

Abstract of a doctoral dissertation

Method of the pre-implementation cost estimation of software changes in a selected class of ERP systems

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This dissertation discusses the problem of estimating of implementation costs of ERP software with respect to a software customization. The purpose of the undertaken research was to develop a new estimation method for software changes that provides more precise results and is more cost-effective in comparison to already-known methods. Results are expected to obtain at the early stages of implementation, i.e. trade negotiations and pre-implementation analysis. The dissertation presents a hypothesis that the ontological model of implementation parameters with fuzzy attributes allows to develop a cost estimation method which gives more precise results at lower costs, in comparison to currently available methods.

Part 1 introduces a basic terminology that is used in further parts of the dissertation and presents important causes of *IT* projects' failures (imperfect models of implementation parameters), which justify the significance of the problem. Part 2 presents the course and results of own research. Referring to Part 1, it contains a definition of the author's Meta-model of Implementation Parameters Estimation (*acronym MSPW*) and the issues related to its use. The definition of the Meta-model allows to construct models of implementation parameters in different aspects, which broadens the area of research on implementation-related phenomena. *MSPW* is the basis to define *BMSPW* – a method which investigates differences between *MSPW*-related models. Another part deals with the implementation of *MSPW* meta-model as an implementation cost model – fuzzy *OMKW*, which is applicable in the estimation process. On the basis of this model and *BMSPW* method, a method of implementation cost estimation (fuzzy *SKW*) was proposed. Chapter 3 provides verification of a fuzzy *SKW* in a field test. The conclusions from the research and recommendations for future works are included in Part 3.

Supplementary information concerning the research is included in Appendixes. Appendix A contains economic analysis of the project implementation. Appendix B contains the analysis of first stages of the implementation from the side of data that are gathered for the estimation process and the reasons for obtaining low quality data at the stage of trade negotiations and

pre-implementation analysis. Presentation of metrics and methods of implementation cost estimation, with advantages and disadvantages of their use at first stages of implementation, are included in Appendix C. Discussion concerning selected implementation models and developed ontological models is presented in Appendix D.

The following results were obtained in the framework of research:

- a) author's Meta-model of Implementation Parameters Estimation – *MSPW* and operations that can be used were identified;
- b) author's *BMSPW* method was defined – studies of changes in models built upon *MSPW* definition;
- c) model of implementation costs with fuzzy *OMKW* attributes based on *MSPW* definitions was defined to meet data quality requirements to a larger extent than currently known methods;
- d) method of implementation cost estimation – fuzzy *SKW*, using a fuzzy *OMKW* model, was defined,
- e) alternative models of implementation properties, e.g., training costs, were proposed;
- f) usefulness of fuzzy *SKW* method was verified.

The results of the research prove the implementation of the dissertation objective and the research hypothesis.

The author's original input to the development of the computer science discipline is the definition of *MSPW* model and *BMSPW* method. They can be used to construct models of *IT* system properties and develop methods for investigating phenomena that accompany software development.

Keywords:

ERP, software cost estimation, metrics, fuzzy ontology, *IT* system implementation, specification of requirements.