# Model-Based Methodology for Development of IT Project Management Plan and Scope Using Artificial Intelligence: Project in Progress*

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**Abstract**

The research project "Model-Based Methodology for Development of IT Project Management Plan and Scope Using Artificial Intelligence Algorithms" aims to elaborate an approach to the development of IT Project Management Plan and Scope Statement templates using model-driven engineering concepts and artificial intelligence algorithms. The project focuses on developing a structured methodology to automate the generation of IT project management plan and project scope artifacts within the principles of MDE and text generation models. Key project activities include analyzing existing project management frameworks, creation of source and target models for project planning and scope definition, integrating AI-driven algorithms for text template generation, and validating the methodology through case studies and prototype development.

**Keywords**

IT project management plan, IT project scope, model-driven engineering, artificial intelligence, documentation generation

## 1. Introduction

Information technology (IT) has evolved from mechanical computing to modern digital systems, encompassing hardware, software, networks, and information management [1]. The foundation of IT dates to the 1940s with computing hardware [2], followed by software development to operationalize these machines [3]. The 1968 NATO seminar on the software crisis [4] highlighted rising complexity and costs, prompting the adoption of formal methods [5] to enhance software quality [6]. The rise of personal computing in the 1980s and internet proliferation in the 1990s accelerated IT transformation, expanding software development into web applications and cloud computing.

Agile methodologies, introduced in 2001 [7], aimed to accelerate software delivery, yet balancing speed and quality remains a challenge, requiring structured project data management and formal transformation rules [8]. The artificial intelligence (AI) revolution of the 2020s, driven by advancements in large language models (LLMs) and generative AI, has transformed IT project management by enabling automation, intelligent decision-making, and enhanced efficiency. AI-powered tools streamline project planning, risk assessment, and documentation, reducing manual effort and improving accuracy. As a result, IT project management increasingly integrates AI-driven insights to optimize resource allocation, accelerate development cycles, and enhance collaboration in dynamic project environments.

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Successful IT project execution relies on robust project initiation, encompassing goal definition, resource planning, feasibility analysis, requirement specification, solution design, and prototyping [9]. The project management plan is a document that outlines how the project will be managed and controlled. Within the scope of this project, it is planned to explore the possibilities of automatically generating project management plans and scope definitions, focusing on the input data and the expected IT project artifacts based on model-driven engineering principles [10]. The goal of the project is to elaborate an approach to the development of an IT Project Management Plan and Scope Statement templates using model-driven engineering concepts and artificial intelligence algorithm. The project is national with the emphasis on international collaboration.

The paper is organized as follows. The next section discusses the main challenges in automating IT project documentation. Section 3 describes the research methodology used in the project and its division into three phases. Section 4 briefly presents the current results achieved within the project, introduces the solution concept, and outlines the development vision. The final section summarizes the research conducted so far and defines directions for future work.

## 2. Research background

Defining project scope is essential for setting boundaries and deliverables while minimizing risks and ambiguities. Balancing speed and quality in scope definition remains a key challenge, driving the need for structured methodologies to streamline project initiation. Automation solutions can enhance project management plan development, improving efficiency and accuracy [11]. However, challenges persist, particularly in generating precise, context-aware documentation. Automated tools may produce overly generic plans, struggle with adaptability, and fail to capture project-specific details, potentially leading to errors or misalignment with actual needs. This is especially true for projects with complex structures or specific requirements [12].

Model-driven engineering (MDE) offers a structured approach to software development by utilizing models to represent problem domains and IT solutions. Rooted in structured programming and Unified Modeling Language (UML) [13], MDE facilitates automated code generation, enhancing development efficiency and reducing manual errors [14]. The Model-Driven Architecture (MDA), introduced by the Object Management Group (OMG) in 2001 [15], aimed to separate business and application logic from underlying technology, promoting abstraction-driven software development [16]. Providing qualitative accurate and complete source model data and definition of intelligent transformation rules can address IT project plan generation issues. This can help generate more precise and relevant documentation fragments. Within the scope of this project, it is planned to explore the possibilities of automatically generating project management plans and scope definitions, focusing on the input data and the high level of formalization of both artifacts based on model-driven engineering principles [14].

## 3. Research methodology

The Design Science Research (DSR) [17] is used as the overall methodological framework of the proposed project. DSR is chosen because of its explicit focus on developing relevant artifacts and its ability to guide combining various research methods as it is necessary for multiparadigm based research. The research process is divided in three phases, namely, Relevance, Design, and Rigor. The detailed task planning within the project schedule is shown in Figure 1.

| Phase | Year | 2024 | | | | 2025 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Month of a year | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 |
| Relevance | Target model definition - (Objective 1) | | | | | | | | | | | | | | | | | |
| | Source model definition – (Objective 2) | | | | | | | | | | | | | | | | | |
| Design | Transformation rules definition – (Objective 3) | | | | | | | | | | | | | | | | | |
| | Methodology specification – (Objective 4) | | | | | | | | | | | | | | | | | |
| Rigor | Prototype development – (Objective 5) | | | | | | | | | | | | | | | | | |
| | Approbation and evaluation – (Objective 6) | | | | | | | | | | | | | | | | | |
| Project management and dissemination activities (Objective 7) | | | | | | | | | | | | | | | | | | |

**Figure 1:** Project phases, objectives and schedule.

In the Relevance phase, requirements are elicited by means of literature review and a case study. A target (Objective 1) and a source (Objective 2) models for further model transformation are created following principles of model-driven development. Target model is defined summarizing Project Management Plan and Scope content and best practices for IT project document development. Whereas, source model is created summarizing methods, tools, standards and guidelines used to produce initial data for IT project document development.

In the Design phase, the model transformation rules (Objective 3) are developed based on elements collection in the source and target models defined at the previous phase. It is planned to define transformation rules in conjunction with artificial intelligence algorithms for automatic identification of the target model elements from the elements of source model. As well as the methodology for creation of IT Project Management Plan and Scope artifacts from the initial project data and information about problem domain (Objective 4) will be defined based on the specified transformation rules. The source and target models may also be refined if needed.

In the Rigor cycle it is planned to develop an application system prototype (Objective 5) implementing the transformation rules completed at the previous phase and used to specify requirements for the tool prototype. The case study will be carried out on synthetic data of some IT project example to evaluate the approach experimentally and to accumulate application experiences (Objective 6). These would provide input for further research activities. The project management and dissemination activities (Objective 7) will be carried out throughout all the project.

## 4. Project status and current results

Currently, the Relevance Phase of the project has been completed, and the Design Phase has started. The following subsections briefly describe results achieved and papers published, as well as introduce the solution's concept and express the development vision.

### 4.1. Systematic literature review

The initial results of the project Relevance phase are related to the performing a systematic literature review on the solutions, which propose the use of model transformations in the initial phases of IT project development [18]. By analyzing selected studies, the paper defines a set of project elements that can be derived automatically through model transformation and those requiring manual intervention. Understanding the limitations and capabilities of model transformations in project initialization provides valuable insights for further research. In particular, this analysis opens opportunities in integrating a model-based methodology for project solution.

### 4.2. Key artifacts in the initial phases of IT project management

Under the Relevance activity authors examined the studies on creation of IT project artifacts used in the initial stages of project management, with a focus on advanced methodologies and frameworks such as Scrum, Kanban, Waterfall, Iterative, and Incremental models. The paper [19] demonstrates the results of the systematic mapping study performed on the definition of IT project artifacts created before the implementation.

The research highlights the importance of well-defined artifacts, particularly in agile and remote work environments, where effective communication and structured approaches are essential for ensuring completeness and consistency. The main result of this paper is a schematic presentation of the artifacts used in IT project initialization showing all the possible transformation solutions among them and referencing the corresponding studies. The defined schema of IT project artifacts transformations can serve as a basis for meta-model creation for both source and target models.

### 4.3. Model transformation chain mapping into IT project artifacts

The initial activities of project Design phase are devoted to the definition of the transformation rules for obtaining IT project Management Plan and Scope elements. The paper [20] expands the work mentioned in Section 4.2 by examining how documentation elements can be systematically extracted and structured based on the transformation chain of IT project artifacts defined previously. The transformation chain presented in [19] (left side of Figure 2) is mapped into IT project documentation artifacts (right side of Figure 2) specified in the initial stages of the project accordingly to IT standards IEEE 830 and ISO/IEC 12207. As a result, the paper [20] offers a set of transformation solutions among IT project artifacts. As well as a case study demonstrates the practical application of these transformations to a small-scale IT project documentation.

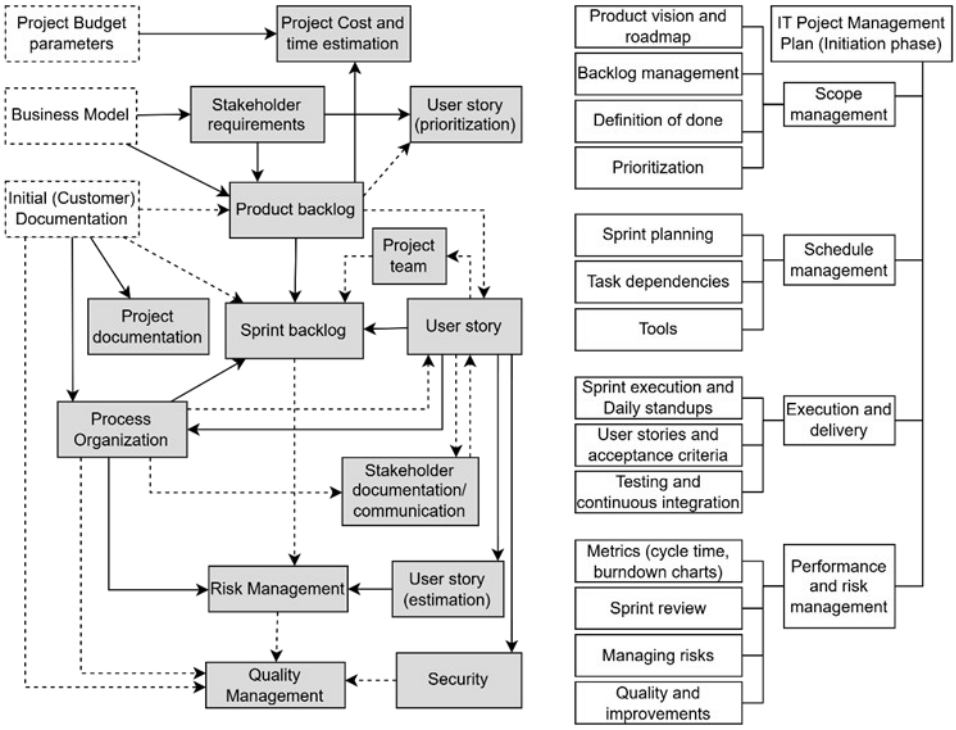


**Figure 2:** IT project artifacts transformation chain vs IT project management plan.

### 4.4. Model transformation chain mapping into IT project artifacts

The defined set of transformation rules serve as a basis for development of the methodology for creation of IT Project Management Plan and Scope artifacts from the initial project data. Project budget parameters, Business process model and Initial (Customer) documentation highlighted as

dotted blocks in Figure 2 are the source items for further transformations. The prototype of the transformation support tool must be capable of interpreting input data in distinct formats: a business process model as a structured model, a document text as unstructured text, and a budget as a tabular dataset. Consequently, the tool should be designed to process and integrate these heterogeneous data formats effectively [21]. The conceptual representation of the proposed solution is illustrated in Figure 3.

The prototype will be implemented as an application capable of processing input data and generating corresponding output data. It will incorporate transformation mechanisms to interpret and convert business process models as XML files exported from the corresponding modeling tools, textual documents, and budget tables into structured project artifacts. The generation of the IT Project Management Plan document will leverage large language models (LLMs) and generative AI to assist in the creation of a new document text. As well as data mining algorithms for identifying relevant text templates will be applied for the repository of previously accumulated project documents serving as a text template library. In general, the approach developed within the project will enable the prototype to generate initial IT project documentation (Plan and Scope) by application of model transformation rules for obtaining of necessary project artifacts, as well as AI-driven text synthesis learning from existing examples.

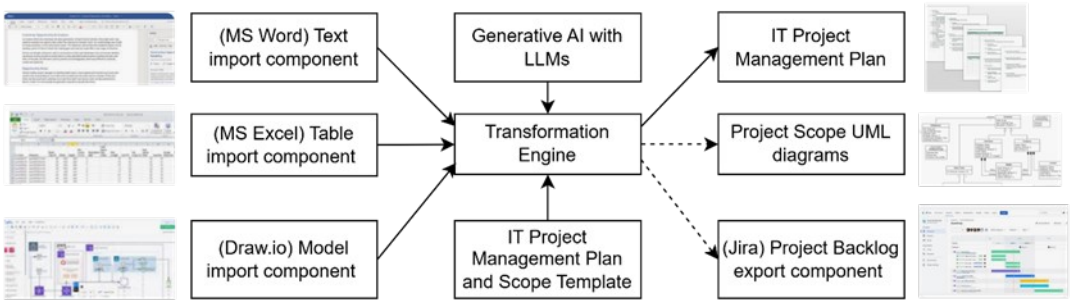


**Figure 3:** Solution's conceptual schema.

Besides IT Project Management Plan document, it is planned to perform experiments with generation of UML diagrams as it has been implemented in BrainTool [22]. Moreover, authors have been performing experiments with transformation of business process model through use cases [23] into product backlog as a list of user stories, which later is imported into Project Management tool Jira [24]. By transforming input data into structured task representations, the system will facilitate the automatic creation of backlog items, ensuring alignment with project plan. This functionality will reduce manual effort in task definition and structuring and enable seamless integration with agile project management workflows.

## 5. Conclusion and ongoing work

This project paper underscores the potential of application of model-driven engineering principles for initial IT project artifacts obtaining. As well as generation of IT project documentation around these artifacts with some AI techniques. The analysis of existing project management frameworks, coupled with the creation of structured source and target models, forms the foundation for a systematic and repeatable approach to project planning. AI-driven text template generation further supports automation, reducing manual effort and minimizing inconsistencies.

Software Engineering is undergoing a transformation with artificial intelligence systems playing a growing role in enhancing development productivity. Over the next five years, human developers and AI will likely collaborate more closely [25]. Future research will focus on refining the proposed methodology through empirical validation, including case studies and prototype implementations. Additional efforts will be directed toward optimizing model transformation techniques and enhancing AI algorithms for improved accuracy in artifact generation. Potential integration with

existing project management tools like Jira will be exploring as strengthen the practical applicability of this approach.

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## Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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