Application of Information Technologies for Lifelong Learning

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Abstract
The relevance of the research involves outlining the need for modern professionals to acquire new competencies. In the conditions of rapid civilizational progress, in order to meet the requirements of the labor market in the knowledge society, there is a readiness for continuous training as an indicator of professional success. The purpose of the research is to identify the impact of various forms of application of information technologies for lifelong learning in order to provide the continuous self-development of each person without cultural or age restrictions and on the basis of rapid digital progress. A high level (96%) of need of the adult population in continuing education with the use of digital technologies has been established. The most effective ways to implement the concept of "lifelong learning" have been identified (educational camps, lifelong learning, mass open online courses, Makerspace activities, portfolio use, use of emoji, casual game, scientific research with iVR game, implementation of digital games, work in scientific cafes). 2 basic objectives of continuing professional education for adults have been outlined (continuous improvement of qualifications and obtaining new qualifications). The features of ICT application in adult education have been investigated by using the following methods, namely: flexibility in terms of easy access to ideas, solving various problems, orientation approach, functional learning, group or individual learning, integration of leisure, personal and professional activities, gamification. The advantages of application of information technologies for continuous education (economic, time, and adaptive) have been revealed. The concept of continuous adult learning in the context of digitalization has been concluded. The research provides a description of the structural principles of the concept of additional education; a system of information requests of the applicant, as well as basic technologies for lifelong learning. The research indicates the lack of comprehensive research in the relevant field. The practical significance of the research results lies in the possibility of using the obtained results for a wider acquaintance of the adult population with the importance of the application of lifelong learning for professional activities and the introduction of methods for its implementation in the educational policy of the state.

Keywords*: the concept of "lifelong learnng", ICT, competency-based approach, information socety, globalization*

1. Introduction

The rapid development and implementation of information and communication technologies in the field of adult education is based on a competency-based approach that makes it possible to train a specialist who can adapt to changing conditions and demonstrate high efficiency. The role of information and communication competence as a basis for self-education and self-development throughout life is growing, forasmuch as a necessary attribute of professional suitability in the modern information society is the ability to use information technology, its tools, forms and methodology.

The system of additional adult education should function within the concept of "lifelong learning". Information technologies can be implemented to facilitate its introduction.

One of the important forms of lifelong learning is e-learning, which provides individualization of learning and creates the possibility of constant access to educational information. It is worth noting that such training requires self-discipline from an online student as well as perseverance and a high level of motivation.

It is precisely because of the introduction of e-education into the lifelong learning system that updated opportunities for educational innovation open up. As a result, they have a positive impact on the structure of professional activity, encouraging each individual, seeking to be competitive, to acquire new competencies. It becomes obvious that the level of competitiveness is determined by the quality and quantity of competencies of professional staff. An increasing role is played by the ability of staff to socialize, adapt to technology, work in a corporate culture, or so forth. As a result, it becomes obvious that the most important part of a person's professional activity is his knowledge. Many of the previously acquired skills and abilities become obsolete at almost the same rate as new technologies enter our daily lives and professional activities. The only way to maintain one's competitiveness in these conditions is to constantly update professional competencies.

2. Literature Review

The interrelationship between lifelong learning and the society is the subject of debate in various fields. On its basis, various proposals are made regarding whether citizens need continuous education (González-García, Blanco-López, España-Ramos, et al., 2021).

Marsh (2018) points out that an increasing amount of literature deals with the importance of digital skills for adults in the context of lifelong learning, however, the

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empirical understanding of their impact on the implementation and effectiveness of such technologies is now significantly limited.

Desjardins, Ioannidou (2020) observe a galloping scientific interest in the study of continuing adult education in the context of political economy. The main purpose of such attention is to understand the causes and consequences of transnational diversity in learning systems of adults. Interdisciplinary areas of research, analyzing the typologies and content of lifelong learning, are of practical importance for the implementation of adult learning systems.

Tamim (2020) believes that the analysis and understanding of adult education in the context of digitalization requires the perspective of systems thinking.

In recent decades, digital competence has become important for the adult population. At the same time, there is a lack of systems for retraining adults in the field of digital competence. In addition, the assessment of digital competence cannot be performed using simple self-assessment tests. In order to conduct this, there are more sophisticated tools, including modeling, a real scenario or so forth. DigComp is an effective way to evaluate the DC (Bartolomé, Garaizar, & Larrucea, 2021).

It must be understood that new digital practices accompany education through the introduction of continuing knowledge technologies (Baruch, & Erstad, 2018). Our digital reality is the result of a complex interaction of the educational and individual field of the seeker of "free knowledge" (Gourlay, Rodríguez-Illera, et al., 2021). The "digital turn" that has taken place in the policy of social development since the early 2000s is characterized by the increasing use of digital devices as tools for developing and managing new educational systems to implement the concept of "lifelong learning" (Dahdah, Quet, 2020).

The modern information society requires new skills for personal, labor and social inclusion. The so-called skills of the twenty-first century are as follows: the competence to solve problems using digital technologies in environments PS-TRE, PISA, PIAAC, OECD or so forth (Iñiguez-Berrozpe, Boeren, 2020).

Singh (2020) notes that there is a need to measure the quality of education systems as part of global change in world politics.

Goriss-Hunter, Sellings, & Echter (2021) note that in modern society, at the national and international levels, the use of information and communication technologies (ICT) has become a vital component for the adult population. In Australia, as in many countries, a national priority within education systems is to ensure that adults in the digital world possess ICT skills.

There is an assumption that after a while the children of Spain (in the context of confronting the consequences of COVID-19), when choosing lifelong education, will choose their school experience. The authors emphasize the importance of the school's role in providing educational opportunities for children with low social-economic backgrounds and discuss particular implications of their findings for understanding the future challenges of implementing the concept of "lifelong learning" (Bonal, González, 2020).

Pronczuk-Omiotek, Skulimowski (2018) note that a new trend is observed in the Polish labor market, namely: employees are trying to improve their working conditions with the help of information technologies.

Based on the spatial model of Durbin (Xiao, Mao, 2021), researchers have investigated the impact of postgraduate education on technological innovation. Using data from China's provincial territories from 2004 to 2018, it has been established that the distribution of graduate students in China shows signs of spatial autocorrelation and imbalance. In general, postgraduate education has a positive impact on technological innovation.

According to the definition of Chen, Huang, & Wu (2021), lifelong education should be based on specific components of self-efficacy; therefore, a group of Spanish experts have proposed to critically consider the importance of lifelong education in the context of implementation (González-García, Blanco-López, España-Ramos, et al., 2021).

The governments of Canada and New Zealand promote a high level of educational development and many years of experience in non-formal adult education (Walker, 2020). However, fragmented fiscal federalism (Krelove et al. 1997), the closure of national adult education organizations, and the cessation of initiatives, as well as the general lack of substantial reform of continuing education, can significantly reduce people's desire to pursue life-long learning.

According to the definition of Fan, Tseng, Chao, et al. (2020), quasi-experimental design is an effective diagnostic method for studying adult education.

Lister (2021) recommends the use of the "Pedagogy of Experience for Smart Learning (PECSL)" model for the implementation of lifelong learning technology. This is a four-level model of considerations for the design and development of educational activities. The learner's experience is at the heart of learning design, focusing on all the complex interrelated tasks that can only be outlined.

Investigations show that the real advantage of informal experience is the long-term transformation of adults into students in specialized training centers by type of science museum, forasmuch as they conduct workshops with special scientific equipment (Staus, Falk, Price, et al., 2021). On this basis, it is also worth noting that public libraries around the world have reconfigured their websites to include "maker spaces" as a special field where readers are involved in creating, inventing,

designing, discovering, coding, building and researching of their own projects (Macann, Carvalho, 2021). Other ways of acquiring knowledge include scientific cafes, which create open public forums to facilitate the exchange of ideas between scientific experts and the public (Childers, Governor, Osmond, et al., 2021). Kim, Song (2021) aim to study the structural interrelationships of factors influencing the intention of adults to use mass open online courses (MOOC). Janakiraman, Watson, & Watson (2021), in their scientific work, focus on the targeted development of digital games for use in lifelong learning systems that provide cognitive knowledge and emotionally engage the recipient in learning activities. Virtual reality immersion game (iVR) is an effective method of lifelong learning (Bodzin, Junior, Hammond, et al, 2021; Mutch-Jones, Boulden, Gasca, et al., 2021). The use of the portfolio in continuing education for adults, according to McDermott-Dalton (2021), is now deeply implemented in practice.

Emoji has also become an indispensable and effective online learning tool in the context of adult education (Li, Yang, 2018). The use of casual games in order to motivate adult learning is often used in corporate retail, forasmuch as it leads to a significant level of motivation in the process of interacting with the game learning platform (Kapp, Valtchanov, & Pastore, 2020). Mobile micro-learning is a promising approach to the introduction of digital competencies in continuing education (Jahnke, Lee, Pham, et al., 2020).

Thus, despite such a set of scientific investigations of the topic under discussion, the issues of describing the set of digital skills of adults during the implementation of the concept of "lifelong learning" and ways to use them remain relevant. On this basis, the presence of digital literacy plays an important role, forasmuch as it is a precursor to the general determinants of the introduction of technology in organizational activities aimed at promoting digital perception and the desire to improve professionally.

3. Aims

The purpose of scientific research is as follows: to identify the impact of various forms of application of information technologies for lifelong learning in order to provide the continuous self-development of each person without cultural or age restrictions and on the basis of rapid digital progress.

4. Research tasks

Achieving a scientific purpose outlined involves solving a system of objectives, namely:

1. to establish the need of the adult population in continuing education with the use of digital technologies on the basis of a survey;
2. to identify the most effective ways for implementing the concept of "lifelong learning";
3. to outline the tasks of continuing professional education of adults;
4. to explore the features of the use of ICT in adult education;
5. to identify the benefits of using information technologies for continuing education;
6. to conclude the concept of continuous adult learning in the context of digitalization.

4. Research methods and methodology

The methodological base is based on sociological and statistical methods of the research, as well as on a systematic analysis of the content of "lifelong learning" concept and its relationship with digitalization.

Sociological methods (sociological survey, method of information analysis); statistical methods (ranking method, descriptive statistics) have made it possible to establish the need of the adult population in continuing education using digital technologies and to identify the most effective ways in order to implement the concept of "lifelong learning".

The research was conducted among the adult population (Ukraine) on the Google-forms platform in order to determine the needs of the adult population in continuing education. The total sample of respondents was 1082 people, after the method of quality screening - 1037 people.

Respondents were asked to answer different types of questions in order to determine the level of understanding of the concept under consideration; their personal need for continuing education (using the ranking method); to evaluate the effectiveness of forms and methods of lifelong learning, which they would (if necessary) prefer by using the method of information analysis.

System analysis has made it possible to study the interaction of the concept of "lifelong learning" with the concept of digitization on the basis of consolidated statistics of respondents' answers.

6. Results

1082 respondents took part in the sociological survey. They were asked to give answers ("yes", "no", "I don't know"), as well as to rank the categories according to their experience.

To the question "Is continuing education implemented in Ukraine?", 641 people answered "yes", 441 people answered "no", which divided the scale by 59% and 49% respectively. The results are presented in Figure 1.

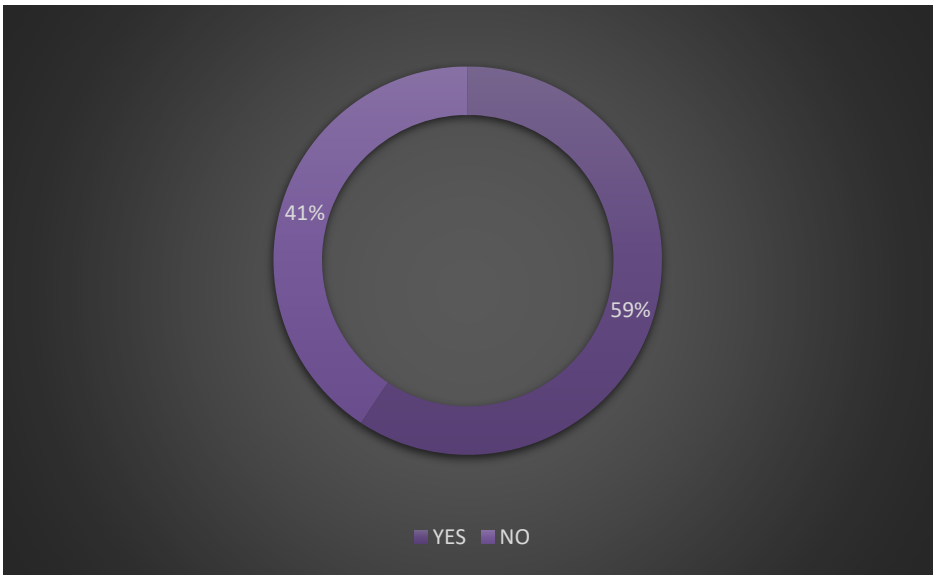
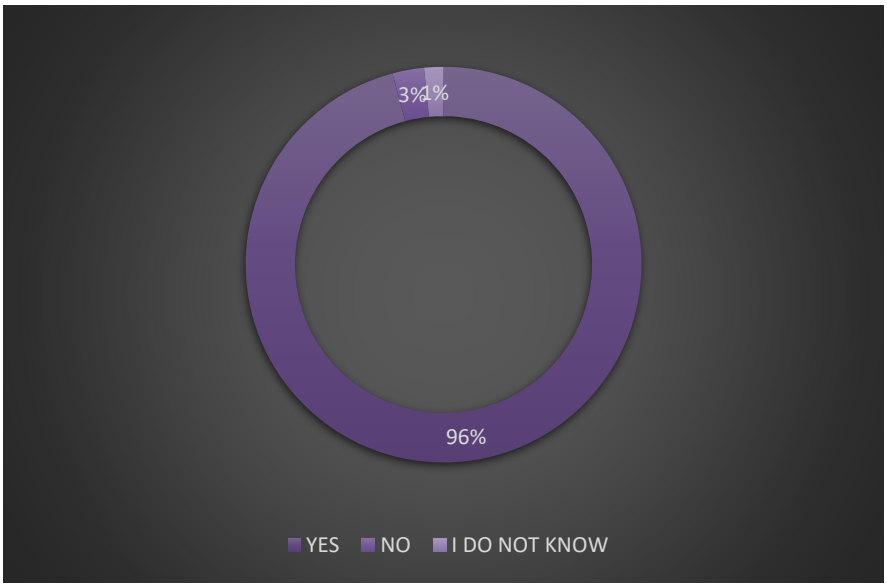


Figure 1. Implementation of continuing education in Ukraine
(Source: author's development; concluded on the basis of the answers of the respondents)

After a brief information on the meaning of continuing education, respondents had to answer the question "Do you feel the need to learn throughout life?", 1037 respondents answered "Yes" (96%), 17 respondents answered "No" (1%), 28 respondents answered "I do not know" (3%). The results are presented in Figure 2.

Figure 2. The need of the adult population for continuing education (Source: author's development; concluded on the basis of the answers of the respondents)



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For those respondents whose answer after the second question was negative or uncertain (17 respondents answered "No" (1%), 28 respondents answered "I do not know" (3%), testing was completed.

Those respondents who gave an affirmative answer continued testing (1037 respondents answered "Yes" (96%)).

The third question was to rank the proposed objects from larger to smaller (each of them had a short description). Respondents needed to identify the most effective ways to implement the concept of "lifelong learning". The results are presented in Figure 3.

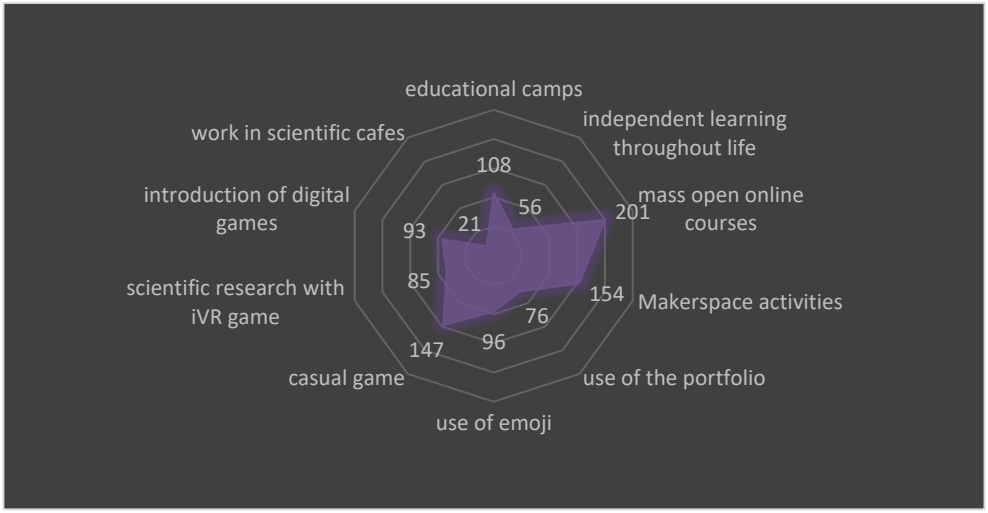

Figure 3. The most effective ways to implement the concept of "lifelong learning"
(Source: author's development; concluded on the basis of the answers of the respondents)

The ranking systems showed the following results, namely: mass open online courses were placed in the first place (201 respondents), Makerspace activity was in the second place (154 answers), and the third place was occupied by a casual game (147 answers). The second three places were as follows: educational camps (108 positions); use of emoji (96 tags); introduction of digital games (93 respondents). The last four places vary in the systems of scientific research with iVR game, use of the portfolio, lifelong learning, and work in scientific cafes with marks 85, 76, 56, 21, respectively.

The fourth issue concerned the ranking in the system of "the objective of continuing professional education of adults". Respondents identified two most important objectives, namely:

- continuous professional development both in terms of technology development and in terms of the dynamics of corporate relations. This task was chosen by 689 respondents.
- obtaining new qualifications by professional staff through the acquisition of competencies demanded by the society and the economy. This task was chosen by 348 respondents.

The fifth question suggested ranking the specifics of the use of ICT in continuing education. The results are presented in Figure 4.

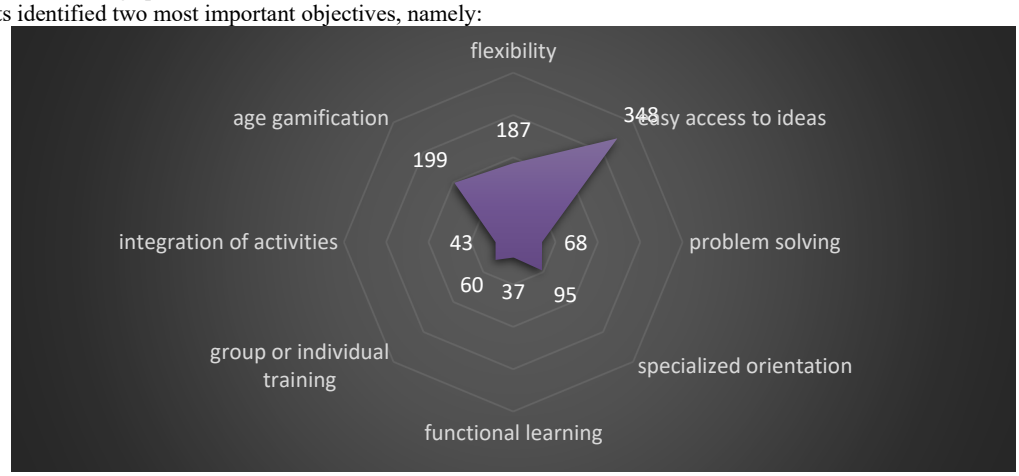

Figure 4. Features of the use of ICT in continuing education.
(Source: author's development; concluded on the basis of the answers of the respondents)

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Respondents gave the following numerical values to the proposed features of the use of ICT, namely: flexibility in terms of content and object, place and time - 187 affirmative answers; easy access to ideas, new products - 348 marks; solving various problems - 68 respondents; focus on an approach that takes into account the needs and expectations of students, instead of simply providing knowledge and information - 95 selected answers; use of functional training through support and implementation of practical tasks - 37 ideas; group or individual training in the form of webinars or coaching sessions - 60 proposals; integration to reasonable limits of leisure, personal life and professional activity - 43 selected answers; gamification of training taking into account age features - 199 marks.

The sixth question concerned the ranking of the benefits of using e-learning for adults on social networks or in special online portals. The results are presented in Figure 5.

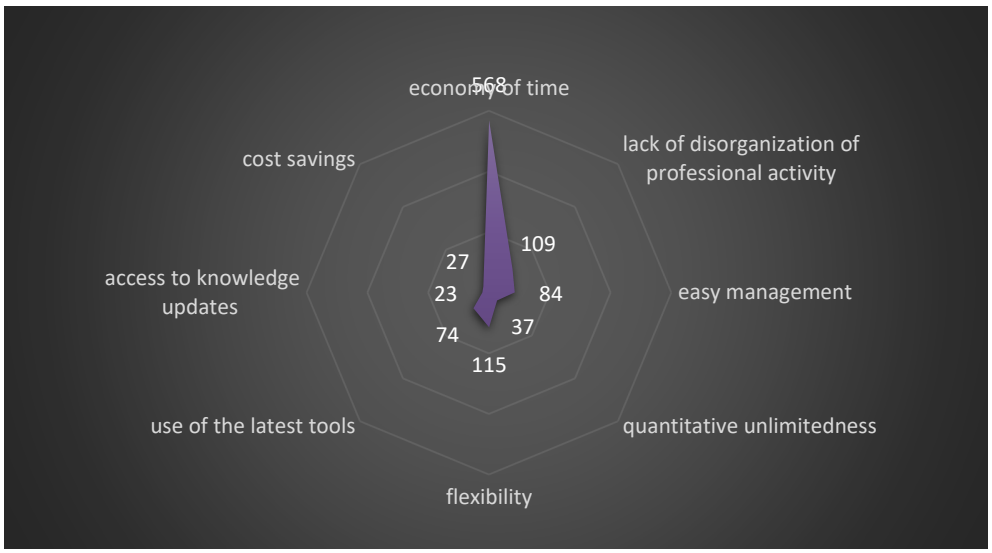

Figure 5. Advantages of using e-learning for adults in social networks or in special online portals (Source: author's development; concluded on the basis of the answers of the respondents)

Among the most important advantages of using e-learning for adults on social networks or in special online portals, respondents singled out the following ones:

- ✓ saving the cost of paying for an online teacher, renting classrooms for training, accommodation, transfer, meals or so forth - 27 marks;
- ✓ economy of time and expenses of online participants for a training trip - 568 answers;
- ✓ lack of disorganization of professional activity, forasmuch as employees of companies can attend online trainings at a time convenient for them, including in the workplace - 109 marks;
- ✓ management staff can easily control the process of training of subordinates through verification testing - 84 answers;
- ✓ lack on restrictions on the number of people who study at the same time in one online course - 37 marks;
- ✓ flexibility in restructuring the curriculum to the requirements of company's management and the needs of online students – 115 answers;
- ✓ use of the latest tools for knowledge transfer and formation of sustainable skills - 74 marks;
- ✓ unlimited access to updating or self-actualization of the acquired knowledge - 23 answers.

7. Discussion

Recipients of the investigation of Walker (2020) believe that investing in the development of citizens' skills in an environment of increasing automation, overall job relocation, contracting, increasing immigration and cultural diversity, and the need to address the legacy of colonization should be implemented in order to be able to operate with the competencies they need to adapt to new standards of work. Our recipients are convinced that Ukraine lacks structures and institutions that would make it possible to coordinate, regulate and professionally and centrally organize the adult education system at a high level.

According to the results presented in Figure 1, there are certain deviations in the system of interaction between citizens and the state, caused by ignorance of Ukrainians about the system of access to continuing education. In order to address this discrepancy, the authors Desjardins, Ioannidou (2020) recommend considering specific institutional features that promote participation in adult learning and point to policy conditions that support effective adult learning systems.

Thus, we understand that the concept of "lifelong learning" is most successfully implemented when it relies on the introduction of information technologies through the following ways, namely:

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1) integration of technological operations into the system (Stec, Smith, & Jacox, 2020);
2) diversification of economic strategies that try to standardize education in the economic system; the evolution of the relationship between public and private educational institutions: the interaction between the public and private sectors, which has really been renewed due to the type of partnership; reconfiguration of such important issues as control, inequality, individual intolerance (Dahdah, Quet, 2020);
3) catalysis of qualitative social changes in the global context (Singh, 2020);
4) matrix model. According to the definition of Chen, Huang, & Wu (2021), continuing education should be based on specific components of self-efficacy (in the matrix STEM self-efficacy + pedagogical beliefs + need for professional development (PD);
5) modular adult learning (Bartolomé, Garaizar, & Larrucea, 2021);
6) a broader understanding of types of learning, which can increase the potential for value for learners and offer more flexibility for learners (Lister, 2021).

The use of information technologies for lifelong learning requires ways of implementation, among which the following should be outlined, namely:

1. by definition of Pronczuk-Omiotek, Skulimowski (2018), educational camps, lifelong learning, mass open online courses or so forth;
2. as defined by Macann, Carvalho (2021), Makerspace, which often involves learning in practice and solving problems in various topics in science, technology, engineering and mathematics (STEM) through the use of public space as an innovative learning environment designed specifically for study of computational thinking (CT) in accordance with the activities of STEM. Recipients of this investigation, as well as our research, see the solution to the problems of continuing education in the development of skills in working with ICT, workshops with tools / robotics or so forth;
3. according to the definition of McDermott-Dalton (2021), the use of portfolios in theories of cultural history in combination with the methodology of "laboratory of change" and expansive learning;
4. according to the definition of Li, Yang (2018), the use of emoji;
5. according to the definition of Kapp, Valtchanov, & Pastore (2020), a casual game;
6. according to the definition of Bodzin, Junior, Hammond, et al. (2021), scientific research with iVR game;
7. according to the definition of Mutch-Jones, Boulden, Gasca, et al. (2021), the introduction of digital games;
8. according to the definition of Childers, Governor, Osmond, et al. (2021), work in scientific cafes.

8. Conclusions

Thus, based on research conducted, it can be argued that the modern concept of lifelong learning is evolving in the humanistic direction with the help of digital technologies.

Based on the results of the electronic survey of 1082 respondents (after the method of qualitative screening - 1037 people), we can present a concluded model of the concept of continuous adult learning in the context of digitalization.

The concept of lifelong learning for adults should include mandatory elements, as follows:

- self-education with the help of IT tools (computer or smartphone and web network);
- individual mentoring and group counseling;
- professional, social, cultural and creative education;
- flexibility of forms of training (synchronous and asynchronous, at a time convenient for the applicant).

Figure 6. The concept of continuous adult learning in the context of digitalization
(Source: author's development; concluded on the basis of the consolidated answers of the respondents)

An important area of further research is the correlation of the basic principles of application of information technology for lifelong learning with the methods and forms of their implementation.

The practical significance of the study involved determining the features of the use of ICT in the context of lifelong learning for adults; outlining effective forms of knowledge and skills transfer; the benefits of learning on social networks or in special online portals; basic principles of application of information technologies for lifelong education.

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