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DEVELOPMENT OF A SIMULATION MODEL OF AN IT COMPANY PROJECT MANAGEMENT SYSTEM IN ANYLOGIC

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Abstract

This paper discusses the development of a simulation model for an IT company's project management system using AnyLogic. Simulation modeling allows for analyzing the impact of various factors on project management, including resource allocation, deadline control, and team interaction. The use of discrete-event, agent-based, and system dynamics approaches ensures high accuracy in modeling business processes. The presented model helps identify bottlenecks and optimize project management strategies. The paper describes the stages of model development, principles of agent interaction, and an analysis of the effectiveness of the proposed approach.

Keywords: simulation modeling, project management, IT project, AnyLogic, discrete-event modeling

1 Introduction

Simulation modeling is an important tool for analyzing and optimizing complex processes, especially in project management, where the dynamic nature of tasks and the influence of multiple factors require precise and well-thought-out decisions [1,2]. In the modern IT industry, companies face numerous challenges: the need for efficient resource allocation, deadline and risk management, adaptability to changing requirements, and team coordination. Simulation modeling enables evaluating system behavior under different scenarios, identifying weaknesses, and suggesting strategies to improve project management efficiency.

This paper presents the development of a simulation model of an IT company's project management system using the AnyLogic tool

2 Literature Review

Simulation modeling in IT project management has attracted researchers' attention as it allows for considering various factors: deadlines, resources, task priorities, and team interactions. This study reviews the main approaches to modeling.

Discrete-event modeling (DEM) analyzes time delays and risks [2]. DEM helps identify bottlenecks and predict the impact of random events. Agent-based modeling considers the behavior of project participants. The work [3] proposes a dynamic risk management model based on network analysis of risk interdependencies. The proposed model allows prioritizing risks, considering their spread, and evaluating the effectiveness of management strategies. The study [3] demonstrates that the proposed approach improves risk assessment accuracy and enhances decision-making efficiency in project management.

System dynamics approach explores the dependency between resources and deadlines. The authors [4] investigate dynamic resource allocation in a multi-project environment, comparing static and dynamic strategies. To analyze the impact of resource reallocation on project performance, the authors use the system dynamics approach. Research results show that dynamic allocation improves deadlines while reducing the load on limited resources. Hybrid models [5] combine the advantages of different approaches and adapt to various project types.

The development of these methods contributes to the creation of more accurate and efficient tools for managing IT projects in uncertain conditions.

3 System Description and Business Processes

The developed system is designed for managing IT company projects, ensuring efficient resource allocation, deadline control, task tracking, and communication among participants. It allows tracking task statuses, considering employee workload, and predicting completion deadlines.

Main business processes:

Project planning – defining goals, tasks, priorities, and deadlines, allocating resources, assessing risks, and developing minimization strategies.

Task allocation – assigning tasks to employees based on their competencies, workload, and priorities (P1, P2, P3), improving motivation and efficiency.

Status tracking – monitoring task completion statuses: "Planned," "In progress," "Testing," "Implementation," "Completed." Flexible status settings enhance monitoring.

Deadline control – the system notifies of approaching deadlines, analyzes delay causes, and suggests task reallocation.

Communication – interaction tools reduce misunderstandings, improve work coordination, and integrate with corporate services.

Reporting and analytics – the system generates reports on progress, team workload, and task execution efficiency. Data visualization aids decision-making.

4 Model Development Stages in AnyLogic

The development of the project management simulation model for an IT company was carried out in the AnyLogic environment, allowing for the creation of a flexible and scalable model that considers various aspects of project management. AnyLogic provides tools for implementing discrete-event, agent-based, and system dynamics modeling, making it an optimal choice for modeling complex business processes with dynamic interactions among participants.

Main stages of project management model development in AnyLogic:

Defining and creating agents. Employees, tasks, and resources are represented as agents with parameters (competence, workload, priority, and status). This allows modeling the project team's workflow.

Developing business processes. Discrete-event modeling was used to simulate task execution stages, where stages (planning, allocation, execution, verification) are triggered depending on agent states.

Interaction and task dependencies. Dependencies between tasks, priorities (P1 executed before P2, P3), are considered, ensuring work consistency.

Scenario parameter configuration. Changing key parameters (resources, deadlines, workload) enables analyzing management strategies and optimizing project execution.

Figures 1 and 2 illustrate the developed simulation model and its execution results.

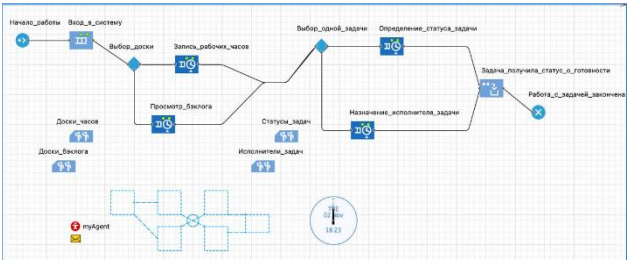

Figure 1. Simulation Model of the System

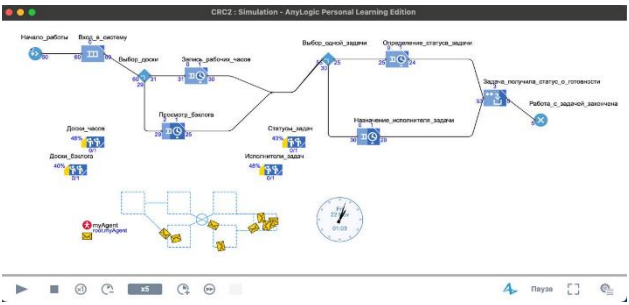

Figure 2. Simulation Result of the System

5 Conclusions

The developed simulation model of an IT company's project management system demonstrates the effectiveness of using AnyLogic for business process analysis and optimization. The inclusion of various modeling approaches allows considering task dynamics, risks, and team interaction specifics. Discrete-event modeling helps identify bottlenecks, agent-based modeling analyzes participant behavior, and the system dynamics approach evaluates long-term trends. Conducted experiments show that using the proposed model improves deadline control, enhances team productivity, and reduces the likelihood of project management failures.

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