

# Development and Implementation of Intelligent Programming Tool for Agile Transformation of Human Resource Management Processes

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## Abstract

The research aims to develop intelligent programming tool for the Agile transformation of human resource management processes in a multi-project environment and to provide recommendations for its implementation in healthcare institutions. An analysis of information systems used in the healthcare sector has been conducted. A model for the information support of the human resource management process in transformation projects has been developed. The developed programming tool the Agile transformation of human resource management processes in a multi-project environment, combines software, hardware, and informational-project support and is based on the proposed methodological framework. A software and hardware complex for human resource management in medical institutions has been developed, which implements methods for forming teams/units of medical institutions, considering specified constraints, and reallocating resources. The comprehensive application of the programming tool allows for increased efficiency in human resource management: improving the team's characteristics by 11-42%, reducing the number of project team members through functional redundancy by 7-34%, and enhancing the speed of decision-making regarding team formation and resource reallocation.

## Keywords

Agile, Human Resource, configuration management, resource reallocation, multi-project environment

## 1. Introduction

The healthcare sector is undergoing a significant transformation driven by the need for more efficient and effective human resource management [1]. As healthcare organizations navigate increasingly complex demands, systems that can adapt swiftly to changes are becoming a growing necessity. Traditionally used in software development, Agile methodologies are gaining traction to enhance flexibility and responsiveness in managing human resources across various projects [2].

This research focuses on developing and implementing tools to support Agile transformation in managing human resources within multi-project environments. By leveraging Agile principles, healthcare institutions can optimize resource allocation, enhance team efficiency, and improve project outcomes. The study aims to bridge the gap between traditional human resource management practices and the dynamic needs of modern healthcare settings, particularly in response to the challenges posed by increasing specialization and the demand for rapid adaptability.

The paper begins by analyzing existing information systems used in healthcare to identify gaps and opportunities for improvement. It then presents a model for information support for transformation projects' human resource management processes. This model integrates software, hardware, and informational project support, grounded in a robust methodological framework. Furthermore, the development of a comprehensive software and hardware complex tailored to the

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unique requirements of healthcare institutions is discussed. This complex facilitates the formation of adaptable teams and efficient resource redistribution, thereby addressing healthcare environments' specific constraints and needs.

The introduction of these tools and methods is expected to significantly improve the effectiveness of human resource management. Key anticipated outcomes include enhanced team performance metrics, reduced project team members required through functional redundancy, and faster decision-making processes related to team formation and resource reallocation. Through these innovations, the research contributes to the ongoing efforts to modernize healthcare management practices, ensuring that institutions are better equipped to meet current and future challenges.

This study is vital for improving operational efficiency and fostering resilience in healthcare systems, particularly in times of crisis or rapid change. Implementing Agile tools and practices represents a strategic approach to managing the complex interplay of resources, projects, and personnel in a sustainable and scalable manner.

## 2. Current Research Analysis

According to the Strategy for Implementing a Risk Management System for the Development of Communities, Territories, and Infrastructure of Ukraine [3], it is necessary to implement the effective use of resources through the optimization of resource allocation (material, technical, human resources, and costs). To minimize losses when forming project teams in medical institutions, attention should be paid to the possibility of resource redistribution in a multi-project environment.

Adhering to a specific sequence of transformational stages and viewing transformation as a reengineering project ensures its manageability and effectiveness [4]. Dr. Shaw noted that one of the three key factors determining the effectiveness of transformation is managing the process of organizational change, as the viability of the transformation project depends on managing the processes of organizational reengineering [5, 6].

The analysis of organizational types and their development potential using coordination mechanisms was discussed by Mintzberg H. [7]. Mintzberg emphasized that the transformation of management processes in the medical environment must be systematic and that changes occurring both within the organization and in the surrounding environment must be considered.

The readiness for organizational flexibility, or the level of Agile maturity, influences the effectiveness of transformation processes [8]. Using templates and standard methods facilitates the assessment of readiness for change and simplifies monitoring procedures.

The research [9, 10] demonstrates the relevance of developing medical information systems. The COVID-19 pandemic has significantly increased the importance of digital transformation in the healthcare system.

Existing human resource management systems, such as HRPlus software, Coloris HRM platform, CleverStaff, etc., have certain limitations when applied to the medical sector:

- Data security;
- Compliance with the Labor Code of Ukraine and Ministry of Health regulations;
- Cost;
- Functional capabilities (resource planning, consideration of resource constraints/reservations, role combinations);
- Support features.

Among the specific software used in medical institutions, knowledge of which is mandatory according to the Digital Competence Framework for Healthcare Workers of Ukraine [11], are:

- Medical information systems;

- Electronic health system;
- Electronic system for managing the stock of medicines and medical products “E-Stock”;
- Information-analytical system “MedData” (system for managing material and technical resources);
- Electronic integrated disease surveillance system;
- Clinical decision support systems (CDSS);
- Databases and knowledge bases, etc.

The analysis of existing medical information systems conducted in [12] showed a need to develop mobile applications to ensure prompt collaboration between patients and doctors. Organizing the management of critical knowledge positively affects the stability of medical institutions' functioning [13].

Application packages for solving coverage tasks that can be used in resource allocation and project team formation do not account for the limitations that exist in the medical sector and are related to its specificity.

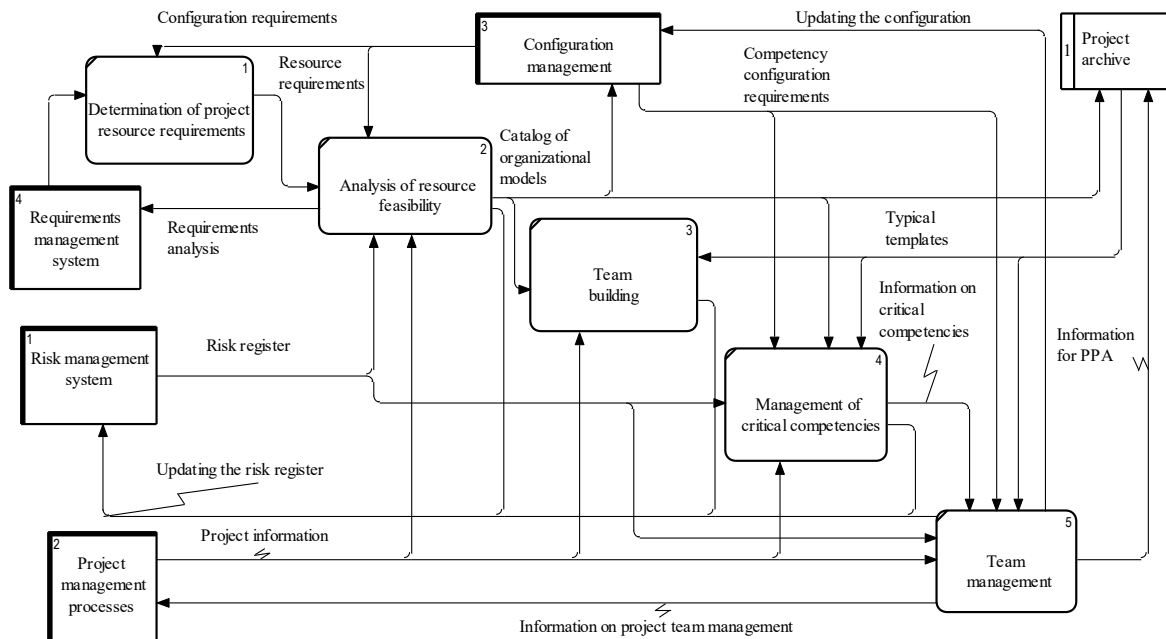
The study aims to develop programming tool for Agile transformation of human resource management processes in a multi-project environment and provide recommendations for its implementation in healthcare institutions' activities.

### **3. Methodical Research Materials**

Based on the conducted analysis of the informational needs of medical institutions, the components of information support for Agile transformation projects have been identified:

- Project documentation;
- Portfolio documentation;
- Regulatory documentation;
- Managerial Information;
- Developed process regulations;
- Standard templates;
- Reports;
- Patient databases;
- Medical information systems;
- Surveys on the quality of medical services;
- Project recommendations, etc.

Since effective information management is possible by integrating Agile transformation project management processes, a model for information support of human resource management processes in transformation projects has been constructed in DFD notation (Figure 1).



**Figure 1:** Model of Information Support for Human Resource Management Processes in Transformation Projects

The inputs to the information management processes are:

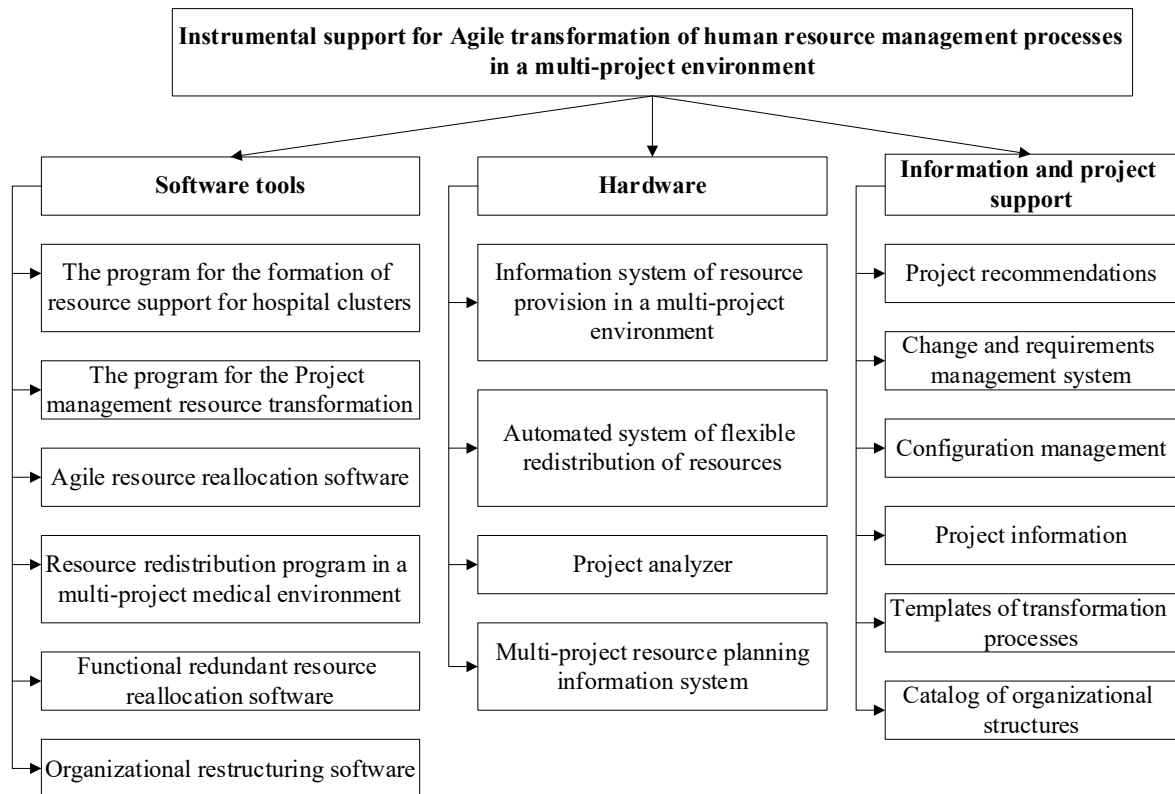
- Outputs of project management processes;
- Outputs of configuration management processes;
- Elements of the requirements management system;
- Elements of risk management systems;
- Elements of the document management system;
- Regulatory documentation from the Ministry of Health, WHO, etc.

The process's outputs include developed project recommendations, project templates, catalogs of organizational structures, updates in configuration management systems, and change and requirements management systems.

To automate the methods proposed in [14-17], a software and hardware complex has been developed, the application of which allows solving the following tasks:

- Formation of functionally redundant teams;
- Formation of adaptive teams;
- Formation of teams considering the degree of involvement;
- Formation of teams considering the level of resilience;
- Formation of teams with fixed appointments/exclusions of performers (directive resource allocation);
- Formation of teams with prohibitions on role combination (prohibition of function combination, participation in multiple teams, working in different medical institutions);
- Redistribution of resources when changing operating conditions both between teams and between medical institutions;
- Management of critical competencies.

Figure 2 shows the components of the tool that support the Agile transformation of human resource management processes in a multi-project environment.



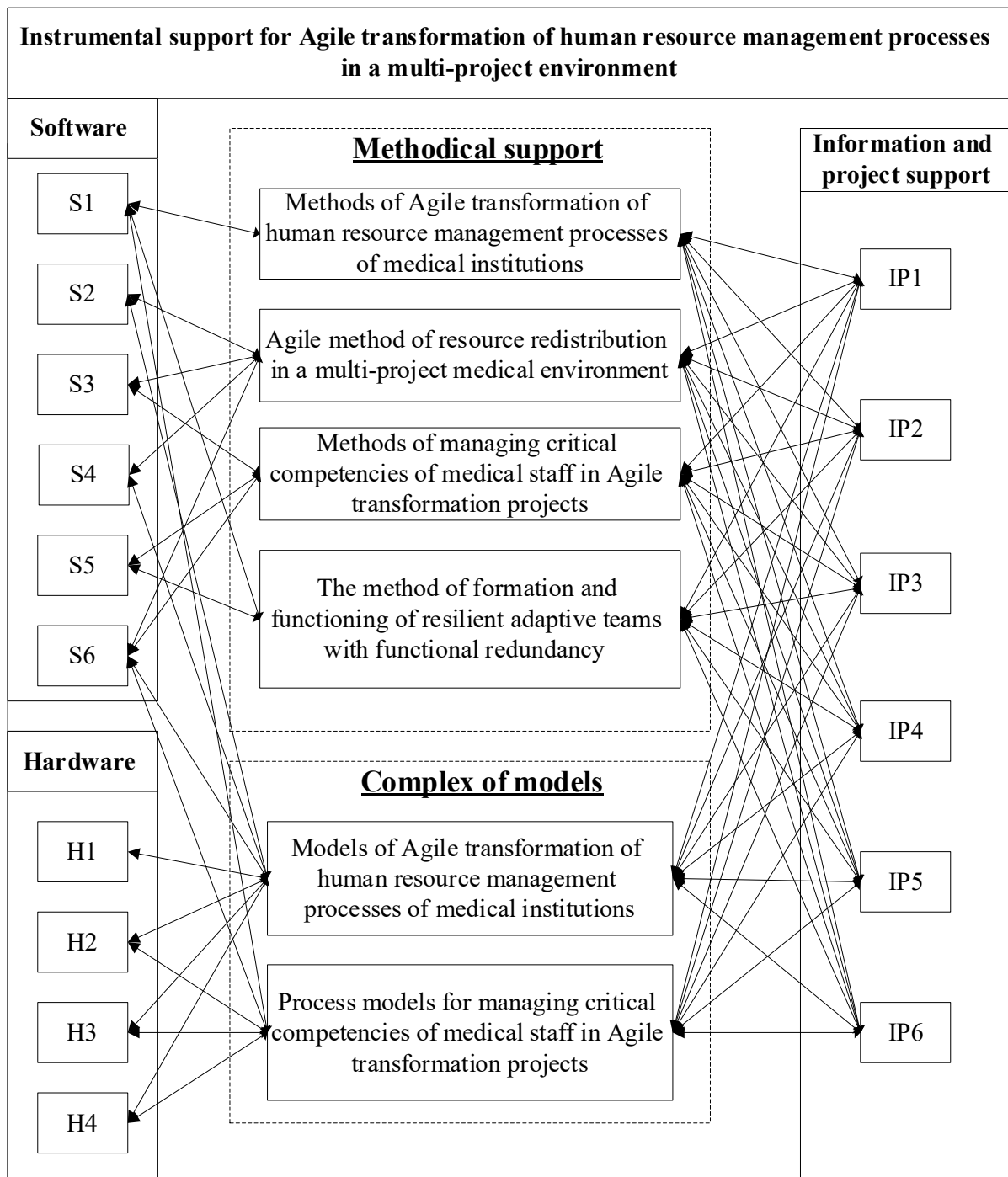
**Figure 2:** Components of Programming Tool

The model of programming tool for Agile transformation of human resource management processes in a multi-project environment is shown in Figure 3.

The comprehensive application of the developed software (The program for the formation of resource support for hospital clusters (S1), The program for Project management resource transformation (S2), Agile resource reallocation software (S3), Resource redistribution program in a multi-project medical environment (S4), Functional redundant resource reallocation software (S5), Organizational restructuring software (S6)), hardware (Information system of resource provision in a multi-project environment (H1), Automated system of flexible redistribution of resources (H2), Project analyzer (H3), Multi-project resource planning information system (H4)), and Information and project support (Project recommendations (IP1), Change and requirements management system (IP2), Configuration management (IP3), Project information (IP4), Templates of transformation processes (IP5), Catalog of organizational structures (IP6)) allows for solving tasks related to resource distribution, team formation, and critical competency management.

The proposed software was tested on case examples. The application of resource feasibility analysis and modified competency matrix analysis at the initial stage allows for increasing the dimensions of the considered matrices by 1.3-1.7 times, depending on the type of matrix and input resource requirements.

A comparative analysis of the proposed software with other HRM showed that, unlike the existing systems Hurma System, PeopleForce, Cleverstaff, HRPlus software, Coloris HRM platform, which are aimed at solving the problems of personnel development and team management, and do not consider the issue of team composition taking into account functional and resource limitations, the developed complex allows you to form teams with certain limitations: availability of functional redundancy; adaptability and resilience; opportunities to redistribute resources; fixed destination; combination or prohibition of combination.



**Figure 3:** Model of Programming Tool for Agile Transformation of Human Resource Management Processes in a Multi-Project Environment

#### 4. Conclusions

Approaches to creating medical information and resource management systems in healthcare institutions have been analyzed. The components of information support for Agile transformation projects have been identified, and a model for information support of human resource management processes in transformation projects has been developed.

The developed programming tool integrates software, hardware, and information-project support. A software and hardware complex for managing human resources in medical institutions has been created, which implements methods for forming teams/units in medical institutions, considering defined constraints and redistributing resources.

The application of software for forming a catalogue of organizational models will allow for generating team configuration options, considering adaptive capabilities, which enhances the speed of decision-making regarding resource reallocation.

The effectiveness of the proposed tool support depends on the input data. Comprehensive application of the tool support allows for improved efficiency in human resource management, increasing team characteristic values by 11-42% and reducing the number of project team members through functional redundancy by 7-34%.

A promising direction is integrating the developed software complex with the information systems of medical institutions.

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