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Fundamental Concepts and Useful Techniques for Technical Vocational School Information Technology

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ABSTRACT

The purpose of this study was to establish a system of educational process automation while taking into account the structure of skilled workers' ICT ability and the tendencies of the information society. It was an experimental study conducted in vocational schools. Over 700 students from 7 vocational and technical schools across Districts of Ogun State, 35 teachers, and 14 specialists from VET centers made up a representative sample that allowed researchers to examine the level of automation in VET schools and gauge its impact on the effectiveness of worker training. An ICT-rich educational environment was created by implementing the system of educational process digitization at a technical vocational school. Learning management systems, information and analytical databases, computer simulations of professional actions, knowledge control programs, applications of ICT for writing diploma papers, computer methods of competence diagnostics, simulation training facilities, and expert and decision support systems are included in this group of interrelated activities. The experiment demonstrated that the application of developed methods of informational training for skilled workers, the use of pedagogical software tools at technical vocational schools, and the instruction of vocational school teachers in the use of ICT all improve graduates' professional competence.

Keywords: Automation of VET. Technical vocational schools, ICT competence, ICT-saturated educational environment, learning management system

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1. INTRODUCTION

The urgent need to improve the educational system, particularly the vocational one, is brought on by the socioeconomic changes taking place in Ogun State, the globalization and integration processes, and this country's ambition to join the worldwide community on an equal footing. The society needs qualified professionals that integrate fundamental knowledge with in-depth practical training and are prepared to behave sensibly in challenging, unpredictably occurring workplace scenarios. Therefore, vocational education should advance the technical reconstruction of industry, take into account contemporary labor market demands, and closely integrate with science and production (OECD 2001). Therefore, vocational education should advance the technical reconstruction of industry, take into account contemporary labor market demands, and closely integrate with science and production (OECD 2001). Under these situations, the purpose of vocational education and training (VET) is to ensure that youth are equipped for the existing and future job markets, to focus on the needs of leading corporations, and to guarantee that graduates of vocational schools have competitive worker qualifications.

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It entails reevaluating the format and content of instruction at vocational schools, implementing a multilevel educational process, and utilizing cutting-edge forms and methods of vocational education, particularly when preparing employees and specialists for high-tech industries. Professional activities in the sector nowadays often involve gathering, processing, and utilizing a variety of information. The production task of the workers is inherent in increasing the share of intellectual labor, digesting the information, as well as producing and employing new ideas (International Association for Technology in Education 2000). The industry's most cutting-edge technologies are mostly focused on automating production procedures. High-skilled professionals who can quickly learn these technologies are in greater demand.

The main contradiction between the orientation of educational institutions towards the solution of the current problems of automation (implementation of ICT into the educational process, training of students in computer literacy - Anderson et al. 2002;) and the current state of this process in the scientific literature has been identified; Li et al. 2006) as well as the pressing need to establish the theoretical underpinnings of the process of automation of vocational schools, perspectives and strategies for the advancement of the educational system in the information society, and the creation of a unified informational and educational space (Coughlin 1999; Dexter and colleagues 2000; Jonassen 1996; Knierzinger and associates 2002; Livingstone 2012; Schacter 1999). It is clear that the extensive approach to VET automation has run its course: saturating institutions with computers does not improve the standard of specialists' training; the lack of preparation of the pedagogical staff in VET prevents the introduction of new ICTs into the educational process; the developing potential of ICT remains unrealized; and as a result, workers' information training does not satisfy employer demands.

1.1 Research Concept

The concept of the information society as developed by D. Bell, J. F. Lyotard, H. M. McLuhan, Yo. Masuda, J. Naisbitt, A. Toffler, etc.; the tenets of the theory of information as developed by L. Brillouin, N. Wiener, W. Ashby, H. Haken, and C. Shannon; the theory of cognitive development as developed by R. Atkinson and J. Bruner (B. Skinner). Theoretical advancements and conceptual methodical approaches to the process of education information technology diverge significantly at the same time. There is little research on the theoretical underpinnings and characteristics of organizational and methodical support for future employees' training through ICTs. Because of this, the incorporation of ICT into vocational schools necessitates a fundamental reorganization of the course content, delivery methods, and organizational structures. This will enable the schools to better align their training with current production demands and foster student and teacher interaction with ICT tools and the cognitive development of future specialists. The main concern with automating educational institutions is the creation and application of electronic educational and method complexes that combine computerized courseware, a database of visual aids for the teaching process, virtual workshops for lab work, control systems, etc. (Ghaleb 2014; Pegalajar 2018; Troter and Ellison 2001).

The research's central idea establishes the theoretical underpinnings and practical strategies for the computerization of the educational process at technical vocational schools, and it includes the following assertions:
Under the conditions of the information society, the strategic goal of the educational system is to hasten beneficial transitions by supplying intellectual resources and scientific advancements alongside the digitization of all human endeavors. The current challenge is to construct a system of tailored long-term education based on computer technology, as well as a comprehensive computer network of science and education (Cuban 2001; Fuchs and Woessmann 2005; Papert 1997). The construction of a fully formed, independent person who is suited to quickly changing reality is the ultimate goal of education, according to the person-oriented paradigm of education. The capacity to operate information data based on the usage of contemporary ICT in line with the needs of the labor market for the efficient performance of professional obligations is one of the essential competencies of a specialist in the twenty-first century (Ashworth and Saxton 1991; Cuban 2001).

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According to Christmann et al. (1997; Lehtinen et al. 1998; McCoy 1996; Reed 1996; Research Report 2000), the content, technological, and diagnostic functions of all the structural components of the educational system are interdependent and work together to provide the individual with an informative education. It is essential to consider the evolution of information flows, techniques and means of their processing, and potential methods of their accounting in the content of education when upgrading the general and professional training of specialists. The process of education automation entails the use of contemporary computer and telecommunications hardware as well as software tools, as well as the introduction of new technical means and improvements to existing teaching methodologies and technology. ICT should be introduced and used in vocational training as part of a process that is systematized, scientifically organized, and didactically based (Markauskait, 2003). Under these conditions, it becomes possible to: realize a powerful ICT potential to present and process training information, acquire sound knowledge, skills, and abilities; effectively assess the students' training results; simulate educational situations related to production activity; use automated educational systems, pedagogical software tools, systems of artificial intelligence, virtual reality; control technological processes.

It is advised to increase the effectiveness and productivity of the educational process, decrease time waste, minimize the routine, unimaginative work of students and teachers, and provide an individualized approach, interactivity, and trustworthy feedback in pedagogical interaction in order to address the complex issues of vocational technical education. (Pelekh 2009). Therefore, it is appropriate to develop an information environment that can harness the potential of the newest technology and do away with the challenges involved in doing so. Enhancing the effectiveness of skilled worker training necessitates the development of a new didactic system based on ICT, including updated content, organizational forms, methods, and means of teaching all subjects while taking into account the level of industry automation; design, maintenance, adjustment, and management of the educational process focused on the creative level of educational activity of students and teachers and the particulars of using industrial ICT; Use of computer-based learning technology is prevalent, and all aspects of vocational training are being intensified as a result. A thorough automation of the educational process (Cotton 1992; Lehtinen et al. 1998; Liao 1998; Reed 1996; In accordance with the national framework of qualifications, new standards of VET, and labor market requirements, taking into account the information model of production, Research Report 2000) will enable teachers to organize and provide proper training of specialists and to coordinate the learning activities of students.

1.2 Problem of Research

At the close of the 20th century, information and communication technologies advanced quickly, causing a shift to a new social formation. This shift resulted in significant changes in social life that were linked to a person's cultural and educational growth. The primary aim is automation the educational process, which enables preparing a person for a full-fledged existence in the conditions of contemporary globalization of the international community, productive use of information and knowledge on the basis of computer technology, and telecommunication facilities. ICT, the procedural element of computer-oriented pedagogical technology, is regarded to be used in the automation of the educational process in pedagogy. Without the use of ICT in scientific research and education (Anderson et al. 2002; Andresen and van den Brink 2002; Ashworth and Saxton 1991; Shapiro and Hughes 1996), qualitative education is not conceivable. The analysis of the theoretical underpinnings of education automation demonstrates that it mandates the creation of an integrated environment for learning and information that will ensure the accessibility, effectiveness, integration, and standardization of educational resources for all levels and types of education.

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The intentional process of automating education entails the provision of methodology, technology, and practices for creation as well as the best possible application of scientific and pedagogical, educational and methodical, programmatic, and technological elaborations aimed at realizing the psychological and pedagogical potential of ICT. It should be highlighted that VET automation primarily occurs on an elemental level, ignoring the actual needs and degree of introduction of new technology Therefore, the goal of our study is to establish the theoretical underpinnings of the educational process automation in technical vocational schools as a pedagogical system that ensures the improvement of the quality of skilled workers' training, as well as to suggest an experimentally tested model, pedagogical conditions, and methodical provisions. Therefore, the goal of our study is to establish the theoretical underpinnings of the educational process automation in technical vocational schools as a pedagogical system that ensures the improvement of the quality of skilled workers' training, as well as to suggest an experimentally tested model, pedagogical conditions, and methodical provisions.

Modern ICT encompass a wide range of unique hardware and software, for which there is no one classification system, and blend technological advances with design, subject matter, and educational methodologies. Mentoring, training, simulation, control, reference, and information systems are among the primary categories of computer-based educational programs. The majority of these systems are networked, and computer training courses include a variety of components. The efficiency and accuracy of information processing, the improvement of information presentation, the design of various processes and phenomena, the activation, individualization, and differentiation of learning, the creation of conditions for the organization of independent educational activity, communication facilitation, and the development of creative approaches are all factors that influence the potential of ICT application while teaching and learning.

Modernizing the goals, topics, strategies, tools, and organizational structures of teaching and learning enables students to develop their unique talents and character traits, fosters the development of their cognitive skills, and encourages them to strive for self-improvement. It also ensures the objectivity of studying real-world phenomena, inseparable communication between the natural and applied sciences, the humanities, and the arts, and permanent dynamic advancement. Not just for this country but also for other nations, it is a pressing issue.

1.3 Area of study

Given the advantages of ICT outlined in the theoretical underpinnings of the study, it is clear that electronic versions of courses for specific subjects and databases (banks) of visual support for the educational process are necessary. The educational technologies used in industrialized nations include interactive simulators, networked learning, and automated training systems. ICT has been shown to help people develop their brains, motivate them to learn, and inspire them to act creatively. Since it is possible to select a personal educational trajectory, control the rate of learning, and take into account the wide variety of individual student characteristics, professional training via electronic means is substantially more successful than traditional approaches. ICT has an edge over other technical means since it may be used as a tool for monitoring, education, and information at the same time.

The need to define the guiding principles for using ICT in vocational education is driven by the expansion of information's social function in society. Thus, it is crucial to establish a comprehensive information base, to validate and pick forward-looking material from the fields of professional training, and to structure and build a bank of professionally useful information turned into educational content. According to current theories of training and development for the workforce, ICT's multimedia capabilities are expanding visibility, which fosters the development of spatial imagination and creative thinking as well as active learning and the acquisition of practical skills. The material is given in a condensed and tailored manner, which improves the quality of future professionals' knowledge.

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However, there are some drawbacks to using ICT that are related to the increased dangers to students' health (Sinko and Lehtinen 1999; Christmann et al. 1997; Lehtinen et al. 1998; McCoy 1996; Research Report 2000). The standardization and implementation of sanitary, hygienic, psychological, and pedagogical criteria as well as guidelines for technological and software tools are all necessary steps to ensure the safety of the students. In order to execute the essential management, scientific, and educational tasks for the educational sector, education automation strives to introduce and apply ICT widely and effectively. (Bykov 2008). From these views, the tasks of an educational institution's automation inside the VET system were examined, particularly the need to teach and grasp informatics' fundamental principles; to foster students' algorithmic thinking style and culture; to gather broad information technology methods; to cultivate computer skills; to master ICT working techniques; to develop professional knowledge, talents, and skills while taking advantage of ICT; to study and master new ICT usage techniques and tools in accordance with future professional activity needs.

The following are the roles that information plays in vocational schools: instructional, compensatory, motivational, individualizing, adaptive, integrative, control and diagnostic, designing, prognostic, and administrative roles. The duties and purposes of information technology are intertwined and geared at developing ICT proficiency as a necessary element of a specialist's professional training. Computer literacy, ICT proficiency, and information culture are the fundamental concepts of the informational component of professional work. In order to successfully use computer technology in a range of tasks, one must possess a particular level of theoretical and practical knowledge and abilities, which is known as computer literacy.

The ability to identify information needs, find information, and use it effectively, as well as the ability to use computers and telecommunications technologies in both professional and personal contexts, is known as an individual's integrative professional quality or ICT competence. ICT competency refers to a person's capacity to navigate the information landscape and successfully utilize information from contemporary information and communication technologies to meet the demands of the labor market.

According to Ashworth and Saxton (1991; Cuban 2001), ICT competency refers to students of vocational schools who have developed the knowledge and capacities to use ICT for learning. The integrity of a person's informational worldview, value orientations, knowledge, skills, and talents enable them to engage in independent, intentional action that is effective in meeting their personal and professional information demands. The advancement of the nation's intellectual capacity, the enhancement of the structure and content of the educational process, and the adoption of ICT and computer-based learning techniques are the goals of the Informationalization of education. T

o increase the efficiency and effectiveness of professional training, it is necessary to identify the methods for the deliberate creation of an informational and educational environment that permits the full use of ICT functions, fosters student autonomy, intensifies the acquisition of theoretical knowledge, and fosters the development of practical skills in the workplace. Use of ICT in vocational training that is uninvited or unsystematic will not have the desired effect.

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2. BACKGROUND INFORMATION

2.1 General background

The study included all Ogun Satte students attending construction-related vocational schools. (i.e. the population of the study). The experimental study was conducted using a variety of construction vocational schools in various Districts of Ogun State. (Ogun Cental, Ogun East and Ogun West) for the academic years 2019–20 and 2020 –21. The analysis and experimental verification of the efficiency of the created system of vocational education automation was the main focus of this study. (On the example of construction vocational schools).

The project was designed to achieve the following specific objectives.

i) To assess and evaluate the level of VET information technology.
ii) To ascertain the extent to which the automation of education has an impact on the standard of professional-theoretical and professional-practical training for future workers.
iii) To determine whether the ICT proficiency of students enrolled in the author's method and in the conventional instruction differs statistically significantly.

2.2 Sample

More than 700 graduate students from technical vocational schools made up the research target group, along with 20 lecturers of informatics and professionally focused subjects and 13 experts from training and methodological centers for VET. A random student sample from technical vocational schools was used to continue the investigation.
Following this formula, the participant sample was determined:

$$n = \frac{t_0^2.\sigma^2 .N}{t_0^2 0^2 + €2.N'} \quad \text{.....(1)}$$

x

where t0 is the critical deviation from the average rating score (according to the tables of values, equal to 2.0, with a probability level of.95); is the standard deviation (calculated using the results of the previous sampling experiment); x is the margin of error (taken equal to.05); N is the total sample (60,249 people - all students at 7 vocational schools operating under the industrial direction "construction" There were 402 students in experimental groups and 397 students in control groups in the sample distribution according to the variables selected overall. The research sample is therefore credible and presentable.

2.3 Tools and techniques

The experiment's approach was created and was divided into three main categories:

1) According to the qualimetric method, the level of information technology in experimental
2) The effectiveness and thoroughness of students' professional knowledge and skill mastery, which is a measure of the training program's quality for construction employees.
3) The ICT proficiency of the graduates.

First, the established factor-criterion quali-metric model (Lytvyn 2011) was employed for the complex measurement of the automation of the educational process in the vocational schools of a technical (namely, building) profile. The research-determined pedagogical conditions, which were described by 33 indicators, were the primary contributors to the educational institution's digitization. An expert committee was used to determine the worth of these indicators. Real indicators were substituted into the prepared table to identify the level of automation of a certain vocational school. The sum of these indicators was then calculated to determine the degree of conformance to an ideal condition.

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A thorough comparison of the academic success of the control and experimental groups of students allowed for the evaluation of the workers-builders training program. The final lessons included control measurements to ascertain the prospective builders' accomplished level of theoretical knowledge (20 test tasks) and practical abilities (5 activities) and its adherence to the state norms of vocational education. The following formula was used to determine the effectiveness of ICT:

$$E_{ICT} = \frac{\sum e - \sum_k}{\sum_k} \quad \text{.....(2)}$$

;

Where: ICT training effectiveness in EICT, The total grade (points) awarded to students in experimental groups for their use of ICT-based learning; the total grade (points) awarded to students in control groups.

At graduation, the ICT proficiency of aspiring builders was evaluated. The formation of various components of a specialist's preparedness to utilize ICT in professional activities can be assessed for this purpose using a set of IC criteria, which can be used in conjunction with the expert method. Indicators with generalized values that represented the high, average, poor, or insufficient level of a specialist's ICT ability were chosen for each criterion. By analyzing the correlation between the outcomes they calculated, the consistency of the experts' judgments was confirmed. Overall, this instrument satisfied all standards for quality. According to the experts' assessments, the things were accurate and appropriate.

2.4 Data Analysis

Using the STATISTICA 10.0 package, the gathered data were analyzed with a level of significance of p .05. In order to determine the degree of connection between the sizes of the data on information technology at technical vocational schools and to confirm the consensus of experts' views regarding the indicators of graduates' ICT competency, the Pearson's r statistic was utilized. Additionally, a students' t-test was performed to compare the means of two independent samples in order to show whether or not there were statistically significant differences in the training of students who used the experimental model and methods and those who did not. According to the quality criteria (completeness, thoroughness, awareness, etc.) of both theoretical and practical professional knowledge, the level of academic performance was compared. The difference is statistically significant if the p value is.05.

3. RESEARCH FINDINGS

3.1 Applications of ICT in professional training

The constant upgrading of tools and materials, the improvement of labor quality, the acceleration of product design, the improvement of goods' dependability and durability, and the energy efficiency of works are the hallmarks of modern industrial production. It is impossible to do it without giving breakthroughs in manufacturing technologies the attention they deserve, without introducing new professions, altering the nature of professional activities, and without improving personnel credentials. The disparity between the level of professional training of labor force personnel and the demands of employers for its quality may be resolved by pedagogical technologies based on information systems and geared toward the development of professional competence. The creation and use of ICT at all levels of education, but particularly during educational and production training, aids in the accomplishment of the primary strategic aims, guiding principles, and objectives of the advancement of technical education. The information society demands people who are able to adapt to a quickly changing environment, perceive life, locate themselves in it, comprehend challenging situations, and come up with logical solutions. One of the key competencies of a modern specialist is ICT competence, which is based on awareness of the role of information in society, knowledge of the laws of the information environment, and understanding of its place in it. It manifests itself in solving various professional and other tasks using information technologies and tools.

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ICT has evolved into a tool for the workplace since the objects of qualified workers' professional activity are now linked to information and communication systems and procedures. ICT proficiency is required of workers while handling manufacturing papers, using cutting-edge equipment, etc. The goal of the online tutorials offered by higher education's architectural and technical (industrial) schools is to educate students on 3D design and CAD/CADD (computer-aided design and drawing) software. In order to plan, prepare documents, build, develop engineering networks and systems, and manage the manufacturing process, it enables future engineers to understand how to work with information (including traceable). The modern construction industry requires comprehensive planning of a technological product, where a change in one parameter automatically changes the others, up to the sketches, specifications, and work schedule. Information modeling of production is a notion of holistic planning of a technical entity using ICT, where changes to some of its elements automatically modify others, up to the drafts, specifications, and work schedule. (Kymmell 2008). We believe that graduates from specific trade institutions need to be informed about the benefits of information modeling.

The fundamentals of integrated design tools (such as CAD/CAM/CAE/PDM and CALS technologies) are already covered in the training of technical specialists. Skilled workers must be aware of the fundamental applications and techniques for using computers in the workplace, the principles of computer design, and the potential for employing ICT for industrial work management. They also need to understand the functions of specific computer programs and be able to select them, as well as how to use automated building planning technologies and organize their work using computers. The following are elements of technical workers' ICT proficiency: global perspective, user, algorithmic, and professionally guided ones. (Hurevych 2004). These component formation criteria include one's motivation, cognition, action, operation, and creative life.

All of the educational process's stakeholders (students, teachers, educational managers, administration), as well as all of its elements (visual aids, textbooks, manuals, means of evaluating and controlling the success of training, processes for the search, exchange, and processing of information, preparation and use of teaching materials, resolution of educational and applied tasks, laboratory workshops, etc.), are affected by information technology. ICT are now a top technical tool as compared to older techniques. One of the most significant pedagogical issues is the justification of sensible directions for employing ICT in the educational process. (Plomp 2003). We were able to define four interrelated ICT application methods thanks to the technical vocational schools' research (Lytvyn, 2011):

- *Organizational and administrative processes at educational institutions are being computerized:* creating the foundational data for the students and teachers, automating the management of an organization and network of vocational schools, organizing the distribution of documents and financial reporting; Planning the educational process while taking into account the characteristics of training for technical professions; creation of methodical and informative support for a technical educational facility; Creation and ongoing maintenance of a website; complicated pedagogical testing and psycho-diagnostics of students; monitoring of the quality of learning and employment of graduates; organization of internal data banks and systems of scientific and technological information.
- *Information technology in education:* a description of "Information Technologies" the incorporation of a subject into the training of workers; the digitization of traditional methods of teaching and learning diverse subjects; the integration of issues relating to formation of ICT-related abilities and skills during the training of workers; use of assessment software; automation of the correction of educational activities; computer design of various phenomena and processes, including industrial ones; intellectual tools and learning environments.
- *The method of producing education is being computerized:* developing professional talents and skills with the aid of imitation software, trainers, and equipment simulators; visualizing and designing industrial technological processes and production scenarios; computerized control of professional and practical talents and skills;

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completion of project work by specialized software. Operation of laboratory equipment as well as genuine units and sets.

- *Informationalization of extracurricular activities:* ICT-assisted self-education and self-training for teachers and students aimed at acquainting them with industrial achievements, aesthetic development, the use of developing computer games, using ICT in future workers' clubs, managing students' intellectual leisure time, etc.

ICT can be utilized in all training cycles and at all learning stages, but their efficacy is directly related to the particular tasks of study and the overall goal of training future employees in accordance with the general objectives and standards of education (Markauskait, 2003). Telecommunications technologies permeate all sectors of information technology, generating new opportunities for students and teaching staff in VET and taking up a sizeable portion of worker professional development. Technology can be used in all learning phases and training cycles, but their effectiveness is directly correlated with the specific study activities and overarching objective of preparing future employees in accordance with the overall goals and standards of education. (Markauskait, 2003). All information technology sectors are impacted by telecommunications technologies, which also significantly influence worker professional development and create new prospects for VET students and faculty. A system of multimedia professional education with a specified profile will be formed by multidisciplinary applications with a single structure and way of use, each of which will include the appropriate amount of knowledge on a given subject.

ICTs by themselves have no bearing on the breadth and depth of pedagogical innovations that are implemented with their assistance, according to research on the paths of automation of education as an innovation process. The primary responsibility falls on the shoulders of the teaching staff (Dusick 1998; Sinko and Lehtinen 1999; Research Report 2000), who while carrying out the job of purpose-setting, adapt ICT to fulfill the objectives of professional training. One of the main areas of pedagogical innovation is the introduction of modern technical and scientific culture and tools (automated production and design, cutting-edge scientific research techniques, informational services, etc.) into professional education. The concept of how a teacher and student should collaborate in the classroom, as well as how the information environment and learning environment should be built, has changed as a result of digitization. An efficient system for managing the development (upgrading) of educational institutions and the educational process is created through the process of digitization. (Wong and Li 2006).

A comprehensive transition to ICT, a logical blending of new technology with conventional learning, is a challenging educational endeavor that necessitates resolving a number of organizational, technological, teaching, psychological, pedagogical, organizational, and other issues. Vocational schools' automation of the educational process is seen as an integral phenomenon, a system of interconnected organizational, educational, and methodical, technological, educational-production, and administrative transformations that aim to meet the future workers' informational, calculable, educational-designing, and communicative needs as well as to create a new culture of pedagogical activity. Under the conditions of the industrial production's automation and the usage of ICT in future workers' training, the automation system comprises students' informative training for professional activity. Today, the process of developing a sophisticated information educational environment is referred to as the "automation" of education. This category has several variations in pedagogical and psychological literature, including "an information communication environment," "an information educational environment," and "a computer oriented educational environment." (Bykov 2008). Researchers frequently do not distinguish between the term "educational environment," which primarily relates to educational institutions, and the much broader term "an information educational space," or "Infosphere". The goal of creating such a space is to meet specific educational demands and didactic objectives that have an impact on an educational institution's informative resource, staff, and structural aspects.

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The term "an ICT-saturated educational environment" was used to investigate the automation of vocational and technical education because it emphasizes the value of using information and communication technologies while studying subjects from various cycles, first of all, of professional and theoretical ones, at vocational schools. As the analysis demonstrates, automation of education goes beyond just replacing analog pedagogical tools with ones that are implemented through the use of ICT. One of the key aspects of the process of education automation is changing a variety of forms and techniques of educational activity utilized at vocational schools to support an ICT-rich educational environment. The goal of such an environment is to expose, unveil, and develop a person's strengths and prospective capabilities, to provide the conditions for self-education, to integrate assessment tools into the teaching process, and to mitigate any potential negative effects of pupils using ICT. A regional information and educational space of VET can include an ICT-heavy learning environment at an educational establishment. The goal of such an environment is to expose, unveil, and develop a person's strengths and prospective capabilities, to provide the conditions for self-education, to integrate assessment tools into the teaching process, and to mitigate any potential negative effects of pupils using ICT. A regional information and educational space of VET can include an ICT-heavy learning environment at an educational establishment.

3.2 The automation of the vocational school system

A set of criteria and indicators for the development of an expert's ICT competence, as well as the general and specific principles and methodical aspects of information training, are all reflected in the information system. These directions for using ICT in the workers' professional training are also structurally and functionally interacted with. To effectively manage the educational process and organize the educational process in accordance with tasks while utilizing chosen ICT forms, methods, and techniques, certain pedagogical conditions must be defined, made available, and implemented in vocational schools. The following are the requirements for educational process information technology at technical vocational schools (Lytvyn 2011):

- *ICT introduction and complicated automation of the educational process readiness of pedagogical staff:* The ability to prevent potential risks and failings inherent to ICT, knowledge of didactics principles, pedagogical theories and approaches, and updating of didactic, informative, and specialized professional knowledge through the use of ICT. Teachers have developed an informative culture and have experience with informative activity.
- *Future workers receive ongoing, comprehensive informational training:* creation of an educational process's content and structure in line with the elements of ICT competency; the development of future workers' communication and informational capabilities; pupils' unrestricted access to computers and information sources; the development of students' motivation to use ICT and to intensive educational activity, the proper management of cognitive activity using ICT, and the stimulation of future employees' creative activity.
- *Establishing and maintaining a methodological and technological foundation for education information technology:* updating technology networks organizations connected to regional and international telecommunications, updating modern software, including specialist software, installing industrial equipment simulators and trainers on computers, etc.; installation of informational terminals, establishment of an electronic library, and technical information databases; Finding software, tailoring it to the needs of the teaching process, and creating one's own computer-supported collaborative learning programs
- *Informationalization of extracurricular activities:* ICT-assisted self-education and self-training programs for instructors and students are designed to familiarize them with technological advances, artistic advancements, the use of creating video games, incorporating ICT into future workers' clubs, controlling students' intellectual free time, etc.

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ICT can be utilized in all training cycles and at all learning stages, but their efficacy is directly related to the particular tasks of study and the overall goal of training future employees in accordance with the general objectives and standards of education (Markauskait, 2003). Telecommunications technologies permeate all sectors of information technology, generating new opportunities for students and teaching staff in VET and taking up a sizeable portion of worker professional development. A system of multimedia professional education with a specified profile will be formed by multidisciplinary applications with a single structure and way of use, each of which will include the appropriate amount of knowledge on a given subject. ICT by themselves have no bearing on the breadth and depth of pedagogical innovations that are implemented with their assistance, according to research on the paths of automation of education as an innovation process. The primary responsibility for using ICT to accomplish professional training goals rests with the teaching faculty (Dusick 1998; Sinko and Lehtinen 1999; Research Report 2000).

One of the main areas of pedagogical innovation is the introduction of modern technical and scientific culture and tools (automated production and design, cutting-edge scientific research techniques, informational services, etc.) into professional education. The concept of how a teacher and student should collaborate in the classroom, as well as how the information environment and learning environment should be built, has changed as a result of digitization. An efficient framework for managing the development (upgrading) of educational institutions and the educational process is created through the process of digitization. (Wong and Li 2006). It is a challenging pedagogical undertaking to make a full-scale transition to ICT, a rational blending of new technology with conventional learning, and it necessitates resolving a number of organizational, technological, psychological, pedagogical, instructional, and other issues.

A system of interconnected organizational, educational, methodical, technological, educational-production, and administrative transformations that aim to meet the informational, calculable, educational-designing, and communicative needs of future workers as well as to create a new culture of pedagogical activity are collectively referred to as vocational schools' automation of the educational process. The automation system includes students' informational training for professional activity as industrial production becomes more automated and ICT is used in the training of future workers.

The "automation" of education is the process of creating a sophisticated informational learning environment today. The terms "an information communication environment," "an information educational environment," and "a computer oriented educational environment" are some of the variations of this category that may be found in pedagogical and psychological literature. (Bykov 2008). Researchers commonly fail to distinguish between the far more general term "an information educational space," also known as the "Infosphere," and the word "educational environment," which primarily refers to educational institutions.The aim of designing such a space is to satisfy particular educational needs and didactic objectives that have an impact on the staff, instructional resources, and structural elements of an educational institution. Because it emphasizes the value of utilizing information and communication technologies while studying subjects from various cycles, first of all, of professional and theoretical one, at vocational schools, the term "an ICT-saturated educational environment" was used to investigate the automation of vocational and technical education.

Since the research demonstrates, automation of education goes beyond just replacing analog pedagogical tools with ones that are implemented through the use of ICT. Changing a variety of educational work formats and techniques employed at vocational. One of the key components of the process of education digitization is schools' support for an ICT-rich learning environment. A complex of hardware, software, and data bases that support appropriate didactic materials, methodologies, educational communication, as well as connection and efficient operation of organizational structures of educational establishments, make up an ICT-rich educational environment.

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The goal of such an environment is to expose, unveil, and develop a person's strengths and prospective capabilities, to provide the conditions for self-education, to integrate assessment tools into the teaching process, and to mitigate any potential negative effects of pupils using ICT. A regional information and educational space of VET may include an educational setting with an IC-heavy learning environment.

3.2 The structure of digitalization in vocational schools

A set of criteria and indicators for the development of an expert's ICT competence, as well as the general and specific principles and methodical aspects of information training, are all reflected in the information system. These directions for using ICT in the workers' professional training are also structurally and functionally interacted with. To effectively manage the educational process and organize the educational process in accordance with tasks while utilizing chosen ICT forms, methods, and techniques, certain pedagogical conditions must be defined, made available, and implemented in vocational schools. The following are the requirements for educational process information technology at technical vocational schools (Lytvyn 2011):

- *ICT introduction and complicated automation of the educational process: readiness of the teaching staff:* The ability to prevent potential risks and failings inherent to ICT, knowledge of didactics principles, pedagogical theories and approaches, and updating of didactic, informative, and specialized professional knowledge through the use of ICT. Teachers have developed an informative culture and have experience with informative activity.
- *Potential employees receive ongoing, comprehensive informational training:* creation of an educational process's content and structure in line with the elements of ICT competency; the development of future workers' communication and informational capabilities; pupils' unrestricted access to computers and information sources; the development of students' motivation to use ICT and to intensive educational activity, the proper management of cognitive activity using ICT, and the stimulation of future employees' creative activity.
- *Establishing and maintaining a methodological and technological foundation for education information technology:* maintaining technopolis, networks organizations connected to regional and international telecommunications, updating modern software, including specialist software, installing industrial equipment simulators and trainers on computers, etc.; installation of informational terminals, establishment of an electronic library, and technical information databases; Finding software, tailoring it to the demands of the educational process, and creating one's own computer-supported collaborative learning programs.
- *Inclusion of ICT application directions with a scientific foundation into the educational process:* ICT is being introduced into various cycles in a coordinated manner, ICT is being studied using computers during training, classic and novel educational methods and technologies are being combined, and ICT-based organizational techniques are being developed. Modeling industrial production processes and producing diploma assignments with ICT assistance.
- *Management of professional training information effectively:* choice of a leader and those in charge of the ICT application's directions; development of an institution's information technology strategy; setting up specialist software for monitoring educational process; Monitoring the informational component of employees' professional competence; evaluating the effectiveness of ICT use; working with a global network of technical institutions and international partners to integrate ICT into professional training.

It is possible to manage teaching and learning efficiently, to carry out the educational process in accordance with its objectives, utilizing a variety of ICT forms and methodologies, as well as a set of automation (conceptual and technological) principles. The automation process must be built on a complex of didactic concepts, personality and activity approaches, programmable, module, and problem education. Experience dealing with computer gear and the qualifications of pedagogical employees are also important factors.

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Without a doubt, the use of ICT in the educational process necessitates the development of vocational schools' infrastructure, including the implementation of computer hardware, network support facilities, information terminals, educational and methodical techniques, and ICT technical support, as well as the creation of a plan for providing educational institutions with the necessary teaching software. All training cycles must incorporate ICT. A long-term program of information technology must be developed by vocational school administration with the goal of installing automation systems. Implementation of educational process management. Because it gives the educational system powerful feedback, it helps to improve management effectiveness and worker productivity. Additionally, it expands opportunities for implementing the necessary changes to the subjects, teaching strategies, and delivery formats of vocational education and enables the best possible solutions to be found for challenging issues relating to the methodical and technical delivery of information during the training of workers.

Teachers must create and implement new educational programs that take into account the most recent scientific advancements, are systematically self-improving, constantly actualize knowledge, renew methods, organizational forms, and workspaces, and prepare students for vital functions whose essence and problems are still difficult to precisely define. (Cradler and Bridgforth 1996; Martin et al. 2002). On the basis of general scientific methods and taking into account both internal and external elements influencing the process of automation, the theoretical and predictive model of the automation of the educational process at technical vocational schools is created. The selection of the model's ideal composition was made in a professional manner, allowing us to identify the components of the pedagogical system and their relationships, which have a significant impact on the quality of the characteristics. We also formed requirements for its constituent parts while taking into account the most recent scientific advancements, cutting-edge psychological, and pedagogical concepts.

The integration of ICT into an educational institution's technological subsystem leads to significant changes in all subsystems, including the didactic, organizational, methodical, managerial, and productive ones, in accordance with the principle of integrity. As a result, professional training is modeled using integrative, instructive, synergistic, and other ways. Combined conceptual and design, process and content, organizational and technological blocks, which coordinate all the components of the educational institution's ICT-rich learning environment, ensure the model's integrity. The conceptual and design block serves as the foundation for the process of automation's methodological, psychological, and pedagogical positions. The structure of the skilled worker's ICT competency and the characteristics of educational institutions' activity in the context of digitization are both determined by the composition of the process and content block. The organizational and technological foundation of the model reflects the content, technical, instructional, and methodical foundation of the technical vocational school's automation.

The model must be put into practice, which includes developing methodological support for the educational process, choosing appropriate ICT, optimizing the content and structure of information training, and coordinating the efforts of pedagogical staff. The pedagogical technologies with ICT use, which enable the integration of knowledge and professional training, are a crucial component of the informatization model of the educational process at the technical vocational school. The technical vocational school's developed model of the automation of the educational process enables identification of the automation system's constituent parts, identification of the mechanisms underlying their connections and interactions, and comprehensive prediction of the process of specialists' ICT training. The use of the information technology model at the vocational school contributes to making the educational process more individualized, reducing pointless time expenditures, and minimizing teacher and student inactivity. It also offers interactive training and trustworthy feedback in pedagogical interaction.

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The Conception of automation of specialists' training at technical vocational schools was developed with the goal of providing a complex solution to the issues related to normative and legal, educational and methodical, organizational and financial provision of automation at vocational schools. It served as the foundation for planning and organizing all the actions required for the realization of the automation process. (Lytvyn 2011). Priority, system, planning, phasing, standardization, directed development, complexity, project activity, and cultural conformity are the conceptual tenets of education information technology. The adoption of standard solutions for the structuring of hardware and software complexes at the local and regional levels, as well as a focus on contemporary telecommunications systems, are some of the technological concepts guiding the automation of vocational schools.

Development of contemporary educational computer complexes, computer-oriented methods for conducting laboratory and practical workshops, interactive multimedia pedagogical software tools, computer simulators, automated library systems, banks of current technical and production information, etc. are necessary for the quality training of skilled workers. As part of a national information and analytical system for managing education, it is crucial to develop a global computer network of science and education, a system of individual continuous learning based on automated training courses, and a system for managing vocational education. The suggested conception is put into practice by the Educational and Methodical Centers of VET through careful preparation and adherence to each educational institution's "Flow sheet of automation."

3.3 Providing VET information in a rigorous and scientific manner

It was also planned and approved to provide scientific and methodical automation of VET; this involves a variety of organizational and methodical factors. The methods of information training and the methods of using pedagogical software at the vocational school are the two main parts of the experimental scientific and methodical support that has been developed. The methods of information training have an impact on all the components of the methods of training future specialists.

The main objectives of information training methods are to effectively develop prospective workers' ICT skills while taking into account the particulars of their future professional activity. The approach entails the professionally focused teaching and learning of informatics at vocational schools – the development of future specialists' thinking required for using computers to solve professional problems, the capability of using ICT to obtain and process information, the practical skills to perceive and use professional information, etc. The widespread use of ICT in all training cycles is a strategy for developing students' general professional and career-oriented informational skills and allows for the overall development of students' ICT competence. ICT-based educational process organization that combines classic and cutting-edge forms and methodologies is effective. The incorporation of ICT into cutting-edge pedagogical technologies, the merging of network databases, different pedagogical software tools, and automated training systems with conventional textbooks, teaching aids, reference books, etc. all help to improve teaching effectiveness.

Problem- and project-oriented approaches to ICT-based worker training are made practical by ICT application. Students gain skills for searching, autonomously gathering information from many sources, and organizing knowledge during the problem-learning process. ICT design technology was mostly utilized when creating the diploma papers. Future professionals will develop the abilities to analyze, process, and use professional information as they acquire experience using CAD. The professional development of employees via the Internet enables the entire use of network technologies, including teleconferences, postal mail, information portals, search engines, etc. (Coutinho and Alves 2010). Professionals can access distant databases, information reference systems, and libraries thanks to distributed resources.

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The creation and adoption of learning management systems (LMS) for technical professions, also known as pedagogical software or educational resources in Ukrainian, significantly increases the effectiveness of professional training in technical vocational schools. The following are some of the benefits of LMS: utilization of graphic arts, audio and video augmentation, support for feedback, ongoing test control, searchability and navigation, compactness, and ease of circulation. Websites must be clearly visible, interactive, and functionally comfortable. They must also follow systematic guidelines, satisfy employer requirements, and provide for the potential of adding new features and making adjustments. CourseBuilder and OnViz, Dazzler and Dazzler Deluxe, eLeaning of Suite, HyperStudio, LERSUS, Moodle, Quest and Designers Edge, Seminar, ToolBook II Assistant and ToolBook II Instructor, and other specialized software as well as programs for editing media (AutoRun Pro Enterprise, Authorware, Dreamweaver, NeoBook Professional, et al.) make it easier to create LMSs.

It was suggested to create electronic educational methodological complexes, which incorporate different learning management systems and provide the students and teachers with the essential educational materials and functions, for the effective automation of technical vocational schools. Depending on the requirements of a subject and the type of workers' training, the content of the complicated components varies. With the aid of specially created computer programs (in the form of LMS or individual), the methods of computer-oriented diagnostics of professional training quality allow for the implementation of all types of control at vocational schools, increasing the objectivity, efficiency, and timeliness of checking the results of training. In order to ensure that this information is used for managing and correcting the workers' training, the use of ICT to diagnose academic achievements, including professional skills through the management of virtual equipment, contributes to the creation of a single information base of all the results of each student's control.

The development of an informative culture of pedagogical staff, or a system, multidimensional concept that includes a style of thinking and a system of values of an informative society, is the goal of training teachers and masters of production studies to use ICT at vocational schools. It also enables the performance of professional activity in the informative educational environment and is a sign of professionalism. With the help of ICT, teachers can modernize their lesson plans, enhance their instructional techniques, increase students' interest and motivation overall, personalize their training programs, grant them access to databases of information, and objectively monitor and evaluate their knowledge, practical skills, and abilities.

As a result, the teaching staff of the vocational school needs to work continuously to improve their information culture, professional development, and self-improvement. The implementation of gradual, ongoing informational training for employees, the use of ICT in general education, general professional, theoretical, and production studies, and its integration into national standards for specific professions are other issues that need to be resolved. In order to provide VET institutions with the most up-to-date, professionally applied teaching software, it was deemed necessary to develop and introduce innovative educational-production and pedagogical technologies on the basis of ICT in accordance with the needs of the labor market and features of different regions.

4. DISCUSSION

This paper, which is based on the research findings, will add to the conversation now being had on the computerization of future specialized training at vocational schools. When extrapolated to the field of education, informational processes—cognitive, communicative, and social—are its system factor and a crucial part of a new, personality-focused paradigm of education. In order to effectively employ ICTs in the training of future professionals, a scientific foundation, the planning and introduction of pedagogical technology, and educational resources are in high need.

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This study made it possible to define the following tasks of automation: generalization and deepening of future workers' theoretical knowledge of the key ideas and techniques of informatics as a scientific discipline; instruction in and mastery of the fundamental informatics concepts; formation of students' algorithmic thinking styles and cultures; mastery of general automation tools; forming skills and abilities of work on a PC; mastery of methods. updating professional knowledge and abilities to reflect ICT possibilities; development of planning skills for ICT resources required for professional duties; the improvement of communication and teamwork skills acquaintance. ICTs have the ability to provide students with knowledge and skills, according to (2007), who noted that educational institutions are under increasing pressure to harness this potential. According to this perspective, the fundamental ICT functions used in the training of skilled workers—including those that are instrumental, visual, informative, compensatory, motivating, individual, adaptive, integrative, control and diagnostic, modeling, predictive, and management—determine the functions of vocational schools' Informationalization. The goals of VET automation are the development of ICT competence as a required component of training, a critical skill in the information society. The duties and functions of VET automation are interconnected.

The expectations of users of educational services and the needs of social partners are not fully met by the informational status of vocational and technical education in today's world. These conclusions are in line with those of the scientific study conducted by Becker and Ravitz (2001), among others. It requires a complex of measures to improve the automation of every step of the professional training of skilled workers at vocational schools, as well as the scientific reorientation of the goals of informative training in VET, the grounded updating of its contents, and the clear determination of the structure and organization of education by means of ICT. It is practical to examine the automation at technical vocational schools in accordance with four areas: in the organizational and management activity (e.g., Law et al. 1999); in the educational process (Tella 1995); in the educational-production process; and in extracurricular activities. This is in light of the structure of skilled workers' ICT competence (Ashworth and Saxton 1991; Cuban 2001; Troter and Ellison 2001). These include, in particular, business intelligence databases, computer-aided production situation and professional action design, knowledge and ability control and self-control programs, the use of ICT to create diploma papers, and computer educational and training complexes. Therefore, every vocational school's job is to develop all of these fields in a comprehensive way.

The educational circumstances of the automation of the educational process at technical vocational schools have been better understood as a result of this research. As a result, these conditions are a complex of social-pedagogical and didactic factors, including: pedagogical workers' readiness to introduce ICT and complex automation of educational process; ongoing, systematic, informative training of future workers; creation and ongoing improvement of methodical and technical base of automation; integral, scientifically-based use of a complex of ways of ICT application within the educational process; effective management. A further intriguing finding is that the technical vocational school's adoption of the model for informatizing the educational process allows for the creation and application of a thorough strategy for informatizing future workers' training that is intended to intensify every stage of vocational training. Techniques of informative training and techniques of LMS application at vocational schools make up the two fundamental components of the scientific and methodical provision of the automation of workers' training. The methodology's primary characteristics are listed below: the professionalization of informatics instruction and learning at trade institutions; the creation of the blend of traditional and cutting-edge forms and ways of structuring educational process on the basis of ICT (Cotton 1992; Liao 1998; Reed 1996; et al.); general professional and professionally oriented informational abilities; the creation and adoption of teaching software for industrial professions; computer-based assessments of the effectiveness of professional development; problem- and project-oriented approaches to ICT-assisted worker training; online worker professional development; and strategies for preparing teachers (Peiuliauskien and Barkauskait 2007; Pegalajar 2018) and production studies masters for the use of ICT in technical vocational schools.

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By providing complex visualizations of professional phenomena, designing challenging professional objects, and increasing the effectiveness of the training stage of professional preparation, information technology is aimed at effectively stimulating and motivating students.

The study's findings can be summed up as follows: using ICT enables the preparation of qualified workers for the demands of the information society: developing their capacity to work with information, reflect on novel concepts, develop communicative skills, individual and teamwork capacities, design capacities, capacities for making the best decisions, capacity to work with virtual objects, capacity to perform the roles of researcher and designer, etc. In addition, because ICT significantly alters how information and instructional methods are provided in the educational process, there are a number of challenges related to the psychological, pedagogical, and organizational principles of ICT use in the learning process. It refers to educational technologies that have improved access to resources, knowledge, and other things (Domingo and Marquès 2011; Lucena 2016), facilitated learning, raised student motivation, and integrated technology into the teaching process (Ghaleb 2014). As stated by Coughlin (1999), Dexter et al. (2000), Jonassen (1996), Knierzinger et al. (2002), and Schacter (1999), a complex issue of designing a strategy for producing and introducing new learning environments suitable for constructive studying needs to be resolved in order to utilize all the benefits that improve the quality of the educational process and to prevent the losses and risks associated with abrupt changes in the teaching methods.

5. CONCLUSIONS

As a whole, the analysis of the state of VET automation revealed that, despite notable advancements in this area and the overall growth of the issue, the potential for optimizing the training of skilled construction workers based on ICT was not sufficiently studied, i.e., there is no thorough analysis and classification of suitable educational software and other electronic teaching aids; There are no systematic suggestions for their efficient usage or a clear technique for evaluating the quality of the information resources and technology employed in vocational schools. The findings and endorsement of this study highlight the interplay of all the automation components in the established and empirically validated model of automation of the educational process at technical vocational schools. It accurately captures its key characteristics and enables forecasting of the outcomes of the VET automation process. The approach aims to establish, maintain, and advance an educational environment heavily reliant on ICT on the basis of technological and communication resources. This setting is beneficial for the growth of the processes of informational and educational cooperation between teaching staff, students, and ICT resources, as well as the development of students' cognitive activity. Any information and educational space of the regional VET system includes the ICT-saturated educational environment, where ICT and pedagogical software are an essential component of the organization and operation of the educational process.

Experimental evidence supports a significant increase in graduates' ICT proficiency as a result of the intricate automation of the vocational school training process. Due to the fact that our technique shows a considerable increase in the proportion of ICT use in professional-theoretical teaching and professional-practical training, the quality of professional training for aspiring construction workers also greatly improves at the same time. In conclusion, the idea of a balanced, steady development of various educational institutions and the VET system as a whole is realized by technical vocational schools' vision of the automation of experts' training. The design focuses on the systemic application of the most recent technologies, taking into account the practical possibilities of resource provision for the automation of vocational education, the creation of electronic educational and methodical complexes, the updating and approval of the informational training materials for specialists, and ICT application strategies when training employees. Thus, it renders it possible to resolve difficult problems relating to the organizational, normative-legal, educational-methodical, and financial support of vocational schools' information technology.

The coordination between educational authorities, training and methodological centers, and VET methodological organizations of qualification training groups makes it feasible to implement the proposed conception. For the purpose of research implications, more in-depth work should be devoted to improving vocational education in Ukraine using ICT, including the development and introduction of computer-based training systems, the planning of blended and distance learning programs, and the creation of tools for electronic support and accompaniment. Research on student ages and psychological characteristics while introducing ICT, realization conditions, and efficiency criteria of automation on the various educational levels and for various subjects should all receive special consideration. In this context, it is important to look into the issues surrounding educational staff members' willingness to use ICT in many facets of educational activity, methods for intelligent tutoring systems, and techniques for managing educational and cognitive activity in the VET system.

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