

Wrocław University of Economics and Business

Faculty of Management

Summary of PhD dissertation:

**An integrated model of the implementation process of customised IT solutions**

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# Abstract

Over the years, the author's experience participating in processes in organizations implementing projects with classic and agile methodologies has allowed for insights into the factors determining the effectiveness of IT project implementation. This experience allowed the author to define a view of project implementation according to different methodologies and provided a basis for identifying the research problem. The author deepened her knowledge to find out more about the causes of the observed problems by analyzing relevant literature and becoming familiar with reports and studies on the implementation of IT projects. Based on the existing research on IT projects, her own experience in implementing IT projects, and following the current trend towards customized project implementation, the author noticed a research gap, which she analyzed. According to the author, the main problem is the lack of a model which would optimize the implementation process of customized solutions. Relying on only one of the selected methodologies for conducting IT projects often results in following procedures which might not fully support the implementation of the solution which results in an incomplete identification of the risks related to the project. As a result of conducting preliminary research before building an integrated model, the author identified determinants that positively influence the implementation of customized IT systems. The preliminary research also allowed the author to solidify the previous hypotheses on the selection of model components, construct the model and subject it to verification analyses and panel discussions. To build the model, the author used components of well-known project management methodologies and standards (Prince2, SCRUM, ITIL) that were adequately chosen, modified, and integrated into a single hybrid process.

The empirical and panel studies of the proposed model allowed for its verification and evaluation, including the component of the project management procedure prepared for the contracting authority. As a result of the research, the particular usefulness of the model was confirmed for those areas of project implementation that are regarded as problematic in the implementation of customized systems. The empirical and panel studies of the proposed model allowed for its verification and evaluation, including the component of the

project management procedure prepared for the contracting authority. As a result of the research, the particular usefulness of the model was confirmed for those areas of project implementation that are regarded as problematic in the implementation of customized systems.

## **Research context**

The dynamic development in modern business requires equally dynamic implementations of IT solutions supporting it. The time from idea to implementation of new software to support business processes is now a determining factor for organizations' competitive advantage. The current trend is to choose such market solutions which allow systems to be customized to the requirements of the entity. Such solutions generate significantly lower project costs than non-customisable systems. Customized systems should have the basic functions required by the ordering party. The essential functions are defined and decided on at the stage of selecting a software supplier and drafting the cooperation agreement. However, only the process of customization of an IT solution at the project stage ensures its full usability, which increases the chances of a successful implementation process and maximum satisfaction of the end-user of the system.

The professional experience of the author allowed her to conclude that the choice of the IT project management methodology is primarily affected by the size of the project. This view is confirmed in the literature on project management, as well as analysis of Standish Group reports. For large projects, classical methodologies based on a cascade scheme of software production are preferred. Within this approach, the phases of project implementation are outlined in the initial stage, project documentation is particularly important, and the project executed according to a detailed schedule. Smaller initiatives are more likely to use agile methodologies, based on an iterative and incremental model, where working software is prioritised over exhaustive documentation, and responding to change takes precedence over following a plan. Neither of the methodologies is without flaws, and

the project itself is, by definition, an undertaking inevitably linked to the risk of a possible failure. A special case of an IT project is the project to implement a customized tool, where the scope of changes is limited to predetermined elements, and the time limitations are by far tighter than for projects going through cascading phases of software production. An additional aspect in the implementation of projects with the specificity of customisation is the element of continuous examination of the project scope in addition to the element of system customization. The experience of the author contributed to the quality of her observations on the application of both approaches, while the analysis of the literature made it possible to formulate conclusions regarding the lack of a dedicated model for the implementation of customized IT solutions.

The existing literature on the subject of IT project implementations often mentions the superiority of Agile methodologies due to them being adapted to the needs of the business. However, these methodologies, as a result of being "easy to understand, hard to master", cannot be applied in full to the process of implementing customized tools. Change management in the software development process requires close operational cooperation between the customer's business and the software vendor's development team, which is difficult to achieve in Agile approaches. A very important aspect of the implementation of customized IT products is the cost approach. The use of agile methodologies makes it difficult to assess and evaluate the investment efficiency due to the inability to estimate the total cost of the project *ex ante*. A solution for the limitations of agile methodologies can be the introduction of elements of classical methodologies in management processes requiring increased control over the implementation of the project. The developed implementation model, accepted by the ordering party and the software supplier, will also allow to decrease misunderstandings between the parties. As shown in the market analysis, it is often at the stage of contract negotiations between the parties that disagreements are making further cooperation impossible, and the contract is crucial element for the initialization of the project. The premise of the thesis is that the parties have entered into a contract that allows the project to be implemented based on an integrated model.

The dissertation attempts to solve the problems of customers buying customized software by preparing a procedure for the implementation of such systems. The author assumes that the model will be useful for both parties involved in the process of

implementing the project (the customer and the software supplier), which she intends to verify through empirical research using the model for project implementation.

## Research objectives

Concerning the issue that is the focus of this dissertation, the author has formulated the following research question:

What are the possibilities of developing an integrated model, using the relevant elements of IT project management methodologies for the implementation of customized IT solutions, to make the process more useful and managerially effective?

The research question is the starting point for the main hypothesis:

An integrated model, constructed from components of selected IT project management methodologies, can be used to support the implementation of customized IT systems, as a tool to increase project success. .

and specific hypotheses:

H1. Hybridization of cascading and agile IT project management methodologies positively affects the implementation of a customized IT solution.

H2. Problems that occur during the implementation of customized IT solutions can be minimized by appropriate management of the project implementation.

H3. The selection of the components for the integrated model is determined by the characteristics of the implementation process of the customized product.

H3. The implementation of the project based on the prepared procedure (based on the integrated model) will positively affect the course of the project benefit the contracting organization.

To verify the established main hypotheses and specific hypotheses, the following goals were set:

The main goal of the dissertation - build an integrated model of the process of implementation of customized IT solutions, as well as a project management procedure that is useful for the ordering party.

The author of the dissertation, in addition to the main objective, distinguished specific theoretical-cognitive, methodologyological, and utilitarian objectives.

Theoretical-cognitive objectives:

CT1. Identification of the importance of the IT project for the organization and the success factors of the implementation.

CT2. Comparative analysis of selected IT project management methodologies and identification of elements of methodologies useful for the integrated model.

CT3. Identification of opportunities to use customized solutions for IT modernization purposes.

CT4. Identification of problems in the process of implementing customized IT solutions.

The theoretical-cognitive objectives of the dissertation include the analysis of IT project management methodologies and a comparative analysis of the selected methodologies, with regard to their selection for the defined integrated model. Among the theoretical-cognitive objectives is an overview of the types of IT systems with an emphasis on the specifics of customized systems and an analysis of further directions of development of customized IT solutions.

Methodologyological objectives:

CM1. Identification of the components of the integrated model.

CM2. Construction of an integrated model for the implementation process of customized IT solutions - structural layer.

CM3. Construction of an integrated model for deployments of customized IT solutions - process layer.

CM4. Construction of an integrated model for deployments of customized IT solutions - behavioral layer.

CM5. Defining the procedure for IT project management from the perspective of the orderer of the customized system.

The main methodologyological objective is to build an integrated model for the implementation of customized IT solutions and to prepare a procedure for IT project management. Given the above, the author focused on the analysis and selection of elements of selected methodologies in terms of their usefulness and adequacy for the integrated model.

Utilitarian objectives:

CU1. Empirical verification of the model.

CU2. Verification of the concept of use of the model.

CU3. Indication of the higher utility of the model in solving problems when implementing customized systems in an organization.

The utilitarian objectives are closely related to the methodologyological objectives. After achieving the methodologyological objectives, it is reasonable to formulate and achieve the utilitarian objectives, which are on empirical verification of the prepared integrated model. To this end, the author verified the concept of the model by conducting a questionnaire survey and demonstrated the superior usefulness of the model in solving problems during the implementation of customized systems in the organization.



## Structure of the dissertation

The dissertation consists of eight chapters, and includes a description of the domain in which the author reviewed the state of current knowledge in the context relevant to the dissertation, presented the results of the research on projects for the implementation of customizable products, proposed an integrated model for the management of the production of a customizable product, and then verified it empirically through a case study analysis, as well as focus studies. The dissertation ends with conclusions and suggestions for further development research. The first chapter focuses on an IT project, the phases of the project cycle, and the organization of the project management process in terms of relevance to organizational development. A comparative analysis of the definition of a project and the author's definition based on the common parts of the literature review was prepared. The chapter introduces the models of software development cycles and their importance and defines the role of IT projects for the organization. The chapter defines the determining factors of implementation success and, in a summary of the research analysis, identifies the implementation success factors adopted by the author of the work.

The second chapter is a comparative analysis of different approaches to implementing IT projects. The chapter begins with a classification of IT project management methodologies. At the beginning of the chapter, an overview of methodologies is presented which then further are classified as traditional and agile. An assessment of the application of methodologies for projects is made, and their advantages and disadvantages are discussed, as well as their applicability for projects of different types. The review of relevant literature also supports that hybridization of methodologies is possible and can increase the efficiency of project implementation if project specifics are taken into account. In this chapter, methodologies the elements of which will form the foundation for building an integrated model: Prince2, ITIL, and SCRUM, are selected.

The third chapter is the result of the analysis of issues related to types of information systems. At the beginning of the chapter, the types of information systems are discussed in the context of production of IT solutions and their implementation in the client organization. Then the analysis of the possibility of using customized solutions is presented and the

phases of implementation of a project aimed at implementing a customized solution. The chapter concludes with an analysis of the feasibility of using customized products for the IT modernization of organizations. The chapter ends with a presentation of problems in the implementation of customized IT solutions which are identified based on the literature and the author's professional experience and divided into structural, behavioral, and dynamic layers.

The fourth chapter presents the results of a pilot, qualitative study conducted before building the integrated model. The author verified the initial assumptions for building the model by participating in two projects for implementing customized systems. The chapter describes the results of the study and the conclusions of the implementation. The preliminary study made it possible to finetune the selection of the model's components and improve its effectiveness.

The fifth chapter contains a theoretical and formal description of the proposed solution. Preliminary assumptions and limitations for the integrated model are presented, such as:

- the phases of the project cycle, which will support by high-level analysis, through the low-level, manufacturing process, application testing, and system acceptance,
- guidance for system customization is the low-level analysis process,
- the contract between the ordering party and the supplier to provide a customized solution covers between 25% and 40% of the system's functionality,
- financial considerations are not included, as they arise from the contract (the author excludes this element as external to the subject of the study).

The chapter also includes a detailed description of the integrated model of the process of implementing customized IT solutions, broken down into structural, process, and behavioral layers. The chapter concludes with a presentation of the procedure, based on the integrated model built previously, which is intended to be useful for the client ordering a personalized system, the implementation of which will be carried out in project form.

The sixth is a verification of the model through empirical research based on case studies. The author verified the usefulness of the prepared integrated model through project

management of customized system implementations. The study was divided into two case studies and was conducted between 2021 and 2023.

The seventh chapter presents the results of a focus study conducted with experienced IT project managers. The focus study place in two stages. The first stage was a survey containing open-ended and closed-ended questions. The survey assessed the assumptions for building an integrated model and its elements. The next stage of the survey was an expert forum, where the model was also discussed. The survey made it possible to assess the usefulness of the model and its applicability.

The eighth chapter summarizes the findings and a makes a recommendation concerning the direction of further research. The structure of the work and the arrangement of the chapters is coherent with the order of the research conducted by the author on the preparation of the integrated model. The chapters on the literature review of the examined subject made it possible to make preliminary assumptions before performing qualitative research and building the integrated model. The construction of the model and the description of its components in the structural, process, and behavioral layers were subjected to qualitative research based on case studies and focus surveys, which allowed to prepare a summary and chart further research directions in Chapter Eight.

# Organization of the research

The following research methodologies were used in the study:

## Theoretical part

1. Theoretical research and literature studies on methodologies and best practices of IT project management.
2. Literature review in concerning scientific studies on the development of customized IT solutions.
3. Analysis of research results on project implementation in IT.

## Conceptual part

1. Pilot study – qualitative
2. Construction of an integrated model using classical and agile project management methodologies by inductive reasoning:
  - a) construction of the structural layer of the model,
  - b) construction of the process layer of the model,
  - c) construction of the behavioral layer of the model.
3. Construction of a procedure for implementations with the specificity of customization of the selected software for customer needs.

## Empirical part

1. Verification of model assumptions
  - a) usability testing of the prepared model case study,
  - b) usability testing of the integrated model case study 2,
  - c) usability study of the integrated model - focus studies.
2. Presentation of the conclusions and further research directions.

The application of the integrated model of the management process and its corresponding procedure requires the provision of human resources with specific

competencies in the roles indicated in the model. The roles in the model will occur, respectively, in the rhythm determined by the procedure throughout the project life cycle.

## **Pilot studies and designing the integrated model**

Based on the literature review and empirical studies, the author identified and categorized problems during implementation projects. The identification of problems during the implementation of customized systems was framed according to the layers of determining factors of project success, such as cost, schedule, and quality. The layers of determining factors of project success have been adapted from those indicated in the Standish Group reports.

Both in the implementation of universal IT solutions and customized products, it is particularly important to identify potential problems in the project planning phase which allows to identify project risks and take appropriate action to reduce the likelihood of the undesirable project outcomes.

Before building the integrated project management model, the author conducted pilot studies based on the specified research procedure, which consisted of three stages. Consequently, a review of project documentation of selected projects, a case study analysis of two selected projects, and an inference process conducted. As part of the first phase of the pilot study, twelve projects of customized product implementations were analyzed for the quality and completeness of their project documentation. In the second phase, two projects meeting the evaluation criteria for the integrated model, in which the author participated as a project manager, were analysed. In this phase, based on the literature review, her own experience, and the results of the analyses of phase one, the author adopted the initial assumptions of the hybrid approach to project management.

As part of the final phase, inference was made, including the identification of determining factors, structural and process elements affecting efficiency (its increase and

the identification of constraints), and the quality of implementation of the analyzed projects. In terms of qualitative research of structural elements, the author selected projects with complete documentation, allowing analysis of compliance of the implementation with the baseline schedule, budget usage level. The author also defined the necessary documentation of the scope of business requirements, and documentation built during project implementation, such as documentation of acceptance test results, functional changes, and project closure.

The conclusions of the pilot study phase, together with the professional experience of the author, made it possible to define guidelines for the construction of a dedicated customized solution which is a hybrid model of integrated components, and to select specific methodologies for conducting project work. In the process of verification, the author formulated supporting theses for both structural and process elements, and for the designing of a coherent project management model.

The overall goal of the dissertation is the construction of an integrated model for the implementation of customized IT solutions and the preparation of a procedure based on the integrated model. A detailed description of the integrated model the process of implementing customized IT solutions, broken down into structural, process, and behavioral layers, is the key element in solving the research problem formulated for this dissertation. To build the integrated model, the methodologies selected as a basis for identifying the components of the implementation management model are Prince2 and ITIL. Another element that complements the construction of the integrated model is SCRUM, which is an element of agile manufacturing management.

The integrated model developed by the author will be applied in the following phases of project implementation:

- analysis (business and system)
- production
- testing
- implementation
- stabilization

As part of the model, a coherent proprietary procedure is also presented since it is deemed to be useful for a customer ordering a customized system which is to be implemented in project mode.

## **Conclusions and further research**

The author has prepared an integrated model of the process of implementation of customized IT solutions based on selected elements of project management methodologies in terms of layers: structural, process, and behavioral. The pillars on which the model is based are Prince2, SCRUM, and ITIL. When selecting the components of the model, it was necessary to separate the components of the selected methodologies from tools and techniques.

The model was subjected to empirical verification by using it in the implementation of two projects and conducting focus studies. The qualitative research conducted based on the case study - the implementation of a project based on the model - gave clear results of increased probability of project success when using the integrated model.

The focus studies also confirmed the usefulness of the model and the model-based implementation procedure and gave worthwhile critical remarks, which might be the foundation for improving the procedure or preparing several variants of the procedure depending on the specifics of the organization's operation, the contract concluded with the supplier, or the resources available for project implementation.

As part of further research on the integrated model, the author of the paper intends to continue the empirical research by using the procedure in a broader scope for a larger number of projects to identify and further distill those elements of the model that specifically affect project success. In addition, the author would like to expand the model

to include the stage of proper system and supplier selection by building an author's methodology for evaluating bids sent by potential suppliers.