

Perspectives on Digitalization of Public Education Institutions' Management Process

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Abstract: *This paper presents the results of a research whose main objective was to reveal, in a prospective manner, the use of digitalization tools in improving the management process in Romanian public organizations in the educational field. The research was carried out by means of a survey based on a questionnaire using snowball as a sampling method and having a sample of 127 subjects, managers, and executives from the public educational system in Romania. The results of the research showed that cloud-based data management software products are the most used digital tools for forecasting, as is the case with organizations. The extent of digital twin use is inherent to the perfection of the organization. The improvement of coordination will involve, according to the results obtained, the use of social media, mobile applications, virtual reality and other specific digital tools. In the case of control, improvement also involves dedicated digital tools for data analysis and processing. The results of the research confirm some of the previous studies on the influence of digitalization on the management of organizations and show that there are digital tools that can be mainly associated with the exercise of certain management functions.*

Keywords: management; digitalization tools; management process; educational institutions.

Introduction

Digitalization has become, in the last two decades, an imperative of the organizational transformation processes of contemporary companies and institutions. The unprecedented development of the IT&C field, the extent of the research results in this field, and the speed with which they were assimilated into economic activities created the potential framework for taking them into the current activity of organizations from different fields of activity. The first two decades of this century mark the unification of real and virtual spaces, as a process of integrating social interactions that take place in physical and digital environments, through emerging technologies such as augmented reality, virtual reality, and mixed reality, a trend that will increase in the future (Laužikas, & Miliūtė, 2020). The scope and diversity of digitalization tools allowed their selective takeover at the organizational level, in different fields, depending on applicability, particularities, and specific interests. Significant is, from this perspective, the studies previously carried out worldwide by Brink, Packmohr and Vogelsang (2020); Davtyan et al. (2021) and in the Romanian context by Banciu et al. (2023); Popa et al. (2023, 2024); Simion et al. (2023); Simion, Popa and Albu (2018); Tilibașa et al. (2023).

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Previous studies (Banciu et al., 2023) also focused on the impact of digital transformation on management process (including foresight, planning, organizing, leading, and controlling) through digital transformation pillars (customers, competition, data, innovation and security), also underlining the main function of cybersecurity management in the context of each function.

Digitalization as a phenomenon, accompanied by the proliferation of specific tools, had an obvious impact on the field of education, both in terms of actual execution processes (educational processes) and management processes in educational institutions. As in the case of other fields, the COVID-19 pandemic has accelerated the digitalization process of educational institutions. The health crisis caused by the COVID-19 pandemic as an opportunity for the digitalization of public institutions is revealed by numerous studies in the specialized literature (Gabryelczyk, 2020; Murariu & Bedrule-Grigoruta, 2020; Müller et al., 2023; Toader et al., 2021).

In the field of education, digitalization has had an impact both on the proliferation of distance education and training (Condruz-Bacescu, 2019; Davtyan et al., 2021; Glotova et al., 2023; Zhanguzhinova et al., 2021) and on the need to develop digital skills (Bogdanova, Parashkevova-Velikova; 2023). Although there have been significant previous attempts to digitize educational processes, the COVID-19 pandemic was, as the previously cited studies reveal, the element that forced educational organizations to largely digitize or completely the execution and managerial processes (Wong, 2023).

From the perspective of the use of digitalization tools in the improvement of management processes in educational institutions, the research carried out had two major objectives: revealing the most important approaches from the specialty literature regarding the impact of digitalization at the level of management of organizations in the educational field; the study of the perception of managers and employees in the public education system on the use of digitalization tools in improving the management process in Romanian public education institutions.

Considering the extent of the digitalization phenomenon and its impact on work processes within organizations, in this research we set out to answer the following research questions:

- RQ1. What are the essential elements of digitalization, revealed by specialized literature, with an impact on the management process of organizations in the field of education?*
- RQ2. To what extent will digitalization tools be used in the future in the management process in public educational institutions in Romania?*

We sought to answer these two questions through a mixed approach based on the study of specialized literature and the analysis of the results of the questionnaire-based research on the use of digitalization tools in improving the management process of public educational institutions in Romania.

Literature review

Numerous studies have been published in the specialized literature that aim at the impact of digitalization both on the execution processes of organizations in the public system (including those in the educational field) and on the management of organizations in the field. Many of these also include aspects of the use of digitalization tools in execution and management processes.

At the level of public sector organizations, as shown by Simion and Popa (2024), there are several opportunities of a technological nature that can be transformed into digitalization tools starting from big data, artificial intelligence, conversational chatbots to virtual platforms, GIS, 3D Printing. Condruz-Bacescu (2019) showed the necessity and usefulness of virtual platforms in e-learning processes, including in the context of the relatively low level of digital competence revealed by the DESI index for Romania. Kaufman and Gluschenko (2019) showed the need for the adoption at the organizational level of tools such as cloud technology, big data, social media and artificial intelligence in human resource management to increase the competitiveness of organizations.

Furthermore, Brink, Packmohr and Vogelsang (2020) showed that, in the students' perception, digitalization affects both components of the educational process itself and the management of organizations. According to the research undertaken by the previously mentioned authors, digitalization has implications on the strategic management of universities and on organizational culture (more precisely on the change of learning culture at the university level). Kasmia and M'hamed (2023) showed that the digitalization of higher education institutions has an impact on managerial practices and development at the institutional level. According to the opinion of these researchers, the digital transformation of higher education institutions influences to the greatest extent: the efficiency of management at the operational level; scientific substantiation of decisions; online learning management; redefining governance and strategic planning. As can be seen, both the research carried out by Brink, Packmohr and Vogelsang (2020) and those carried out by Kasmia and M'hamed (2023) highlighted the double impact, at the operational and strategic level, of digitalization on the management of organizations in the educational field.

From the study of specialized literature, we note that the effects of digitalization on the management of organizations in the educational field and especially on higher education were considered. The transformations produced by digitalization at the operational and strategic level, at the level of organizational culture, were addressed, but studies focused on the role of digitalization in improving the management process in educational institutions are less represented. In addition, the research focused on the digitalization of educational organizations are more oriented to the execution processes and less to the management ones (including those regarding the use of digitalization tools).

For these reasons, in this research we addressed the issue of using digitalization tools in improving the management process in educational institutions in Romania. Since most of the previous studies addressed the issue of digitalization of educational institutions in a retrospective manner, we considered it necessary to address the issue of the use of digitalization tools in a prospective manner, considering the opinions of the respondents regarding the impact of digital tools on the improvement of the management process in future.

Methodology

To analyze the perspectives regarding the use of specific digitalization tools in improving the management process in Romanian public educational institutions, a questionnaire was designed that included a section with questions to characterize the respondents and the organizations in which they operate and one regarding the use digitalization tools in improving the exercise of management functions in the future. Such an approach was considered as management functions represent the content of the management process.

The subjects were questioned on the extent to which digitalization-specific tools will be used in the future for better planning of activities, for the improvement of organization at

the institutional level, for improvement of personnel coordination and communication, for the improvement of the control of the activities carried out in the institution. Digitalization tools considered in each of the questions included: cloud-based data management software, artificial intelligence (AI) and machine learning (ML), virtual collaborative platforms, mobile applications, virtual reality (VR), augmented reality (AR), Internet & Internet of Things (IoT), Digital twin, data analysis and visualization tools, cybersecurity, blockchain, wireless networks, 5G networks, automation solutions based on robots and/or drones, business intelligence, GIS, printing/ 3D streaming, social media. The potential answers to each question regarding the use of these tools in improving the future exercise of management functions were expressed in the form of a Likert scale starting from 1 and ending with 5. Respondents' opinions on the use of these tools were analyzed in the form of their average scores.

The sample included 127 respondents from the field of education, and the sampling technique used was a snowball one. The choice of this sampling technique was made considering the following criteria: the time required for data collection and the initial, relatively limited number of contacts from public institutions active in the educational field. Thus, the initial process started with a few contacts in the educational field, and upon the recommendations of the respondents, their number expanded permanently within public institutions in the educational field, reaching 127 respondents.

Results and discussions

According to the elements presented in the methodology section, the research results aimed at the contribution of digitalization tools to the improvement of the future use of digitalization tools for respondents' opinions regarding the expected use of digitalization tools for better planning of activities in public institutions are presented in figure 1.

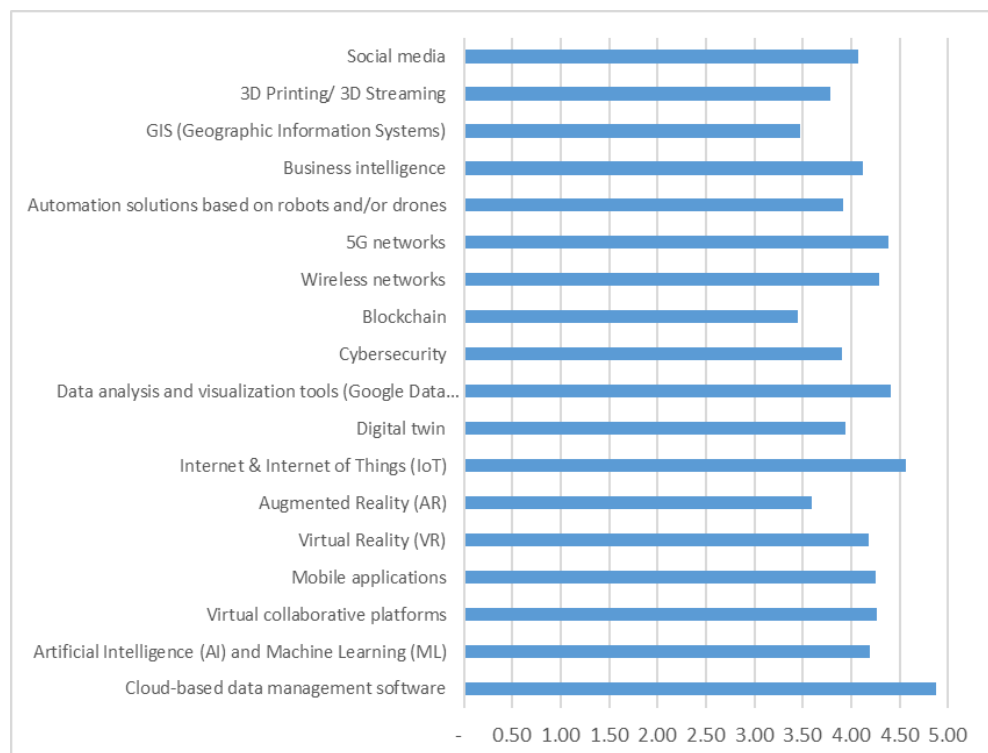


Figure 1. Future use of digitalization tools for better planning of activities in public educational institutions
 (source: own processing of survey data based on a questionnaire)

The analysis of the data presented in the previous figure seems to show that cloud-based data management software products will be the most used for better planning of activities in public institutions. From the perspective of frequency of use, according to respondents' opinions, these will be followed by Internet & Internet of Things (IoT); data analysis and visualization tools, wireless networks and 5G networks. It should be highlighted that, from a predictive perspective, the respondents of the questionnaire (managers and executors) still give little importance to the use of artificial intelligence and machine learning.

Regarding the future use of digitalization tools to improve the *organization* at the institutional level are presented in figure 2. Like planning, Cloud-based data management software tools will be the most used for better organization of activities in public educational institutions. These are followed by Internet & Internet of Things (IoT) and 5G networks.

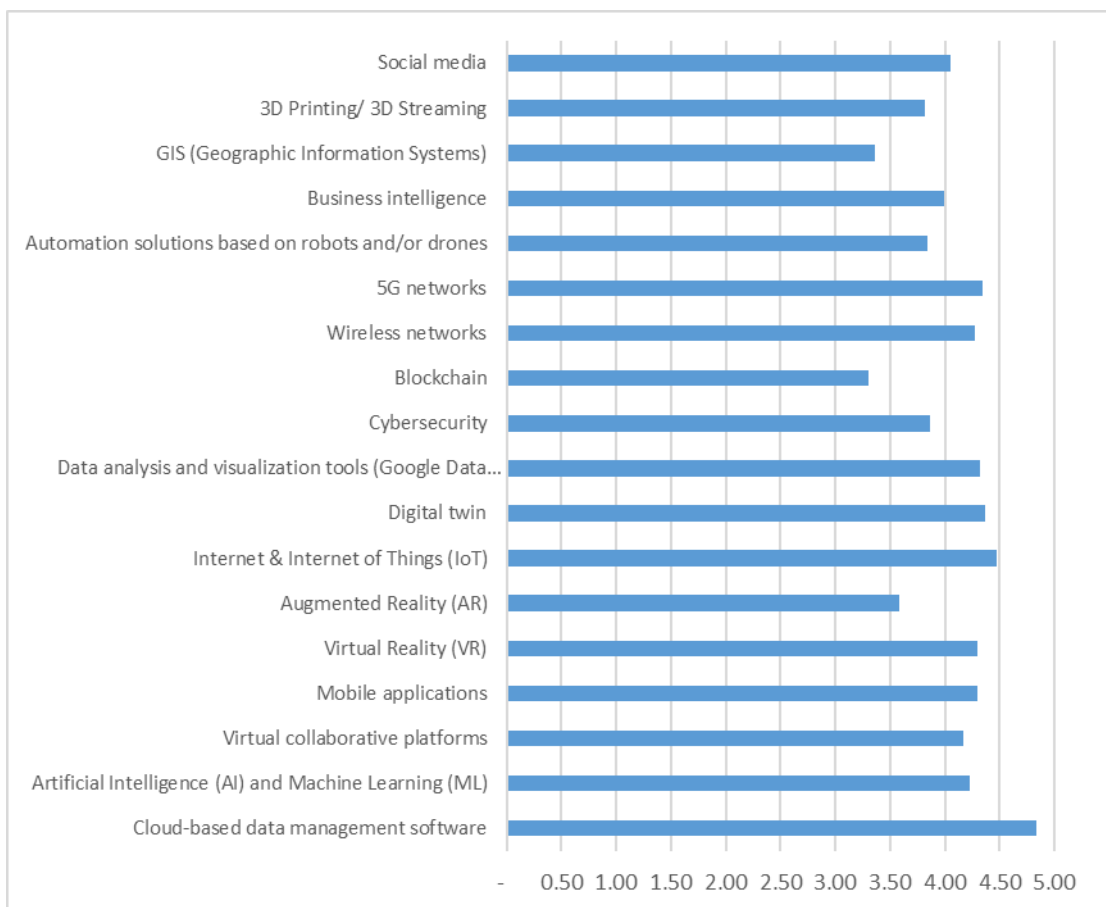


Figure 2. The future use of digitalization tools to improve the organization of public institutions in education

(source: own processing of survey data based on a questionnaire)

It can be observed that, compared to the opinions of the respondents regarding the improvement of the exercise of the foresight function, the share of the digital twin as a concrete form of virtualization of the organization has increased, especially at the procedural level. From this point of view, the opinions of the respondents of the questionnaire seem to agree with others in the specialized literature (Simion et al., 2023) that indicate a tendency to amplify the use of digital twin in the future.

The opinions of the respondents to the questionnaire regarding the use of digitalization tools in the future to improve *staff coordination* and communication at the level of public institutions in the field of education can be viewed in figure 3. It can be noted that in the case of the coordination function, an important role falls, according to the assessments of the subjects surveyed, those digitalization tools that are focused on facilitating communication: social media, virtual reality, internet, and mobile applications. Improving the exercise of coordination in the future is assimilated to a good extent by respondents to the digital transformation of communication processes in organizations in the educational field.

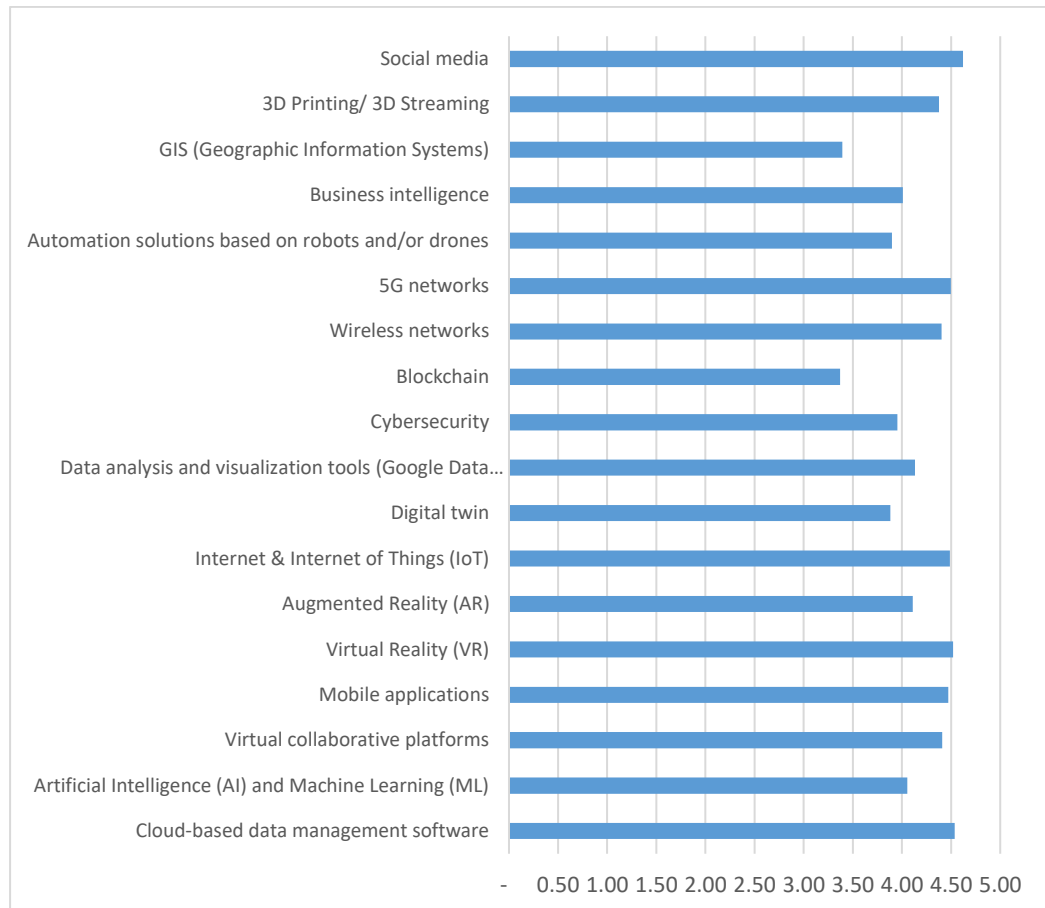


Figure 3. The future use of digitalization tools to improve the coordination of public institutions in education
 (source: own processing of survey data based on a questionnaire)

The opinions of the respondents of the questionnaire regarding the use of digitalization tools in the improvement of *control* are presented in figure 4. The most used digital tools for the improvement of the exercise of the control function seem to be, according to the opinions of the respondents, cloud-based data management software products, analysis tools and data visualization, 5G networks and cybersecurity. Although there are digital tools used mainly in other components of the management process, some of those previously mentioned are particularly related to the exercise of control: tools used for data analysis, cybersecurity, etc.

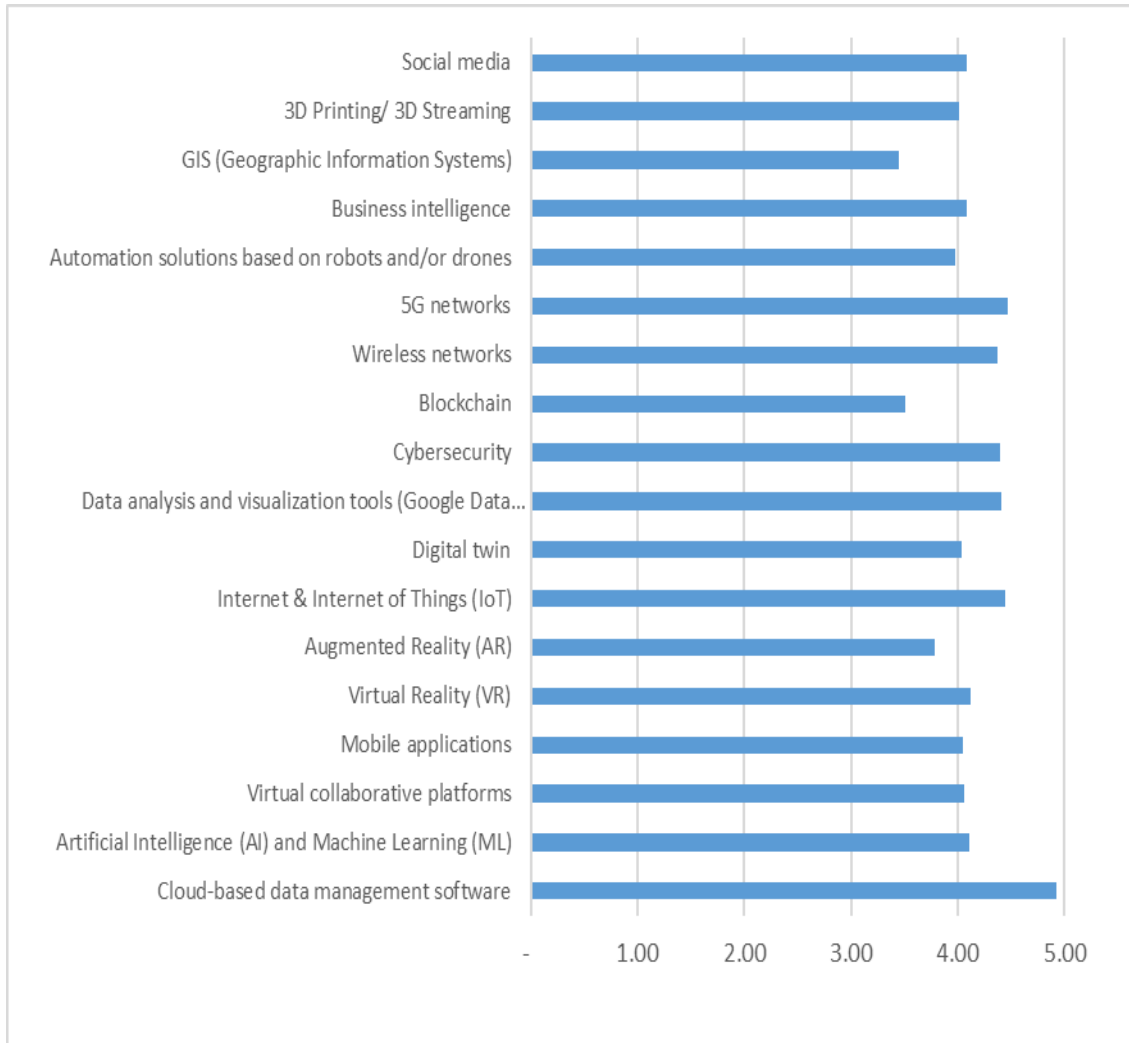


Figure 4. The future use of digitalization tools to improve the control of public institutions (source: own processing of survey data based on a questionnaire)

The results obtained in the questionnaire-based research on the perspectives of the use of digital tools in improving the management process in Romanian public educational institutions seem to confirm some elements from studies previously published in the literature. Amplification of the future use of digitalization tools in the improvement of activity planning seems to confirm the influence of digitalization in terms of some elements of strategic management presented in the research carried out by Brink, Packmohr and Vogelsang (2020) as well as those carried out by Kasmia and M'hamed (2023). The proliferation of digitalization tools in the future exercise of the control function seems to confirm the area of applicability of digitalization tools at the level of organizational management that Kaufman and Gluschenko (2019) noticed.

Conclusions

Since digitalization is a phenomenon that influences and will influence in the future organizations from all fields of activity, it certainly has and will have a special impact on educational institutions, including in Romania. Previously published studies showed a major influence, much amplified by the specific conditions of the COVID-19 pandemic, of digitalization both on the execution processes in educational institutions (the actual

educational processes) and on certain elements of the management of these organizations.

The research was carried out on the basis of a questionnaire-based survey with managers and executors as respondents aimed at the prospects of using digitalization tools in the improvement of management processes in public institutions. According to the opinions of the respondents, cloud-based data management software products will be the most used for better planning of activities in public institutions and will have a high degree of use also in the case of improving the exercise of other management functions. The research results seem to indicate that there are several digital tools that can be mainly associated with the exercise of certain management functions: digital twin for the organization function, social media and virtual reality for the coordination function, as well as data analysis tools for the control one.

The future directions to be developed of the research presented in this article will take the form of comparative studies on the effects of digitalization on management processes in other fields of activity (not only in education and in the public domain) and conducting research on the impact of digitalization on the system of management at the organization level and on the component subsystems.

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