OPINION

by Prof. Desislava Ivanova Paneva-Marinova, PhD

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on the Dissertation for awarding educational and scientific degree "**doctor**" (PhD),

in the Area of Higher Education 4. Natural Sciences, Mathematics and Informatics,

Professional Field 4.6. Informatics and Computer Sciences

PhD Program „Informatics"

Author: Ivaylo Zhivkov Blagoev

Topic: Development and delivery of personalized e-learning content

Scientific supervisor: Prof. Vladimir Monov, PhD, Institute of Information and Communication Technologies, Bulgarian Academy of Sciences

1. General presentation of the procedure and the PhD student

In accordance with Order № 326 from 20.12.2024 of the Director of the Institute of Information and Communication Technologies, Bulgarian Academy of Sciences (IICT-BAS) I have been appointed as a member of the Scientific Jury to provide the procedure for the defense of a dissertation titled "Development and delivery of personalized e-learning content" Ivaylo Zhivkov Blagoev for awarding the educational and scientific degree "doctor" in the Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, the Professional Field 4.6. Informatics and Computer Sciences of the PhD Program "Informatics". The author is a PhD student at the Department "Modelling and optimisation" at IICT-BAS, with scientific supervisor Prof. Vladimir Monov, PhD, IICT-BAS.

The presented Opinion is made in accordance with the Act for the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation and the Rules on the Specific Conditions for Acquiring Science Degrees and Holding Academic Positions in IICT-BAS.

The presented by Ivaylo Zhivkov Blagoev set of materials is in accordance with Article 6 (1) of the Rules on the Specific Conditions for Acquiring Science Degrees and Holding Academic Positions in IICT-BAS.

2. Relevance of the topic

The dissertation presents the results of research related to the development of technological tools to support and implement e-learning. In particular, the goal is to create a system and tools for

the development and delivery of interactive personalised e-content. The development is topical and of great scientific and applied interest.

3. Knowledge of the problem

The realization of the dissertation goal requires in-depth theoretical knowledge and practical skills. It is evident from the dissertation and the materials presented that the PhD student has a solid theoretical background and extensive insight into modern technologies required to achieve the research objectives. He demonstrates good knowledge of the research object and performs clearly formulated the tasks leading to specific results. The research is presented competently and with well-founded analyses and inferences.

4. Characteristics and evaluation of the dissertation and contributions

The dissertation of Ivaylo Blagoev contains 202 pages presented by a table of contents, a glossary of terms and abbreviations used in the dissertation, an introduction, a structure of the dissertation, four chapters, a conclusion and a summary of the results obtained, a graph of the dissertation, guidelines for future development, list of author's publications on the topic of the dissertation, list of noted citations, declaration of originality of the results, bibliography of 125 references in English, list of figures, list of tables.

The **aim, objectives and methodology** of the study are presented at the end of Chapter 1 "Analytical overview of personalized e-learning", a natural conclusion of the extended review of the state and development of e-learning from its first appearances to the present day. **Chapter 1** discusses basic models for creating e-learning content and technological tools for managing and implementing e-learning. In the context of implementing personalized learning, the concepts, approaches and tools, including those using current AI technologies, are presented. Challenges and problems in the development of personalized learning content are discussed, requiring the creation and application of new models for personalizing the learning process in the online environment.

Chapter 2 focuses on the development and delivery of e-learning content. A classification of online courses according to the mode of delivery and method of presenting learning content is shown. An approach for generating learning content using generative AI is presented. A methodology for evaluating e-learning systems according to their characteristics reflecting specific needs and goals of different organizations is described. An approach to e-learning course development is presented.

Chapter 3 presents an architecture for an e-learning content development and delivery system and a tool for creating customized e-learning content.

Chapter 4 describes in detail the prototype of the e-learning content development and delivery system and its components.

In the **Conclusion** relevant summaries are made on the obtained results and directions for future research and development.

The dissertation is thoroughly developed. The problem area is competently and critically analysed. The presentation of developed models, methods and approaches is detailed.

The following scientific and applied contributions can be highlighted:

- The created method for generating training content by generative AI;

- The developed model for personalized e-learning based on the learner's competency profile;

- The created architecture and prototype of a web-based platform for the development and delivery of interactive learning content.

5. Assessment of publications and personal contribution of the PhD student

The author's list of publications on the topic of the thesis includes 7 titles, 6 of which are currently indexed in Scopus and/or Web of Science. Five publications are in proceedings of international conferences and 2 are in scientific journals. One publication is in a scientific journal with SJR - Cybernetics and Information Technologies and two in scientific journals with IF - Cybernetics and Information Technologies and International Journal of Education and Information Technologies. All publications are in English. In six publications Ivaylo Blagoev is first author. Six of the publications are co-authored. There are 21 citations.

Having read the dissertation and the submitted materials, I believe that the formulated scientific and applied results are the personal work of the PhD student. The PhD student is the first author in most of the publications.

6. Abstract

The abstract is 44 pages long and correctly reflects the structure of the dissertation, the results obtained and the conclusions drawn from the study. The requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation and the Rules on the Specific Conditions for Acquiring Science Degrees and Holding Academic Positions in IICT-BAS have been met.

7. Remarks and questions

I have some comments/questions that are not critical.

There is a need for more precise specification and unification of the terminology used. For example, there is mixed use of generative AI and generating AI, training and learning content, etc., but no clear specification of the essence of the terms.

As the goal of the research is *to create a system and tools for developing and re-delivering interactive personalized e-learning based on **learners' prior knowledge***, but there is not enough spec-

ificity on how to build the learners' prior profile (viz. the "capture" of prior knowledge). Furthermore, it is necessary to comment in more detail on *the rules for linking* specific learning objects to a learner's basic profile, which defines/defines his/her initial individual learning path. How are the learner's cognitive style, interests, specific needs and preferences reflected in the selection of appropriate learning objects? By what means is the learner's profile formally constructed and represented? How is it verified that a learner has actually acquired a particular competency to be dynamically included in his/her learning record?

CONCLUSIONS

The dissertation ***contains scientific and applied results, which represent an original contribution to science*** and ***meet all the requirements*** of the Law for the Development of Academic Staff in the Republic of Bulgaria, the Rules for its Implementation and the Rules on the Specific Conditions for Acquiring Science Degrees and Holding Academic Positions in IICT-BAS.

The dissertation shows that the PhD student Ivaylo Zhivkov Blagoev **possesses** in-depth theoretical knowledge and professional skills in the scientific specialty "Informatics", **demonstrating** qualities and skills for independent scientific research.

Due to the above, I give my ***positive evaluation*** for the conducted research, presented in the dissertation, abstract, achieved results and contributions, and ***I propose the honorable Scientific jury to award educational and scientific degree "doctor"*** to Ivaylo Zhivkov Blagoev in the Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6. Informatics and Computer Sciences, PhD Program "Informatics".

07.02.2025   **Scientific ju**   На основание

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