

# Re-Engineering of Educational Contexts in the Digital Transformation of Socio-Economic Interactions of Society

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## Summary

The article examines the key constants of reengineering the modern educational cluster, associated with the processes of digital transformation of all spheres of modern socio-cultural space. The first constant is the strategic rethinking of the educational process organization and awareness of the new roles of all participants (tutors, applicants, controlling elements, etc.). The other constant involves practical re-design of the system of educational services, which consists in the reorientation from the traditional model of education functioning for society to the implementation of the educational format in the form of new projects (structural, target, business). Consequently, the purpose of the study is to highlight the attitudes relevant to the modern realities of information and technological support of education in the context of socio-economic interactions of society. The criteria for the reengineering of educational concepts and the structural organization of the educational sphere are defined. The modern world is going through a period of complete digital transformation of all spheres of public activity. The scientific intelligence notes that education is no exception in these processes, as the dependence of educational realities on information and computer technologies is now noted. The COVID-19 pandemic, for all its tragedy, was also a kind of trigger, clearly marking the new components that have become defined in the organization of the educational process. The conclusion is made that the use of digital technologies in the organization of the educational institution or in the organization of the educational process has become not an auxiliary element, but a dominant factor. Mobility, dynamism, interdisciplinarity, synergy - all these aspects are relevant for socio-economic interactions of society and should be provided by educational programs. The results of the study can be used in the reorganization processes of educational institutions and institutions. Further research requires aspects of the analysis of the foreign experience of reengineering in education, carried out

taking into account digital transformations of modern socio-cultural space.

**Keywords:** *Digitalization of education, information and computer technology, educational processes, the transformation of the education system, reengineering of education.*

## 1. Introduction

Education cannot develop autonomously, because the modern world is permeated by interconnectedness between all spheres of social activity. Conservatism and linearity in the functioning of the environment are gradually becoming a thing of the past. Nowadays, the dynamic development of education as an important component of social activity is relevant. The question remains - what means are used to ensure this dynamism? If previously the driving forces of progress and transformation were the ideas and opinions of thinkers or reformers, this niche is gradually filled by information and technological processes. Thus, digital transformation is at the heart of building a new model of the educational environment, which is characterized by qualitatively new norms and priorities of socio-economic or socio-political interactions of society. Such guidance is relevant for all parts of the domestic educational space. In particular, one of the key tasks of the National Academy of Pedagogical Sciences of Ukraine is the study of current issues of informatization and computerization of the educational process [1].

It is important to develop criteria for the implementation of reengineering ideas in the educational sphere. It is necessary to realize that education is a specific cluster of socio-cultural space, so the application of reengineering models from other spheres (business or

marketing) is not justified and carries risks for the successful functioning of education. Due to the fact that reengineering involves “the fundamental rethinking and radical redesigning” [2], such transformations in education should be implemented in a balanced and consistent manner. When it comes to digital transformation, we should be aware that we are dealing with information flow, which partly has signs of uncontrollability and spontaneity. Consequently, the issue of streamlining the criteria of information and digital aspects of reengineering educational structures and processes becomes more acute. We propose the use of methodological guidelines that will regulate the transformations in the conditions of digitalization without violating the fundamental socio-economic foundations of society.

The problem of implementation of innovations in education is relevant to state educational institutions, in particular the National Academy of Pedagogical Sciences.

The definition of reengineering as a process of transformation was formulated by M. Hammer [2]. Features of the reengineering process in a general sense can be found in the works of O. Skoryk [5], Mergela, Edelmann & Haug [7], Nagy [15].

The specifics of reengineering in the educational cluster were investigated by Tsekhmister Y., Konovalova, Tsekhmister B., Agrawal & Ghosh [3], Gupta [11], Towner [12].

Peculiarities of the prospects of re-engineering in the domestic system of education were covered by Tsekhmister A., Konovalova, Tsekhmister B., Agrawal & Ghosh [3]; Tsekhmister, Malatsai, Nechitailo, Yemelianova, Korol & Statsenko [16].

## 2. Methodology

The purpose of this article is to highlight the constants of reengineering the modern educational space through digital transformation, namely: strategic rethinking and practical redesigning. Research methods cover a set of general scientific methods of a synergistic nature. The methods of analysis and systematization provide an overall characterization of digital transformation as a manifestation of transformation in education. The structural method allows investigating the format and target component of educational cluster reengineering processes.

## 3. Results

To understand the essence of reengineering in education, it should be understood that this process is more focused on rapid cardinal changes. However, reengineering cannot be identified with permanent changes in the educational environment. Rather, we are talking

about the inevitability of introducing digital technologies into the training and functioning of educational institutions, not as auxiliary elements, but as a full-fledged alternative (replacement) of existing traditional models of the educational process. Further active use of information and communication technologies is no longer reengineering, but the inertial development of this process.

It is necessary to understand the difference between reengineering in education and innovations of reengineering character or reengineering services. When we are talking about certain processes that are characterized by the introduction of new information and technological or organizational elements that do not change the organizational and structural forms of the educational process, it indicates the practical use of innovation without transforming the fundamental components of the existing educational system. For example, if in the course of teaching a certain course students are offered to use an educational and information resource (INTERNET-source, distance learning platform, etc.) as one of the elements of methodological support, then we are talking about the application of innovative technologies in the traditional paradigm of the educational process. When the teaching staff, by agreement and approval of the administration of the educational institution, develops an electronic course of the discipline, proposing the organization of all elements of the educational process (foundational, teaching, methodological, and control forms), then it is an example of re-engineering processes in the educational process.

Another example of re-engineering could be the radical transformation of the curriculum of a discipline or the replacement of obsolete subjects with relevant and in-demand ones. In this case, we are talking about the reengineering of the curriculum. Now we are dealing with the dynamism of the development of all spheres of social activity. In some spheres, changes occur at lightning speed. In such conditions, the traditional format of educational services is not appropriate. Consequently, re-engineering in the formation of work curricula for such industries is the formation of dynamic learning content. Using all the advantages of information and communication technologies, students are offered constantly updated learning materials. In some cases of practically oriented learning, it is a question of online updates. Instead of traditional, classic university courses, students are assisted by trainings or courses shaped for a specific event, process, or phenomenon. Thus, the training content is linked to the realities of professional activity. This format ensures that the applicant receives relevant competencies.

A separate issue in the context of reengineering is the problem of acquiring professional skills. The modern education system is gradually reoriented towards the triad of skills, which is a prerequisite for training a high-class specialist: hard-skills, soft-skills, and digital-skills.

Reengineering in education has a direct impact on the formation of all these skills. However, here we should distinguish the format of the sequence of this relationship. If soft-skills & digital-skills are the consequence of engineering processes and are modified according to the content of the new format of educational content, then hard-skills are the essence of the reengineering process itself, as they affect changes in fundamental aspects of the content of a particular discipline, scientific cluster or area of activity. Consequently, we can draw certain identities between hard-skills and reengineering through the affinity of their axiological priorities as the basic components of organization and functioning of the educational system as a whole. As for digital-skills, they are a part of reengineering processes and an element that allows acquiring necessary competencies for a future specialist. It should be noted that digital-skills are at the same time a characteristic of a teacher's professionalism.

The pandemic and, as a consequence, the digital transformation of the conduct of the educational process has lasted almost two years. During this time, certain conclusions have been made about the implementation of virtual distance education. In particular, let us pay attention to the study of the impact of digital transformation on the learning process of medical students. It is worth noting that applicants to the medical profession felt the changes in the organization of the educational process very acutely because it is medical education that needs a direct "live" practical learning process. However, the experience of preceptors and the self-organization of students allowed not to decrease the indicators of quality of education. The results of studies and surveys indicate positive feedback and encourage further use of online learning. Since the application of digitalization of the educational process since the beginning of the pandemic and the transition to distance learning has already lasted more than 2 years, it is possible to draw certain conclusions about the success of the processes of reengineering in the education system. Let us focus on the positive aspects associated with the active use of digitalization of learning. In particular, it is noted that the system of online teaching compensates for the lack of classroom training and direct contact between students and tutors. This is argued to free up time for students used for learning activities and practical skills using virtual reality technologies [3].

The synergetic model of educational process organization in conditions of reengineering requires special attention. Synergetic implies the observance of two obligatory aspects concerning all subjects of educational activity:

- first, interdisciplinarity as the basis for transforming educational content;
- second, the self-organization of mentors, applicants, and the administration of the

educational institution in the context of changes in the education system.

Reengineering in the modern educational sphere departs from the principles of replacing one component by another. A more relevant format is the unification and interaction between different elements of educational and organizational processes. This approach is dictated both by educational and methodological necessity and by socio-economic expediency. When planning reengineering processes in individual education clusters, the aspect of potential advantages and disadvantages of transformations is taken into account. As a rule, it is interdisciplinarity that allows ensuring the advantage of positive elements and justifies the relevance of transformations.

The economic feasibility of reengineering is also obvious. Successful Western institutions of higher education traditionally calculate economic costs and their correlation with the possible results before introducing reengineering processes. The experience of such transformations indicates that full replacement of the existing courses and facilities is quite expensive. If, however, interdisciplinary discourse, rather than replacement, is taken as the basis of transformations, it significantly reduces both the financial and organizational burden of re-engineering processes.

In matters of educational and methodological support, interdisciplinarity has long been recognized as the most effective methodological tool for obtaining relevant competencies by applicants of educational and qualification levels.

On the part of the subjects of educational activity the relevant component of reengineering is self-organization. This process has several key manifestations:

- a passive context in which students, mentors, and administrators can perceive all the changes proposed to them during the transformation of the educational process;
- an active context, according to which all stakeholders of the educational process can influence and improve the existing system, adjusting it to their needs and characteristics (remaining in the regulatory field of general educational requirements for the educational process).

Self-organization is a positive phenomenon that significantly improves the conditions for the implementation of re-engineering in the education system. However, it should be noted that self-organization requires responsibility and criticality (both individual and collective). Reengineering in many ways ensures the effectiveness of self-organization processes. This manifests itself in the provision of the latest forms of implementation of the learning process thanks to information and communication and technological means. Learning content ceases to be the sole tool in the teacher's

arsenal. Access to information activates the very organizational potential of the student body. The mentor's role becomes more of a motivating, advisory and corrective vector. This model of re-engineering implementation is the most effective. Elements of digitalization come to the fore, as electronic systems gradually master the role of communicators and knowledge control methods.

Reengineering in education is driven not only by pandemic realities, which have been more of a trigger for implementing change. "The challenges of innovation, demographic shifts, socio-cultural challenges, an aging population, and technological advances have prompted educators, employers, and public institutions to rethink the education system to address the gaps"[4].

In fact, reengineering is successful when it is implemented comprehensively, covering if not all, then the key areas of society. When reengineering is implemented in an educational cluster but is not provided with appropriate transformations in economic, social, and technological life, it is extremely difficult to achieve the goals set. However, domestic education is still taking steps to transform the educational environment, despite the accompanying difficulties.

An important factor that makes possible a radical transformation in the education system is the global trend toward the use of information and communication technologies. These technologies are available to everyone, so there is no need to approve their use at the administrative level. However, another important need arises - the ordering of the use of the acquisitions of scientific and technological progress in educational practice. The process of streamlining itself is not very relevant to reengineering, which implies change rather than improvement. However, given the unprecedented scale of the information and communication cluster, it is appropriate to classify the streamlining of these moments as an element of the reengineering process.

There is now an increasing emphasis on the need for the digital transformation of the management system. Management plays an important role in today's educational environment. Therefore, it is necessary to highlight the elements of digitalization of managerial work organization in the educational environment. The process of re-engineering becomes partly contradictory, as fundamental aspects of the development of different spheres involved in the transformation come into conflict [5]. The introduction of digital algorithms, which are typical for business models, cannot be effective methods in the educational system, because this approach contradicts the purpose of education as a socio-cultural phenomenon in general. Of course, education should be integrated into the socio-economic development of society as much as possible. However, the purpose of education, in addition to economic expediency, also implies the formation of

spiritual and cultural aspects. Consequently, digital transformation should serve as a tool for the educational manager, rather than the goal of his professional activity. The peculiarities of reengineering in a particular educational institution should be noted, taking into account socio-economic, socio-cultural elements.

The success of reengineering projects largely depends on the activity and professionalism of educational managers who implement the elements of digital transformation [6]. The managerial function is to coordinate the algorithms of digital information and communication technologies innovations between all the stakeholders of the educational space. Partly, digitalization becomes irrelevant in the educational dimension, denying the value aspects of education itself. Consequently, the need to determine the feasibility of implementing digital transformation is relevant and requires human resources to comply with it. An important aspect is also the organizational and structural component of digital transformation, which "replaces bureaucratic and organizational culture and stakeholder relations"[7].

Education is a sphere of public activity, which is characterized by the stability of its own basic foundations. Consequently, the transformation must be accompanied by an understanding of the specifics of the educational environment. Strategies of transferring reengineering models from business models to the educational cluster are erroneous.

The organization of the educational process should be provided with relevant support from digital technologies. Thus, all stakeholders of the educational environment can count on the formation of digital competencies that significantly increase the efficiency of professional activities, the learning process, and organizational and managerial work in educational institutions of different levels. Among competencies as the main factor in assessing the quality of education, we note the emergence of a new concept – "Digital skills" along with the already familiar Hard-skills and Soft-skills. In fact, computer literacy, orientation in the modern information space, and programming skills are important factors in the high productivity of work or training. "Digital competencies are a set of knowledge, abilities, character traits and behaviors that are necessary for a person to be able to use information-computer and digital technologies to achieve goals in their personal or professional lives" [8]. At the same time, digitalization should not only refer to the availability of skills and abilities to use digital technologies; but also form a worldview paradigm covering social, cognitive, cultural, and psychological components of social activity in education.

Digital mastery is different from pedagogical digital mastery. Nor does access to electronic learning resources build the necessary professional competencies in students. In this case, we see digital technology as a tool through

which we transform education. Electronic resources themselves, without interaction and targeting, are not capable of organizing the educational process. An electronic resource may be relevant to a person's everyday life, but it has no methodological potential to provide a person with professional skills.

Let us note the imbalance in the development of modern domestic education. The ratio of traditional pedagogical methods and means of innovative education is in a state of dialectical opposition rather than in a synergetic combination. The pedagogical methodology is based on traditional social sciences and humanities. At the same time, the realities dictate the dominance of technological-informational methods. Systems theory, artificial intelligence, cybernetics, informative and communicative theories are actual elements of the digital transformation of society [9]. There is a contradiction between traditionalism and innovativeness. On the one hand, we are aware of the need for change and transformation. On the other hand, we understand the complexity of transformations in education through digital reengineering, because it can lead to the destruction of the spiritual and moral component of education as a key element of stability of human civilization.

In the case of digital transformation in education, we cannot limit ourselves to simply using information and digital technologies in the educational process. Reengineering implies a change in the educational model dominated by automated learning systems and systems for organizing educational objects. There is a process of changing the thinking of the current generation of students, accompanied by the introduction of new technologies with different advantages and disadvantages [10].

In such circumstances, not declarative models of stating the need to implement digitalization of education are needed. Now relevant are educational and methodological recommendations, which will unify the systemic transformation in education. It would be appropriate to develop practical mechanisms for the implementation of digital elements in the educational process. Such a format implies justification of such aspects of educational activity:

- mobility, which includes the possibility of using e-learning format under any conditions and potential changes in the organization of the educational process (relevant under the constraints of the pandemic);
- dynamism, allowing you to change, supplement, improve the existing electronic learning content in fact in real-time;
- progressiveness, which reconciles the problem of the relevance of educational programs and their compliance with the requirements and challenges of our time.

The strategy of state regulation in the educational sphere should be aimed at realizing the inevitability of reengineering. Transformation in the educational cluster takes time and allows organizing the educational process in such a way that the applicants of the corresponding educational and qualification levels receive the necessary professional competencies during their studies. Thus, the process of training highly qualified personnel who will be competitive in the labor market will be ensured.

However, here we come into contradiction with the existing problems of socio-economic nature, which are relevant for Ukraine. The technological production process, innovations in the economy, business models do not always provide conditions for the integration of digital transformations. Naturally, some institutions of higher education streamline their curricula, guided by the requirements of the time. Here we face another problem, which is the inability to implement their professional advanced skills in the realities of socio-economic interactions of the current domestic society. We face a paradoxical situation when the preparation of high-quality specialists by domestic educational institutions is not supported by the real sector of the economy and our best graduates are a morsel for recruiting agencies and subsequently sold in foreign companies and organizations. In developed Western countries, education is not limited to knowledge from a particular area but assumes that a specialist has a set of skills that are necessary for successful professional activities. Without the implementation of digital technologies, we will significantly lag behind not only in socio-economic indicators but also in the aspects of human capital. Comprehensively developed specialists are the main resource that can lead certain sectors of social activity out of any crisis.

So far, such contradictions are global in nature and become the subject of scientific research. In contemporary scientific discourse, there has been a debate about the specifics of the implementation of reengineering processes. A professor at San Diego State University, M. Gupta [11] urges not to identify the processes of reengineering in the technologically productive industry and anthropologically oriented scientific and educational sphere. He appeals to the opinion of W. Towner [12], professor at Worcester Polytechnic Institute, according to which reengineering engineering education identifies the transformation of raw materials into products produced in a factory and the training of students who learn to become specialists. At the same time, their common position is the realization that people are the most valuable resource. The development of human potential is a key task of educational institutions. Reengineering education is a prerequisite for the continuous development of this cluster of social activity. The threats and risks associated with the digitalization of educational processes should not be excluded. First of all,

it is necessary to limit the influence of anti-humanistic tendencies that accompany the processes associated with the change of roles at the level: man-technology. Consequently, the normative and supervisory function must be adequately built and integrated into the new realities of the educational process. The next element requiring attention is the observance of moral and ethical standards in the implementation of digital technology in the educational process. Technology is a fertile field for manifestations of dishonesty. At the same time, digital technology, if properly configured, can be one of the important levers to combat academic dishonesty and other negative manifestations in the educational sphere.

It should not be forgotten that we are considering the reengineering of education during the crisis caused by the COVID-19 pandemic [13]. Let us note that the processes of transformation under the established conditions of development and in times of instability are significantly different. First of all, we are talking about expectations from changes. If the society is characterized by stability, then optimization, improvement, progress are expected from reengineering actions. When we are talking about a period of regressive destructive processes, then transformations in any sphere are considered a solution to a problem, salvation. Such moral and psychological admonitions indicate that the present dictates conditions characteristic of the second variant of implementation of practical transformations in education.

As the role of digitalization in education has significantly increased in recent years, there are obvious moments when digital transformation becomes an integral part of the reengineering of the educational process. This digitalization fully permeates the educational cluster at the macro and micro levels[14].

Some researchers focus on the normative component of re-engineering because if these processes are uncontrollable, there are risks for the humanitarian aspects of educational development. Consequently, it is proposed to give the state the opportunity to control the implementation of re-engineering in education and regulate the digitalization of the educational space, preventing anti-human manifestations [15]. At the same time, educational institutions must retain autonomy, reserving the right to choose the model of implementation and the specifics of the use of digital learning.

Re-engineering in the educational sphere implies changes in the administrative and organizational plan as well. A special role is played by the managerial link, who is entrusted with the mission of implementing reengineering processes in practice. There is a situation when a developer of an innovative digital resource creates it, teachers and students use this resource in the educational process. There is a need for an organizer of the process of implementing digital transformations directly into the educational process. It is noted that the emergence

of the specialty of educational manager due to the metamorphosis of social and economic life and fierce competition between educational institutions [16]. The success of reengineering will largely depend on the cooperation of all the links related to the transformation in education.

Only in conditions of active and productive socio-economic interactions of society is it possible to implement reengineering innovations. Usually, all subjects of the educational process must perceive the need for change. It is also important to acquire digital-skills necessary for the implementation of innovative elements of digitalization of education. In the end, the feasibility of implementing the re-engineering of educational elements is formed.

### 3. Conclusions

Consequently, we can state that re-engineering in the educational sphere occurred with the beginning of the COVID-19 pandemic, which created conditions in which the transition to distance and virtual learning became inevitable. Consequently, the reengineering of the educational space in the context of digital transformation is being implemented at a rapid pace. Currently, the prospects for further research are to streamline the effects of these transformations and develop effective normative aspects of the functioning of digitalization in education in the socio-economic interactions of society. Constants are proposed, which will provide interpretation of both strategic transformations and practical transformations in the educational space. Mobility, dynamism, interdisciplinarity, self-organization, synergy are the newest elements of the progressive development of the educational environment under conditions of digital reengineering and new normative guidelines of social interaction in the educational space. Such guidelines should provide conditions for the implementation of re-engineering processes in the education system; monitor the quality of transformations in the educational system due to digital transformations; determine the prospects and feasibility of further transformations in the educational sphere by the realities, requirements of economic life, socio-cultural specifics.

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