

# Innovative Project Management Tool with Azure Services

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**Abstract** –This article introduces an innovative project management tool developed using Visual Studio, C#, and Azure Optical Character Recognition (OCR) service. The tool digitizes scanned text, automatically generating ticket structures and tasks. It facilitates efficient project planning, user roles, task assignment, progress tracking, and customized reporting. Integration with Azure OCR enables automatic conversion of documents to digital formats. The tool streamlines task integration using modern software technologies. This tool empowers users to collaborate, set objectives, and efficiently manage projects.

**Keywords**-component; Cognitive Services; Azure OCR; Project Management Tool; Task; Ticket; Algorithm

## I. COMPARATIVE STUDY OF PROJECT MANAGEMENT TOOLS

In today's fast-paced business environment, effective project management plays an important role in ensuring the success of any organization. However, managing projects efficiently and ensuring seamless collaboration among team members can be a complex and time-consuming task. To address these challenges, we propose an innovative project management tool that leverages the power of Visual Studio, C# programming language, and the Azure OCR services. This tool aims to improve the project management process by digitizing scanned text and automatically generating ticket structures and associated tasks. By offering a comprehensive solution for project planning and monitoring, our software instrument enables teams to streamline their workflows and achieve greater efficiency. Next, a comparative study will explore the functionalities, advantages, and disadvantages of seven popular project management tools: Jira, Trello, and Microsoft Project. While these tools offer various features and capabilities, it is essential to identify their limitations to make informed decisions when choosing the most suitable tool for project management needs.

One of the most popular tools is Jira<sup>®</sup>, developed by Atlassian<sup>®</sup>. It is widely recognized for its robust issue-tracking and project-management capabilities. It provides a flexible platform that allows teams to create and manage tasks, track progress, and collaborate effectively [1]. Jira's key features include task assignment, workflow management, and customizable dashboards for real-time project monitoring. Additionally, Jira offers extensive integration options with other Atlassian tools like Confluence and

Bitbucket. Paper [2] presents an industrial case study using Jira and third-party plugins for efficient requirements management, traceability, and systems engineering processes in transit systems. The study discusses the methods, technologies, and results obtained in terms of traceability metrics.

Project management tools, such as Jira, have become increasingly prevalent in various systems, including voice assistants, spam filters, and Service Desk ticket processing systems [3]. One particular study focuses on the intelligent automation of request processing for wireless network equipment using a subsystem integrated with Jira via a specially developed API [3]. In the context of agile project management, efficient handling of service requests is crucial, as exemplified by the case of Walmart using Jira for monitoring and assigning tickets [4]. The introduction of a bot for automated ticket assignment has proven successful in reducing disparity and decreasing average ticket resolution time, benefiting both reporters and engineers [4]. The bot also facilitates timely tracking by sending reminders and status updates through various communication platforms [4].

Another research area explores the mining of software repositories for valuable information, including the analysis of sentiments expressed in issue comments within Jira repositories [5]. By applying a supervised classification model, the study reveals that comments on unresolved issues tend to express less positive and more negative sentiments compared to comments on resolved issues [5]. Furthermore, the study uncovers interesting relationships between sentiments and factors such as issue resolution types and the time/day of the week when comments were written [5].

In the context of software education, an agile game was designed to help computer science students understand agile project management and work with software tools [6]. The game, available in both board and computer versions, provides a practical interpretation of agile approaches, with a focus on the Scrum framework [6]. Through this interactive learning experience, students gain a deeper understanding of agile principles within a 90-minute timeframe [6]. In terms of research resources, a dataset of 16 public Jira repositories with millions of issues, changes, comments, and issue links has been made available [7]. This dataset offers numerous

opportunities for investigating issue evolution, linking, cross-project analysis, and cross-tool analysis when combined with other well-studied issue-tracking system datasets [7].

Trello is a popular Kanban-style project management tool known for its simplicity and intuitive interface. It utilizes boards, lists, and cards to represent tasks and facilitate task management. Trello focuses on visual organization and allows teams to easily track progress, assign tasks, and collaborate seamlessly. Recent research has focused on the use of Trello as a versatile tool for collaboration and project management in educational settings [8]. In a study conducted with high school students, project-based learning facilitated active participation, group work, and self-learning, while the technical manager played a guiding role [9]. Another study involving engineering students found that Trello effectively encouraged collaboration and facilitated direct feedback between students and teachers [10]. In the context of distant distributed learning courses, Trello was analyzed to understand team dynamics and develop interventions for better collaboration among geographically dispersed student teams [11]. In the corporate sector, Unicom Indonesia adopted Trello to increase employee performance and meet project management needs, as other tools did not suffice [12]. Additionally, an assessment of collaborative tools revealed that Trello offers strong support for collaboration and awareness aspects, making it a favorable choice for various business projects [13]. These studies collectively highlight Trello's versatility, effectiveness in facilitating collaboration, and potential for improving project management processes in educational and corporate environments.

Microsoft Project is a comprehensive project management tool offering a wide range of planning, scheduling, and resource management features. It enables users to create Gantt charts, track dependencies, allocate resources, and generate detailed reports. While Microsoft Project is widely used, it has limitations in resource-constrained project scheduling compared to other software packages [14]. Existing project management systems, including Redmine, Microsoft Project, and Jira, lack specific features such as generating project groups, tracking student progress, and monitoring client meetings [15]. To address these shortcomings, a research study proposes a project management system with advanced capabilities like generating project groups based on student skills, utilizing project repositories for tracking progress, and incorporating automatic peer reviews and client portals [15]. Additionally, a Genetic Algorithms technique has been developed to optimize project schedules created in Microsoft Project, offering an efficient solution for project management optimization [16]. These studies collectively highlight the challenges and advancements in project management systems, with Trello emerging as a versatile tool that addresses specific requirements and offers potential solutions to overcome limitations in traditional project management software.

Despite the numerous advantages offered by project management tools like Jira, Trello, and

Microsoft Project, there are certain limitations that need to be considered. For instance, while Jira excels in issue tracking and project management, research indicates the need for improvements in sentiment analysis of issue comments and handling service requests efficiently. Similarly, although Trello is praised for its simplicity and versatility, there is a demand for enhanced features such as generating project groups and monitoring client meetings. Moreover, while Microsoft Project provides comprehensive planning and scheduling capabilities, it may fall short in resource-constrained project scheduling compared to other software packages. These limitations underscore the importance of developing a new project management tool with artificial facilities integrated.

## II. THE PROPOSED APPLICATION

The innovative project management tool proposed in this paper was developed using Visual Studio, C#, and Azure OCR services. The main objective of the application aims to revolutionize project planning and monitoring. By digitizing scanned text and automatically generating ticket structures and associated tasks, the solution offers an efficient way to streamline workflows and enhance collaboration among team members. With user-friendly features like role-based access, task assignment, progress tracking, and customizable reports, the application empowers teams to set goals, communicate effectively, and collaborate seamlessly, ultimately enhancing project success. Next, the application will be referred to as Modern Project Management Tool (MPMT).

The MPMT has the following modules:

- **User Module.** This module implements different roles for accessing other modules. The roles implemented include administrator, project manager, programmer, and tester. The functionalities of this module include standard features such as login, logout, and forget the password section;
- **Statistics Module:** The application incorporates a dedicated statistics module that provides valuable insights into project progress. Currently, the module displays the number of tickets initiated and completed each month throughout the current year. This feature allows project managers to track project milestones, identify trends, and make data-driven decisions to optimize project performance;
- **Ticket Module.** In this module, the project manager can add and edit tickets using a dual approach:
  - a. **Manual Ticket Creation.** The project manager can add a ticket by manually completing the required fields;
  - b. **Image Scanning.** Tickets can also be added by scanning an image, which contains a sheet with the main ideas sketched. After scanning, the Azure OCR service extracts the text and automatically populates the form fields.

Each ticket benefits from the standard features of a task planning platform, including:

- Adding tasks within the ticket. This can be done using both the traditional method of manual entry and by utilizing the intelligent service;
- Assigning responsible individuals to tasks;
- Changing task status;
- Sending notification messages to task owners one day before the integration planning starts and one day before the deadline;
- Displaying the number of days remaining until the scheduled completion of the task;
- Integrating a sub-module for information and detail exchange within the ticket, in the form of a chat;
- PDF Ticket Export: The application includes a feature that enables users to export tickets in PDF format for printing purposes. The exported PDF contains all the associated details and information related to the ticket, ensuring comprehensive documentation and easy accessibility.

By incorporating these modules, the MPMT provides a comprehensive solution for project planning and monitoring. The user module ensures secure access and role-based restrictions, while the ticket module streamlines the process of adding, editing, and managing tickets. The integration of the OCR service allows for efficient ticket creation by automatically extracting text from scanned images. The task management features within each ticket enable effective assignment, tracking, and communication among team members. With these functionalities, the MPMT aims to enhance project efficiency, collaboration, and overall success.

Figure 1 presents the block diagram for adding a ticket in the classic version. By using this method, the user has to manually fill the required fields. In this figure, it can be seen that initially, the algorithm collects the necessary input from the user, such as ticket title, description, start date, stop date, and status. Next, it validates the input data to ensure it meets the required criteria. If the input is valid, proceed to the next step. Otherwise, display an error message and return to the previous step. If the input is valid, the algorithm creates a new Ticket object with the collected data and saves the new Ticket object in the database. If the ticket creation is successful, redirect the user to the ticket list or a success page. Otherwise, display an error message. If the user wants to complete the process by using Microsoft Azure Cognitive Services - Forms Recognizer, which integrates the OCR technology built into Azure to extract text from PDF documents and images, Process *p1* will be completed. Figure 2 presents the block diagram for adding a ticket using Microsoft Azure Cognitive Services - Forms Recognizer. The input for the block diagram is the image and the output is represented by the text associated with each field.

Figure 2 provides a detailed overview of the process *p1* highlighted in Figure 1.

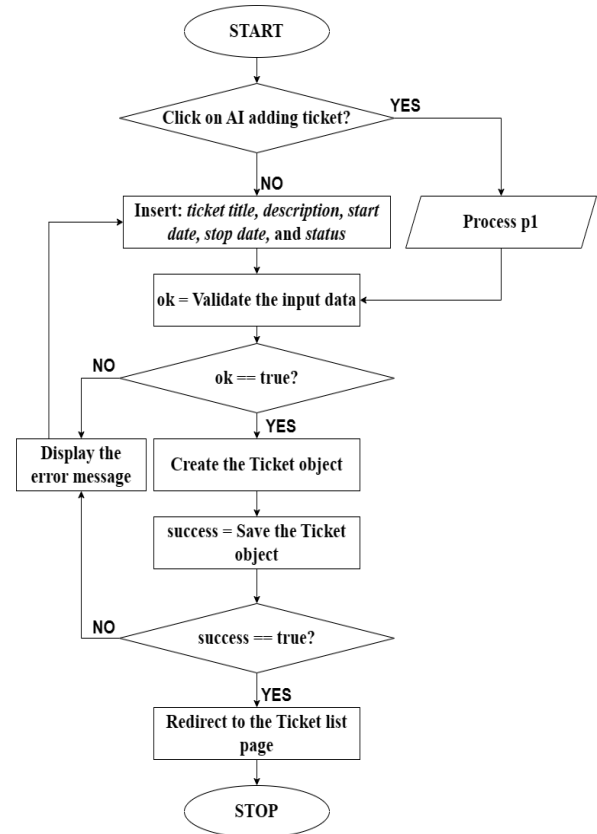


Figure 1. Block diagram of the MPMT – Ticket algorithm – classic version

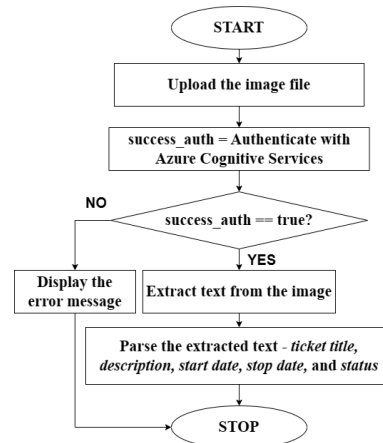


Figure 2. Block diagram of the MPMT – Ticket algorithm – Microsoft Azure Cognitive Services version

In Figure 2, the user will upload the image file to a temporary storage location. Next, the algorithm will try to authenticate with the Azure Cognitive Services using the endpoint and key. If the authentication fails for different reasons, such as an invalid or expired subscription key, incorrect endpoint, network connectivity issues, regional restrictions, service downtime, or maintenance, the algorithm returns the corresponding code for the error. Otherwise, the Azure OCR service will extract text from the uploaded image file. Next, the algorithm will parse the extracted text to retrieve the ticket title, description, start date, stop

date, and status. Finally, the process will continue using the steps provided in Figure 1.

The process of adding tasks follows similar steps to adding tickets, encompassing the stages of capturing task details, assigning task attributes, and setting task status. However, tasks differ in that they are also associated with specific individuals responsible for their implementation. These assigned individuals are accountable for carrying out the tasks and ensuring their completion within the specified timeframe. By assigning tasks to individuals, the workflow becomes more organized and facilitates effective task management and collaboration within the project.

### III. THE MPMT INTEGRATION

The MPMT algorithm was integrated using the following technologies:

- Visual Studio development environment because it provides a comprehensive and user-friendly development environment, offering various tools and features that facilitate the integration process;
- C# programming language with ASP.NET MVC 5 that offers a structured approach to Web development;
- Microsoft databases with T-SQL dialect and Entity Framework. Using this framework simplifies the integration of databases into the project, offering an object-relational mapping approach;
- Razor, jQuery, and AJAX for dynamic Web pages. Razor, a server-side markup language, allows seamless integration of C# code with HTML, enabling the creation of dynamic and interactive Web pages. jQuery and AJAX provide powerful client-side scripting capabilities, enhancing user experience and enabling asynchronous data retrieval;
- Bootstrap for design implementation. This framework is a popular CSS framework that offers a responsive and mobile-first design approach. It provides a wide range of pre-built components and styles, simplifying the implementation of a visually appealing and user-friendly interface;
- Azure Cognitive Services for optical character recognition (OCR) services. By leveraging Azure Cognitive Services, the application can extract text from image files, enabling automated processing and analysis of scanned documents;
- PDFSharp for generating reports in PDF format. By utilizing PDFSharp, the application can dynamically create PDF reports, providing a convenient way to present and share information.

These technologies were used due to their proven capabilities, extensive community support, and compatibility with the project requirements. Together, they enable the seamless integration of the algorithm

into a Web application, ensuring efficient development, robust data management, dynamic user interface, and enhanced document processing capabilities.

In the following section, we will present the achievements accomplished through the implementation of the proposed MPMT algorithm, with a series of screenshots highlighting these achievements. This demonstration aims to provide a visual representation of the successful integration and utilization of the algorithm within the application. The screenshots will showcase key features, functionalities, and outcomes obtained during the implementation process, offering concrete evidence of the algorithm's effectiveness and impact. The inclusion of these visual illustrations serves to enhance the comprehensibility and clarity of the presented results, enabling readers to gain a deeper understanding of the practical implications and benefits of the implemented algorithm.

### IV. THE MPMT RESULTS

The application is structured into three modules. Each module has been designed to ensure simplicity and intuitiveness in the application's usage. The modular approach allows for a clear separation of functionalities, facilitating ease of navigation and user-friendly interaction. By dividing the application into distinct modules, users can easily comprehend and navigate through the different sections, enhancing their overall experience. The emphasis on simplicity and intuitiveness in the design of each module aims to provide an intuitive and seamless user interface, promoting efficiency and a smooth user experience throughout the application.

The MPMT application features a user-friendly graphical interface that provides easy access to the most frequently accessed pages. Figure 3 showcases a screenshot of the main interface, which offers quick access to view all tickets, as well as tickets with the statuses "in progress," "Waiting," and "In tests" that the authenticated user is assigned to solve. If the user has a manager role, they can swiftly access the tickets they have added to monitor progress effectively. The user interface design prioritizes convenience and efficiency, enabling users to navigate and interact with the application effortlessly. With intuitive navigation and prominently displayed ticket categories, users can efficiently manage their tasks and monitor project progress, enhancing overall productivity and user satisfaction.

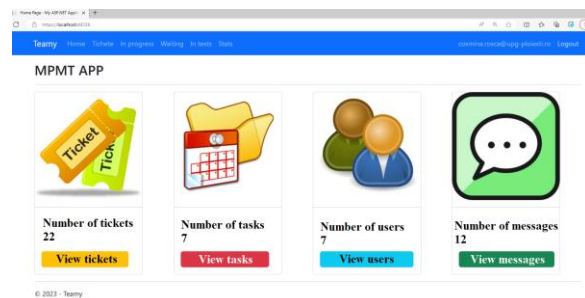


Figure 3. Screenshot of the MPMT main interface

The user module has the following features:

- Different roles (administrator, project manager, programmer, tester), ensuring restricted access to application modules based on each user's role;
- Role-based access control to ensure data security and privacy, allowing administrators to define and manage user permissions within the application.

The stats module has the following feature:

- Visualizes the number of tickets started and completed each month of the current year, providing insights into project progress over time;
- Customizable reports with user-friendly features, enabling users to generate comprehensive reports tailored to their specific project management needs.

Figure 4 presents an example of statistics where four tickets had a start date in June and two had a completion date, while two tickets had a start date in July and four had a completion date. Additionally, Figure 4 shows the responsive nature of the application, with the collapsed menu. The responsive design ensures that the application adapts seamlessly to different screen sizes and devices, providing optimal user experience and accessibility. The collapsed menu conserves screen space and allows users to navigate efficiently, even on smaller screens, without compromising functionality. The responsive design aspect enhances the versatility and usability of the application, enabling users to access and interact with the system effectively across various devices.

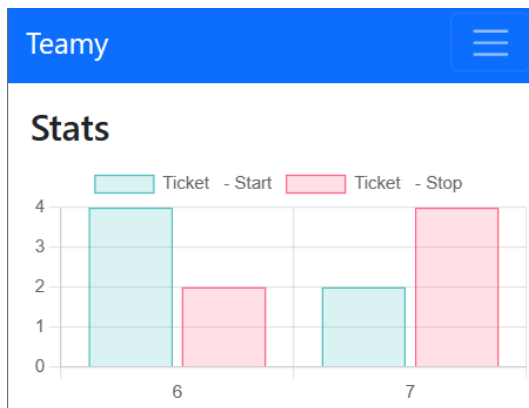


Figure 4. The stats of the MPMT

The module of Tickets and Tasks has the following features:

- Integration with Azure OCR services for seamless scanning and automatic text extraction from images, allowing quick addition of tickets by simply scanning sketches or notes;
- Exporting tickets to PDF format, providing the ability to print or easily share all ticket details in a user-friendly format;

- Integration of a chat system within each ticket, allowing team members to communicate and collaborate directly within the context of that ticket;
- Automatic notification feature to send reminders to task assignees one day before the scheduled integration and one day before the deadline.

Figure 5 shows an example of handwritten text that is transcribed into digital text using OCR service as a ticket within the MPMT application:

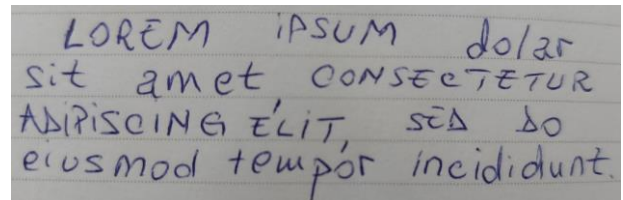


Figure 5. Handwritten text example

Figure 6 presents a screenshot that highlights all the sections of this module:

Marker 1 in Figure 6 corresponds to the ticket details.

Marker 2 emphasizes the associated tasks for the ticket.

Marker 3 illustrates the remaining time until the deadline for task implementation;

Figure 7 highlights the communication feature within a ticket, maintaining a history of discussions and providing details on the respective subject.

**Details**

**Ticket title**  
LOREM IPSUM

**Ticket description**  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt .

**Start Ticket**  
07.07.2023 12:20:00

**Stop Ticket**  
17.07.2023 12:23:00

**Status**  
In progress

[Add task](#)      **Change Status:** In progress | In tests | Waiting |

Task	Created by	Start	Stop	Status
At	cosmina.rosca@upg-	07.07.2023	13.07.2023	In
consectetur	ploiesti.ro	12:13:00	12:18:00	progress
lorem				
donec				

Consequat nisl vel pretium lectus. Sem et tortor consequat id porta. Ut eu sem integer vitae justo. Fringilla phasellus faucibus scelerisque eleifend donec. Turpis egestas maecenas pharetra convallis posuere morbi leo urna.

**Assigned to:** cosmina3@yahoo.com

**Change status:** In progress | In tests | Waiting |

50% time elapsed
50% time left

Figure 6. The Tickets and Tasks module of the MPMT

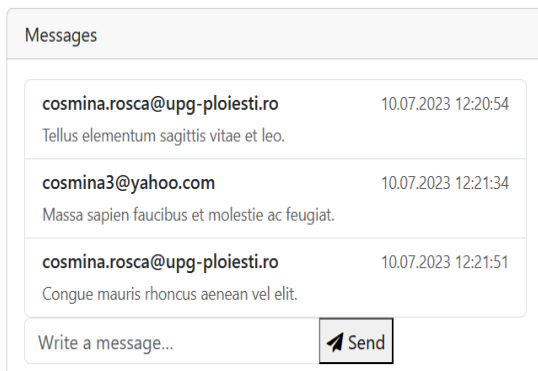


Figure 7. Communication feature within a ticket

The MPMT application describes an innovative and efficient solution for project management and monitoring, offering advanced functionalities, a user-friendly interface, and the integration of modern technologies. Through the utilization of the proposed algorithm and its implementation within the application, we have achieved remarkable results, facilitating project planning, collaboration, and progress tracking. With the help of relevant screenshots and meaningful statistics, we have demonstrated the effectiveness and usefulness of our application in the context of project management. Therefore, we are confident that our application brings added value and can significantly contribute to the success and efficiency of project teams.

## CONCLUSIONS

In this paper, three project planning tools, namely Jira, Trello, and Microsoft Project, have been analyzed. Subsequently, a series of improvements have been proposed through the integration of new functionalities specific to artificial intelligence. The platform designed and implemented to achieve this goal utilized Azure Cognitive Services and demonstrated the effectiveness of its utilization. In the future, the platform will incorporate additional artificial intelligence features, such as Voice-to-Text conversion, along with standard functionalities such as advanced search with filtering options, enabling users to quickly locate specific tickets based on various criteria such as status, assignee, or priority and seamless integration with other popular collaboration tools such as Confluence and Bitbucket, facilitating a smooth workflow and enhanced collaboration across multiple platforms.

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