THE METHODOLOGY FOR CREATING AN INFORMATION AND ANALYTICAL SYSTEM FOR CONTROL, PLANNING AND MANAGEMENT OF THE EDUCATIONAL PROCESS IN HEIS AND ITS FUNCTIONAL STRUCTURE

AUTHORSHIP

Ihor Kolodii

PhD in Pedagog, Associate Professor of Pedagogy and Innovative Education, Educational and Scientific Institute of Law, Psychology and Innovative Education, Department of Pedagogy and Innovative Education, Lviv Polytechnic National University.

ORCID: https://orcid.org/0000-0002-7368-2239
E-mail: kolodij-is@ukr.net

Lyudmyla Byelova

Doctor of Sociological Sciences, Professor, Director, Public Administration, Department of Social and Humanitarian Policy, Kharkiv Regional Institute of Public Administration.

ORCID: https://orcid.org/0000-0003-1679-5146
E-mail: belova.renessans@gmail.com

Svitlana Aleikseieiva

Doctor of Pedagogical Sciences Didactics department, Kyiv Institute of Pedagogy.

ORCID: https://orcid.org/0000-0002-8132-0465
E-mail: sv-05@ukr.net

Vadym Kushnir

Postgraduate, Doctor of philosophy, Professional career, Institute of Vocational Education of the National Academy of Pedagogical Sciences of Ukraine.

ORCID: https://orcid.org/0000-0002-9495-2752
E-mail: Kushnirvadim95@gmail.com

Yaroslav Rudyk

Candidate of Pedagogic Sciences, Faculty of Humanities and Pedagogy, Department of Management and Educational Technology, The National University of Life and Environmental Sciences of Ukraine.

ORCID: https://orcid.org/0000-0001-5382-1505
E-mail: magic@nubip.edu.ua

Yurii Kalichak

Candidate of Pedagogical Sciences, Associate Professor, Department of General Pedagogy and Preschool Education, Faculty of Psychology, Pedagogy and Social Work, Department of General Pedagogy and Preschool Education, Ivan Franko Drohobych State Pedagogical University.

ORCID: https://orcid.org/0000-0003-4348-1740
E-mail: yukalichak@gmail.com

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INTRODUCTION

In recent decades, higher education institutions have gradually shifted their emphasis to building development strategies, not focusing solely on research and teaching. Universities are the creators of advanced scientific thought and the basis of higher education, but in today's world, they are key actors in cultural and economic growth, who must use high technology and digitalization opportunities to improve their own activities. Universities need to focus on social and technological change in general (ETZKOWITZ et al. 2019), which determines the issues of management systems research. A number of researchers (MAAS, JONES, 2017) have identified three main dimensions of the mission of universities that should bring educational institutions to the outside world: the transfer of technology and innovation; organization of a continuous educational process and active public position of the educational institution (SALGUR, 2013; KUZMINA et al 2020). Further development of the model is a topical research issue in the field of education.

There is also a concept of Entrepreneurial University (ETZKOWITZ et al 2019), which is accepted by scientists and society as a definition of a university that introduces modern technology and promotes science and technology in the region, scientific and economic development of the country. can be the foundation for the formation of factors promoting new technologies, innovations and economic development, indicates their role in the development of new management and control systems within the implementation of education management, improving the overall level of digital education not only at the educational institution but also regional development in general. All this is a new and relevant direction of the modern research paradigm.

The information-analytical system (IAS) is generally a management hub that performs integrated functions, manages the system of evaluation, control and management, starting from traditional principles, organization of the knowledge acquisition process, and is the development of technologies, innovation systems, catalyst for innovation in management and social community life (MAAS, JONES, 2017). IAS as a structure of management of the educational process in academic circles is interpreted as a systemic activity related to the introduction, improvement and support of the control and evaluation system, management of the processes of creating scientific and pedagogical knowledge. In general, a high-tech

management system is a social process that uses appropriate digital technology tools. Defining the ways to implement IAS in the space of university education, understanding of models and mechanisms of systematization of assessment and control of the educational process are of fundamental importance for modern management of higher education. With such positions, the role of AIS in the strategy of development of modern universities as creators and disseminators of new knowledge and technologies is relevant; the organizers of digital literacy remain the guardians of academic integrity and democratic approaches to learning.

Approaching the prospects for the introduction of information technology at all levels of the education management system requires constant search and updating of management models, tools and strategic decisions in university education. The growing relevance of this level of educational development in HEIs, the new automated management and control system requires in-depth study of approaches, implementation processes and tools that support the creation, improvement and integration of new knowledge and skills in implementing the development strategy. The potential and efficiency of IAS implementation in higher education institutions require further consideration, and the international experience of introducing high technologies into the management system of educational institutions should be considered.

AIMS

The aim of the study is to establish the feasibility, correctness and effectiveness of the introduction and improvement of IAS in the educational process of higher education institutions. This goal involved solving a number of issues:

- establish the main components of the information-analytical system of management, planning and control;
- calculate the feasibility and effectiveness of the implementation of an automated information and analytical management system;
- identify ways to organize cooperation between individual departments of the university;
- establish a change in teachers' assessment of the introduction of IAS components to the educational process at the beginning and end of the pilot project.

LITERATURE REVIEW

The corpus of key positions of the IAS is the core of a set of innovative systemic measures used in the management practice of universities (SENTHILKUMAR, KANNAPPA, 2017). Knowledge management and planning processes are the result of managerial work based on objective data (scientific results, research, business projects, etc.), obtained using IAS. Researchers focus on public and private educational institutions that are actively introducing high technologies into the management system of educational institutions (ROMANO et al, 2014). The last few years have examined university management strategies in the context of the development of European educational institutions (RICCI et al. 2019), which considered management strategies in the context of the formation of a new type of university.

A number of studies have also described various models of modern universities: the "involvement" model, which focuses on regional interests; "Formal" model that is focused on financial gain and profit; a "comprehensive" model that focuses on the development of one's own region, but also takes into account economic benefits in the system of governance and development (GIONES, 2019). An important issue is to ensure a constant exchange of knowledge and new management technologies between universities (ALVAREZ-TORRES et al., 2017), the introduction of cooperation in the university management strategy (DOLAN et al., 2019), constant and effective digitalization of teaching and control systems in the university education (KO et al., 2013). It is common practice to study the effectiveness and feasibility of implementing planning systems using empirical analysis, which combines qualitative and quantitative approaches, where the basis for analysis is the primary data collected through questionnaires and interviews with project participants (MASON, 2006).

The systemic nature of public policy in the implementation of IAS in the education sector is also considered (KOCHENKOVA et al., 2016); there are studies that assess the effectiveness of digital technologies in planning and managing the educational process (FLEK, PRINCE, 2014; RODRIGUES et al., 2019), ways to determine the effectiveness and efficiency of academic innovation and university management policy (SANDSTRÖM et al., 2018; KIANI MAVI et al., 2019); a clear definition of the expected results and a clear vision of the strategic consideration of the higher education institution are discussed (RYBNICEK et al., 2019). The problems and prospects of research of information-analytical systems of management, planning and control in higher education remain insufficiently researched.

METHODS

The research experiment was conducted during the 2019-2020 academic year. The survey method was used; it was carried out using Google Drive forms. In the context of experimental studies close to those carried out in our pilot project, the basics of such a methodology were developed. Given the presented context, the structure and features of the introduction and adaptation of IAS in higher education were considered.

The study used the method of questionnaires, and because the project has an observational nature, because the empirical method of observation was used. This will determine the assessment of the implementation of IAS, the degree of satisfaction with working with it, as well as the level of cooperation and coordination of different university departments. All methods are involved in order to determine changes in the level of perception of IAS in planning, management and control measures.

63 lecturers working at Kharkiv National University of Economics (Kharkiv, Ukraine) were invited to participate in the pilot project.

In order to clarify the features and prospects of the implementation and improvement of the IAS to the educational process, as well as planning and management in the school at the beginning and end of the survey was carried out on the attitude of groups to Personal Educational Systems KhNUE named after Semyon Kuznets. The system was evaluated, questionnaires were regularly administered and discussions were held with technical consultants and trainers.

After the implementation of the curriculum, a final survey was conducted; changes were made in the level of assessment of digital literacy, the level of stress, technical support and the quality of student/teacher interaction.

The body of questionnaires, which were compiled for the implementation of the research goal, was adapted to the requirements of educational and pedagogical staff. The survey of respondents was conducted while maintaining the privacy of project participants.

Stage I. Assessment of the level of training, methodological and digital literacy of teachers, and the actual moral readiness to work on the project. Consultations, formation of educational materials, choice of forms and methods of control.

At the second stage, a survey was conducted on expediency of IAS implementation to planning, control and management at the university.

Stage III. Identify changes in respondents' assessment of the feasibility of implementing IAS in the planning, control and management of HEIs. A survey was conducted, which indicated its own position on the advantages and disadvantages of the AIS system.

Disadvantages and difficulties observed during the experiment: the reasons for preferences (choices) and evaluations were not identified, such a pilot project takes a long time (during the semester), the research team takes a passive position as an observer; does not have the opportunity to conduct in-depth qualitative research.

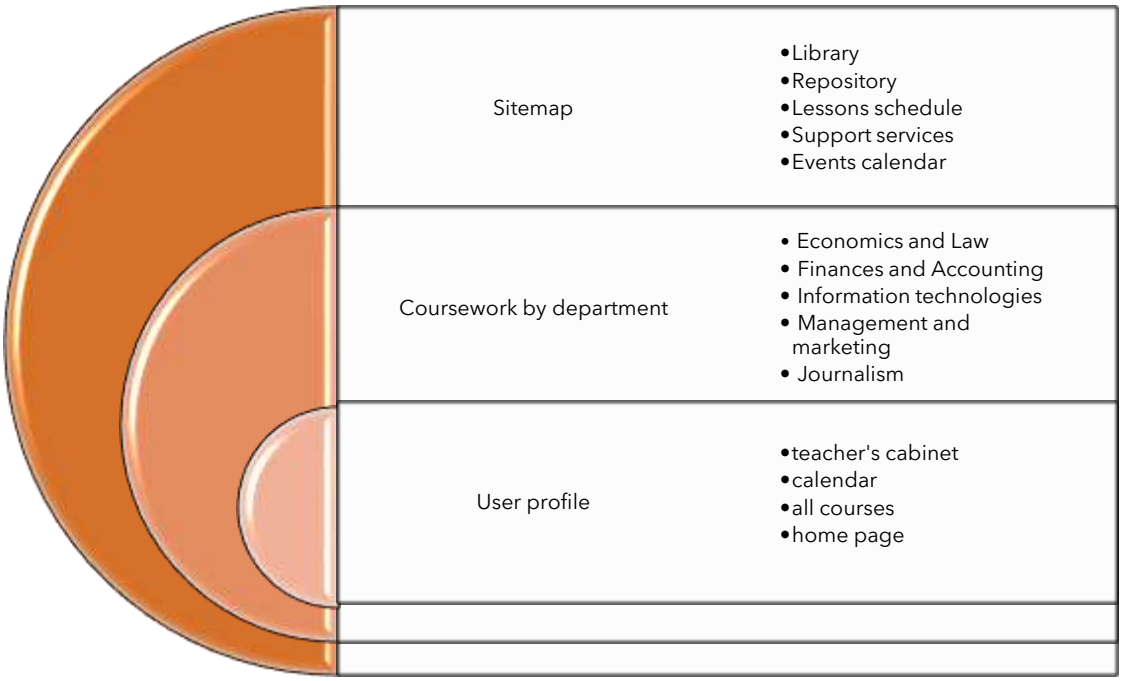
Regarding the interpretation of data, qualitative and quantitative approaches were used to establish and compare the frequency of responses and transform it into rating items. The respondents agreed to take part in the survey; their anonymity was maintained.

RESULT

The central aspect of the introduction and unification of AIS in the university system of control and management is the organization of interaction between scientists, administration, technical support and other external institutions. These also informal, individual ties motivate and contribute to a positive assessment of the system (this will also contribute to institutional innovation and the effectiveness of educational activities). There is a bilateral dynamics, when students, teachers and administration have a joint motivation to participate in the work of the system. This is the establishment of a favorable institutional environment (including between the university cooperation) contributes to the establishment and ordering of the implementation of the educational process, evaluation and planning of further actions.

At the first stage, preparations were made for the pilot project: the existing technical means were modernized, and the necessary new ones were purchased to increase the IAS capacity. Training for technicians, consultants, administrators, and trainers who agreed to participate in the project was conducted. Organized a special site, where modifications were made during the experiment in accordance with the requests and needs of the project participants. In addition, the teachers conducted preparatory work for the formation of educational and informational materials, which later were posted on the site of personal learning systems. Control materials of various forms and contents (from control tests with open-ended questions to the implementation of creative and technical projects) were also prepared. The structure of the site was formed and modified in accordance with the notes and recommendations received by the administration during the pilot project.

Figure 1. The structure of the Site of personal educational systems of KhNUE named after Semyon Kuznets



Source: Search data.

In the second stage of the study, respondents were presented with 4 questions that teachers had to answer, determining the level of their own technical knowledge, transparency of planning and management, efficiency and objectivity of control of knowledge and skills.

Table 1. Respondents' assessment of the feasibility of implementing IAS for planning, control and management

Question	High level	Average	Low level
How well do you navigate in the system?	10%	50%	40%
Evaluate the evaluation efficiency level by using the system	65%	20%	15%
Do you have the skills to use the system?	50%	15%	35%
Evaluate the level of accessibility and transparency of planning in the system	63%	10%	27%

Source: Search data.

The results of the survey showed a fairly low percentage of respondents who are able to easily use the system without prior training, most respondents indicated a lack of necessary knowledge and skills. This is one of the main areas of university management, where counseling should be conducted constantly and online. This practice has been introduced. System users can ask questions to the consultants on the website.

Additional remarks that the pilot project participants were able to make include the high cost of implementing such projects and the inability of some teachers to have their own gadgets suitable for working with IAS and the lack or insufficient power of the Internet. In view of this, the university administration organized the necessary equipment at the departments and consultants.

At the final stage (stage III), the participants of the experiment were asked to name the advantages and disadvantages that, in their opinion, are presented in the university AIS. The number of positive responses is presented as a percentage.

Table 2. Advantages and disadvantages of IAS in the assessment of respondents

Advantages	Disadvantages
1. Impossibility of personal influence of the teacher-student during the control (73%). 2. Improving the quality of education, the ability to repeat topics at will (58%). 3. Empowerment of students (55%). 4. Popularization of information-analytical evaluation systems (43%) 5. Improving the digital competence of teachers and students (42%). 6. Facilitation of the work schedule (17%).	1. Increasing the workload on technicians to create, implement and maintain the program (82%). 2. Insufficient level of awareness of the work of IAS (82%). 3. High workload of teachers, which is aimed at creating, teaching, filling content, supporting and improving the learning process and control (68%). 4. Disadvantages of technological infrastructure, technical support: low Internet bandwidth, insufficiently powerful equipment (64%). 5. Inconsistency of course design and student knowledge (43%). 6. It is difficult to control the learning process (25%)

Source: Search data.

As can be seen from the survey, the greatest difficulties in implementing and improving the work of the IAS is considered a significant additional burden on students, teachers, and technicians-consultants. It is important to conduct regular classes on mastering the system. System engineers and consultants recorded video tutorials and instructions for using the system. They were posted on the site in the "Instructions" section.

After working on the IAS KhNUE testing project, the respondents also had to re-evaluate their own attitude and work with this system, its effectiveness in planning, control and management of the educational process.

Table 3. Respondents' assessment of the feasibility of implementing IAS for planning, control and management

Question	High level	Average	Low level
How well do you navigate/work in the system?	12%	40%	58%
Evaluate the level of assessment objectivity by using the system	7 6%	15%	9%
Do you have the skills to use the system?	60%	25%	15%
Evaluate the level of availability and transparency of planning in the system	65%	15%	20%

Source: Search data.

There is a positive dynamic of continuous practice of consulting and teaching the staff on the use of the system. As a result, the attitude towards the possibility of mastering the systems has changed for the better; the positive perception of the system has increased by an average of 10%. Additional wishes also left the issue of providing the necessary equipment and quality Internet, but the number of such comments decreased by 60% on average. The increase in the level of orientation in the system and objectivity, transparency of the evaluation system were most appreciated. All this indicates the feasibility of further introduction of high-tech information and analytical systems in the educational process HEIs.

DISCUSSION

The introduction and improvement of IAS in the management structure of the university requires the use of an active strategy of attracting high technology, as well as active interaction of all participants in the educational process who are invited to work in the system. Work within the system should be seen not only as a knowledge transfer, planning and monitoring activity, but also as a multi-vector exchange of experience, research search for better ways, openness and democracy in approaches to evaluation (CENTOBELLI et al., 2019). A research team (SECUNDO et al., 2019) in analyzing strategies and tools for managing the educational process in entrepreneurial universities indicated that effective governance models support innovative education systems and research practices (PURANIK, 2020; GUERRERO et al., 2019).

The results of our study confirm this thesis, because working with AIS required teachers to introduce new means of control, the formation of test materials, the transition to more effective methods of communication with students, required the active use of innovations in learning and knowledge control. The Giones study (GIONES, 2019) proposed new approaches to the analysis of rating structures, introduction to the information and analytical system in the higher education institution of the luggage-vector technique of decision-making, where the oversight and accessibility of information allows to make correct and appropriate managerial decisions. As the results of our study show, there is a high level of trust in the system, the ability to objectively assess and compile ratings of student performance, teachers, that is, in fact, to influence the strategic management of the university. In addition, university IAS can promote moderate planning, better use of educational resources, coordination of further educational and research loyalty, in general, adaptation to the macro-strategy of the country's development.

The issues of introduction of such a system in the educational space are insufficiently researched. The institutional content, ways of introduction and improvement of information-analytical systems that should work in the educational field were little considered, it is also important to find changes aimed at facilitating the full transition to such systems, which will contribute to the formation of a modern university. This is especially relevant in a regional context, where such a supportive innovative management and planning system is still underdeveloped or lacking.

CONCLUSION

All results confirm the vision of the strategy of university development as centers of knowledge, promotion of high technology, scientific research. The management of higher education institutions should work to organize democratic processes, uphold the principles of academic integrity and openness. From such positions, research, transfer and dissemination of knowledge, skills and abilities should be presented as a constant process of self-improvement,

as a way of learning through research in a constantly humanizing and technologicalization of education. The management and planning processes in higher education institutions are the result of an integrated approach to the education process and research principles: availability of scientific results, high level of success, availability of publications, practice-centered research, continuous introduction and development of new technologies.

The implementation of the pilot project has shown that the application and continuous improvement of IAS control, planning and management in the educational institution is appropriate and effective. In general, respondents positively assessed the transparency, democracy and objectivity of the control and planning system, the correctness and effectiveness of the introduction and improvement of IAS in the educational process of higher education institutions. At the end of the experiment, the positive perception and level of preparedness of teachers for further work with the project increased by 10% on average. All this was possible due to active cooperation between individual departments of the university: the introduction of continuous online channels for consultations on the system, training, video and individual instruction, as well as constant surveys of teachers working with the system, in particular.

It is necessary to continue work on the implementation of pilot projects related to the development of information and analytical systems in higher education institutions. A small number of prospective issues remain open: how much can the educational strategy of the university change under the influence of digitalization of education; how will the principles of academic integrity, gender equity, prosody of information to the university models of gaining knowledge, the implementation of scientific research be integrated; how the implementation of high technologies in higher education will affect the regional context, the labor market, and socio-cultural changes in society.

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The methodology for creating an information and analytical system for control, planning and management of the educational process in HEIS and its functional structure

A metodologia para a criação de um sistema de informação e análise para controle, planejamento e gestão do processo educacional no HEIS e sua estrutura funcional

La metodología para la creación de un sistema de información y análisis para el control, planificación y gestión del proceso educativo en HEIS y su estructura funcional

Resumo

O objetivo do estudo é estabelecer o nível de eficiência e viabilidade do sistema automatizado de informação e gestão analítica, bem como identificar formas de organizar a cooperação entre os departamentos individuais da universidade e considerar o nível de avaliação de componentes do IAS pelos professores no processo educacional, que são elementos-chave da transição para um modelo de gestão digital das ISIs. A hipótese é que as tecnologias de informação da gestão de processos educacionais aumentem o envolvimento dos participantes do setor educacional no modelo de administração universitária, aumentem a eficiência do planejamento e garantam a objetividade do sistema de controle. O resultado do estudo é estabelecer que a informação e o sistema analítico de gestão de processos educacionais na universidade são fáceis de usar, percebidos positivamente pelos alunos, e contribuem para a simplicidade e eficiência da avaliação nas IES.

Palavras-chave: Modelos de gestão do conhecimento. Instituição de ensino superior. Universidades empreendedoras. Papel estratégico.

Abstract

The aim of the study is to establish the level of efficiency and feasibility of automated information and analytical management system, as well as to identify ways to organize cooperation between individual departments of the university and consider the level of IAS components evaluation by teachers in the educational process, which are key elements of the transition to a digital management model of HEIs. The hypothesis is that information technologies of educational process management increase the involvement of participants in the educational sector in the model of university administration, increase the efficiency of planning and ensure the objectivity of the control system. The result of the study is to establish that the information and analytical system of education process management in the university is user-friendly, positively perceived by students, and contributes to the simplicity and efficiency of assessment in HEIs.

Keywords: Knowledge management models. Institution of higher education. Entrepreneurial universities. Strategic role.

Resumen

El objetivo del estudio es establecer el nivel de eficiencia y viabilidad del sistema automatizado de gestión analítica e información, así como identificar formas de organizar la cooperación entre los distintos departamentos de la universidad y considerar el nivel de evaluación de los componentes de las NIC por parte de los profesores en el proceso educativo, que son elementos clave de la transición a un modelo de gestión digital de las IES. La hipótesis es que las tecnologías de la información de la gestión de procesos educativos aumentan la implicación de los participantes en el sector educativo en el modelo de administración universitaria, aumentan la eficiencia de la planificación y aseguran la objetividad del sistema de control. El resultado del estudio es establecer que el sistema de información y análisis de la gestión de procesos educativos en la universidad es fácil de usar, percibido positivamente por los estudiantes, y contribuye a la simplicidad y eficiencia de la evaluación en las IES.

Palabras-clave: Modelos de gestión del conocimiento. Institución de educación superior. Universidades emprendedoras. Papel estratégico.