

OPINION

On the PhD thesis of **Dilyan Chavdarov Korsemov**

“Models and Algorithms for Supporting Group Decision Making”

Presented for awarding the educational and scientific degree “PhD”
in the Doctoral Program “Application of Principles and Methods of Cybernetics in
Different Fields of Science (Technical)”, Professional area 5.2 Application of
Principles and Methods of Cybernetics in Different Fields of Science (Technical)

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ACTUALITY

Cybernetics is one of the scientific fields dealing with the laws of receiving, processing and transmitting information. In the last three decades, in the context of constantly evolving information technologies, it has become especially relevant and widely used in various scientific and scientific fields. The subject of this dissertation is research, related to the development of models and algorithms for information analysis, in order to support decision making, and in particular – group decision making. As a part of cybernetics, the mentioned research direction is also very actual. The dissertation is devoted to the development of well – founded mathematical models and algorithms to support group decision making.

GENERAL CHARACTERISTICS OF THE DISSERTATION WORK

The dissertation submitted to me for review consists of 121 pages. It is structured in an introduction, three chapters, a conclusion, statement of originality, list of dissertation publications, found citations and used literature. The body of

text contains a large number of formulas, 22 tables, and 21 figures that contribute to the clarity and completeness of the text. The reference list contains 136 titles.

The general statement of the decision making problem using multiple attributes is considered in the dissertation. Different decision making models are proposed: modified simple additive weighting (SAW) model, modified weighted product model (WPM), and modified simple multi-attribute rating technique (SMART) model.

Corresponding algorithm is developed for each proposed model for group decision making support. Also a generalized algorithm for group decision making with integrated three different strategies - for selection of one best alternative, for choice of several good alternatives, and rank of all alternatives according to their preference degree, is proposed. Finally different models for decision making under uncertainty conditions, based on the principles of Wald, Laplace, Hurvitz and Savage, are formulated.

The research methodology includes development of convenient mathematical models and algorithms, as well as evaluation of their effectiveness and practical applicability by numerical testing using real data.

CONTRIBUTIONS

A review, connected with the decision making process, with the analysis of available techniques, models and methods for group decision making support is presented.

The results in the dissertation work are summarized in the following scientific and scientific-applied contributions:

- 1) Modifications of weighted sum model, weighted product model and SMART model for selection of alternative(s) under group decision making conditions are formulated. The modifications of the models allow the selection of one best alternative, as well as to choose several good alternatives. The proposed models give the possibility combinatorial optimization problems to be formulated,

whose solutions determine the optimal preferred alternative(s). Also corresponding algorithms for practical application of proposed models are developed.

2) A generalized algorithm for group decision making, integrating three different strategies, is proposed: 1. for choice of one best alternative, 2. for selection of several good alternatives, 3. for ranking all alternatives. For each strategy, appropriate optimization models for group decision making are formulated, taking into account the expert opinion of each member of the group.

3) Modified models for group decision making under uncertainty conditions using the criteria of Wald, Laplace, Hurvitz and Savage are proposed. Corresponding optimization problems are formulated to determine the optimal alternative for each of these criteria.

4) MS Excel spreadsheets are created for a part of proposed modifications of the models for group decision making. The results obtained from the tests in MS Excel and in the Lingo environment are identical, which proves their practical applicability.

PUBLICATIONS

The PhD student is the author of seven scientific publications, six of which are on the topic of the dissertation and are cited in the dissertation. Six publications are in scientific journals. Three of them are in journals with SJR. One of the publications is at an international conference. A total of four citations of three of the publications have been found.

CONCLUSION

The presented dissertation **meets** the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria. The results achieved give me a reason to propose to the honourable Scientific Jury to award to **Dilyan Chavdarov Korsemov** the educational and scientific degree "Doctor" (PhD) in

the professional area 5.2 Application of the principles and methods of cybernetics in various fields of science (technical), doctoral program - "Principles and methods of cybernetics in different fields of science (technical)".

05.09.2019

Sofia city

Signature:

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/Assoc. Prof. PhD Vassil Guliashki/