REVIEW

f the thesis for the acquisition of the educational and scientific degree PhD
in the professional field 4.6 Computer Science and Computer Science,
PhD program 01.01.12 Informatics
on the topic: "**Intelligent techniques for analyzing financing processes of Small and Medium Enterpises**"
Author: **Georgi Lazarov Shahpazov**
Reviewer: **Academician Vassil Stoyanov Sgurev**

I was appointed as a member of the scientific jury for the defense of the educational and scientific PhD degree of the aforementioned PhD thesis by order No. 263 of 31.10.2019 of the Director of the IICT at the BAS, Prof. Galia Angelova, based on the Law for the Development of the academic staff (LDAS) in the Republic of Bulgaria. At its meeting on November 4, 2019, the scientific jury elected me as a reviewer of the PhD thesis.

As a member of the scientific jury, the PhD thesis, the author's abstract, the PhD student's publications and the accompanying administrative documentation were submitted to me in paper and electronic form.

The review of the above mentioned documents shows that they fully comply with the requirements of the LDAS in the Republic of Bulgaria, the Rules for its implementation, the Rules for the conditions and the order of acquiring academic degrees and occupying academic positions in IICT at BAS.

Recent studies show a decline in the development of Small and Medium Enerprises (SME). The recovery and restructuring of the economy goes through rebuilding and modernization of industries that create long-term value. The continuous development of already established SMEs in some of the sectors of economy being analyzed is in line with their potential. In the sectors that were initially identified as favorable ones, the object of investment is below the basic level needed for future

investments by the relevant funds and investors. Other options should also be studied depending on market developments.

The PhD thesis is written in English and has a volume of 157 pages. It is structured in: an introduction, three chapters, a conclusion summary of the results obtained, and guidelines for future research, publications on the dissertation, a statement of originality of results, and a bibliography of one hundred and ten sources.

The meaningful content of the thesis is structured thematically and generally in the following way:

a) Overview of intelligent methods for analyzing complex processes;

b) Analysis of SME funding processes;

c) Experimental results.

In item a) a review of the intelligent methods is made, in item b) an overview of the current state-of-the-art for the problems of the PhD thesis is presented, and in item c) some experimental results are given. The dissertation contains a list of 110 sources used. Of these, 100 are in English, 3 in Bulgarian and 7 are Internet resources.

The list of publications in the PhD thesis includes nine publications. Of these, two are book chapters, in the series Modern Developments in Fuzzy Sets, Intuitionistic Fuzzy Sets, Generalized Nets and Related Topics, four are papers in a scientific forum referenced in Scopus - International Symposium on Business Modeling and Software Design held consecutively in Geneva - Switzerland, Noordwijkerhout – The Netherlands, Luxembourg - Grand Duchy of Luxembourg, Milan - Italy, two in the refereed journal - Notes on Intuitionistic Fuzzy Sets (NIFS) and one in the proceedings of an international scientific forum held in the country - International Workshop on Advanced Control and Optimization: Step Ahead.

All publications are co-authored, and in seven of them, the PhD pretender is at first place. So far, 14 citations of the publications on the topic of the PhD thesis have been noticed.

All requirements of the Art. 3 of the Rules on the Specific Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at IICT-BAS,

in relation to the minimum number of points for indicators of professional field 4.6. Informatics and computer science, for acquisition the PhD degree are observed. For the group of indicators A, the PhD student has the required number of 50 points, and for the group of indicators D the required number of points is 30, and the PhD student has 102 points.

Generally speaking, the main scientific, scientific-applcation and applcation results, presented in the dissertation can be formulated as follows:

1. Systemizing of the existing toolkit for funding the small and medium business through the JEREMIE initiative has been carried out.

2. An analysis of the processes of small and medium-sized businesses financing has been performed by applying intelligent techniques for analyzing the mechanism of functioning at the first level of a banking institution for financing small and medium-sized business.

3. Methods for analyzing the financing processes of small and medium-sized businesses are proposed by applying intelligent techniques to analyze the effectiveness of the internal financial structural units of different banks, such as levels of the decision-making hierarchy. Results obtained by these methods are described.

4. Methods have been developed to analyze the financing processes of small and medium-sized businesses by applying intelligent techniques for analyzing various types of hybrid credit products, by which relevant results have been obtained.

5. Approaches to the analysis of SME financing processes through the application of smart data analysis techniques for micro, small, medium, and large economic entities in the EU-27, evaluated by different economic indicators, are outlined.

6. Methods have been developed for the analysis of SME financing processes by applying intelligent techniques to analyze the financing mechanism of small and medium business by the EU budget. Results obtained by these methods are given.

The latter could find application in increasing the efficiency of SME financing processes.

The following notes and recommendations can be made on the dissertation:

1. Estimates of the asymptotic behavior of the computational complexity of the proposed algorithms and tasks using Landau parameters are not been given and probably such have not been made. However this is too important to evaluate the performance of the algorithms themselves, and to compare them with each other, as well as to compare them with previously known algorithms. If among the newly obtained algorithms ones of exponential complexity are found, this would become a serious obstacle to their operation in real time.

2. At certain places it is not clear what exactly the PhD student has done and what are the known results so far. It is not clear what part of the proposed methods and algorithms are verified by numerical modeling.

3. In many of the author's claims – to each chapter, and in the overall conclusion, the emphasis is on the research methods and means used, not the final substantive results obtained.

During the preliminary discussions I had the opportunity to make other notes and recommendations, many of which have been taken into account by the PhD student in the final completion of the dissertation.

CONCLUSION

Taking into account the mentioned contributions in the PhD thesis being reviewed, as well as the fact that all the requirements of the relevant normative documents for the educational and scientific degree PhD have been observed, I dare to confidently recommend to the Scientific Jury to vote Georgi Lazarov Shahpazov to be conferred on with PhD degree in Professional field 4.6 Informatics and Computer Science, a PhD program in Informatics.

November 29, 2019
Sofia

Reviewer:

/Academician Vassil Sgurev/