Intelligent Decision Support System in the Face of Uncertainty and Risks in Project Management

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Abstract

In today's world, Scrum is the most popular approach to managing teams in software development. However, there are factors that influence the emergence of project risks, namely: inaccuracies in the formulation of tasks that the team evaluates and a low level of communication culture, as well as shortcomings in the procedures for distributing tasks among team members. An intelligent decision support system under conditions of uncertainty and risk in project management allows the project manager to provide mechanisms to reduce the impact of risks. The purpose of this study is to reduce the impact of risks associated with the perception of tasks from the tracking system and the distribution of tasks among team members within the project sprint to ensure the successful completion of the project. Key factors affecting the effectiveness of teamwork are analyzed and identified. An intelligent decision support system has been developed that integrates data from the tracking system and, using LLM and a stable matching algorithm, provides recommendations for describing project sprint tasks and distributing these tasks among performers.

Keywords

project, risk, project team, intelligent system

1. Introduction

Among the popular approaches to team management in the software development process, the Scrum methodology occupies a special place.

The main tasks of Scrum-based project management are: controlling the execution of tasks within one or more sprints (terms of reference), efficient resource allocation, and prompt coordination of actions in case of unforeseen circumstances to ensure stable team performance [1]. Given the limited time horizon of management, it is of particular importance to study the factors that affect the effectiveness of teamwork. However, even the use of agile methodologies does not completely eliminate the problems associated with the impact of risks on the project team's activities.

The effectiveness of a project team is influenced by a significant number of factors. Among the most important are the following [2]:

- team qualification, which determines the professional level of the participants, their ability to adequately evaluate the sprint tasks, and perform them efficiently and on time;
- errors in the assessment of sprint tasks can affect the allocation of resources, timing, and the final result. The consequences can extend beyond a single sprint, affecting future phases;
- Inaccurate task descriptions or misunderstanding of tasks by developers can lead to incorrect estimates and complications in execution;
- Reduced resources, i.e., planned or unexpected losses of team members, for example, due to illness or vacation, reduce the amount of work performed and may cause delays;

- The internal culture of the team, which includes established rules, task distribution processes, decision-making strategy and internal communication, determines the team's ability to adapt to crisis situations and overcome unforeseen circumstances.

These factors significantly affect the quality of project implementation, so it is important to create a flexible mechanism by which the team can reduce the impact of these risk factors on the effectiveness of achieving project goals.

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2. Proposal of conception

An analysis of approaches to managing a project team in the face of risks has revealed that the key factors that increase the risk of project failure [3] are:

- inaccuracies in the wording of the tasks that the team evaluates;
- low level of communication culture;
- shortcomings in the procedures for distributing tasks among team members.

In this paper, the team is considered within a specific project and consists of a project manager, developers, a technical lead who is also involved in the project implementation, and a tester. The paper considers projects that are executed iteratively by the project team, i.e., agreed and approved tasks are broken down into clearly defined tasks to be completed during the project sprint. The project manager is responsible for managing, coordinating the team's work, and communicating with the customer, receiving tasks and clarifying technical requirements. These tasks are recorded in the tracking system and the project team uses these descriptions to select and assign tasks to the sprint. Failure to complete the project sprint tasks is due to inaccurate task descriptions or lack of understanding of the tasks by the developers, which can lead to incorrect estimates and difficulties in implementation.

The developed intelligent decision support system for uncertainty and risk in project management allows the project manager to provide mechanisms to reduce the impact of project risks by improving the task formulations stored in tracking systems. The intelligent system uses artificial intelligence methods, in particular, large language models (LLM) to support decision-making, which are capable of processing textual data, including technical documentation, risk reports, project status reports, etc.

The proposed system is based on a methodology for researching linguistic characteristics for project task management. With this methodology, the project manager chooses the wording options for the task description, which the LLM evaluates and assigns points based on its clarity and comprehensibility. The project manager can use these recommendations to improve the task description of the project team [2]. When creating a project product backlog or project sprint, the project manager has two options for choosing the best task description. To do this, they need to review and reformulate the task descriptions of the sprint in order to reduce project risks and increase the quality of project execution.

The distribution of tasks in a project sprint between performers also affects the failure to complete project sprint tasks, which may be due to a lack of qualified performers or switching performers to other specific tasks. Thus, the task of task distribution arises as a problem of finding stable pairings.

In the proposed intelligent decision support system, to reduce the impact of the risk associated with the unstable distribution of tasks in the project sprint, a technology based on the stable matching algorithm (SOSM) [3] and the efficiency-adjusted deferred decision-making algorithm (EADAM) [4] is proposed. According to the authors' research, the EADAM and SOSM

algorithms are the most efficient, they ensure the distribution of tasks in a sprint, meet the requirements of developers, and are characterized by low computational complexity. Based on these algorithms, the project manager receives a stable comparison based on the prioritization of tasks and the qualifications of performers, which allows him to successfully complete the project sprint tasks.

To assess the impact of the risks of failing to meet the project sprint objectives, the failure rate per unit of time is used. This indicator determines the number of failures per hour, day, or a certain period (sprint). It is used to assess the reliability and productivity of the workflow [5]. Failure rate can be calculated as the ratio of the number of failures that occurred during a certain sprint to the total number of attempts that may fail. The failure rate of an IT project is a key indicator of the quality of sprint or project management. A high failure rate indicates the presence of significant risks that can be caused by insufficient team preparation, inaccurate task description and planning, and the influence of external factors. The use of recommendations by the project manager helps to reduce the failure rate and increase the stability, accuracy of tasks, and ensure the successful completion of the project.

The use of the failure rate also helps to track the dynamics of risk exposure and evaluate the effectiveness of the implemented management measures. With the help of the failure rate, it is possible to assess the effectiveness of the implementation of the proposed intelligent decision support system in the face of uncertainty and risks in project management.

3. Conclusion

The developed intelligent system provides the project team with the necessary information to effectively manage the project under conditions of uncertainty. The system integrates data from the tracking system and, using LLM and a stable matching algorithm, provides recommendations to the project manager on how to describe the project sprint tasks and distribute these tasks among the performers.

The implementation of an intelligent system allows you to create tasks with greater clarity, which will contribute to better team understanding and project execution. By utilizing LLM in the project management workflow, an intelligent system provides a more efficient and effective task management process that increases the productivity of the project team.

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