E-Portfolio as a Component of the Information and Analytical System of Scientific Staff Training

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Abstract. In the conditions of extremely dangerous human life (COVID-19 pandemic, martial law, etc.) the urgent tasks of science and education are the preservation of values, creation of e-communications for adaptive and comprehensive support of scientists.

The goal of the research is to intensify the problems of information analytics in the system of scientific staff training (SST) and to develop a methodology for building information-analytical system (IAS), which will ensure the integrity of the process of intellectual potential formation. This is aimed at the rationality of the IAS, in particular its component – e-Portfolio. This will make it possible to convert the accumulated information into electronic form and facilitate the transition to the creation of fundamentally new types of information resources. They can be combined into digital collections, which in the projection on the educational space become a system complex of digital scientific and educational resources – part of the IAS.

When force-majeure makes radical changes in the education system and causes a certain failure in all spheres of scientific activity, the e-Portfolio itself becomes a reasonable and well-reasoned decision. Its development as open component of the IAS for SST is using methods of adequate definition of structure on the basis of systematic, competency, transdisciplinary and diagnostic approaches. The components of structure are combined into meaningful blocks based – conceptual, organizational, socio-psychological, diagnostic. This allows to establish transdisciplinary relationships between research in different fields of science.

Thus e-Portfolio is an effective IAS-tool for distance SST and also helps of adaptive performance of scientific tasks.

Keywords: Information-Analytical System, e-Portfolio, Transdisciplinarity, Scientific Staff Training

1 Problem statement

The field of scientific activity is quite diverse. Research is carried out in almost all sectors of the economy countries and is provided by the systematic work of scientific units of higher education institutions (HEI) and research institutions (RI). In addition, great attention is paid to scientific education, i.e. improving the efficiency of the scientific and educational process of the SST.

In situations of extreme danger to human life, caused by the introduction in 2020 of quarantine restrictions caused by the COVID-19 pandemic, force majeure, as well as those that led to martial law in Ukraine in 2022 and shook almost all concerned world public space, topical issues and the main tasks of science and education is the preservation of values acquired by mankind during its existence.

Adaptive provision of quality activities of scientists and educators, creating effective conditions for remote communication with of applicants of scientific education and performers of scientific research using asynchronous and online technologies using modern software and mobile applications has become increasingly important.

Today, more than ever, the task is to intensify the technology of information analytics in the system of SST and ensure the dynamic improvement and development of methodology for building information systems in this vector. This will ensure a high level of integrity in the process of forming and maintaining the intellectual potential of the state in extreme conditions.

In addition, modern information technologies make it possible to transform the accumulated information into electronic form to create fundamentally new types of information resources. Such resources will be combined into so-called digital collections (repositories, databases, knowledge bases, libraries, etc.), which in the projection of the educational space become systems of electronic/digital educational resources (EER/EDR). One of them is a dynamic component of the ECO-environment of IAS for SST – e-Portfolio.

The rationality of providing of the SST using ECO-environment of IAS, in particular its functional component e-Portfolio, will become more effective in the conditions of remote work. Transdisciplinary relationships of the process of its development in the context of research in various fields become the basis of a holistic view of scientists, HEI and RI where they study or work, as well as the development of certain scientific areas in the context of individual and team research, in the relevant scientific school. In this way, the results of scientific activity are generalized and systematized according to certain criteria to transdisciplinary, scientometric and personal indicators of scientists, which characterize the integrity of their research activities.

2 Analysis of recent research and publications

Considering that force majeure, caused by both quarantine measures from the COVID-19 pandemic and the imposition of martial law in Ukraine, slows down the real course of the scientific and educational process (even at a distance). After all, the need for scientific support for the country's economy, and the formation of intellectu-

al potential is obvious and requires adaptive information and analytical support by all possible means, given the challenges of today – the development of global world science and transformational changes in scientific and educational space.

Content analysis of various sources, retrospective experience and results of studying the practical aspects of today's scientific and educational space indicate that the active introduction of various EER/EDR in the SST has certain advantages.

The problem of creating and functional support for the content of the e-Portfolio has been an active interest of researchers for many decades. Attention is paid following: the semantics of the concept of "e-portfolio", the structure and content, tools for building an e-resource portfolio, the use of appropriate software and more.

Thus, O. Berezhna and T. Andriushchenko defines the e-Portfolio as a collection of reliable and diverse data that demonstrates the achievements of an individual or organization for a certain period (of reveal the possibility of using an electronic portfolio of the department as a tool to improve the learning process at the university) [1].

In turn, researchers M. Swell, M. Markzak and M. Horn believe that the e-Portfolio is a tool for evaluating professional programs, which reflects the progressive process of the author or author's team [2].

There is also an interpretation of the e-Portfolio as a web-based information management system that uses electronic media and services.

In turn, S. Kuku conducts some research and gives examples of existing E-folio systems such as: eFolio Minnesota (high-quality learning-based e-Portfolio system), ModernEfolio (photo-based system), The NASA Explorer Schools Project (NES: eFolio-system is the result of NASA's collaboration with teams from various US educational institutions) and others. The researcher argues that when developing an e-Portfolio system, the goals of its further use should be clearly stated and attention should be paid to the universality of the created system in terms of its use both for educational purposes and for individual (creative or working) [3].

In turn, researchers N. Morze and L. Varchenko-Trotsenko believe that "modern electronic university learning environment should provide open decentralizing component that would contain a webpage with every educational process participant's qualitative and quantitative indicators of educational activity – an e-Portfolio". They believe that "indicators of a portfolio should include those of a priority for university development at a certain time and be taken into account on different ratings, including international and Ukrainian" [4].

Researchers study the problem, determine the main vectors in this way, systematize and summarize the results, share guidelines and technical and technological solutions for the formation and development of E-portfolio [1, 2, 3, 4, 5, 6, 7]. It should be noted that the e-Portfolio is already one of the effective tools of e-Learning, including in open science education.

Thus, in developing a methodology for building an information-analytical system taking into account the component of the e-Portfolio as a team-personal data bank in the SST, in our opinion, rationalizes a single electronic document management database HEI/RI, which provides quality information and analytical support for each of applicants of scientific education (undergraduates, graduate researchers, doctoral researchers, etc.).

Thus, it is in the e-Portfolio as a Component of the IAS for SST that the storage, processing, analysis (synthesis) and provision of in-formation necessary for research activities are carried out in a convenient form for the subjects of SST.

3 Statement of basic material and the substantiation of the obtained results

It should be noted that competent scientific training is carried out in the HEI and RI in the vector of modernization of the scientific and educational process. And during the quarantine activities of the COVID-19 pandemic in early 2020, it was temporarily transferred to remote mode. Then there was an urgent need to use modern online tools (conference platforms, mobile applications and other Internet services) for educational communications, such as: Zoom, Google Meet, Jitsi Meet, Skype and others [6]. However, the issue of control, evaluation and various measures for the certification of subjects of scientific training (undergraduates, graduate researchers, doctoral researchers, etc.) was resolved in the mode of feedback using these electronic resources and communication via e-mail. Only when martial law has brought radical changes in the education system, including scientific, and caused some failure in all areas of scientific and educational activities has, e-Portfolio become a reasonable and reasoned solution that allows for generalization, systematization and control and assessment of acquired scientific knowledge in the specifics of the field of knowledge and relevant competencies.

The e-Portfolio technology is becoming effective IAS-tool for remote SST, including in martial law because e-Portfolio helps to improve the quality of rational and adaptive performance of scientific tasks set by re-search rules and in the future will provide a methodological basis for construction and functional support of IAS for SST [8]. For the effectiveness of the development of an open e-Portfolio as a component of the IAS for the SST, certain methods have been used to determine its components based on systematic, competency-based and diagnostic approaches.

Ensuring its dynamic basis, which will change over time and depending on the acquired knowledge and experience of predecessors, will take into account the methodology of transdisciplinary (including adaptive and ontological resources of this approach). For example, these components can be combined according to the content blocks based on techno-logical approach – conceptual, personal (personal), socio-psychological, professionally oriented, practical, specific to the scientific profession, and so on.

It is projected that the general structure of the transdisciplinary IAS will include several main blocks (see Fig. 1) – information content, analytical content, Open e-Portfolio of scientific training and interrelated individual e-Portfolio of applicants for scientific education (undergraduates, graduate researchers, doctoral researchers, etc.), as well as other subjects of scientific training.

The transdisciplinary relationships [9] that take place in the IAS for SST are also reflected in the content of the open e-Portfolio of scientific training. The developed structural and logical model of such an e-Portfolio, which operates in the transdisci-

plinary ECO-environment of IAS for SST [8] allows clarifying its main components (see Fig. 2).
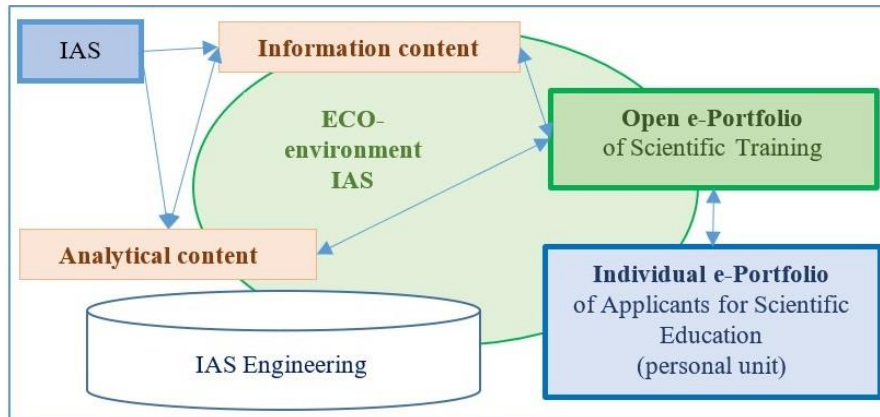

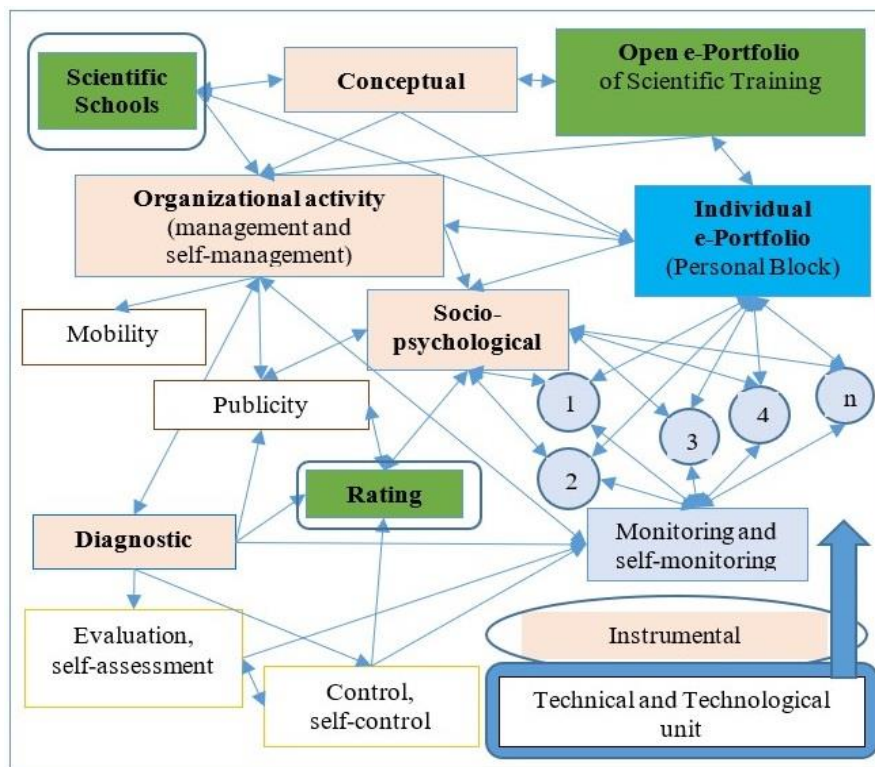**Fig. 1.** General structure of transdisciplinary IAS

Fig. 2. Structural and logical model of open e-Portfolio of SST in the transdisciplinary IAS

Note that it is logical to carry out scientific training taking into account the experience of scientific schools operating in HEI/RI, which have a close relationship with the open E-portfolio of SST through close transdisciplinary links be-tween the main blocks:

— the conceptual block is based on the implementation of the ideas of the scientific school, the strategy of research in this vector, etc.
— the organizational and activity block is aimed at providing adaptive principles of management and monitoring of SST, as well on the self-management and self-monitoring of applicants for scientific education and other of subjects of activity in the SST, their mobility in the world academic space and in the publishing activity (scientometric indicators), etc.
— socio-psychological block is related to personalized content and the main thing in providing the content of personal content in individual e-Portfolios of applicants for scientific education and other subjects of activity in the SST (see Fig. 2: 1, 2, 3, 4 ... n) – summaries, achievements, author's ideas and publications, network of so-cially organizing scientific communications, etc.
— the diagnostic unit reveals the rating indicators of applicants for scientific educa-tion and other subjects of activity in the SST – evaluation and self-evaluation, con-trol and self-control, respectively – monitoring and self-monitoring. This compo-nent combines research and educational activities of applicants for scientific educa-tion, educators' other subjects of activity in the SST, using technical and techno-logical tools, helps to fill both individual e-Portfolios (see Fig. 2: 1, 2, 3, 4 ... n) and thus an open e-Portfolio as a component of IAS for SST.

It should be noted that all these blocks are transdisciplinary connected and are in some interdependence and have some interinfluence.

For example, the rating component of the applicants for scientific education, in the structure of the diagnostic unit of the individual e-Portfolio (and collectively in the open e-Portfolio of SST) includes not only a qualitative assessment of research activi-ties but will reflect individual and team rankings – organizational and activity aspects (event-analysis of participation in scientific-practical events, content-analysis of pub-lishing activity, scientometric indicators, etc.). At the same time, the conceptual as-pects that position a certain scientific school will reflect the scientific position in the e-Portfolio of IAS for SST, both the scientific team of researchers and each of them individually, and others.

4 Conclusions

Thus, the analysis of scientific and practical experience on the problem of methodolo-gy of building IAS, in particular, regarding the formation of e-Portfolio in the SST, allowed to state that:

1. SST in the conditions of modern educational transformations takes place in a mixed form, in particular by remote means, the qualitative experience of applica-

tion of which is active gained during the introduction of quarantine from the pandemic COVID-19. In this context, it is important to preserve the integrity of the research system and find rational approaches to self-organization and self-development of applicants for scientific education (undergraduates, graduate researchers, doctoral researchers, etc.).

2. Traditionally, the SST is carried out in HEI or RI and of branch academies, in state research institutions. Of course, the main departments in this sense are postgraduate and doctoral studies, admission to which is regulated by current legislation. In the process of SST is the development of specific knowledge of the applicants for scientific education in relevant fields, the basis of which is based on the classification of sciences, which is integral to the formation of new scientific knowledge, determined by a particular speciality and specialization. However, specialities as scientific areas are components of natural sciences, humanities and technical sciences.

3. Analytical conclusions based on the results of the research once again confirm that in the system of SST it is important to provide each of applicants for scientific education with scientific and education and adaptive conditions for acquiring the appropriate level of theoretical knowledge and practical competencies in the research implementation of and their productive quality organization.

4. Given that the current state of systemic educational transformations encourages the scientific and educational staff of the HEI and RI to organize effective information and analytical support for research activities of applicants for scientific education, updating scientific and methodological support for training in the digitalization of modernization and reform the educational field is considered relevant and timely. An important role in this context is played by the e-Portfolio as a component of the IAS for SST.

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