Problems and Prospects for the Art Education Development in Higher Educational Institutions Based on Big Data Technologies and Digital Platforms

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Abstract

In order to build an effective system of providing educational services in the art direction, it is necessary to possess an assessment of the results of Big Data initial implementation. Previously conducted studies on the specifics of implementing digital platforms in the educational art space are incomplete and insufficient. Most universities of different countries introduce these systems independently, and, therefore, there are no methods and principles for implementing such measures in the educational process. The purpose of the present research is to assess the role of Big Data and digital platforms in improving the quality and efficiency of art education. An analysis of assessing the implementation and functioning of digital systems in the leading higher educational institutions of the art direction in Poland, the Czech Republic, and Ukraine was carried out. This made it possible to generalize the experience gained and identify the main trends of this process. This made it possible to generalize the experience gained and identify the main trends of this process. In particular, 70% of students have a positive attitude towards using digital platforms that allow them to expand their awareness and informativeness, and 73% note these platforms as a source of obtaining available information. This made it possible to generalize the experience gained and identify the main tendencies of this process. As a result, modelling of the concept of using Big Data in higher education in the art direction has been presented. The main methods and examples of using Big Data in art education have been defined and characterized. Prospective directions for further application and implementation of innovative digital systems have been indicated. The use of research results creates opportunities for more flexible expansion of existing digital systems and the formation of new directions for subsequent implementation in the educational process. The research pointed to the most significant problem of comprehensive using Big Data by students due to ignorance and lack of awareness of the potential of Big Data in terms of planning, forecasting behavioral actions both in the process of learning, and in future professional activities. Further development of the research topic should focus on the quantitative and qualitative assessment of existing systems and the formation of a detailed methodology for the introduction of the latest educational services in the art education system.

Keywords: digital technologies, digital platforms, educational services, Big Data, art education, artistic competencies

1. Introduction

Information and digital technologies occupy leading positions in educational processes. Such a tendency is also being observed at the higher educational institution of art education. Such trends indicate that the control of educational processes of universities is enhancing. Along with this, the improvement of the strategy formation of higher educational institutions is observed; the operative assessment of trainees and students is carried out. Thus, it ensures the formation of optimal decisions for the administration regarding the management of the institution and the educational process. Ultimately, this strengthens the position of the institution itself in the education market.

There is no need to explain the thesis that the intensive implementation of relevant digital technologies, access to educational services has decreased many times. At the same time, the area of using the unique educational materials via the Internet has expanded. Art education is also developing in this direction, but the pace of such implementation is still not at the same level as professional engineering educational institutions. However, the introduction of educational complexes, which are oriented towards art education, is being monitored. Such complexes are implemented through online platforms Coursera, Show Academy, Udemy. They are aimed at a wide range of interested parties, without age, social and geographical restrictions. Traditional higher educational institutions are also connected to these processes; therefore, they introduce mixed forms of art education. The involvement of information and communication systems is characteristic for them (Patel & Desai, 2016; Yu & Wu, 2015).

The implementation of quarantine measures during the spread of the coronavirus disease pandemic has become a significant impetus for implementing digital technologies in the field of art (Davis et.al., 2020; Akpınar, 2021; Stage et.al., 2022).

It should be noted that online education through digital platforms is not the primary function of educational institutions. In particular, some authors consider these processes supplementary (Ishchenko, 2020; Chakir et al., 2020). Thus, art science is currently in the process of initial transforming classical educational technologies into innovative digital technologies, as noted by Ericsson et al. (2019).

It should be noted that the conducted scientific studies do not sufficiently note the effectiveness of the introduced innovations in art education. Therefore, the purpose of the present research is to assess the role of Big Data and digital platforms in improving the quality and efficiency of art education. In accordance with the purpose, the following objectives are put forward:

- to evaluate the structural and semantic relations in the Big Data system regarding the art educational process.
- to analyse digital platforms on the term of efficiency of their applying in art education.
- to conduct a comprehensive assessment of the perception and use of Big Data technologies by pedagogical workers in the art educational process.

2. Literature Review

With the development of computer technology and informatics since the mid-90s of the last century, the category of Big Data began to be introduced in scientific publications. In particular, it was firstly mentioned and explained by the scholars (Mashey, 1998; Osmanbegovic & Suljic, 2012). Currently, this category is explained as the collection and processing of massive information of a diverse nature, which allows effective management of processes based on the processing of an array of information in a very short time through the use of special information and communication technologies (Xu & Duan, 2019; Chae, 2018; Ahmed et al., 2018). Big Data by its structure is a system of data arrays, which are divided into three basic groups: structured, unstructured, and a separate symbiosis of semi-structured (Margetts&Sutcliffe, 2013). Thus, it should be noted that Big Data is potentially attractive in the education system for forming appropriate educational complexes of students and conducting academic research.

In modern conditions, digital platforms are widely used in the educational process, the purpose of which is the exchange of information between a large number of users (Manjarres et al., 2019; Cantabella et al., 2019). It is digital platforms that represent a unique space for the functioning of the digital communication system of its participants (Sichkarenko, 2018; Mikalef et al., 2018; Zheng & Bender, 2019). Digital platforms have gained particular relevance in the process of online learning in order to increase the efficiency of the educational process. Digital platforms are used in all types of educational services, from pedagogy and economics to management theory. Researchers, analysing the scope of digital platforms, identify a number of categories of subjects who are involved in a certain way in educational services. The leading subjects are developers of ready-made content (Schneider et al., 2019); subjects that adapt educational content for end users (Williamson, 2016); a group of subjects of academic training who create high-quality educational materials based on software platforms (Eduson, Universalium, Web. University). In addition, individual subjects of the educational process are persons hosting author's materials ((Zillion webinars) (Valêncio et al., 2020), as well as pedagogical workers introducing author's methods and developments into educational school programs. The so-called integrated models are distinguished as a separate approach in Big Data implementation (Bamiah et al., 2018), the content of which is reduced to the integration of classical educational processes with online learning.

The modern quality and efficiency of the educational process due to its saturation with Big Data array and particular digital educational platforms is determined by the relevance of the problems of monitoring educational services

through the use of teaching and evaluation methods (Baratè et al., 2019; Hiremath et al., 2021). This causes the process of control, assessment and teaching through digital platforms to become an integral process of functioning of higher educational institutions.

3. Materials and Methods

The study was carried out on the basis of a comprehensive approach, which was applied to the description and processing of the objectives set in the research. The theoretical and scientific base of the research was conducted using descriptive methods. This is due to the fact that the social-artistic sphere, including education, is specific, for which these research methods are most suitable. The assessment of phenomena was carried out on the basis of induction and deduction and a qualitative and quantitative approach. The assessment was carried out on the basis of induction and deduction and a qualitative and quantitative approach, as well as through the classical method of questionnaire survey. Considering that digital learning and Big Data in art education do not allow to fully and qualitatively be described only through quantitative methods, therefore, these processes were investigated through the classical method of questionnaire survey.

The survey was conducted from September 2021 to December 2021, in fact, for 1 academic semester. At the same time, 110 students were interviewed, which made up the C1 group. A separate group was formed on the basis of the teaching staff that made up the B1 group. In addition, 20 administrative workers who formed the A3 group were interviewed. The structure of the questionnaire included nine main questions regarding the assessment of using innovative digital technologies in art higher educational institutions.

The students and employees of the following higher educational institutions were interviewed, namely: the Academy of Fine Arts in Prague (the Czech Republic), the Academy of Fine Arts in Warsaw (Poland), Kharkiv National University of Arts named after I. P. Kotlyarevsky (Ukraine). These are those higher educational institutions that actively use digital technologies, in particular Big Data and information platforms. The questionnaire was conducted on a voluntary basis, and the principle of confidentiality and anonymity was followed. In addition, we studied literary sources and collected relevant information, which made it possible to analyse and summarize the results of the research.

4. Research Results

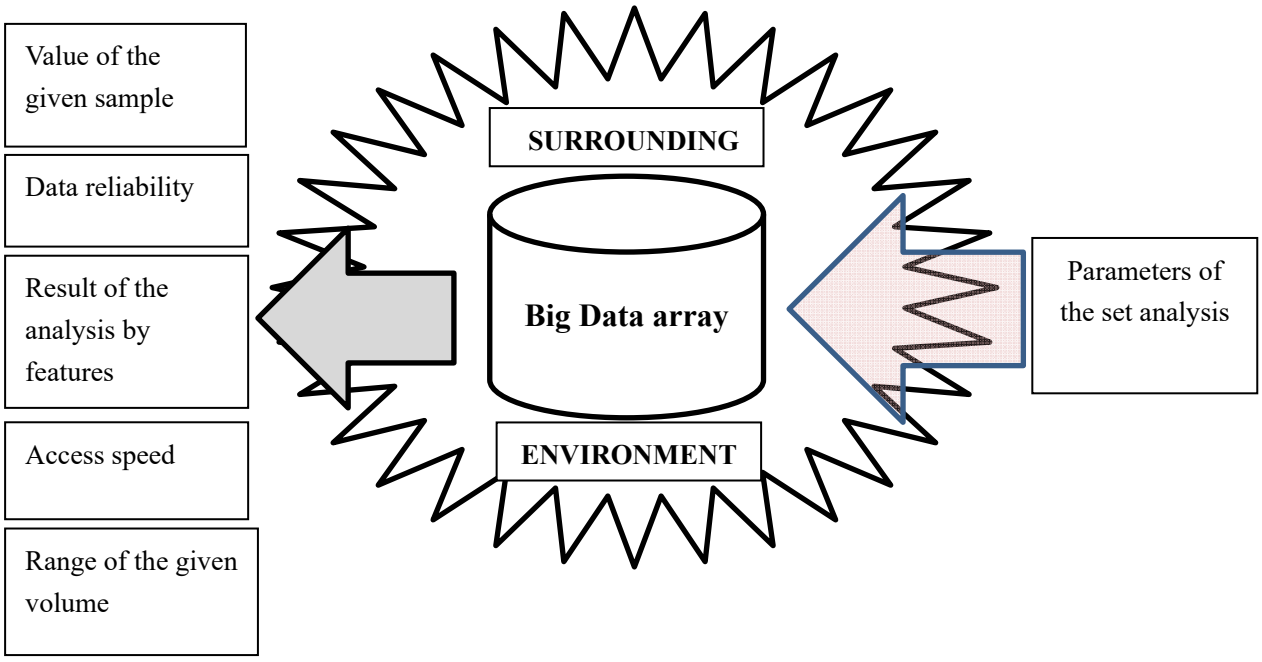

Figure 1. Characteristic Features of Big Data and Digital Technologies in the Teaching the Art Directions in Higher Educational Institutions

Source: author's development

Characterizing Big Data, it is expedient to highlight its main components, which allow using the large data stores in the art space (Figure 1), namely:

Diversity determined by storing an array of unstructured data that is generated and updated automatically online.

Speed indicates that the selection of the necessary information from the database is carried out instantly according to the specified parameters, which corresponds to the specific educational process of the relevant speciality, specialization and educational institution.

Validity indicates that the obtained samples correspond to the information stored in the database and obtained in accordance with legal requirements and user needs.

The value for the art space is determined by database processing systems according to the approaches and application criteria in the practical educational process.

The range characterizes part of the total volume of created and stored database information, which in sufficient quantity characterizes and allows management of educational services in the art direction.

The next stage of our research was the assessment of the ways of using Big Data in art education by universities of the relevant profile. The results are summarized in Table 1.

Table 1. Main Ways and Examples of Using Big Data in Art Education

Directions of digital projects implemented	The sphere of implementation in the educational process	Educational institutions in which Big Data was implemented
Analysis and forecasting of demand for educational services, Risk assessment	Grading System (GPS), Moodog System	Universities of the United States (California, Arizona)
Platforms for implementing online education	Internet	Ukrainian and Japanese universities Edison University, Zillion
Visualization programs for learning	Social Networks Adapting Pedagogical Practice (SNAPP)	Australian universities, educational institutions of Asia
Reduction of reporting processes, Automated system for evaluating the activity of an educational institution	Data mining, BDA and web dashboard	Universities of Europe (Spain, Great Britain)
Minimization of reporting processes, Evaluation of the activity of the higher educational institution	Degree Compass	Universities of Europe (the Czech Republic, Poland)

Source: author's development

In general, the conducted analysis indicates that innovative and digital technologies are used quite widely and in various ways by international educational institutions of the artistic profile. In particular, modern educational programs improve the communication system of participants in the educational process, from officials to students, which in turn makes it necessary to change and adapt the management system of higher educational institutions and ministries of education. At the same time, the system of control, analysis and forecasting of prospects for the development of the artistic sphere and the relevance of future new creative directions of education is simplified.

The results of the survey have noted that the involvement of block chain in the management of educational services allows to effectively establishing joint communication between the teacher – the student, the teacher – the administration, the administration – the ministry. This simplifies the organization of the educational process and quickly improves its content. At the same time, data is exchanged online.

The conducted research has also revealed that Big Data and digital platforms are acceptable for higher education in the art direction due to the simplification of control over the educational process, the reorganization of the educational process itself, taking into account the requirements of the external environment and the implemented government policy in the field of arts. At the same time, digital technologies make it possible to increase the level of competitiveness of higher educational institutions and the perception of the institution by the international public. In other words, Big Data and digital platforms act as a basic factor in the development and image of a higher educational

institution (Table 2)

Table 2. Prospective Areas of Applying Big Data and Digital Technologies in Art Education

Task	Data for analysis	Using
Modeling of algorithms for knowledge verification	Answers received, time spent, identification of typical shortcomings	Acquired knowledge and skills
Behavioral modeling	Parameters of activity in the electronic learning environment, classroom training, parameters of the learning management system (LMS)	Behavior and motivation formation
Satisfaction from learning	The level of workload of teachers, the management of an educational institution, the method of assessing the quality of the educational process, the mode and functions of the activities of educational institutions	Ranking of learning perception
Curriculum modeling	Parameters of competencies, skills, habits, component signs of the problems of their formation	Improvement and development of topics of lectures, practical classes, laboratory works, concert performances
Analysis of the content of education	Parameters of taxonomic methods	Basic and optional subjects, their thematic logic of the educational course
Customization and personalization	Biographical aspects of students	Revealing creativity and improving practical skills

Source: author's development

The survey conducted in the specified educational institutions has revealed that higher educational institutions mainly use hybrid intellectual educational platforms, namely: Android; Prometheus.

The Android platform became attractive to the majority of respondents due to constant software updates and support for end-user requirements, for instance: the formation of a database of student feedback and a system of interactive evaluation of diploma theses of graduates. The Prometheus platform is in demand due to the possibility of creating specific courses at the request of education seekers. Writing courses have become the most popular in Ukraine. Google, the world leader in search queries, has developed a specialized educational application to increase demand for the Android platform, and it is implementing various software systems. This allows commercializing the individual courses and individual disciplines with a volume of up to 30 credits. In addition, the company conducted the survey of students in order to assess the effectiveness of using existing educational platforms in university education.

Table 3. Summarized Results of the Survey in the Higher Educational Institutions Regarding the Evaluation of the Implementation of Innovative Digital Technologies

Question	C1	B2	A3
Do digital platforms help students to improve the knowledge quality?	70%	55%	50%
Can distance courses be called a tool for self-improvement?	68%	23%	30%
Does the use of Big Data help predict the situation in the labor market?	24%	48%	61%
Can students gain additional knowledge and skills, regardless of their geographic location, and have a better chance of winning grant programs and competitions through distance education?	38%	50%	43%
Does analytics based on Big Data affect the search for a better job in the labor market?	40%	53%	54%
Do certificates obtained through innovative platforms affect future employment opportunities	58%	43%	28%
Do Big Data skills help with reporting to the management?	17%	44%	53%
Do innovative platforms provide information, useful advice and practical skills?	73%	40%	38%
Has Big Data improved the monitoring of learning outcomes and assessment?	55%	61%	69%

Source: author's development

According to the results of the survey, it has been established that 70% of the students surveyed indicate a positive attitude towards digital platforms that allow expanding the circle of awareness and information content. 73% note that these platforms are a source of available information. The use of digital innovative platforms in the educational processes of educational services will make it possible to increase and improve the educational process itself; it will give an impetus to intensify the intellectual activity of students and teachers, and, consequently, it will form a methodology for the team learning process between the university and students (Table 3).

In the context of the conducted research, the level of students' awareness of potential using Big Data in the educational process was assessed. The students' answers show that they are aware and understand the application of Big Data only in a narrow and limited context, namely: navigation, answering questions, preparing creative tasks, searching for information on topics and subjects, etc. Students pay particular attention to the system of communication relations, namely interpersonal communication with subjects of disciplines and creative tasks, a student-teacher in the profile of conducting disciplines. In addition, insignificant attention was paid to the direction of communication "the student - the university administration" regarding household and economic issues during students' life and organizational issues related to financial relations during studying (payment for tuition and accommodation, receiving a scholarship, etc.). By the way, students also actively use information about the results of current and previous academic performance in the learning process.

Considering the students' answers on using Big Data, a direction is logically outlined, which notes that students are not familiar with the wide and large-scale possibilities of Big Data. In particular, the digital platform can predict the future solution of tasks with an accuracy of seconds with the possibility to estimate the predicted time characteristic of executing the given tasks (based on the completed works). In addition, students do not take into account the potential of the system regarding the mechanisms of forecasting and planning their further education, both in the university and outside of it, as well as the directions in which the student can implement his unconscious talents (become a producer, a director, and an artist). It should be noted that students cannot imagine that Big Data is able to provide them with relevant indicators regarding their behavior and actions while studying at the university through planning the nearest time horizon, taking into account random and situational factors, as well as their emotional and psychological state.

Thus, the complex application of digital technologies will lead to an increase in the potential for implementing practical skills, revealed in the process of teaching the students' creative talents. It will form a simplified influence on the entry of university graduates into professional activities. However, students don't link aspects of planning and predicting educational and professional future behavior to the potential opportunities of Big Data. In general, students consider Big Data as an element that becomes mandatory due to the administrative implementation of the university and behavioral interpersonal communication with classmates and teachers in the aspect of solving the set educational tasks and cultural and mass events.

5. Discussion

The informational change in the modern society is updated at an extremely fast pace. Along with this, such a speed is not observed in art education, although it has clearly accelerated in recent years (Bamiah et al., 2018; Madyatmadja et al., 2021). At the same time, the educational art market is gaining momentum due to the introduction of digital technologies. Consequently, a separate direction of European research is the study of ways of implementing Big Data and digital educational platforms (Digital Education, 2017). In addition, the publication of educational manuals, mainly in electronic form, and catalogues is rapidly implemented. Another direction of research is the use of digital technologies in order to assess the quality level of educational services, provide wide access to educational services for all those seeking to obtain them, as well as monitoring the reporting of the educational process (Troisi et. al., 2018). Digitization of art education has made it possible to control the attendance of classes by students and to form a methodology for increasing students' interest in the educational process and the choice of higher educational institutions. From the standpoint of the management of higher education institutions, digital technologies allow successfully forming the own resource base of institutions and carrying out perfect modelling of educational processes. Such changes in the educational processes of the art space are positively perceived by 65% of the surveyed respondents.

Let's draw attention to the contribution of Zawacki – Richter & Latchem (2018) regarding assessing the development of computer education, highlighting the relevant periods: the development and growth of computer education (1976-1986), multimedia education (1987-1996), network technologies for organizing joint education (1997- 2006), online learning (1997-2006). For the current period, we can supplement the presented periodization by indicating that this is the stage of planning and forecasting training based on the psychological and behavioral action of students.

Regarding predicting further education, one of these aspects was studied by Buniyamin et al. (2015), but from the standpoint of students' group success. Undoubtedly, this aspect is already fully applied by dean's offices and departments in assessing the academic performance of higher education seekers.

The study of Khare et al. (2017) on assessing forecasts for the probability of dropping out of studies for individual courses is also of particular interest. Unfortunately, Ukrainian universities do not use this approach in their control over the learning process. Our research has revealed that students do not use this aspect in applying the potential of Big Data. Therefore, it should be claimed that, in general, students do not use forecasting and planning in their studies. The university administration also doesn't involve potential of Big Data in planning career guidance work with potential applicants and in the admission process. However, we agree with Asif et al. (2017) that enhanced analytics of learning effectiveness is being conducted in terms of academic groups and specialties and courses. Regarding assessing learning effectiveness, the research of Nasiri et al. (2012) should be noted. It considers a model for predicting academic success based on monitoring and support of first-year students. Moscoso-Zea et al. (2017) evaluate the effectiveness of education according to the basic criteria: the number of expelled students and the number of students who have graduated. This aspect of online education's effectiveness was not considered in our research. After all, the inadequacy of this direction is dictated by the narrowly focused study of only students and teachers, and not university administrations. It is expedient to conduct such a study in the future.

The direction of studying students' success and awareness of the possibilities of Big Data based on taking into account demographic factors, in particular, the percentage composition of groups based on gender, place of schooling (city, village), regional characteristics, is quite relevant. Such studies were conducted by Ocumpaugh et al. (2014); the scholars note a significant impact of effective training on the system.

The conducted review has indicated the main essential directions of studying the influence and use of Big Data. We have noted that the potential use of Big Data in the Ukrainian educational space is used at a minimal level; it is at the initial stage of using by students and teachers.

6. Conclusions

The research has revealed an increase in the productivity of the educational process in art institutions due to the introduction of information and digital technologies, in particular Big Data and relevant digital educational platforms. At the same time, it facilitates the demand for obtaining art education. The combination of digital technologies with management decisions and consideration of public opinion allows revealing and increasing the effectiveness of educational activities of higher educational institutions. In particular, this made it possible to widely and massively transfer the educational process to online learning mode. This tendency is supported by the participants of the survey. At the same time, they note this aspect as technological innovation.

The survey has provided the opportunity to reveal the positive effects of the introduction of intelligent platforms and Big Data technologies in the educational process of higher education, namely:

- Systematization and improvement of educational programs and courses;
- Prompt filling of educational complexes with the relevant author's developments and methods;
- Correct and qualitative assessment of knowledge and skills of education seekers;
- Broad and mass access to university websites;
- Complete analysis of research and pedagogical work of scientists.

In the course of evaluating the management aspect of higher educational institutions, the respondents have noted a simplified system of contacting the administration and an increase in the efficiency of management of the education system.

Along with this, the research has also revealed negative tendencies in the implementation of Big Data and digital platforms. In particular, the imperfections of the Big Data architecture, unreliability of information security, insufficient confidentiality and violation of ethical requirements in the digital space have been observed.

In general, the research notes the problem of insufficient training of specialists on the implementation of Big Data in the art educational space. Therefore, students do not have the sufficient potential to use Big Data in relation to their operational planning of learning and behavior prediction due to emotional and psychological state and random factors of an external nature. The most significant thing is that Big Data will make it possible to reveal unconscious talents and skills in the future professional art field.

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