

OPINION

by **Prof. Tania Koleva Pencheva, PhD**
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on the Thesis for awarding educational and scientific degree **PhD**
under the Scientific Field **4. Natural sciences, mathematics and informatics**,
Professional Area **4.6. Computer sciences**,
PhD Programme **Informatics**

Author of the Thesis: **Georgi Lazarov Shahpazov**
Theme of the Thesis: **Intelligent Techniques for Analysing Financing Processes
of Small and Medium Enterprises**

In accordance with Order 263/31.10.2019 of the Director of the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences (IICT-BAS), I have been appointed as a member of the Scientific Jury regarding the PhD thesis of the PhD student **Georgi Lazarov Shahpazov** for awarding the educational and scientific degree "**Doctor of Philosophy**" (PhD).

As a member of the Scientific Jury, I have been provided with:

1. A copy of the dissertation thesis for awarding the educational and scientific degree "Doctor of Philosophy".
2. A copy of the PhD thesis synopsis.
3. Copies of the publications related to the PhD thesis.
4. Reference by Georgi Shahpazov regarding the fulfilment of the minimal requirements formulated by IICT for awarding the educational and scientific degree "Doctor of Philosophy".

The PhD thesis of Georgi Shahpazov is 157 pages long, presented in English, which is eligible in accordance with the Internal Regulations in IICT-BAS for the Application of the Development of Academic Staff Act in the Republic of Bulgaria. The thesis consists of an Introduction, three chapters, a Conclusion, a section with formulated scientific contributions, a list of 9 publications related to the PhD thesis, a declaration for originality of the results obtained, and a Bibliography containing 110 references. In its presented form, the thesis conforms to the specific requirements, as defined in Article 27(2) from the Regulations for application of Development of Academic Staff Act in the Republic of Bulgaria.

The **aim** of the PhD thesis is analyzing financing processes of small and medium-sized enterprises by applying modern paradigms in the field of intelligent systems.

For realizing the **aim** of the thesis, the following **tasks** have been formulated:

1. To systematize the existing intelligent methods for the analysis of creditworthiness and financing processes through the JEREMIE initiative.
2. To apply intelligent techniques to analyze the mechanism under which the first tier of a banking institution operates, for financing small and medium-sized businesses.
3. To apply intelligent techniques to analyze the effectiveness of the internal financial structural units of different banks, such as levels of the decision-making hierarchy.
4. To apply intelligent techniques for analyzing various types of hybrid credit products that are appropriate for the needs of small and medium-sized businesses.
5. To apply intelligent data analysis techniques for micro, small, medium and large economic entities in the EU-27, evaluated by different economic indicators.
6. To apply intelligent techniques to analyze the financing mechanism of the EU budget for small and medium-sized enterprises.

I consider the set aim **up to date**, and the formulated tasks imply the possibility for practical application of the obtained results in the financing processes of small and medium-sized enterprises.

The presented list of publications made in relation to the PhD thesis, 9 papers are included, all of them co-written. Seven of these publications are referred in the worldwide known databases, but no one with IF or SJR, and 2 others are in thematic collections. It should be noted that the most recent publication on the dissertation is from 2016, but a list of 14 citations is provided, which confirms the timeliness of the topic of the dissertation presented and the results achieved.

The presented synopsis of the PhD thesis consists of 41 pages in Bulgarian and 35 pages in English. It reflects the essence and contents of the thesis, including the aim and tasks, as well as their execution and the contributions from the research conducted. Due to the fact that the dissertation thesis is in English, the presented synopsis in English is better preserved in style, while the Bulgarian version is very close to machine translation.

I have the following critical notes on the dissertation and the synopsis:

1. The correct English term is *index matrices*, not *indexed matrices*.
2. I consider the presentation of basic mathematical methods in the introduction chapter disproportional – about 15 pages for the apparatus of generalized networks and only 1-2 pages for intuitionistic fuzzy sets, index matrices and intercriteria analysis approach, which is the subject of research in the dissertation.
3. I believe that specifying the formulated contributions would do favour to the better presentation of the results achieved.

4. I have the following specific remarks to the dissertation: 1) *enterpises* should be *enterprises* in the title of the dissertation (the error is duplicated in the English synopsis); 2) figure 1.1 is in Bulgarian; 3) there are quite a lot incomplete sentences in the dissertation thesis and in both synopses; 4) the matrix in Eq. (15) should be of dimension $m \times m$, not $q \times q$; 5) there are many misspellings in the Bulgarian synopsis; 6) in the Bulgarian synopsis there are cited references with labels greater than 110 (which is their number in the dissertation thesis), which probably means incorrect citation of the other references in the synopsis, etc.

Despite the listed critical remarks, I accept the formulated contributions as a reflection of the results achieved in the PhD thesis and consider them as being of fundamental and applied science nature. I consider positively the fact that the PhD student deems the practical realization of the developed generalized net models possible. In addition, as a result of his research, the PhD student identifies the intercriteria analysis approach as useful in the decision-making process of funding processes, which can be integrated and further extended to other related application areas and problems, where it makes sense to look for correlations between a variety of economic and other indicators.

The final assessment of the dissertation thesis also demands taking into consideration the requirements stipulated by the Development of Academic Staff Act, and the IICT-BAS internal regulations for its application. According to the presented reference for the fulfilment of the minimal requirements of IICT-BAS, the PhD candidate **Georgi Shahpazov meets**, and even **exceeds**, the requirements for awarding the educational and scientific degree "Doctor of Philosophy", stipulated in the IICT-BAS Regulations for application of the Development of Academic Staff Act in the Republic of Bulgaria.

In the light of the foregoing, I confirm that the **requirements for awarding the educational and scientific degree "Doctor of Philosophy" of the Development of Academic Staff Act in the Republic of Bulgaria, as well as of the Internal Regulations for its application in IICT-BAS have been fulfilled**. My impressions from the presented dissertation thesis and the publications that give visibility of the achieved results, the analysis of their significance and the contained achievements therein give me the reason to express my **positive assessment** of the dissertation thesis, and to recommend to the respected members of the Scientific Jury to vote positively for awarding **Georgi Lazarov Shahpazov the educational and scientific degree "Doctor of Philosophy"** in Professional Area **4.6. Computer sciences**, PhD Programme **Informatics**.

December 2, 2019
Sofia

Signature:



(Prof. Tania Pencheva, PhD)