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2.2 Drivers of the digital development of the national economy for the transition to the Economy 5.0.

The relevance of the study is determined by the transition of the sectors of the national economy towards a new concept of the Economy 5.0. This idea supports sustainable development of the national economy's industries through the implementation of new digital technologies such as artificial intelligence (gathering, processing, and analysis of the data to provide public goods), analytics of the data to create new values for the economy, the society and the formation of the new system of the ecoinnovations. It offers opportunities to implement widespread social, digital and technological innovations for the social needs. The purpose of the research is to determine the impact of the main driving forces for the national economies and the formation of principles, methods and approaches of the transition to the Economy 5.0. The research methodology includes the following methods: abstract-logical, induction and deduction, system analysis, statistical, graphic methods. The outcome of the study is the simulation of the interrelationships between indicators of the drivers of the transition to the digital development of the national economy based on the ecosystem of innovations. A multi-level structure of the ecosystem is proposed, demonstrating the interaction of all institutions regards to the national economy, where public and private institutions interact to exchange information and knowledge with the aim to implement new innovative processes in the economy and the society. Conclusions. It has been proven that the transition to a new wave of digitization and the implementation of a person-centered approach will ensure the competitiveness of the national economies, both for attracting FDI and for the transfer of most sectors of the economy to more modern and ecological technologies, and will strengthen the economic security of the country. The implementation of the new Economy 5.0 paradigm in Ukraine will allow the national economy to speed up the European integration process and join the European digital area.

In world economic science, the issue of e-government in various fields of public life of the country is becoming increasingly apparent. One such fields is the sphere of education and science, which is one of the fundamental foundations for creating socio-demographic security of Ukraine. After all, without the formation of a stable and transparent management system, it is impossible to ensure the development of the country's economic system.

In world and domestic economic science, there is a debate about the essence, factors, types and forms of economic security. Among the factors of economic security, some economists single out uneven socio-economic and scientific-technical development, the demographic situation, the level of education of the population, which destabilize the economic system.

According to the Law of Ukraine "On Fundamentals of National Security of Ukraine", national security is interpreted as the protection of vital interests of man and citizens, society and the state, which ensures sustainable development of society, timely detection, prevention, and neutralization of actual and potential threats to national interests.

In our opinion, socio-demographic security is one of the most important types of economic security, which affects the state of labor resources, their composition, quality characteristics, in particular education, health, spiritual and physical development, demographic situation, level of social protection (Fig. 1).

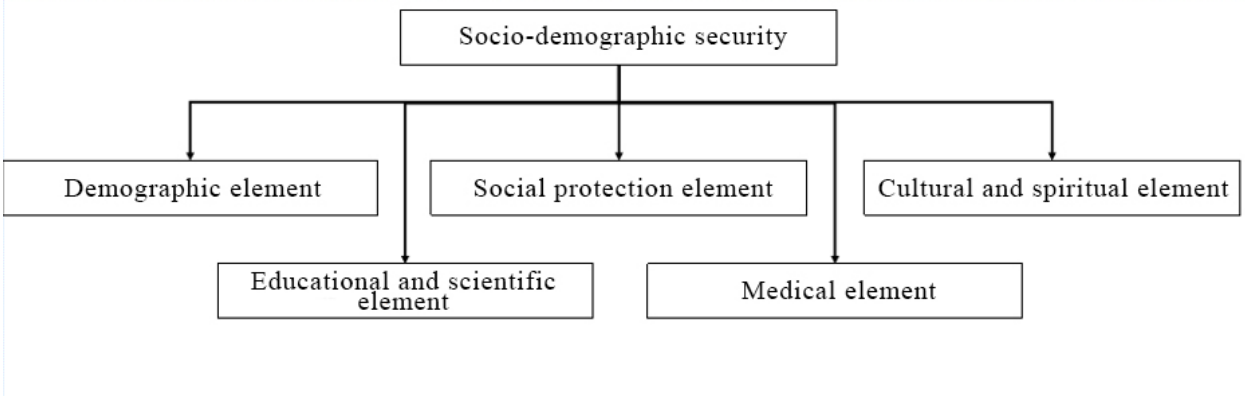

Fig. 1. Constituent elements of the socio-demographic security of the country

Source: compiled by the authors

Therefore, the purpose of the study is to build an economically efficient model of the unified platform for the education and science governance and management, which will allow to unify all available information resources into a single database and improve the interaction between all participants of the scientific and educational sphere.

The assessment of the needs of parties concerned, their involvement and participation in the state institutions combined with the purpose of governance was chosen as the basis for the development of system. All introduced system products will make it possible to strengthen socio-demographic security.

As humanity advances further its technical capabilities digitalization of most aspects of our lives becomes inevitable and education as well as science are no exception. Ben Williamson described in his articles how monitoring and governing of educational systems shift towards one united digital platform, software or database that can influence digitalizing trends and contribute towards Europeanizing of educational policy. In has study he describes that software as digital instruments of educational governance enables data to flow through the already created infrastructures. Thus a creation of structured system in educational governance platform is needed to find what kind of users will be on the platform and what are they going to use it for. In addition such platforms must include all the needed data structures as well as algorithms to effectively use and navigate through big data that comes with these platforms [56, 57]**.**

Europe is considered to be one of the leaders in expending digitalization. Because of number of challenges such as green transition, demographic change, COVID-19 impact, deficiency of employees with needed skillsets etc., EU launched multiple policy initiatives to create more prosperous environment for education. First is European Skill Agenda is set out to increase a proportion of people with STEM skills as well as make it easier for people to acquire knowledge and support lifelong learning through the use of digital learning planforms [51].

Another way to encourage change is through Digital Education Action Plan, which is concentrated around digitalizing field of education making it more engaging, diverse, comprehensive, and ever-growing. In Action 3 of Digital Education Action

Plan is described the framework which would include a unified digital platform that would make it easier for people to get access to high quality data sources, be able to manage and organize digital content, create your own contend and adding to already existing body of knowledge while understanding intricacies of copyright and licensing as well as keeping it a safe digital environment. Such platform would use cohesive merged data that would include user data (personal information about staff and students etc.), educational data (materials and literature, course syllabuses etc.), financial data (accounting balances etc.), governmental data (licenses, registrations etc.) and other type of data that would be up to date and could be accessed easily at any given point in time, essentially creating a bigdata platform [49, 50, 57].

Such integrated platforms also exist in other scientific fields such as healthcare facilitating easier development and data access. Electronic Health Records (EHR) is one such example, a system that was created in 1970s for storing systematized collection of patients health records and histories in hospitals which is often used in developed countries like United States. Evans R. S. and Zangara in their respective works analyse how over the years EHR with further development of digital transformation evolved from hierarchical or relational databases to multifaceted systems which can store a lot of individual data. Much like educational platforms mentioned prior EHR uses similar structure except in the field of healthcare. Such data can be access not only by primary care physicians, but also by insurance companies in order to make a decision about payments, by nursing homes to understand individual needs of a patient, hospices, as well as other establishments for population analysis etc [52, 53].

Stupen. N and Karpinskyi describe and predict future development pathways for the The State Service of Ukraine for Geodesy, Cartography and Cadastre (StateGeoCadastre) platform which is a unified system that stores geospatial data about land within Ukraine and is also an example of singular integrated platform. Such platform allows to store quantitative and qualitative land data as well as distribution, assessments, landowner and user data. This in turn creates a comprehensive profiles of

different land plots within Ukraine in such system that can be accessed from digital platform [54, 55].

In summary, merged digital platforms already exist and keep developing. They include plethora of fields such as education, government or scientific ones such as healthcare or geodesy. Typically such systems have highly structured comprehensive databases that would pull information from multiple sources to include personal user data, financial data, field in question data (be it personal healthcare or educational program) etc. creating an all-encompassing hierarchal bigdata data base software.

To implement the digital governance system for the education and science and transfer its service to the cloud in Ukraine it is necessary to assess its efficiency, advantages and disadvantages. The key advantage of the usage of a cloud as a medium of the unified platform is the reduced costs as all the members of the system have no need to maintain separate data centers, servers, etc., as those services will be provided by the chosen cloud.

The assess the efficiency and advisability of the creation of the unified platform and its transfer to the cloud, it is essential to evaluate future expenditures for the formation (development and implementation of the necessary applications) and maintenance (regular payments) of the said platform. Zeng et al. (2012) postulates that the usage of the cloud technology allows to avoid expenditures for purchasing and using own equipment, to save the cost of wages of the specialist.

To compute the advantages of cloud usage, we adapted the methodology offered by Armbrust (2009), and propose the formula that includes the following:

$$\left|UH_{cloud}\left(R_{fees} - Cost_{HC}\right)\right| \leq \left|\sum_{i=1}^{n}\left(UH_{PSi}\left(R_{fees} - \frac{Cost_{HSi}}{U_i}\right)\right)\right|, \quad (1)$$

where UH_{cloud} – hour of cloud usage by the platform,

R_{fees} – revenues received by the platform from the fees for the services provided,

$Cost_{HC}$ – expenditures per hour of the cloud usage,

UH_{Psi} – hours of public server usage,

$Cost_{HSi}$ – expenditures per hour of the public server usage,

U_i – average utilization of the public server,

n – number of public servers.

It is obvious that for the unified platform in the cloud to be more cost-efficient, it is necessary that the total net expenditures for the cloud usage were lower than total net expenditures for maintaining all the public servers that at the moment contain databases and provide informational services to the users.

It is assumed that the cloud will include the storage of the data, gathering and processing of information, the query processing for the different external users, software and administration, the cyberprotection of the data, and the certification GDPR regards to the personal data protection (requirement for the integration into the European digital area) as the services offered. The expenditures of the public servers include purchasing and maintenance of the equipment, development and administration of the required software, the wages of the IT specialists. It is necessary to take into account that the public servers are not used for processing information at full capacity and each server has its own utilization, so the transfer to the cloud will allow to pay for the time of usage of the required capacity and nothing else.

As the services provided to the external users (query processing) are not free, the users will pay the fees to the platform that will be used to cover the costs of the cloud.

The left side of the formula shows the amount of income the platform will be able to receive as a result of the usage of the cloud. The right side represent the income received by all the public servers as a result of their usage. It is possible that the results for the both sides of the equation will be a negative number because the services provided are public goods so the difference will be financed by the state budget. It is the difference itself that we assess, as it needs to be as little as possible.

To build an electronic system of governance in the field of education and science, it is first necessary to analyze the macrogroups of existing parties in question – users of the information in the system. For this purpose, it is necessary to use the provisions of the Laws of Ukraine "On Education" and "On Scientific and Scientific-

Technical Activities", as well as the principles set forth in the Bologna and Turin processes. So the whole system, according to the authors, should be divided into:

1) formal education;
2) non-formal education;
3) information education;
4) science.

According to the authors, it is necessary to distinguish the following categories of interested parties in macrogroups and outside them (Fig. 2).

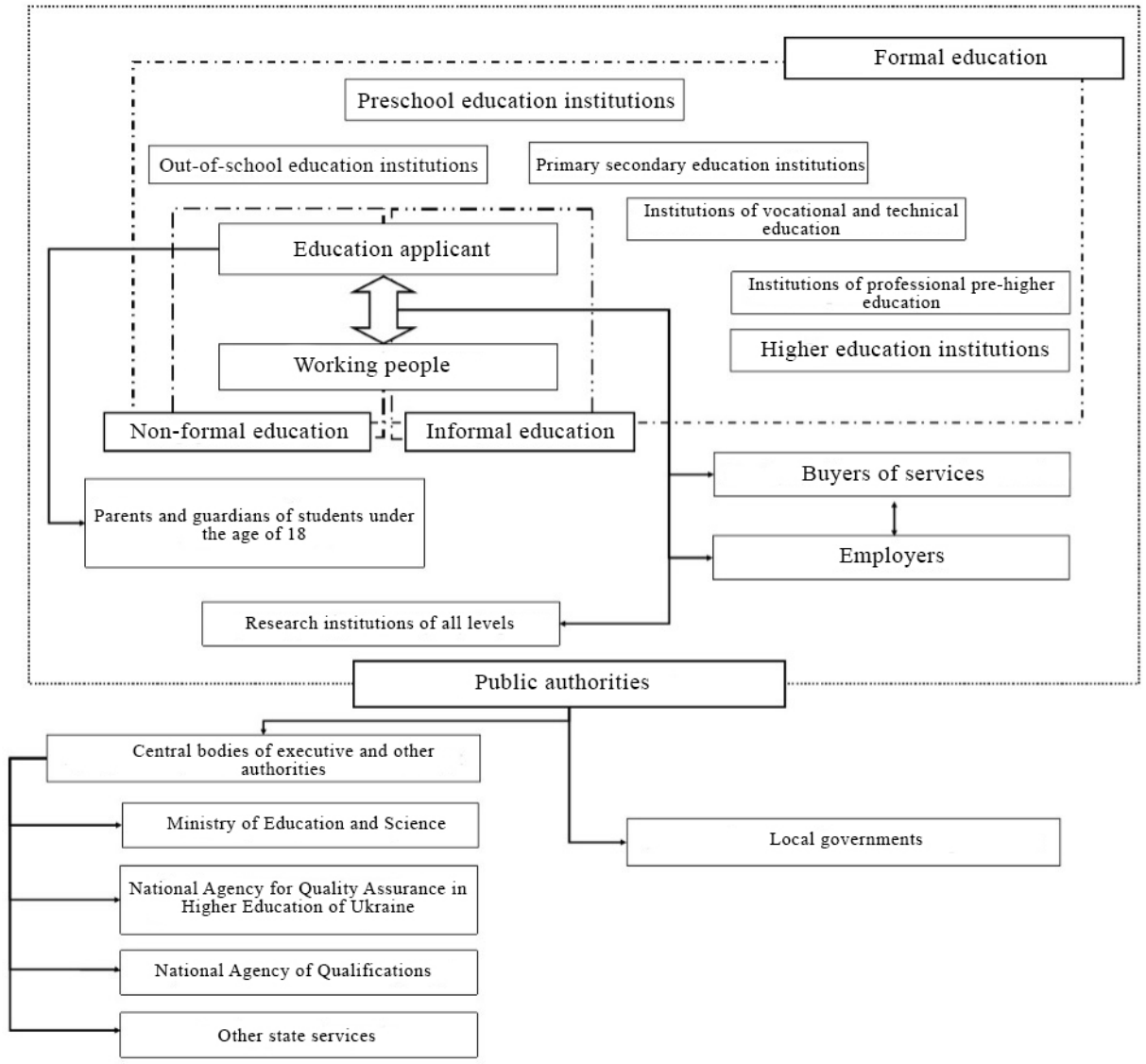

Fig. 2. Categories of users of information inside macrogroups and outside of them in the e-government system in the field of education and science

Source: compiled by the authors

The next step in building an electronic governance system is to isolate the information that is in the system and should be processed by it (Table 1)

Table 1.

Institution	Information category	Users
Preschool educational institutions	Personal data on the qualifications of employees and their professional development	administration of the institution, educators, Ministry of Education and Science, preschoolers, parents (guardians), local governments
	Material and technical base	
	Personal data about preschoolers	
	Educational process	
	Methodical and educational work	
	Management workflow	
	Financial documents	
	Formation of documents on education	
Out-of-school education institutions	Personal data on the qualifications of employees and their professional development	administration of the institution, educators, Ministry of Education and Science, participants of circles/sections, parents (guardians), local governments
	Material and technical base	
	Personal data about members of circles/sections	
	Educational process	
	Methodical and educational work	
	Management workflow	
	Financial documents	
	Formation of documents on education	
Primary secondary education institutions	Personal data on the qualifications of employees and their professional development	administration of the institution, teachers, Ministry of Education and Science, State Quality Service, students, parents (guardians), local governments
	Material and technical base	
	Students' personal data	
	Educational process	
	Current assessment of achievements	
	Methodical and educational work	
	Management workflow	
	Financial documents	
	Military registration and training	
	Final control and certification	
	Formation of documents on education	
Institutions of vocational and technical education	Personal data on the qualifications of employees and their professional development	administration of the institution, teachers, Ministry of Education and Science, State Quality Service, students, parents (guardians), local governments
	Material and technical base	
	Information on compliance with licensing conditions	
	Personal data of listeners	
	Educational process	
	Current assessment of achievements	
	Methodical and educational work	
	Management workflow	

Institution	Information category	Users
	Financial documents	
	Military registration and training	
	Information on scholarship accruals	
	Information on payment for services provided	
	Final control and certification	
	Formation of documents on education and assignment of qualifications	
Institutions of professional pre-higher education	Personal data on the qualifications of employees and their professional development	administration of the institution, teachers, Ministry of Education and Science, NAQA, students, buyers of services, local governments
	Material and technical base	
	Information on compliance with licensing conditions	
	Personal data of students	
	Educational process	
	Current assessment of achievements	
	Methodical and educational work	
	Management workflow	
	Financial documents	
	Information on accreditation and post-accreditation monitoring	
	Information on scholarship accruals	
	Adherence to academic integrity	
	Information on payment for services provided	
	Final control and certification	
	Formation of documents on education and assignment of qualifications	
Higher education institutions	Personal data on the qualifications of employees and their professional development	administration of the institution, teachers, Ministry of Education and Science, NAQA, students, graduate students, doctoral students, cadets, adjuncts, interns, buyers of services
	Material and technical base	
	Information on compliance with licensing conditions	
	Personal data of students, graduate students, doctoral students, adjuncts, cadets, interns	
	Educational process	
	Current assessment of achievements	
	Methodical and educational work	
	Management workflow	
	Financial documents	
	Information on accreditation and post-accreditation monitoring	
	Information on scholarship accruals	
	Information about the scientific work	
	Information on payment for services provided	
	Adherence to academic integrity	

Institution	Information category	Users
	Information on intellectual property rights	
	Final control and certification	
	Formation of documents on education and assignment of qualifications	
Research institutions	Personal data on the qualifications of employees and their professional development	administration of the institution, employees, Ministry of Education and Science, NAQA, applicants, buyers of services
	Material and technical base	
	Information on compliance with licensing conditions	
	Scientific process	
	Current assessment of achievements	
	Management workflow	
	Financial documents	
	Information on accreditation and post-accreditation monitoring	
	Information on the accruals of state research funding	
	Information on payment for services provided	
	Adherence to academic integrity	
	Information on intellectual property rights	
	Personnel certification	
	Formation of documents on education and assignment of qualifications	
Employers	Personal data on the qualifications of employees and their professional development	administration, teachers, Ministry of Education and Science
	Employee compliance with positions	
	Adherence to academic integrity	
	Information on intellectual property rights	
	Advanced training and retraining	
	Documentation on education and assignment of qualifications	

Source: compiled by the authors

Our assessment of the potential advantages of the creation of the unified platform for the digital governance in the area of education and science showed the following:

1. The difference between the cost of providing services and the fees received will be lower for the cloud than for the sum of all the public servers.

2. Not all the public servers are used equally, so the cloud will allow to pay only for the hours used unlike the servers where it is necessary to pay the maintenance cost 24/7.

3. Processing and storage capabilities of the cloud will be greater than for the individual servers.

4. Attacks at the energy infrastructure of Ukraine made it impossible to offer continuous services for the users as the servers are not provided with electricity so the cloud is necessary for the unimpeded access to the information.

5. The possibility of the physical destruction of the servers and information stored there makes it imperative to transfer at least the function of the information storage to the cloud positioned outside the borders of Ukraine regardless of the cost-benefit analysis.

Conclusion

In addition to the above-mentioned advantages regarding the creation of a single database that will combine all available information resources in the area of education and science in a single digital space, it is possible to prove the financial efficiency of transferring all the servers available at the relevant institutions to a single specialized data center that will provide cyber protection, administration and technical maintenance of the existing database. We will try to prove the economic efficiency of such a decision.

Having taken a course towards the European integration processes, a necessary condition is the transition in unison with the EU to the new paradigm of Economy 5.0, which is based on digital development and the creation of digital platforms in various spheres of economy and industry, public services and others. The implementation of a unified platform in the area of science and education will allow the creation of a powerful information resource, which will allow combining all personal information about educators and scientists, their achievements, qualifications, work experience and will create conditions for the creation of mobile scientific teams, the search for specialists with appropriate qualifications to perform relevant works, use of scientific achievements for further use in the practical field, transfer of knowledge, etc.

The creation of the mentioned platform will improve the educational and scientific element of the socio-demographic security through better management of the human resources.