

# E-Learning - the practice in industrial enterprises

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**Abstract**—The dynamic development of technology in today's digital world entails changes in the business models, thus predetermining a radical turn in human resource management (HRM). We witness the constant readjustment of the functions of HRM professionals due to the creation and implementation of new technologies. Among the most currently used technologies are: E-Learning, social networks, mobile technologies, learning management systems, virtual reality, chat bots, gamification and artificial intelligence. The authors explore in this report the E-learning practices in the industrial enterprises. Based on their survey, they draft conclusions and provide methodological guidelines for overcoming the weaknesses in the process of online training of the personnel in the industrial enterprises.

**Keywords**—*E-Learning, E-Learning systems, E-Learning instruments, E-Learning methods*

## I. INTRODUCTION

In recent years, E-Learning is developing with great dynamism in industrial enterprises. This trend is an expression of both the growing interest in modernizing education through the inclusion of modern digital forms of learning and the hopes and expectations of employers in terms of opportunities to achieve more flexible and effective learning. The aim of the authors is to analyze the E-Learning practice, to outline the problem areas and to indicate the areas in which efforts should be directed in order to increase the quality of E-Learning. To achieve this goal, we make a literature review of key concepts, analysis of practice in E-Learning and outline areas for change in E-Learning. We use survey research, semi-structured interview, comparative analysis, data processing, observation, systematization of theoretical statements.

## II. LITERARY REVIEW

### A. Basic views of E-learning

We are witnessing the introduction of information technology and the successful implementation of the European project "E-Learning". The Europe 2020 strategy calls on EU countries to make significant investments in

education, new technology development, innovation and job creation. One of the main priority areas identified in the strategy is smart growth (promoting knowledge, innovation, education and the digital society). The realization of this sphere in the field of industry will increase respectively the competitiveness of the industrial enterprises in Bulgaria, due to the increase of the quality of the human resources. In this regard, the role of E-Learning is of high importance for the development and functioning of the business.

The review of the specialized literature related to the essence of the key concept in our report - E-Learning, shows different author's approaches in defining it. In E-Learning: Definitions and Varieties, the authors analyze some of the definitions of E-Learning [1]. We classify three of them, which in our opinion most clearly express the content element of the key concept considered in Table 1, namely the place of training - the electronic environment (Table 1). The difference in these definitions is the different emphasis, such as "accessibility ("anywhere and anytime"), distance ("geographically remote"), speed ("real time"). The team of authors of this report is in favor of shorter definitions, which at the same time exhaust the basic essence. Therefore, we consider "learning supported by the use of information and communication technologies" to be the most appropriate [5].

TABLE I. DEFINITIONS FOR E-LEARNING

№	AUTHOR	DEFINITION
1.	HUDDLESTONE J., PIKE J. 2007	"E-LEARNING IS ALSO CONSIDERED AS TRAINING" PROVIDED BY ELECTRONIC MEANS INCLUDING WEB-BASED SYSTEMS AND INFORMATION IN COMMUNICATIONS IN COMMUNICATIONS AND COMMUNICATIONS
2.	AKOUR I. 2012	"TRAINING BASED ON INFORMATION AND COMMUNICATION TECHNOLOGIES", IN WHICH THE TRAINING MATERIALS ARE PROVIDED IN ELECTRONIC FORM TO A GEOGRAPHICAL OBSERVER.
3.	TAWILA N., ISMAILA N., ASSHAARIA I., OSMANA H., NOPIAHA Z., ZAHARIM A. 2011	"INFORMATION AND COMMUNICATION TECHNOLOGY OPERATING THROUGH THE INTERNET, PROVIDING IN REAL TIME AND / OR AT ALL TIMES ELECTRONIC AND 4-ELECTRONIC NUMBER"

Experts most often define E-Learning as learning built through the use of information and telecommunications technologies. It covers a wide range of applications and processes. They often reach the learner in the form of video lectures, simulations, interactive quizzes and additional reading materials. The relationship between learner, trainer and learning content is a criterion for some authors to identify variations in e-learning. The most common types are:

- **asynchronous learning** - it does not require a presence in front of a computer or other means at a specific time. This predetermines the independence of the learning process from the time of the training [3]. According to researchers, this type of E-Learning is the most common in organizations [6].
- **synchronous** E-Learning (e-training, webinar, online training) - it is characteristic that it is conducted in real time. In addition, participants need to join the training at a specific time and be physically present.
- **blended learning** - is a combination of traditional learning forms with forms related to the use of high technology, such as multimedia, conference calls, online text and animation, video, blogs and online publications.

Another criterion for determining the types of E-Learning is the device that participants use to engage in the learning process. On this basis, there are:

- **E-Learning** - it requires desktop computers, mobile computers, mini mobile computers;
- **M-training** - is conducted via mobile phones with operating system (smartphone) or tablets.

#### *B. Basic views of E-Learning systems and instruments*

The review of specialized publications gives us the opportunity to highlight the scientific article "E-Learning systems and tools", which analyzes the modern systems and tools for e-learning [7]. The dynamic development of technology is a prerequisite for the emergence of new learning technologies [8]. Learning Management Systems (LMS) provide a secure online environment for creating and managing courses and generating lists of different categories of learners. Their main feature is that they provide opportunities for:

- creation of user profiles;
- personal virtual space;
- creating a study schedule;
- real-time results, etc.

Database generation systems (Big Data) play a significant role in the learning process by improving the experience gained. The main advantages are:

- The relationship between the behavior and activity of the participants in the learning process and their success or failure is established;
  - Learning is customized through Learning Analytics (LA), with learning management systems collecting vast amounts of user data.
  - LMS records and stores information when a participant interacts with a training module or communication instrument;. Data can be sorted, filtered and linked to specific indicators such as activity and learning achievement;
  - Through the created models, the instructors and course designers can make changes that help the learners in the learning process [9].
  - As a result, it is possible to create personalized e-learning courses that are more effective for the specific user. Educational institutions that can use the information are well placed if they seek to develop a strategy that focuses on student success, continuous improvement and the use of analytical tools for learning purposes [10].
- Gamification systems are essential through various games, bonus schemes, badges and medals for achievements and others to stimulate learners by retaining their interest. Some authors take the position that despite the main functions of LMS, they lack the level of improvement that is possible with the help of current generations of web tools [11]. According to other authors, using traditional LMS tools, the

learning space is left under the control of the educational institution and the instructors, as a result of which the opportunities of the trainers for self-study are limited [12]. The review of modern scientific publications provides an opportunity to highlight some of the main E-Learning tools:

- *Interactive courses and presentations* - can include different backgrounds, images, multimedia slides, videos, add multiple choice questions, fill in text and other types of interactions .;
- *Branching Scenario* - allows authors to structure the content as a tree with multiple branches, giving different feedback and evaluation. The final grade can be formed on the basis of collecting points or through a final grade. The tool allows you to add text, image, image with a dot (Hot Spot), which is clicked to display information, interactive video or video only.;
- *Interactive type of video content* - allows you to add different types of questions that can be adaptive, ie. according to each user's answer to load a different scenario for the next question and / or to move to another part of the video;
- *Interactive photo content* - graphic stories are created with the ability to add a short explanatory text for each image, and users to compare and analyze the sequence of images ;
- *Interactive tests and assessment tools* [7].

In summary, these are some of the most used systems and tools in the practice of E-Learning. Trends in the use of educational tools focus on improving the educational process, with a view to increasing the competencies and knowledge acquired by different categories of assessment people [13].

### III. MATERIALS AND METHODS

The authors' own research is focused on the study of E-Learning practice in industrial enterprises. The participants are three groups: learners, human resources managers and trainers. The aim is to identify weaknesses in E-Learning practice through the prism of the three countries. The tasks of the research are: Establishment of the level of digital competencies of the three groups of respondents as a prerequisite for conducting quality E-learning.

- To determine the factors influencing the motivation of the participants in the research to join E-Learning.
- To study the attitudes of the respondents towards the application of modern forms of E-Learning.
- To establish the attitude of the three groups to the advantages / disadvantages of E-Learning.
- Based on the results of the research to formulate guidelines for the improvement of E-Learning in industrial enterprises.

The study was conducted in three stages:

- Questionnaire survey of students in industrial enterprises;
- Semi-structured interview with the managers of the human resources departments;

- Survey with the lecturers of the employees in the industrial enterprises.

The survey was conducted in the period January 2021 - May 2021. The survey involved 1568 people from 40 industrial enterprises located in the South Central region in Bulgaria. Industrial enterprises are large and medium-sized enterprises from the sectors: "Manufacture of food products", "Manufacture of clothing", "Manufacture of beverages", "Manufacture of tobacco products", "Manufacture of paper, paperboard and paper products" and cardboard "; "Printing and reproduction of recorded media "; "Manufacture of chemical products"; "Manufacture of machinery and equipment "; "Manufacture of electrical equipment "; "Repair and installation of machinery and equipment "; "Manufacture of computer and communication equipment, electronic and optical products "; leather processing; manufacture of footwear and other articles of leather.

Of the participants in the survey, the first 156 are top and middle level managers; 295 - are analytical specialists; 264 - are applied specialists; 668 - are highly skilled workers and 185 - low-skilled workers. In the first section of the questionnaires are formulated questions for establishing the profile of the respondents, related to their gender, age and category of position in the enterprise. The second section contains 5 questions given in the table (Table 2).

The second stage covers the semi-structured interview with the managers of the human resources departments. The main goal is to study the level of their digital competence, which depends on the correct identification of E-Learning needs, as well as the level of training organizations and the topics of E-Learning. The participants are 34 HR managers.

TABLE II. QUESTIONNAIRE FOR STUDENTS

№	Question	2019	2020
1.	How many e-trainings have you participated in?	420	116
2.	What is your rating for E-learning? • Weak • Satisfactory • Good • Excellent	12% 25% 48% 15%	10% 27% 51% 12%
3.	What are the factors that motivate you to participate in e-learning? • Advanced training • Career development • Increasing wages • Saving the workplace	18% 15% 36% 31%	25% 12% 27% 36%
4.	Which of the following advantages of e-learning do you		

	value the most?		
	• Training at a time convenient for me	85%	83%
	• I have access to resources at any time	82%	81%
	• Saves transport costs	35%	34%
	• Much more interesting than traditional	26%	35%
5.	How do you assess your digital competence?		
	• Weak	22 %	19%
	• Satisfactory	28%	25%
	• Good	38%	44%
	• Excellent	12%	12%

The third stage includes a survey with the lecturers about their experience in conducting e-learning, their attitudes towards the application of modern forms of E-Learning, as well as their needs to improve their expertise on E-Learning. The participants are 45 lecturers.

#### IV. RESULTS AND DISCUSSION

The analysis of the results of the survey shows a sharp decrease in the number of E-Learning in 2020 - 116, compared to 420 in 2019. Undoubtedly, this is due to the difficult financial situation of enterprises related to the crisis COVID 19, as a result of which the company's investment in e-learning is declining. The comparative analysis of the results shows that the assessment of the respondents for e-learning does not differ significantly in 2019 and 2020. The percentage of those who give a good assessment of the E-Learning in which they participated is relatively high. Figure 1 shows the percentage distribution of participants who give respectively poor, satisfactory, good and excellent score.

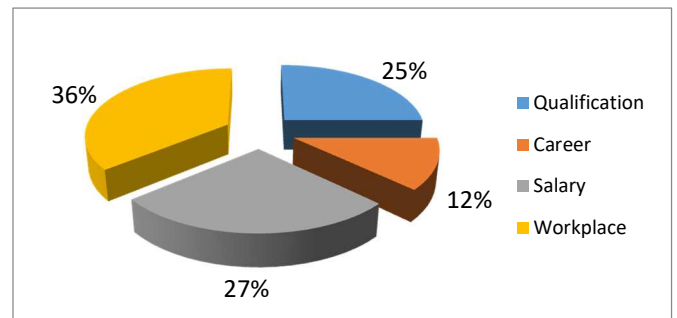


Fig.1 Percentage distribution of grades of E-Learning

37% of respondents are largely dissatisfied with the quality of E-Learning and their assessment is poor and satisfactory. In most cases, these participants have a low level of attitude and digital competence for E-Learning. This group includes workers over 50 years of age. In addition, in interviews with participants to clarify the reasons for the

assessments given, they argue that training needs as well as training topics are not always properly identified.

The factors that motivate employees in industrial enterprises in 2020 to participate in E-Learning are: job retention - 36%, salary increase - 27%, training - 25% and



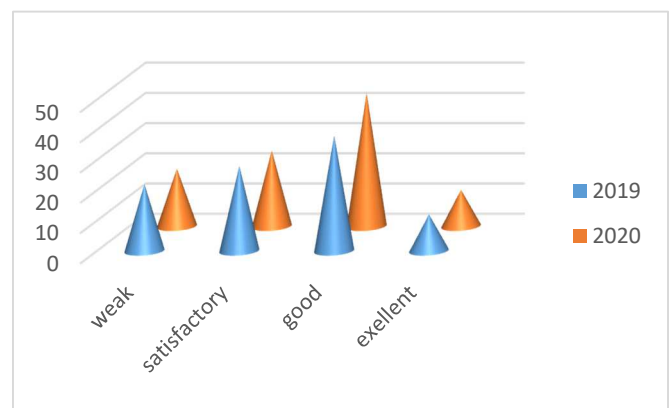
career development - 12% (Fig. 2)

Fig.2 Percentage distribution of the factors for E-Learning

The participants in the study rank the advantages of E-Learning in the following order:

- Training at a convenient time
- Access to resources at any time
- Much more interesting than traditional
- Saves transport costs

Of interest is how the participants in the research evaluate their own digital training, on which the quality of e-learning largely depends (Fig. 3). Impressive is the relatively high percentage of participants who assess their digital competence as weak and satisfactory - 50% in 2019. In connection with the actions taken to improve digital skills in some of the large enterprises, this percentage in 2020 has decreased to 44%. 38% of the participants in 2019 and 44% in 2020 have good digital training. The employees with excellent digital expertise are firmly 12% in both surveyed years. The age analysis shows that the respondents over the age of 50 fall into the group with a weak and satisfactory digital qualification, and those - up to the age of 35 - have an



excellent digital qualification.

Fig.3 Self - assessment of the digital competence of the participants in E-Learning

The analysis of the results of the semi-structured interview at the second stage with the respondents - 34 HR managers shows the following:

- 58% self-assess with good digital competence;
- 22% - are excellent digitally prepared;
- 20% still have a satisfactory self-assessment of their digital knowledge;
- Gaps are allowed in determining the needs for E-Learning, as some managers and analysts participated in 3 trainings in 2019, while highly qualified specialists - in 1, and low-skilled - did not participate.
- In most cases, the effectiveness of E-Learning is not determined.
- HR managers do not study the needs of the training topics in sufficient depth and very often offer those identified by the training organizations.
- The level of provision with E-Learning resources is low.

The analysis of the results of the third stage of the survey of 45 lecturers allows us to draw the following conclusions:

- Extremely high percentage of speakers - 67 have excellent digital competence, and the rest self-assess as well prepared.
- 78% have experience in conducting E-Learning.
- 52% of the lecturers need to increase their expertise in the areas: Methodological and technological knowledge and skills for working with video conferencing platforms and Technological literacy related to mastering software, creating video lectures and guides.

## V. CONCLUSION

In the report we tried to establish the characteristic charts of E-Learning practice in industrial enterprises. The main problem areas that are emerging are:

- Insufficiently good preparation for E-Learning of its participants, as a result of which its efficiency decreases.
- HR managers do not always correctly determine the needs of E-Learning, their content, as well as its effectiveness.
- The low level of security of industrial enterprises with e-learning resources such as spreadsheets, social networks, computer simulations, E-Learning games and dynamic visualizations.

In conclusion, based on the theoretical research and our own research, we can conclude that e-learning is extremely important for those working in industrial enterprises and its

role will continue to grow. In this regard, we will highlight the main areas in which E-Learning practice needs to be improved.

First of all, it is important to increase the digital competence of employees. This will increase the quality of e-learning.

Secondly, the role of HR managers needs to change radically. In the new conditions, they are the people who have to create conditions for digital attitudes in human resources, to increase their digital competence. To this end, it is necessary, above all, that they have the necessary digital expertise to be able to properly plan the needs of E-Learning, to offer the exact topics to employees and to accurately select lecturers. Only then, it will make sense from the conducted E-Learning, when they contribute to increasing the efficiency of industrial enterprises.

Third, business leaders need to realize the essential role of E-Learning in order to make a reasonable investment in providing companies with the necessary electronic resources.

In a synthesized form, these are the areas in which efforts can be directed to create adequate conditions for increasing the efficiency of E-Learning, respectively to increase the competitiveness of industrial enterprises.

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