

## REVIEW

**for the thesis of Georgi Lazarov Shahpazov  
on "Intelligent Techniques for Analyzing Processes  
financing of small and medium business ”  
for the acquisition of the educational and scientific degree "PhD "  
in the professional field: 4.6 "Computer science"  
doctoral program 01.01.12 " Informatics"**

1. From the submitted CV it is evident that Georgi Shahpazov was born on August 23, 1976 in Sofia. In 2005, he graduated from the Academy of Economics "Dimitar Apostolov Tsenov" – Svishtov with a Master Degree in Finance. As of 01.10.2011, with Order No. 69 of the Director of IICT-BAS, he has enrolled for full-time doctoral student.
2. Georgi Shahpazov's dissertation thesis is 157 pages long and consists of an Introduction, three Chapters, Conclusion, Summary of the obtained results, a list of 9 publications on the dissertation thesis, and a Bibliography of 110 items.

The dissertation is devoted to the application of two mathematical methods for modeling and analysis of the financing processes of small and medium-sized business – generalized nets and intercriteria analysis. It is written in English.

Without dwelling on the content, I will outline the most important contributions and inaccuracies in the dissertation.

The first chapter is in nature a complete review. It is dedicated to intelligent methods for analyzing complex systems. Some of the most significant inaccuracies are: John von Neumann and Oscar Morgenstern are the creators of game theory, not decision making (p. 7); Figure 1 on page 10 is in Bulgarian; as in [11] and [14] (more precisely, it should have been cited [15]), "indexed matrix" is written, whereas in English the term "indexed matrix" is "index matrix" (p. 31); the indices for the rows and columns in the indexed matrix on page 33 must be  $m$ , and not  $q$ ; Table 1 on page 34 contains the values for the degrees of coincidence (as was done in 2014-2016) but not the inconsistency, as has been done in the last 2-3 years in the articles on intercritical analysis.

Chapter Two is devoted to the analysis of the processes of financing small and medium-sized businesses. I am not a specialist in this field so I will not comment and evaluate the results in it, but I was interested to read them.

The third chapter describes four generalized net models of processes, discussed in the second chapter. Since I am a co-author of two of the articles which this chapter is based on, I will not discuss the two models of these articles. The other two models are described correctly. Despite the inaccuracy in the description of the index matrix used in the

intercriteria analysis referred to in Chapter One, in Chapter Three, the index matrices used in the intercriteria analysis are correctly and fully described.

As one of the creators of this mathematical tool, I, of course, am pleased to see it used in a dissertation work, but I cannot fail to note that in recent years this analysis has already made it possible to work with data not only from two-dimensional, but also from three-dimensional and even  $n$ -dimensional index matrices. For example, if data on individual European countries are available in different years (in the thesis data has been cited only for 2012), additional results may be obtained. I recommend that such analysis be carried out in the future, with focus on seeking proximity not only between criteria and countries, but also between years.

Despite these minor inaccuracies, in general, the dissertation work is precisely designed.

3. The synopsis (separately provided in Bulgarian and English) reflects the content of the dissertation thesis and complies with the requirements of Academic Staff Promotion Act and the Regulations on the conditions and procedures for acquiring scientific degrees and for occupying academic positions at the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences. There are some spelling mistakes in the Bulgarian version of the abstract.

4. From the attached report we can see that Georgi Shahpazov is the author of 9 publications related to his dissertation, two of which in a specialized issue of Polish Academy of Sciences, and one in an international scientific journal published in Bulgaria. Eight of the publications are conference reports in Bulgaria (2), Italy, Luxembourg, Poland (2 - subsequently, as mentioned above, published in a specialized issue of Polish Academy of Sciences), the Netherlands and Switzerland. These publications cover the requirements of the Rules for the Terms and Conditions for acquiring scientific degrees and for occupying academic positions at the Institute of Information and Communication Technologies at BAS.

From our work on two joint articles I have very good impressions of Georgi Shahpazov.

The above is my reason to give a positive assessment of the dissertation thesis and its accompanying materials, and to recommend the respected members of the Scientific Jury to vote for the award of Georgi Lazarov Shahpazov, the educational and scientific degree "PhD" in the professional field 4.6 "Computer Science".

30 November 2019

Reviewer:.....  
(Corr. Member Prof. Krassimir Todorov Atanassov DSc DSc)

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