



FastPro RESOURCE OPTIMIZATION AND SCHEDULING WEB APP

BY: DUNCAN MUNENE MURIUKI

ADMISSION: 21/04706

BSD 3106 FINAL PROJECT

A PROJECT PROPOSAL SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE IN SOFTWARE
DEVELOPMENT IN THE SCHOOL OF TECHNOLOGY AT KCA UNIVERSITY

SEPTEMBER 2024

DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

Student Name: MURIUKI DUNCAN MUNENE Reg No. 21/04706

Sign: _____ Date: _____

I do hereby confirm that I have examined the project proposal of

: _____

And have certified that all revisions that were recommended for the student have been adequately addressed.

Sign: _____ Date: _____

Mr. _____

Project Supervisor.

ABSTRACT

In industries that involve a lot of resource planning and concern with time bound projects, resource and schedule management is very important. Resource Scheduling and Optimization Web Application is a resource-friendly solution for managing project time and resources to schedule the available resources with their desired tasks according to the priority of projects with flexible features and constant updates. Users of this system will be able to locate itself on the registered list and will be in a position to have real-time information like availability of resources, progress of the project, and even tendencies towards production bottleneck hence making better decisions in the project.

In contrast, this web application is based on sophisticated algorithms of project and resource management that replace conventional genres and tools of manual time and cost estimations with the desired scalability. It makes the feasible resource, which makes it possible to allocate resources in various places and assess the possibility of postponement while offering the changes needed.

The Resource Scheduling and Optimization Web Application works as a user-friendly tool that optimizes scheduling by providing both suggestions for specific actions and regular updates on existing working processes, thereby significantly improving the overall project management. This will assist industries to fully exploit their resources to achieve organizational goals, minimize costs and effectively complete projects on time.

ACKNOWLEDGEMENT

I would greatly thank God for the strength and grace he has given me to reach this far with my studies. Secondly, I would appreciate my parents for the effort, prayers, guidance and courage they have always had towards me, and to my supervisor, Winfred Okong'o who patiently provided the guidance and support that enabled me to complete this project, her guidance has indeed enriched the results of this study.

Contents

DECLARATION	2
ABSTRACT.....	3
ACKNOWLEDGEMENT.....	3
CHAPTER ONE: INTRODUCTION.....	4
1.1 Introduction.....	4
1.2 Background study	5
1.3 Problem Statement.....	5

1.4 Proposed solution.....	6
1.5 Aim and Objectives.....	6
1.5.1 Objectives	6
1.6 Significant the Study	6
1.7 Scope of the study	7
CHAPTER TWO: LITERATURE REVIEW	7
2.1 Introduction.....	7
2.2 Resource Management	7
CHAPTER THREE: METHODOLOGY	8
3.1 Introduction.....	8
3.2 Research Methodology	8
3.2.1 Research Design.....	9
3.2.2 Data Collection Methods	9
3.3 Development Process.....	9
3.3.1 Agile Methodology	9
3.3. 2. Data Analysis Techniques.....	10
3.3. 3. Evaluation and Validation.....	10
3.4 System development environment	10
3.5 System testing	11
3.6 RISKS AND MITIGATION.....	11
APPENDICES	11
Appendix I Budget:.....	11
Appendix II: Gantt Chart	12
CONCLUSION.....	13
REFERENCES.....	13

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Especially in the context of the present-day world where competition is rise and business operates at higher speeds, resource management is of great essence to ensure completion of business projects across industries. Resource scheduling and optimization play a significant role in managing resources in organizations, sustaining costs as well as achieving set project delivery times. However, the traditional approaches of planning such as manual entry of data, and use of fixed tools in planning are unable to cater for complexities and dynamics of project today.

The Resource Scheduling and Optimization Web Application will help to address these challenges by containing a solution that eliminates the manual approach to the scheduling process and improves on the usage of resources. Embedded in the algorithms and the tracking capability that collects resource

data instantaneously in real world organizations, the purpose of this application is the optimization of the resources on use, minimization of resource overcommitment and reduction in the incidence of resource delays.

This approach focuses on an understanding of the enhancement of the existing system required for the allocation of resources in relation to the multiple project environment to ensure efficient expenditure of resources. This is effective because the proposed solution is a single location where the users can view and track different project resources, time schedules and reply to changes in the project specifications effectively. Using this context, the objective of this project is to discuss the idea and architecture of an optimal, easy-to-use web-based tool for planning work and managing potential risks associated with projects.

The Importance of this study is that it can change the way business resources and business time commitments are planned. By using the proposed technology, the Resource Scheduling and Optimization Web Application will provide a practical way of managing and mitigating on resource constraints to get better project outcome and organizational performance.

1.2 Background study

Resource management is one of the key plans of a project that entails a process of organizing and identifying the right resources needed for the project. However, traditionally, companies have used conventional planning methodologies and organizational instruments at their fingertips, such as excel to schedule the resources and schedule the projects. As the scale of operations and number of related activities increases these methods are not effective because they lead to overworking and overusing resources, delays in operations, and higher operational expenses.

The culture of efficiency has however especially been evident in recent years whereby organizations feel the heat in terms of usage of resources to remain relevant in the market. This means that the introduction of digital solutions to manage resources scheduling is now more crucial than before. A Resource Scheduling and Optimization Web Application entails a platform that offer businesses an innovative way of organizing resource scheduling to make intelligent forecasts of areas of congestion ahead of time for better decision making.

This web application is designed to fill in the existing deficiencies in today's resource management systems by providing the project managers with the ability to work with multiple projects and teams at once, prepare forecasts of resource needs, and align the schedule. It also includes forecasting models that examine past data to identify resource deployment patterns to enable projects to be completed within set time and cost.

The proposed system also has the advantage of enabling more effective communication between teams and stakeholders as well as the ability of responding to changes timelier. When resources are made more visible across the different projects and the resources are automated, the wastage that results from the human errors and the negative effects that they bring are greatly eliminated.

1.3 Problem Statement

Inefficient resource management and scheduling often lead to project delays, overutilization of some resources, and underutilization of others. The absence of a unified system for resource management and procurement can result in resource wastage, extra costs, and delayed product delivery. Limited real-time visibility into resource capabilities and availability can hinder effective decision-making. Additionally, the inability to adapt to changes in project scope or resource availability can create challenges in meeting project deadlines and objectives. Finally, ineffective collaboration and

communication among team members and stakeholders can hinder project progress and increase the risk of misunderstandings and errors.

1.4 Proposed solution

Data Upload and Integration allow users to import project and resource data in Excel format, providing a seamless transition from existing systems. Real-time Data Entry enable users to input data directly into the system, allowing for real-time updates and adjustments to schedules and resource allocations. Resource Optimization Algorithms Implement algorithms that can analyse project requirements, resource availability, and constraints to optimize resource allocation and scheduling.

Centralized Platform provide a single, integrated platform for managing all aspects of resource management and procurement, reducing the risk of errors and inefficiencies.

Real-time Dashboard: Develop a dashboard that provides project managers with real-time insights into resource utilization, availability, and potential bottlenecks.

Dynamic Scheduling: Design the system to be flexible and adaptable, allowing for easy adjustments to schedules and resource allocations in response to changes in project requirements or resource availability.

Collaboration and Communication Tools: Incorporate features such as task comments, notifications, and real-time updates to facilitate effective communication and collaboration among team members and stakeholders

1.5 Aim and Objectives

The main aim of the project is to design and deploy a Resource Scheduling and Optimization Web Application that can streamline resource management and project scheduling for organizations.

1.5.1 Objectives

- Analyzing current resource management practices to identify challenges and requirements for optimization.
- Designing and developing a web-based resource management system that allows users to upload data via Excel files or input information directly, and optimizes resource allocation based on project needs and real-time data.
- Testing and evaluating the system's performance to ensure it meets the specified requirements for scheduling efficiency, resource optimization, and ease of use.
- Providing a real-time dashboard that visualizes project progress, resource utilization, and potential bottlenecks, aiding in data-driven decision-making.
- Integrating collaboration and communication tools to ensure seamless coordination among team members and stakeholders during the project lifecycle.

1.6 Significant the Study

The development of the Resource Scheduling and Optimization Web Application can lead to several significant outcomes, including enhanced efficiency, improved resource utilization, data-driven decision-making, scalability, enhanced collaboration, and a competitive advantage. By automating scheduling, optimizing resource allocation, providing real-time data, and facilitating collaboration, this application can help organizations streamline their project management processes and achieve better results. Additionally, the study contributes to the growing body of research on digital tools for project and resource management.

1.7 Scope of the study

The Resource Scheduling and Optimization Web Application focuses on the needs of project managers and resource coordinators. Key features include Excel file import/export, real-time data input, scheduling, graphical resource load visualization, and communication channels. Research questions could explore technology choices, optimization techniques, interface design, data requirements, testing criteria, industry constraints, and future research directions.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on resource scheduling and optimization, focusing on conceptual overviews, research techniques, and similar systems used in the process of designing the Resource Scheduling and Optimization Web Application. This paper has discussed the findings of the existing literature and has presented a set of problems that may be faced by resource managers, as well as the solutions that are available in this application.

2.2 Resource Management

A concept that has something to do with effective and efficient utilization of resources in an organization with an aim of accessing them in future as when they are required. According to Kerzner (2017), resource management involves the effective allocation, allocation and application of resources that would include people, money and technologies to meet the identified aims of a project. Due to the fact that modern projects are characterized by higher levels of complexity the technique of resources management by using traditional tools take much time.

Scheduling constitutes part of the project schedule as the timing and usage of resources are concerned. According to Lock (2020), a schedule should foster communication within a project's team, define the goals of a project, and map out how different tasks would be accomplished. These two scheduling techniques that help in the determination of the string of activities which take the longest time in a project and therefore forms the project duration are called CPM and PERT.

While technology has improved a lot in the recent past, there are several issues that organizations experience while scheduling their resources. According to Morris and Pinto (2010), there are familiar problems manifested in the overbooking of resources, their underutilization, as well as the absence of insight into resource capacities. They could possibly give outcomes such as getting more time to do the work, higher costs as well as a reduction in the pace at which the project is completed. Therefore, it is important to stress here that the ascendance of one certain core system that helps to provide updated data and to manage resources within these threats is utterly important.

Resource management is the efficient use of organisational assets with the intention of attaining an optimal mix that avoids unnecessary resource depletion. In their paper, Chiu and Lin (2017) present an overview of the optimization methods, tools, based on linear programming, genetic algebra, and heuristics. Still, such approaches help the project manager to determine if it is possible and how this resource can be used optimally when some conditions cross the project's time, resources, and requirements. Resource scheduling applications incorporate algorithms to enable changes and make good decisions on the resources required.

there are already several tools available that provide the ability to manage resources at different levels of granularity but many of them have limited functionality to provide all of the necessary aspects required for optimizing the resources. However, there are general planning instruments on the market such as Microsoft Project or Asana designed to help in the process of scheduling, but frequently they do not carry sufficient flexibility or direct database connection to fit the details. According to a survey done by Gartner in 2021 for 313 organizations, there is a new and urgent demand for integration systems that include predictive analytics and automation of resource management.

The advances in technology foremost of which is cloud computing and mobile technology has influenced strongly the way resources are managed in organizations. As such, closely resembled to the perspective of Agarwal and Dhar (2014), it affirms that through cloud solutions, organisations are able improve on obtaining the capacity of real time access to information from any geographical location that promotes collaboration and decision making. Even more, resource management applications with AI & ML added to the mix can help to predict resource requirements based on data learned from past use.

New trends suggest a flowing further towards Real Time Adaptive Intelligent Scheduling of resources. In the authors' opinion as stated in Fischer and Gendron (2020), measures such as AI analytics will assist in the preparation of the scale and resource movement. Other productivity tools such as applications that deliver current information and instant messaging applications will also help the team cooperation.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter outlines the methodologies adopted for the development of the Resource Scheduling and Optimization Web Application. It will look at the background research, sources of data, and processes to construct a well-organized structure to align the application to its objectives and install mechanisms for automatic resource management and optimized scheduling. Specific areas to be covered in the chapter include system development, user needs, selection of technologies, optimization algorithms, testing procedures, and application effectiveness as a whole. A good research design ensures that an application developed will be complete and efficient to be utilized by an organization for any resource management issue.

3.2 Research Methodology

The research methodology is an approach that is systematic in nature that will be used to define and develop the application of the Resource Scheduling and Optimization Web Application efficiently and also to test the application of the system.

3.2.1 Research Design

The adopted research design in this study is the mixed research design, which denotes the adoption of both qualitative and quantitative research methods in the one research study. This makes it easy to understand the user needs, the problems faced when obtaining resources, meanwhile achieving the statistical verification of the application.

3.2.2 Data Collection Methods

There exist questionnaires, interviews, and focus groups to assess the would-be consumers' understanding of their needs and expectations. In the days to follow, any contributions given will focus on integrating agents, such as the project manager, the team manager, and the coordinator of resources, regarding information on current experiences with any resource management tools in practice, along with new elements they would like to find in the new application.

This leads to an intensive literature review in order to establish existing solutions, methodologies, and useful resource scheduling optimization techniques. It will detail application and use characteristics with the view to make sure that they are going to be developed under enhanced principles.

Historical data on resource allocation, project schedule, and dependencies will be collected for testing and proving the efficiency of optimization algorithms. This information will be acquired from those organizations willing to provide research-friendly anonymized project files.

3.3 Development Process

3.3.1 Agile Methodology

Agile is one of the most popular ways to conduct software development, emphasizing iterative development, collaboration with customers, and flexibility in any kind of change. It is particularly fit for projects at which the requirements are uncertain or if rapid delivery is imperative.

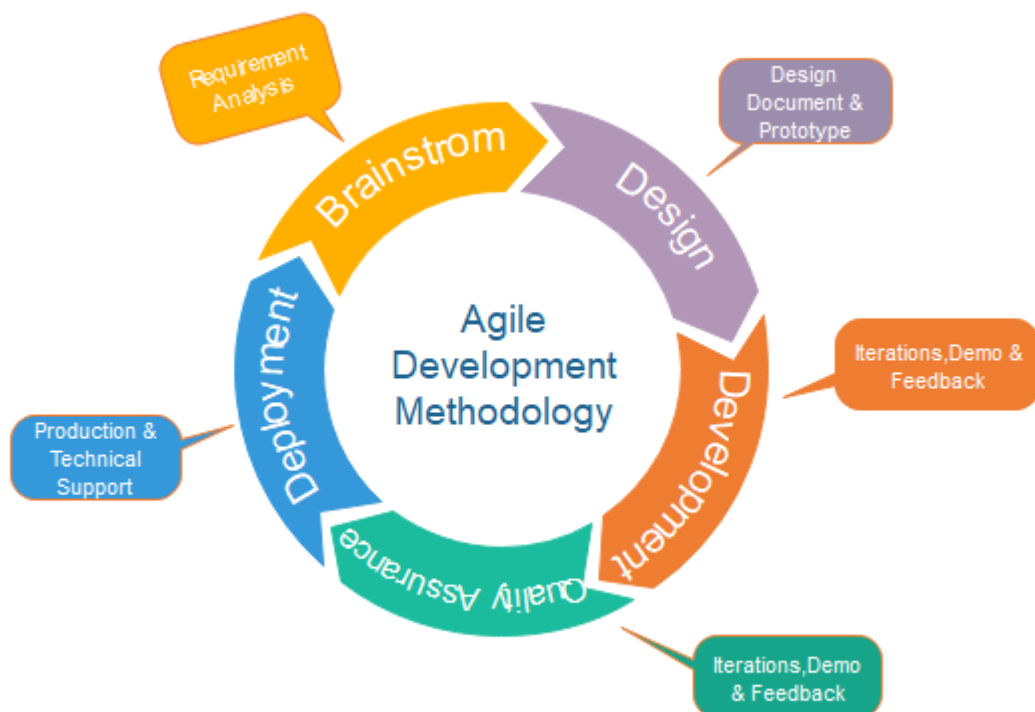


Fig. Agile Model

Key principles of Agile:

Iterative Development: The project is broken down into smaller iterations or sprints, such that each iteration would deliver a functional product increment.

Customer Collaboration: The frequent interactions with stakeholders ensure that the product caters to their needs and expectations.

Flexible adaptation: One of the important advantages is that at any moment, the development process can adapt to changes in requirements or market conditions.

Continuous improvement: The team continuously reflects on their processes and makes improvements.

Applying Agile to the Resource Scheduling and Optimization Web Application:

Sprint Planning: In each sprint, there would be development of a certain set of features, like data import, scheduling algorithms, or reporting. Daily Stand-ups: It would be a daily meeting amongst team members to go over the work progressed, blockers if any, and to plan for the day. Product Backlog: A prioritized list of features, maintained and updated throughout the project life cycle. Continuous Integration and Testing: Frequent integration and testing of code changes for quality assurance.

User feedback: The stakeholders' feedback would be gained on a regular basis to guide the process of development to cater to the needs of the stakeholders.

The Resource Scheduling and Optimization Web Application could be made flexible in the approach or methodology of Agile, responsive to change, with a focus on user value.

3.3. 2. Data Analysis Techniques

Numerical data that will be collected and analysed will be used to assess the application usage of resources, project schedules, and overall efficiency. Also, performance measures to quantify the impact of the application on resource management system will be set.

Qualitative data will be analysed using thematic analysis, sourced from user feedback and interviews to pick out patterns and visualize insights into levels of user satisfaction and areas that are ripe for improvement.

3.3. 3. Evaluation and Validation

Additionally, the organizations will be used in a pilot study to test the performance of the implementation and use of Resource Scheduling and Optimization Web Application, and general user satisfaction in terms of usability and functionality.

The results obtained with this use case will compare and measure results against the objectives set forth at the beginning of the project to validate if such an application tests and enhances resource management processes and optimizes use in a better way.

3.4 System development environment

Hardware

- Computers
- Network equipment
- Printers and scanners
- Mobile devices for testing

Software

- Operating System-Windows 10
- React Native (JavaScript framework)
- MySQL will be used to provide database facilities

3.5 System testing

A number of tests will be conducted to try identify and fix the possible errors that might be in the system. Some tests include (unit, integration and system tests)

system operational environment requirements

Hardware

- Computers
- Network equipment
- Mobile devices for testing

Software

- Operating System-Windows 10
- React Native (JavaScript framework)
- MySQL will be used to provide database facilities

3.6 RISKS AND MITIGATION

Risk No.	Risk	Mitigation
1	Lack of Clear Requirements	<ul style="list-style-type: none">✦ Conduct thorough requirement gathering sessions with stakeholders.✦ Engage subject matter experts to clarify ambiguous requirements.
2	Resource Constraints	<ul style="list-style-type: none">• Allocate resources based on project workload and timelines.• Prioritize tasks and assign resources effectively.
3	Technical Challenges	<ul style="list-style-type: none">• Conduct a comprehensive technical feasibility study.• Engage technical experts and consultants.
4	Budget Overruns	<ul style="list-style-type: none">• Review and adjust the budget as needed during the project. Explore cost-saving opportunities

APPENDICES

Appendix I Budget:

Requirements	cost
--------------	------

Laptop	60,000
Wi-Fi	2,500
Biding paper	1000
Electricity	500
Printing of Documentation	700
Pen	80
Flash disk	2,000
Transport	2,000
others	5,000
TOTAL	73,780

Appendix II: Gantt Chart

Task No.	Description	Task No. of Hrs.	Subtask No. of Hrs.	Planned Start Date	Actual Start Date	Planned Completion Date	Actual Completion Date	Deliverables
1	Proposal Presentation	12	10	27/9/2024	27/9/2024	1/10/2024		proposal
2	Data collection	10	8	15/9/2024	17/9/2024	17/9/20234		Research

3	SDS Presentation	14	10	10/10/2024		18/10/2024		SDS
4	SRS presentation	13	9	15/10/2024		30/10/2024		SRS
5	Coding	20	10	15/10/2024		20/03/2024		Coding
6	Deploying	6	5	20/03/2024		26/03/2024		Deploying
7	Project presentation	10	9	24/03/2024		30/03/2024		Project presentation
8	Project Report Submission	20	10	15/03/2024		17/04/20234		Final report

CONCLUSION

The Resource Scheduling and Optimization Web Application is supposed to resolve all issues in the way of inefficient project resource management by facilitating data upload, real-time entry of data, resource optimization algorithms, a centralized platform, real-time dashboard, dynamic scheduling, and collaboration tools.

This empowers organizations to enhance their efficiency, be more effective in resource utilization, make fact-based decisions, scale up the scale of operation, and hence provides competitive advantages. Further research and development are needed for refinement in this application, integrating advanced functionalities that will finally revolutionize resource management practices and project delivery efficiency.

REFERENCES

1. Monica, 2018. A Car Breakdown Service Station Locator System. INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH, 3(4), pp. 13-16.
2. Reichardt,e.,2002.CarTalk2000.[Online]Availableat:<https://ieeexplore.ieee.org/abstract/document/1188007> [Accessed 17 December 2019].
3. The Interaction Design Foundation. (2020). Prototyping: Learn Eight Common Methods and(Anon.,2020)BestPractices.[online]Availableat:<https://www.interactiondesign.org/literature/article/prototyping-learn-eightcommon-methods-andbest-practices> [Accessed 20 Jan. 2020]
4. Masahiko,e.,2000.GooglePatents.[Online]Availableat:<https://patents.google.com/patent/US6972669B2/en> [Accessed 20 October 2019].
5. J. W. Ding, C. F. Wang, F. H. Meng, T. Y. Wu, "Real-time vehicle route guidance using vehicle-to-vehicle communication", IET Commun., vol. 4, no. 7, pp. 870-883, Apr. 2010.