Digital Learning Hubs as a Component of the Information and Digital Learning Environment

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Abstract

The article aims to analyse digital education in terms of modern information and the digital learning environment. Based on the use of such theoretical pedagogical research methods as system analysis, concretisation comparativistic approach the study is investigated. The results demonstrate the functioning of educational hubs as a sociocultural phenomenon in modern educational policy, the modern experience of using digital hubs in education, particularly, the experience of CISCO and other influential players, the possibility of forming digital learning hubs based on libraries of higher education institutions. It is shown that important directions for further research are the coverage of the development of technologies and the impact of this process on the evolution of educational environments in the future. In conclusion, it was noted that the use of educational digital hubs contributes to the decentralisation of the educational system. The effectiveness of the use of regular test competitions are noted, which contributes to the formation of a competitive environment.

Keywords: digital education hub, digitalization, higher education, learning environments, libraries

1. Introduction

Classical methods of providing educational services during the formation of the information society asserted themselves based on the human factor and the interaction between teachers and students. Human resources provided a suitable basis for learning. Through personal qualities, professionalism, and hard work on their knowledge, students had opportunities to acquire the necessary theoretical knowledge and practical skills.

An urgent modern problem became the issue of improving the qualified specialist's training quality, taking into account educational and social challenges, the needs of the labour market. In order to implement this approach, it is important to use forward-looking approaches, modernisation of the content of training, the involvement of responsible social partners. The effectiveness of the transformation will require timely analysis of the demand for relevant competencies of qualified graduates, innovative, organisational, and methodological principles of training. The modern development of information society associated with the processes of globalisation and digitalisation requires revision of classical paradigms, their modification, and significant updating (if not even negation and approval of new forms). As of today, it is not possible to completely abandon the use of human potential in learning, nor is there a definite immediate need for this. Above all, we are talking about ways of improving existing human intellectual and professional resources by integrating them with digital technologies of information transfer. This, in turn, actualizes the need to develop conceptual definitions of digital transformations.

Against the background of other proposals, the concept of hub, which has been successfully used for some time in other extra-educational areas of social activity (e.g., manufacturing), is important. Synergy needs are important for all manifestations of the contemporary sociocultural environment. Today's processes of digitalisation, which have permeated all spheres of learning and organisational activity, have led higher education to turn to the active use, formation, and filling of digital learning centres. The centres should become a combination of theoretical knowledge and practical skills - a kind of educational hub offering a combination of traditional and digital education.

The role of educational hubs in the digitalisation of learning has already been the subject of detailed scientific analysis. For example, Passey (2021) analysed the potential benefits and risks of digital learning. Machiavelli & Cavalcante (2022) identify features of digital learning course use that distinguish these technologies from digital hubs. Klenin et al. (2020) traced the challenges that can arise when using distance digital learning. Kucirkova & Littleton (2015) summarised the idea of digital learning hubs functioning by focusing on the need to further explore this issue - through ongoing technology updates that will require further reflection. Digital Learning Hubs bridge geographical and socio-economic gaps by providing access to educational resources and opportunities for individuals who may not have had them otherwise. This inclusivity is a cornerstone of modern education. Personalized Learning: These hubs enable personalized learning pathways, catering to the individual needs and preferences of learners. By leveraging technology, educators can tailor content and resources to meet diverse learning styles and paces. It is worth mentioning the works of researchers who analyzed the impact of digitalization on the educational process - an important area of modern educational activity in global dimensions. In particular, Martinez-Nuñez, Borras-Gene & Fidalgo-Blanco (2016) analyzed the impact of digital learning environments on the education sector. It is important that this work was written before the global COVID-19 pandemic, so the researchers' opinions and views are free from conclusions about the effectiveness of digitalization and distance learning in general. They concluded that Digital Learning Hubs encourage collaboration among students and educators, fostering a sense of community and engagement. They enable interactive and multimedia-rich content that keeps learners motivated and interested in their studies. Data-Driven Insights: Through analytics and data collection, these hubs offer valuable insights into learner progress and performance. This information empowers educators to make informed decisions and adapt their teaching strategies accordingly. Prokopenko (2021) outlined various possibilities for the development of the learning system in the future, focusing on the impact of technological solutions on this process. Haidabrus (2022) traced the possibilities of digital technologies in the management of scientific and educational institutions - the importance of his views is justified by a broad empirical basis for the study. As he thought, Digital Learning Hubs support lifelong learning by providing resources for professional development, upskilling, and reskilling. They facilitate continuous learning in an ever-evolving digital world. Klenin et al. (2020) identified the main difficulties on the way to introducing digitalization in the educational process of today. But also, digitalization can complement traditional classroom instruction, allowing for a blended learning approach. This integration enhances the overall educational experience and prepares students for the digital demands of the future. Bashynska et al. (2021) traced the features of Smart Education 4.0 and its capabilities. They thought, that the field of digital education is constantly evolving, and Digital Learning Hubs must adapt to new technologies and pedagogical approaches. Institutions and educators should remain flexible and open to innovation. Papapostolu & Spassov (2020) identified the main stages in the transformation of libraries into modern multimedia centers and the difficulties that arise along the way. As that showed, it is important to acknowledge the challenges associated with Digital Learning Hubs, including issues of digital equity, privacy concerns, and the need for robust technical support. These challenges require ongoing attention and solutions. Skakun (2017) identified the peculiarities of the digitalization of the educational process through traditional Ukrainian educational processes and their development over the past decades. Therefore, the issue is represented by various studies, which, at the same time, did not demonstrate the importance of an integrated understanding of digital hubs in the system of modern education.

Тож, the article aims to analyse digital educational hubs as components of a modern information and digital learning environment. To realize this goal, it is proposed to consider the following issues:

1. To analyze the formation of the phenomenon of digital hubs in modern times.
2. To evaluate the effectiveness of the formation of digital hubs in the educational process.
3. To consider opportunities to transform university libraries into multimedia digital hubs.

2. Method

The study is formed based on the use of theoretical pedagogical research methods, as demonstrated Bondar et al.

(2020). Namely, based on the system analysis, the features of the organization of digital hubs are reflected, the possibilities of transforming university media libraries into digital educational hubs are investigated. Using the systematic method, the system under study was decomposed into smaller components and analysed how these elements function in order to implement the educational and digital environment. A particular importance is given to the method of instantiation, which is the basis for the study of the features of the formation of digital education centers in the networks Cisco, Eton Connect, Intructables, etc. At the same time, the key conceptual differences between digital educational hubs and open online mass courses (MOOCs) are characterized through the prism of comparativistic analysis. Note that these concepts are often used by researchers without comprehending their differences.

An important basis for the article was also provided by certain European administrative documents regulating the use of educational digital hubs. Based on the study of these sources, the article highlights the possibilities and prospects for further implementation of this technology in the educational space.

Scientists have welcomed the research's consistency, as evidenced by Bashynska et al. (2021). The study, as a whole, unfolded across multiple phases. Initially, it entailed an exhaustive review of professional literature and the synthesis of experts' perspectives concerning the utilization of digital hubs. In the subsequent stage, drawing upon theoretical research methods, the primary research issues were delineated, and potential solutions were explored. The concluding stage serves to encapsulate the key findings and conclusions arising from the study. Tsekhmister (2022) proposed to used meta-analysis as the preeminent methodological paradigm for the examination of digital space within the realm of higher education. At the same time, Tsekhmister (2023) described the issue of the effectiveness of case-based learning in modern education on the basis of meta-analysis. This paradigm boasts a multifaceted nature, encompassing a diverse array of empirical and rationalist techniques. The principles governing the self-organization of complex systems find direct applicability when analyzing the digital educational hub and its integration within education. Within the contemporary scientific landscape, the field of medicine stands out as a domain actively embracing transdisciplinary concepts. In light of this, our focus shifts to information and communication technologies, where substantial emphasis must be directed toward what we term 'digital scientific methods.' These methods are steadily carving out a significant niche within the methodological constellation of the modern scientific and ideological paradigm.

3. Results

3.1 Educational Hubs as a Socio-Cultural Phenomenon in Contemporary Educational Policy

Table 1. Ranking Countries by Digital Capabilities

States		
High level of income	*1.*	United States of America (1st place)
	2.	Singapore (2nd place)
	3.	Sweden (3rd place)
Average income level	*1.*	China (23rd place)
	2.	Malaysia (36th place)
	3.	Russian Federation (40th place)
Below the average income level	*1.*	Ukraine (50th place)
	2.	Indonesia (59th place)
	3.	India (61st place)
Low level of income	*1.*	Rwanda (101st place)
	2.	Zambia (113th place)
	3.	Uganda (116th place)

Source: *Countries Benchmarking the Future of the Network Economy (2022)*

An important achievement of educational hubs is the creation of all the necessary prerequisites for the decentralisation of the educational process (Bondar et al., 2021). A digital hub achieves this goal through the use of decentralised digital resources, which automatically distances it from traditional models of administrative management of educational processes. A tangible positive element of its use can be described as solving the needs and gaining the necessary experience of higher education applicants. with additional dynamism in the development adds both the interests of teachers and the needs of potential employers interested in the acquisition of relevant knowledge, skills, and abilities by students (Gütl et al., 2014). Their observations, recommendations, and practical implementations further decentralise the learning process. Ukraine is currently undergoing an active digital transformation of its education sector. Current digital development rankings show that Ukraine ranks 50th in the world in terms of digital capabilities. And among lower-middle-income countries, it ranks 1st in the analysis of key digital resources (See Table 1).

In general, taking into account the digitalisation indicators in Central and Eastern Europe, the digitalisation process in Ukraine is assessed as adequate (Countries Benchmarking the Future of the Network Economy, 2022). Ukraine ranks 50th with a total score of 55.71. For example, the first country in the ranking, the United States, has a total score of 80.30. The digital human potential of Ukraine is generally at a fairly high level - 54.43 (compared to the countries of Central and Eastern Europe. For example, the figure is 48.48 in Hungary, 53.53 in the Czech Republic, 34.36 in Bosnia and Herzegovina, 45.25 in Slovakia, 51. 35, etc. A more detailed overview of Ukraine's digital indicators is presented in Figure 1.

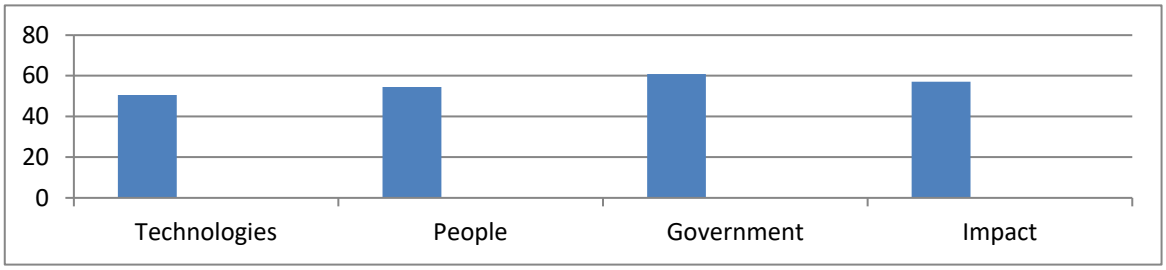

Figure 1. Key Indicators of Ukraine's Digital Development

Source: *Countries Benchmarking the Future of the Network Economy (2022)*

Due to this, we believe that Ukraine, despite the military actions, has an important digital potential for the development of digital educational products. Therefore, the process of developing digital educational hubs will develop in line with the trends of integrating digital elements into the general educational space.

The digital transformation is based on the active implementation of several key concepts, particularly the combination of culture and skills, infrastructure capabilities and technologies, ecosystems, etc. (Digital learning hub, 2022). Researchers note above all the importance of the element associated with the concept of “culture and skills” (Passey, 2021). Among the digital technologies that have flooded the modern information and cultural space, the skills of dealing with today's challenges become relevant. It is very important to know and be able to organise information, work with it, etc (See Figure 2).

The element of “infrastructure and technology” includes parts of technology that ensure the smooth operation of digital learning hubs (Digital learning hub, 2022). Appropriate software solutions, working channels of information, and content transfer, without a pecking order for cybersecurity, are as important for the implementation of educational activities in the hub as the direct work of teachers and higher education applicants.

The concept of “ecosystems” is quite popular in today's environment, particularly academia. Its main goal is to arrange the work of the hub in such a way that it is in harmony with the environment while providing its basic functions (Digital learning hub, 2022). The digital information world is also part of the environment and can harm it with its relentless development. To streamline the growth process, there is a need to constantly monitor coexistence with ecosystems in which humans play leading dominant roles.

Additional benefits of using digital hubs are the work of learning-information ordering (Slukhenska et al., 2019). Above all, it is about reorganising the libraries and scholarly collections of texts of institutions of higher education. For example, successfully establishing digital content centres and performing their functions requires academic libraries to realize the unifying potential of their collections and archives. Synergy and impact effects on learning

environments are fulfilled through collaborative work (Özhan & Kocadere, 2019). The teaching staff forms repositories at the expense of their own scholarly accomplishments, which are open to the work of other members of the scholarly and student communities interested in improving their own knowledge systems. For this reason, reforming classical libraries and archives into digital educational hubs creates additional lines of interaction at the collaborative levels of higher education faculty, scholars, and graduate students.

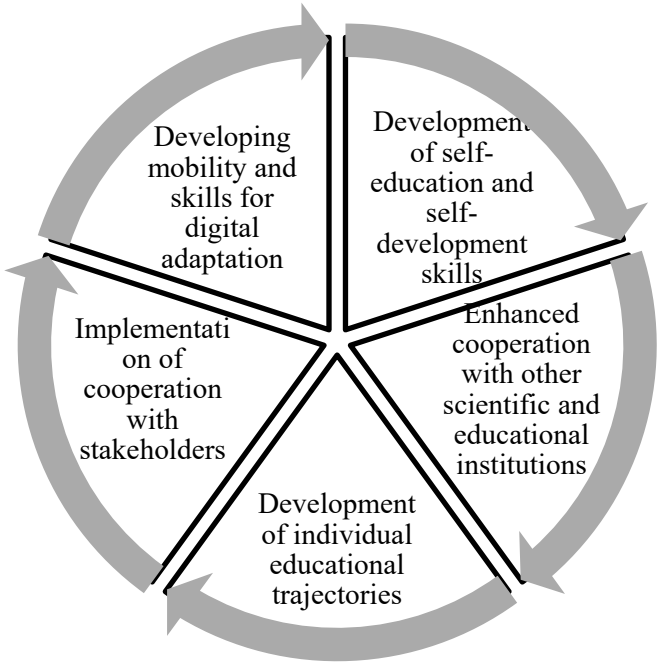

Figure 2. Key Areas of Digital Transformation in the Education Sector

Source: article authors' development

3.2 Digital Hubs in Education: Current Experience of Use

The development of digital educational hubs is the American company Cisco, which was founded in 1984 by the spouses Leonard Bosack and Sandra Lerner, who were engaged in the technical maintenance of computing devices of the Stanford University branch. In its 26 years of existence, more than 13 million students have already gone through the program. However, the development of the Internet without a parallel development of "digital literacy" can create a "digital divide" (Martinez-Nuñez, Borras-Gene & Fidalgo-Blanco, 2016). A separate project, the Cisco Networking Academy, is improving the digital literacy skills of the population. The main idea of the company's slogan is to make quality digital education more accessible: everyone on the planet should be able to get a quality education. In order to realise these ambitious plans Cisco started to organize and implement platforms for improving the efficiency of remote education. Especially effective projects were the development of the Webex tool with its additional functionality for education, interactive digital Webex Boards.

Cisco was offering these digital solutions long before the COVID-19 pandemic. After the lockdown, Cisco began to provide free licenses for Webex, helped to adjust training methods for distance learning, organised special seminars to improve the digital competence of teachers. Cisco Digital Learning Hubs are developing a hybrid approach to learning, where students have a choice of what form of learning they can use to gain knowledge in a particular area. In the 2020-2021 academic years, more than 2.3 million students attended the Cisco Networking Academy. Overall, the Cisco Networking Academy was formed to train professionals who will be in the job market of the future.

The Cisco Networking Academy portfolio includes special training courses that focus on systems education while training IT professionals from the ground up. Cisco also has such courses for students who have no experience in information technology. In addition, Cisco helps providing school-level career guidance. In 2021 the Network Academy began the development of three areas: Cloud Security, Talent Bridge, Webeducation. Cloud Security includes a 35-hour cloud security course that can be taken by Academy-based students. The talent Bridge program is

also important, which is the only comprehensive Cisco training system that allows students to go through the full cycle: from the beginning of training to qualification to operability. One believes that the courses Fundamentals of Social Media, Introduction to Cybersecurity, and Fundamentals of Linux are especially valuable in today's student training systems. All Digital Hub participants have access to a full-featured version of Webex.

In Instructuables, students use a variety of videos in order to provide instructions and specific example processes. This promotes the experimentation of participants, influences the formation of creative thinking, and the development of new innovative solutions. A prime example of a digital learning hub is Eton Connect, which provides its resources for free. The hub covers a diverse range of participants from professional educators to students. In the digital learning system of the Eton Connect educational centre, the main emphasis is placed on the creation of special teaching and learning videos. Predominantly these are created by Eton College chemistry faculty or in collaboration between college faculty and Eton Greek participants. In addition, Eton Connect is a network of more than 1,000 interdisciplinary collaborations among schools and community organisations to develop quality digital education. Through the development of special innovative solutions in chemistry, biology, medicine, the use of digital tools and resources, the organisation of special training events, distance conferences, and webinars, Eton Connect brings together people who intend to develop their skills and knowledge in the above-mentioned areas through the prism of preparing specialists of the future who are able to understand the latest technologies, developments and know how to use them in practice.

As noted, Kucirkova & Littleton (2015) in digital educational hubs there are regular test competitions, where the losing product, project, development choose the participants themselves. Consequently, they do not have a single predetermined result or outcome. Such a system of openness gives students additional motivation for learning, a sense of prospective achievements. Moreover, the transparency of the learning process also forms an open competitive environment that affects the effectiveness of learning and the acquisition of professional skills (Prokopenko, 2021). The defined learning process differs significantly from MOOC education: here, the focus is on the end product, which is a predetermined outcome. Although some MOOC resources have begun to use fast-motion animation techniques (affecting the formation of more engaging learning), their key strategic goal remains the same: they use this kind of technology to implement an established interpretation of learning content (Mudzamba & De la Rey, 2013). The point is that they are not often used to implement a collaborative learning process that students can imitate or build upon.

3.3 Digital Hubs at Higher Education Institutions' Libraries: Opportunities for Interaction

Modern library systems in Ukraine and the world constitute a kind of information and media environment, the purpose of their functioning is the use of modern means and methods of providing information support, primarily in the educational process. This can be explained by the fact that without libraries intellectual development in the educational environment does not happen (Papapostolu & Spassov, 2020). Considering libraries as resource centres for quality assurance of educational work, we can conclude that they differ from each other according to the main target audience. Particularly, public or children's libraries have the potential to be transformed into media libraries using modern digital technologies (Liubarets et al., 2022).

Academic libraries at institutions of higher education have the greatest potential to be transformed into educational hubs where users will have quick access to what they need through the use of print, archival, and digital publications (Papapostolu & Spassov, 2020). Thus, using their potential to create hubs will lead to transforming them into spaces for the realisation of relevant educational, creative, cultural, social, and any other needs (See Table 2).

In fact, the current library system has undergone a profound transformation in recent years. One of these features has been the gradual abandonment of the use of paper information carriers of educational and scientific literature, and the absence of the need for physical visits to such institutions. The digitalisation of the library space has led to the automatic transformation of such institutions into digital hubs, which today are increasingly needed by higher education applicants (Haidabrus, 2022). The role of classical libraries, unwilling to integrate into today's information society, is largely confined to the preservation of books and other printed literature (Skakun, 2017). A much more useful manifestation of library activities is the broadcasting of current ideas of medical literature. In particular, higher education applicants will download books or textbooks in minutes - all that matters is providing them with the ability to download the literature they need. Therefore, given the possession of digital information, libraries are transformed into educational hubs, where everyone will be able to realize their own needs in the context of providing or receiving education.

Table 2. Key Aspects of the Functioning of Digital Educational Hubs Based on University Libraries

Direction	
Electronic access to resources	University libraries create electronic access to various digital resources, such as e-books, research articles, journals, dissertations, conference abstracts, video tutorials, lecture materials, etc. These resources are available through the library catalogue or electronic databases.
Organisation of digital archives and media libraries	Many university libraries are working to create and maintain digital archives that store unique and historically valuable documents, photographs, manuscripts, paintings, and other digital objects.
Expanding global access	Digital educational resources allow students, teachers, and researchers to access information from anywhere in the world with Internet access. This helps to improve the level of education and research development in the global community.
Optimisation of information search	Libraries provide users with the opportunity to use a variety of tools to search for information in digital collections. These can include various filters, indexes, keywords, and other features that help you find the information you need faster and more efficiently
Support for e-courses and distance learning	University libraries can support digital materials for teaching and learning. They can collaborate with faculty to create digital textbooks, learning materials, lecture notes, and more.

Source: article authors' development

Of course, the painless transformation of academic libraries into something more cannot happen without the necessary provision of the necessary digital equipment for the transmission and use of quality educational services, as the needs of users are transformed in accordance with the transformation of digital technology and the cooperation with them applicants for higher education (Launch of the European digital education hub, 2022). Getting the opportunity to work with a variety of information, scientific, economic, political, cultural, social, legal literature, and applicants will be able to increase their level of professional training, better meet the requirements and needs of the market, modern political and social life. At the same time, the functioning of educational digital facilities based on university libraries requires constant access to the Internet (Hillier, 2018). However, modern research shows that Ukrainian universities need fast and high-quality WiFi (see Figure 3).

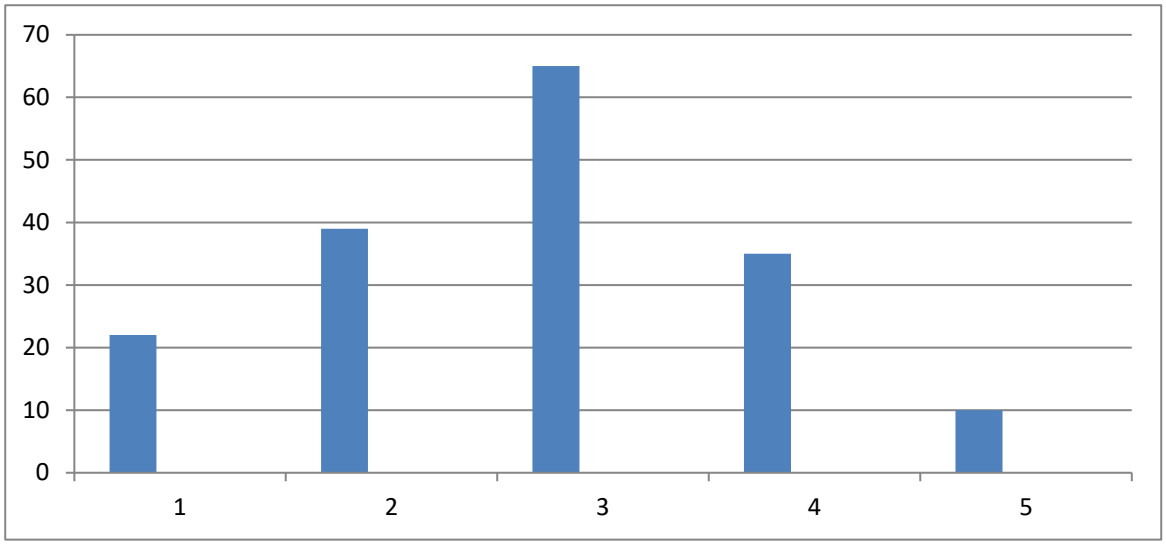

Figure 3. Students' Assessment of the Quality of WiFi Access

Source*: Digital tools at the Lviv National University named after I. Franka: survey results (2020).*

Therefore, an important challenge to the large-scale use of digital educational hubs based on university libraries is to improve the material and technical base.

The formation of digital educational hubs based on scientific libraries will contribute to the creation of an attractive space, which is very much appreciated by stakeholders today (Klenin et al., 2020). The image created builds interest and popularises the structure among other organisations that can offer collaboration. Turning libraries into a kind of university research hubs will further enhance civic consciousness and promote the importance of the learning process, which, incidentally, will contribute to the traditional functions of libraries - it says about the social influence on higher education applicants and preservation of documentary and cultural information about the era. The influence of technological progress dictates the emphasis on web-oriented concepts of library development - from the classical library environment to the creation of interactive information space tools Web 2.0, the introduction of semantic technologies Web 3.0 relevant to education, working with the Internet of Things, intelligent digital data processing, artificial intelligence, etc. education action plan (2021-2027), 2021). Recent evolutionary changes associated with Web 4.0 technologies are aimed at further improvement of neural network technologies, the use of artificial intelligence in smart technology, the development of further intelligent interaction of the software with people, and the use of optimisation algorithms that make it as easy as possible to achieve educational goals.

The development of educational digital hubs based on university libraries has been considered by the American Centre for the Future of Libraries. According to their definitions, opportunities for the development of concepts under the conventional names of “Library 4.0” and updated functions of library work are inevitable parts of the further development of the whole industry (Deb & Bhatt, 2020). Some researchers have paid particular attention to the issue of improving the quality of education and digital approaches (Bashynska et al., 2021). Also, there are some difficulties on the way of their development. The first is economic borers.

Then it raises several questions concerning sustainability of the future development. Based on previous experience it concludes by the statement that the slogan Industry 4.0 is not complete. If it will not simultaneously include also massive extension to Industry. 4.University and Industry.4.Teachers activities, a sustainable development will be seriously jeopardized, at least in the Central Europe. Huba & Kozák (2016) wrote: “Then it raises several questions concerning sustainability of the future development. Based on previous experience it concludes by the statement that the slogan Industry 4.0 is not complete. If it will not simultaneously include also massive extension to Industry. 4.University and Industry.4.Teachers activities, a sustainable development will be seriously jeopardized, at least in the Central Europe” (p. 103). One of the new proposed phenomena can be considered as Makerspaces - special equipped laboratories for various researches in media libraries, educational public centres, and higher education institutions; where recipients can get the resources they need to do empirical research, work with projects (Ionescu et al., 2020). The use of such labs is also possible in media libraries, educational public centres, and institutions of higher education where recipients can obtain the resources they need to conduct empirical research, work on projects, and acquire new knowledge. The formation of such laboratories is also possible in a virtual space, where they could bring together several higher education institutions to organise effective collaboration.

4. Discussion

Emergency remote teaching has played a pivotal role in the advancement of online learning, ushering in fresh possibilities and contemplations for the educational sector. As observed through the discussions held within the forum, the experience of the COVID-19 crisis has unveiled a range of distinctive challenges that necessitate attention for the development of novel methodologies, pedagogical approaches, dedicated infrastructure, and purpose-built platforms tailored to online education. These innovative approaches must adopt an interdisciplinary and holistic perspective, aligning with the responsible research and innovation approach, to preemptively assess potential consequences and societal expectations. It has become abundantly clear that the COVID-19 emergency has underscored the fact that technology, on its own, does not constitute a panacea. The enduring disparities among students in varying educational contexts have been starkly illuminated during the pandemic. Both students and educators have grappled with diverse hurdles in the realm of remote teaching, stemming from existing constraints linked to technological, pedagogical, and social challenges, which are expounded in Results.

The digital educational hub blurs the boundaries and expands the set of opportunities for schoolchildren and students who want to get a quality education using modern digital technologies. A virtual space of thought and creativity, created based on modern technology, serves as a launching space for students (specialists of the future), who can become qualified specialists in various fields. A study by Norwegian researchers Kucirkova & Littleton (2015) noted that there are several fundamental differences between Massive Open Online Courses (MOOCs) and digital learning

hubs, which researchers often confuse in their research. Note that MOOCs are ad hoc distance learning courses developing global unrestricted participation "first conceptualised as free and without formal accreditation for students," but many MOOC courses are currently criticised in leading scholar circles (Machiavelli & Cavalcante, 2022). Although their learning techniques and methods differ markedly, the most popular MOOC systems (FutureLearn, Coursera, and EdX in particular) address what Reynis & Bechini (2014) have defined as Stanford's version of artificial intelligence, essentially a digital facelift to "traditional education". The study notes that the main challenge to the further development of digital education hubs in Ukraine is insufficient access to the Internet. Other researchers, such as Özmen & Kan (2022), who have described the main problems of digital transformation of the education sector, also emphasise that an important challenge for the further development of digital education is the issue of improving the material and technical base. Other scientists agree with this statement Murphy et al. (2022). The conceptual underpinnings of MEPs and education hubs form different models of learning community education. Although theoretically they may be related, in practical terms they are markedly different. The point is that MEPs are located in a system of distributed individual learning, while educational (often based on mutual educational interests) in a distributed collective education (Bondar et al., 2020; Ferri et al., 2020). For this reason, the key difference between the aforementioned (individual and distributed collective) techniques is the formation of the main focus of educational activities not on products, but on the processes of implementing learning.

For example, in a distance learning hub, the educational processes are developed in several models and ways (Budko et al., 2023). Namely, in an online digital design hub called Ravelry, the learning process involves participants sharing their designs and designs before or after the product is published. The key emphasis is on sharing experiences, sharing learning progress. Learning is organised in a similar way at the Intructables Education Centre. Here students can develop a kind of instructuables, the system constantly has a variety of training materials, images, videos, which can be downloaded at any time on a personal PC. As a result of the organisation of a variety of learning competitions and the constant increase of the community, this affects the creation of more complex designs, because all participants of the centre can follow special instructions and upload their schemes and designs on a constant iterative basis. Thus, this approach affects the improvement of previously practical skills and digital competence of the hub participants. At the same time, the development of technology continues to make the issue of using digital hubs relevant. In particular, promising areas for further research include tracing the evolution of relevant educational technologies and their integration with the existing digital environment, forming relevant digital hubs based not only on universities but also on NGOs that would deal with non-formal education.

5. Conclusions

Digital Learning Hubs play a pivotal role in shaping the modern educational landscape by providing a flexible, inclusive, and data-driven approach to learning. As technology continues to advance, these hubs will remain a cornerstone of the Information and Digital Learning Environment, helping individuals of all backgrounds and ages to acquire knowledge and skills essential for success in the digital age. To fully harness their potential, it is crucial for educational institutions, policymakers, and educators to collaborate, adapt, and invest in the continued development of Digital Learning Hubs within the broader educational ecosystem.

So, digital education, as part of the modern information and digital learning environment, plays an important role in the modern educational process. This phenomenon is associated with the processes of globalization and digitalization of all spheres of human activity, the total penetration of technology in the educational field. The use of digital educational hubs forms the necessary prerequisites for the decentralization of learning. First of all, we are talking about the fundamental influence of employers on the educational process, recommendations of higher education applicants and teachers - these influences bring dynamics to the educational processes. Another advantage of using digital hubs can be the settlement of educational and informational resources, bringing them into a unified order. Particularly, the transformation of standard scientific libraries operating at universities into broader platforms with educational and digital functions plays an important role. In fact, scientific libraries at institutions of higher education can have considerable potential for transformation into digital educational hubs. In addition to access to digital networks and the use of modern software, they possess a considerable amount of information resources, access to which can significantly enhance the functioning of educational schools and learning in general. The development of the concept of Library 4.0 can be an indispensable element in the further development of the educational sphere. Namely, the availability of special laboratories for various research libraries will allow combining the potential of several higher education institutions to organize effective cooperation.

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6. Recommendations

It is recommended to use method of regular competition. The experience of using digital educational hubs in European countries and the USA has shown the effectiveness of using methods of regular test competitions, where the winners (a team, a specific performer, or their product) are democratically chosen by the participants of the educational process themselves. For this reason, there are few opportunities for premature results or unfair competition. Such systems of openness provide additional motivation for gaining knowledge, a sense of perspective, and the importance of personal achievement. In addition, the inherent transparency of the educational process in digital hubs creates the basis for a competitive environment, which has a positive impact on the effectiveness of learning and the acquisition of professional skills.

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