalization, and modeling were used to achieve this goal.

Results. The digital oilfield technologies are aimed at controlling the process of hydrocarbon extraction, taking into account data collected in real time.

Digital oilfield technologies include:

- digitization of operational data that were previously collected manually;
- application of electronic devices on wells, usage of Supervisory Control And Data Acquisition (SCADA) systems;
- improvement of telecommunications;
- application of underground and underwater control systems for construction and operation of oil and gas fields;
- 4-D visualization and modeling;

- availability of trained staff.

Monitoring the results of oil and gas field construction and operation makes it possible to process relevant information and make timely technical decisions, to manage the processes of hydrocarbon extraction at a distance. Collection, processing and analysis of big data allows to make technical and managerial decisions that reduce equipment downtime, increase production control, per minute drilling speed, flushing fluid circulation speed, downhole pressure, reservoir productivity, etc.

According to research, managerial and engineering staff encounters problems in the production process related to:

- complicated access to information,
- fragmentary information,
- data overload;
- inefficient knowledge management;
- significant time spent searching for information on problem identification - approximately 75% of the total time, and less than 25% - on problem analysis and decision making [6, p. 5].

Highly qualified staff with the appropriate level of knowledge and experience is required to make prompt and informed management decisions.

To solve this problem, oil and gas companies must proactively plan the provision of qualified personnel, staff training, identify and apply measures of tangible and intangible motivation of personnel to develop.

The main purpose of staff development, according to the authors [7] is to increase the «return» of each employee, unit and organization through «reinforced and motivated» employee loyalty to the organization.

Staff development, namely its professional component, should be seen as a process that involves the expansion of knowledge, competencies of employees in order to perform new functions and tasks, gain new positions and career growth. To obtain the expected effective results, this process must be managed.

Personnel development management is the implementation of a set of management functions, organizational and management methods, technologies and approaches aimed at improving the hard and soft skills and abilities of the employee, in order to increase his or her productivity, expand functionality, provide further professional and career growth [8].

Development can be both professional and personal, which involves improving the physical, psychological, moral and economic qualities of enterprise's personnel. The very combination of professional and personal development forms an active staff of the enterprise, which is capable of productive work.

The digital oilfield personnel development management can be represented as a model which takes into account the causal relationship between training, development and growth of staff efficiency (fig. 1).

Determining what knowledge an employee needs for effective work and awareness of the employee's need for training is one of the tasks of effective management of any enterprise, including the enterprise that implements the digital oilfield technologies.

Planning of the learning process should be in accordance with the needs of the enterprise and must ensure the acquisition of the necessary competencies by the employee. In order to conduct effective learning one has to determine:

- direction of study;
- teaching methods;
- learning technologies;
- forms of education.

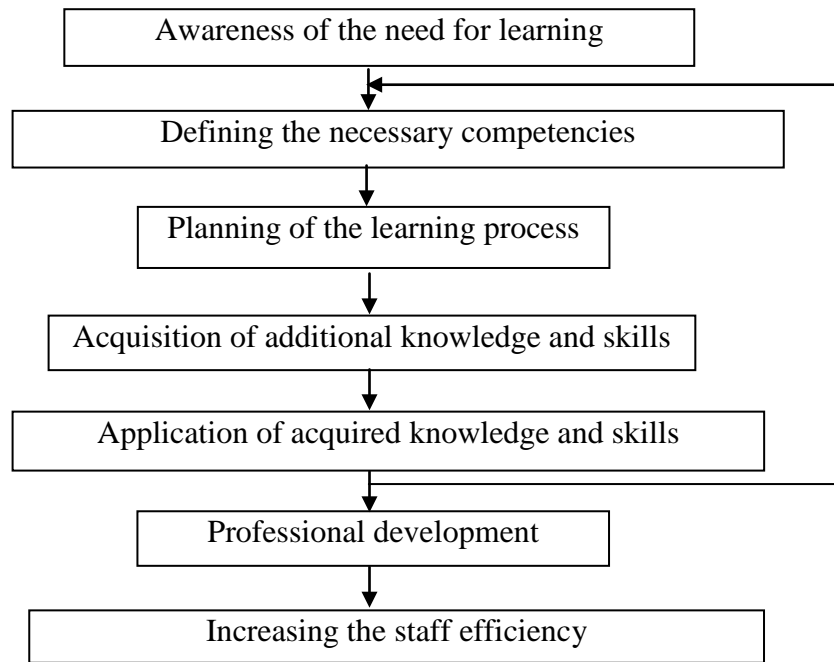


Fig. 1. Personnel development management model
(Authors' development)

Direction of study is determined by the students' needs, level of knowledge, work experience. Students' needs may include: raising the professional level, acquiring new skills and abilities, self-improvement.

Modern teaching methods are divided into two groups:

- methods of on-the-job teaching: buddying, coaching, mentoring, storytelling (motivational story), action learning, in-basket method (simulation of situations), shadowing («tracking»), rotation;

- methods of teaching outside the workplace: training, master class, case study, modeling, e-learning, business games, attending conferences, seminars, job fairs, lectures, etc.

Through the learning process, employees receive the necessary knowledge for the organization, among which are:

- basic knowledge (fundamental), i.e. the minimum knowledge that employees must have to perform the tasks;

- specific knowledge that enables the employee to perform professional functions;

- innovative knowledge that allows the company to develop and compete in the market.

To form, maintain and develop knowledge, share it and use it effectively, the organization must ensure the management of three interrelated components, namely:

- the knowledge infrastructure, which through the relevant structural elements distributes knowledge and manages it; determines the place where an employee can get knowledge, according to the company's needs;

- the knowledge culture that ensures the formation of a cultural environment conducive to the transfer of knowledge, its exchange and motivation of such processes among company's staff;

- the knowledge technologies that ensure the availability of modern tools and technologies for obtaining and transmitting knowledge, document management, management decision-making tools.

Management of personnel's professional development from the enterprise's standpoint involves the definition, planning and motivation of a set of professional competencies of employees that will contribute to the organization's strategic tasks solution.

Competences are what a person can demonstrate here and now in its work, the result of professional experience. Competences are formed in the process of work, during the performance of certain tasks, they are stored while the person works and have ability to be gradually lost as soon as the person ceases to be engaged in this kind of activity.

An important task of enterprise management is to provide opportunities to apply the acquired knowledge and competencies in the workplace. Managers and personnel working on digital oilfields must have appropriate technologies that can help solve problems that arise during the workflow and be able to use the capabilities of intelligent systems.

It should be kept in mind that most oil and gas companies use mechanistic management models. Professional staff development in such organization:

- has a discrete nature;
- is divided into separate, not always logically connected, stages;
- in most cases depends on the top management and the decisions it makes;
- is associated with the ability to quickly and effectively adapt to change;
- involves the implementation of the traditional career components.

The motivations for successful professional development in such an organization are:

- job promotion;
- obtaining the status (internal-organizational, external-organizational);
- assignment of official ranks;
- diplomas, certificates, other documents confirming qualification;
- the amount of salary;
- closeness to top management;
- the ability to influence the decisions.

The ability to use the acquired knowledge contributes to further professional development by understanding employees' own expectations and the expectations of the company, understanding the ability to influence the results of the enterprise, giving them the opportunity to show initiative and make decisions.

The personnel efficiency increase due to the acquired knowledge and competencies should be accompanied by the integration of information technologies, which form production process models based on original data obtained from wells, pipelines and equipment.

Currently, employees of Ukrainian oil and gas companies can be trained at Safe Drilling LLC according to the curricula of international standards IWCF (International Well Control Forum). The advanced training and certification course is carried out on the basis of Ivano-Frankivsk National Technical University of Oil and Gas. The training program promotes the dissemination of best practices in the oil and gas industry in the following areas of certification:

- «Drilling Well Control. Control of wells, prevention and elimination of fluid manifestations during well drilling and well overhaul»;
- «Coiled Tubing Operations. In-well operations with the help of a Coiled Tubing Unit»;
- «Wellbore Intervention & Fishing. Conducting operations in the wellbore and using a vast array of fishing systems and tools available to remove any wellbore obstruction safely and efficiently».

The implementation of scientific experience in production provides a real opportunity to test the theoretical level of knowledge and practical training of students. DrillSim-20, the unique and only one in Ukraine compact mobile drilling simulator is used to control the well operations during training.

After the successful training the student is issued an international IWCF certificate, which is recognized worldwide. IWCF international certification provides:

- staff's professional level growth;

- wage growth;
- career growth;
- self improvement;
- personnel reserve preparation for international projects participation;
- prevention of accidents and human casualties at work;
- compliance with the requirements of technological discipline;
- observance of rules and requirements concerning labor and environment safety, enterprise's property protection.

These learning outcomes are relevant for oil and gas companies, as they provide an opportunity to meet the needs of the employee and the main objectives of the company.

An important task for organizations implementing digital oilfield technologies is to become a self-learning organization, where employees are:

- constantly developing their own abilities;
- creating new intellectual organizational models;
- being a part of the «collective spirit»;
- able to see problems and solutions [9].

An important task of the modern organization management is the ability to create conditions and form personnel's understanding in the need of the self-learning organization concept application and implement the main directions of this concept, through the following five components:

- system thinking;
- personal development;
- intelligent models;
- general vision;
- group training.

Modern understanding of staff development involves a combination of team building, team development and individual development. Thereby, staff should be formed with a high level of motivation and developed talents focused on improving performance and success of the whole team.

It should be noted that modern science identifies certain limitations of the competency approach, namely that such an approach is relevant only for non-managerial work, which can be accurately and clearly described. For complex professional activities, in particular managerial, which has a great variety of ways to effectively achieve the same goal, this approach is not applicable.

Therefore, there is a need for staff with meta-competences.

Meta-competences are the characteristics of a specialist that can guarantee his effectiveness in many activities; they form reasonable productivity and directed activity.

Personnel with meta-competences have the following characteristics:

- thinking is focused on solving problems and creating opportunities;
- entrepreneurial competencies, i.e. the ability to act in a situation of uncertainty and take responsibility;
- creative abilities;
- ability to cooperate;
- empathy and emotional intelligence;
- responsibility ethics to society and nature;
- ability to concentrate and attract attention;
- flexibility, adaptability and internal stability;
- focus on development, i.e. the ability to learn and relearn throughout life.

Such meta-competencies form a trans-professional employee that modern leading world organizations and oil and gas companies in particular want to have in their staff.

In order to effectively operate digital oilfield, the promotion of management staff's meta-competencies development should be an important task.

Conclusions. The scientific novelty of the study is to solve problems that have theoretical and practical significance in the field of digital oilfield personnel development management. To achieve this goal, the following tasks were solved:

- the components of digital oilfield are determined;
- the problems that arise during the oil and gas field management are identified;
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- the motivators of professional development of employees are determined, in particular, for advanced training of oil and gas enterprises' employees resulting in the international IWCF certificate acquisition;
- the competence and meta-competence approach of personnel development is analyzed.

To ensure the effective operation of oil and gas companies, the motivational and administrative methods of personnel development management require further research, along with creating conditions for the self-learning organization concept implementation, and effective use of oil and gas enterprises staff's development and training results.

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Вербовська Л.С.¹, Микитюк Н.Є.²

УПРАВЛІННЯ ІНТЕЛЕКТУАЛЬНИМИ ПРОДУКТАМИ В УМОВАХ ЗМІН

Івано-Франківський національний технічний
університет нафти і газу,
Міністерство освіти і науки України,
кафедра менеджменту та адміністрування,
вул. Карпатська, 15, м. Івано-Франківськ,
76008, Україна,

¹тел.:+380666091419,
e-mail: verlesya@gmail.com,
ORCID: 0000-0002-2509-1194

²тел.:+380503388898,
e-mail: nataliamykytiukmmm@gmail.com,
ORCID: 0000-0002-3194-3891

Анотація. Стаття присвячена пошуку шляхів ефективного управління інтелектуальними продуктами починаючи від етапу винаходження, реєстрації та виходу на ринок. Для досягнення поставлених завдань використано методи: аналізу та синтезу; системний аналіз; логічний; абстрактний. Авторами статті запропоновано визначення суті поняття «інтелектуальний продукт», який слід розуміти як новостворені духовні і матеріальні цінності, які виступають результатом інтелектуальної діяльності особистості чи групи в результаті