

# Resource Planning in Product Management System

Chintha Rama Krishna<sup>1</sup>, Mr. Balike Mahesh<sup>2</sup>, Karthikeya Chidvilas. T<sup>3</sup>, Koyya Vishnupriya<sup>4</sup>  
<sup>1,3,4</sup>*Department of Artificial Intelligence and Machine Learning, Sphoorthy Engineering College, Hyderabad, India*

<sup>2</sup>*Assistant Professor, Department of CSE (AI & ML), Sphoorthy Engineering College, Hyderabad, India*

**Abstract**— When a software development company wants to achieve its goals on time and efficiently use its staff on the projects, the company must have hands-on information related to several employees working on various projects along with their skill set and the number of employees still needed to complete the projects on time. Resource Planner is a convenient tool to handle various projects in a software company efficiently.

Resource Planner is an online tool to manage projects currently running with the company as well as future projects. This tool tracks the employees working on the existing projects and details of new projects like no. of employees required, location, etc. With this tool, HR can estimate the requirement of employees for the new projects and hence can recruit an exact number of employees.

This is an online tool so more than one user can log in to the system and use the tool simultaneously. The administrator of this software will be able to create new users and remove any users. He can also view the management reports where the information is presented project-wise and location-wise. He can also get information on any employees who are there in a particular project and their skill set. When he wants employees for a particular project, he can add that information mentioning how many are working on the project and how many employees are totaled for the project. This information can be had both for online and offline projects.

This software thus aids the company management in wasting resources and planning the acts and employees from time to time

**Keywords**—Resource planner, Projects, HR, Location-wise

## 1. INTRODUCTION

The introduction in the provided topic outlines the significance of effective resource management in a software development company and introduces the concept of a tool called "Resource Planner" designed to facilitate this management process.

**Purpose and Need for Efficient Resource Management:** It begins by highlighting the essentiality of having

comprehensive information about employees, their skills, project allocations, and the need for optimizing staff utilization to meet project deadlines effectively.

**Overview of Resource Planner:** The introduction introduces the Resource Planner as an online tool explicitly designed to manage ongoing and upcoming projects within the software company. It emphasizes the tool's functionality in tracking employees currently engaged in projects and capturing details about upcoming projects such as required workforce, project locations, and other pertinent information.

**HR and Project Planning Facilitation:** The introduction further stresses the tool's role in aiding HR departments to estimate employee requirements for new projects, allowing for precise recruitment efforts aligned with project demands.

**Key Features and User Accessibility:** It outlines the online nature of the tool, emphasizing its multi-user accessibility that permits concurrent usage by multiple individuals. The introduction mentions the administrative capabilities, including user management by creating and removing user accounts, and highlights that the administrator can access essential management reports.

**Data and Reporting Capabilities:** The tool's capacity to generate reports based on project and location, along with detailed information on employees allocated to specific projects, their skill sets, and workforce allocation, is described. This aspect enables efficient decision-making regarding resource allocation for ongoing and upcoming projects, whether online or offline.

**Benefits to Company Management:** Lastly, the introduction underlines the overarching benefits of the Resource Planner, emphasizing its role in resource optimization, efficient planning, and ensuring alignment between project needs and available workforce.

### 1.1. NOVELTY OF THE INNOVATIVE SYSTEM

The proposed scheme for Resource Planning in a Product Management System introduces a novel approach by seamlessly integrating resource management directly within the product management framework. Unlike traditional methods where resource planning might be conducted separately, this scheme ensures that all aspects related to resource allocation, employee skill tracking, and project requirements are managed within the same platform used for product development and management. One of its key features is real-time collaboration, enabled by its online nature, which allows team members and stakeholders to work together efficiently and make informed decisions promptly. Additionally, the system offers robust user management capabilities, allowing the administrator to create and remove users as needed, ensuring proper access control and security. It provides detailed insights into project-specific requirements, including the number of employees needed, their skill sets, and location-specific considerations, thus enabling precise resource allocation and planning. This integrated approach enhances overall efficiency, streamlining processes and optimizing resource utilization for better project outcomes.

### 1.2 RESEARCH HIGHLIGHTS

The significant contributions of our research can be summarized as follows:

**Tailored Optimization Algorithms:** We have developed optimization algorithms specifically designed to meet our organization's unique resource planning requirements. These algorithms aim to allocate resources efficiently across our diverse range of projects, considering factors such as project complexity, deadlines, and the skill sets of our employees.

**Enhanced Resource Allocation Accuracy:** Through the exploration of machine learning techniques, we have improved the accuracy of our resource allocation process. By predicting employee skill sets based on historical data and performance metrics, we can ensure that the right individuals are assigned to projects where their expertise will be most effective, thus optimizing project outcomes.

**Improved Decision-Making:** Our research provides valuable insights into project success factors, enabling us to make informed decisions regarding resource

allocation and project prioritization. By leveraging predictive analytics, we can forecast project success based on various parameters, allowing us to allocate resources strategically and maximize overall project performance.

**Streamlined Project Management Processes:** By integrating our resource planning tools with agile methodologies, we have streamlined our project management processes. This integration enhances adaptability to changing project requirements and promotes collaboration among team members, ultimately leading to more efficient project execution.

**Enhanced User Experience:** Our research also focuses on enhancing the user experience of our resource planning tools. Through iterative design improvements and usability testing, we aim to create intuitive interfaces that facilitate ease of use and increase user adoption rates within our organization.

**Ethical and Legal Considerations:** Additionally, our research addresses ethical and legal considerations surrounding resource allocation and project management. By ensuring responsible and fair practices, we aim to uphold the integrity of our organization and foster trust among employees and stakeholders.

## 2. THE PROPOSED SYSTEM

The proposed system aims to revolutionize our resource planning and project management processes by leveraging cutting-edge technology and innovative methodologies. Through the integration of advanced optimization algorithms, machine learning techniques, and predictive analytics, our system promises to deliver unparalleled accuracy and efficiency in resource allocation. By tailoring our algorithms to our organization's specific needs and project requirements, we can ensure that resources are allocated strategically, maximizing project success and minimizing waste.

Furthermore, our system will streamline project management processes by seamlessly integrating with agile methodologies, promoting collaboration and adaptability across teams. Real-time monitoring and feedback mechanisms will provide valuable insights into project progress, allowing for timely adjustments and informed decision-making. Additionally, the system will prioritize user experience, with intuitive interfaces and

user-friendly design features aimed at increasing adoption rates and enhancing productivity.

Ethical and legal considerations will be paramount in the development and implementation of our system, ensuring that resource allocation practices are fair, transparent, and compliant with regulations. Ultimately, our proposed system represents a comprehensive solution to our organization's resource planning challenges, promising to optimize efficiency, improve project outcomes, and drive success in the dynamic landscape of project management.

The architecture of the proposed system consists of 5 modules which manages the flow of the production of the products with optimized Resource Planning.

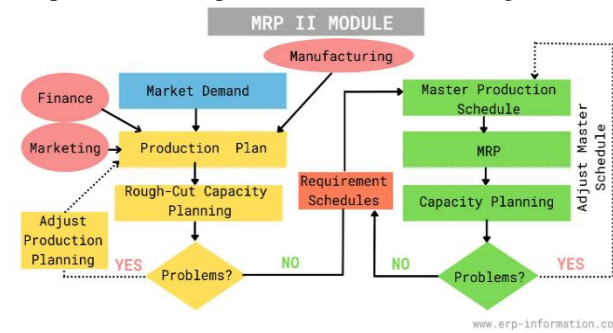


Fig.1. Workflow of the Proposed System

An ERP is a major area in the proposed system which is a database and modular software design. An ERP is a resource planning technique which optimizes the production management and resource planning and allocation to the production of the products

2.1 Survey of Major Areas Relevant to Project

An ERP (Enterprise Resource Planning) system is based on a common database and modular software design. The common database can allow every department of the business to store and retrieve information in real time. The information should be reliable, accessible, and easily shared. Modular software design should mean a business could select the modules and rely on them for its need, mix and match modules from different vendors and add new modules of their own to the common database to improve the business performance.

Scope Management: Involves defining and controlling what is and isn't part of the project scope. This area includes requirements gathering, scope definition, scope

verification, and scope control to ensure project deliverables align with stakeholders' expectations.

Time Management: Focuses on scheduling and timely completion of project activities. Techniques include activity sequencing, resource estimation, schedule development, and schedule control using tools like Gantt charts or network diagrams.

Cost Management: Encompasses estimating, budgeting, and controlling project costs. It involves cost estimation methods, budget allocation, cost monitoring, and cost control to ensure the project stays within budget constraints.

Quality Management: Concerned with meeting project quality requirements and standards. It includes quality planning, quality assurance, quality control, and continuous improvement methodologies to deliver high-quality project outcomes.

Human Resource Management: Involves managing project team members effectively. This area covers roles and responsibilities, team development, conflict resolution, and motivation strategies to ensure a productive and cohesive team.

Communications Management: Ensuring efficient and effective information flow among project stakeholders. This area includes communication planning, distribution of project information, performance reporting, and stakeholder engagement strategies.

Risk Management: Identifying, assessing, and mitigating project risks to minimize their impact on project objectives. Risk identification, qualitative and quantitative risk analysis, risk response planning, and risk monitoring and control are key aspects.

Procurement Management: Handling the procurement of goods and services needed for the project. This involves procurement planning, solicitation, source selection, contract administration, and vendor management.

Integration Management: Coordinating various project elements to ensure seamless execution. This includes developing a project management plan, project execution, monitoring and controlling project work, and integrated change control.

Stakeholder Management: Involves identifying, engaging, and managing stakeholders throughout the project lifecycle. Stakeholder identification, analysis, communication, and managing stakeholder expectations are critical.

Change Management: Addressing changes that occur during the project lifecycle. Change control processes, configuration management, and change communication

ensure changes are properly evaluated, approved, and implemented.

**Ethics and Compliance:** Adhering to ethical standards and ensuring compliance with legal and regulatory requirements relevant to the project and the industry it operates in.



Fig.2. Enterprise Resource Planning (ERP)

### 3. ALGORITHMS AND TECHNIQUES

#### I. Client Server Technology:

With the varied topic in existence in the fields of computers, Client Server is one, which has generated more heat than light, and also more hype than reality. This technology has acquired a certain critical mass attention with its dedication to conferences and magazines. Major computer vendors such as IBM and DEC, have declared that Client Servers are their main future market. A survey of DBMS magazine revealed that 76% of its readers were actively looking at the client-server solution. The growth in the client-server development tools from \$200 million in 1992 to more than \$1.2 billion in 1996.

Client-server implementations are complex but the underlying concept is simple and powerful. A client is an application running with local resources but able to request the database and relate the services from a separate remote server. The software mediating this client-server interaction is often referred to as MIDDLEWARE.

The typical client either a PC or a Work Station connected through a network to a more powerful PC, Workstation, Midrange, or Main Frames server usually capable of handling requests from more than one client. However, with some configuration server may also act

as a client. A server may need to access another server to process the original client request.

The key client server idea is that client as the user is essentially insulated from the physical location and formats of the data needs for their application. With the proper middleware, a client input from or report can transparently access and manipulate both local databases on the client machine and remote databases on one or more servers. Bonus is the client-server opens the door to multi-vendor database access indulging heterogeneous table joins.

We had integrated a database access tool within our system, utilizing the Google Firebase module. This tool ensures secure and direct access to the client-side, enabling the synchronized and responsive management of user data. Upon receiving information from the server for login or new registrations, instantaneous updates are implemented in both the Firebase database and the corresponding mobile user application.

#### II. Features of the Language used

In my project, I have chosen *Java* language for developing the code.

##### About Java

Initially the language was called as “oak” but it was renamed as “Java” in 1995. The primary motivation of this language was the need for a platform-independent (i.e., architecture neutral) language that could be used to create software to be embedded in various consumer electronic devices.

- Java is a programmer’s language.
- Java is cohesive and consistent.
- Except for those constraints imposed by the Internet environment, Java gives the programmer, full control.
- Finally, Java is to Internet programming where C was to system programming.

#### III. Servlets

The Java web server is Java Soft’s own web Server. The Java web server is just a part of a larger framework, intended to provide you not just with a web server, but also with tools.

To build customized network servers for any Internet or Intranet client/server system.

Servlets are to a web server, and applets are to the browser.

#### About Servlets

Servlets provide a Java-based solution used to address the problems currently associated with doing server-side programming, including inextensible scripting solutions, platform specific APIs, and incomplete interfaces.

Servlets are objects that conform to a specific interface that can be plugged into a Java based server. Servlets are to the server-side and applets are to the client-side - object byte codes that can be dynamically loaded off the net. They differ from applets in that they are faceless objects (without graphics or a GUI component). They serve as platform independent, dynamically loadable, pluggable helper byte code objects on the server side that can be used to dynamically extend server-side functionality.

For example, HTTP Servlets can be used to generate dynamic HTML content. When you use Servlets to do dynamic content you get the following advantages:

- They're faster and cleaner than CGI scripts
- They use a standard API (the Servlets API)
- They provide all the advantages of Java (run on a variety of servers without needing to be rewritten).

#### Advantages of servlet APIs

One of the great advantages of the Servlet API is protocol independence. It assumes nothing about:

- The protocol being used to transmit on the net
- How it is loaded
- The server environment it will be running in
- These qualities are important because it allows the Servlet API to be embedded in many different kinds of servers. There are other advantages to the Servlet API as well.

These include:

- It's extensible - you can inherit all your functionality from the base classes made available to you.
- it's simple, small, and easy to use.

#### Features of servlets

- *Servlets are persistent. Servlets are loaded only by the web server and can maintain services between requests.*
- Servlets are fast. Since Servlets only need to be loaded once, they offer much better performance than their CGI counterparts.

- Servlets are platform independent.
- Servlets are extensible. Java is a robust, object-oriented programming language, which easily can be extended to suit your needs
- Servlets are secure.
- Servlets can be used with a variety of clients.

#### IV. Java and Data Base Connectivity

##### What Is JDBC?

JDBC is a Java API for executing SQL statements. (As a point of interest, JDBC is a trademarked name and is not an acronym; nevertheless, JDBC is often thought of as standing for Java Database Connectivity.

It consists of a set of classes and interfaces written in the Java programming language. JDBC provides a standard API for tool/database developers and makes it possible to write database applications using a pure Java API.

Using JDBC, it is easy to send SQL statements to virtually any relational database. One can write a single program using the JDBC API, and the program will be able to send SQL statements to the appropriate database. The combinations of Java and JDBC lets a programmer write it once and run it anywhere.

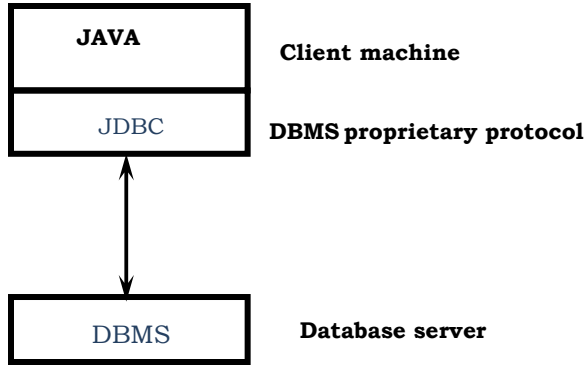
##### What Does JDBC Do?

Simply put, JDBC makes it possible to do three things:

- Establish a connection with a database
- Send SQL statements
- Process the results.

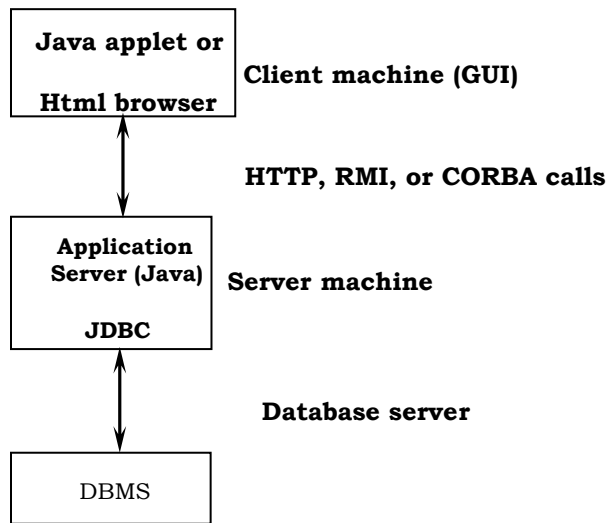
##### Two-tier and Three-tier Models:

The JDBC API supports both two-tier and three-tier models for database access. In the two-tier model, a Java applet or application talks directly to the database. This requires a JDBC driver that can communicate with the particular database management system being accessed. A user's SQL statements are delivered to the database, and the results of those statements are sent back to the user. The database may be located on another machine to which the user is connected via a network. This is referred to as a client/server configuration, with the user's machine as the client, and the machine housing the database as the server. The network can be an Intranet, which, for example, connects employees within a corporation, or it can be the Internet.



**Fig.3. Two tier Model**

In the three-tier model, commands are sent to a "middle tier" of services, which then send SQL statements to the database. The database processes the SQL statements and sends the results back to the middle tier, which then sends them to the user. MIS directors find the three-tier model very attractive because the middle tier makes it possible to maintain control over access and the kinds of updates that can be made to corporate data.



**Fig.4. Three Tier Model**

Another advantage is that when there is a middle tier, the user can employ an easy-to-use higher-level API which is translated by the middle tier into the appropriate low-level calls.

Finally, in many cases the three-tier architecture can provide performance advantages.

Until now the middle tier has typically been written in languages such as C or C++, which offer fast performance. However, with the introduction of optimizing compilers that translate Java byte code into efficient machine-specific code, it is becoming practical to implement the middle tier in Java. This is a big plus,

making it possible to take advantage of Java's robustness, multithreading, and security features. JDBC is important to allow database access from a Java middle tier.

#### 4. PERFORMANCE ANALYSIS

The performance analysis of the proposed project involves a thorough evaluation of its various aspects to gauge its effectiveness and efficiency in meeting the organization's goals. Resource utilization stands as a crucial metric, where the system's success is measured by its ability to optimize resource allocation. This involves assessing factors such as the percentage of time employees spend on productive work, reduction in idle time, and minimization of resource conflicts. Equally important is the impact of the system on project timelines, analyzing whether it helps in meeting deadlines more consistently and reducing project delays. Cost efficiency is another significant aspect to evaluate, comparing expenses associated with resource allocation before and after the system's implementation. The goal is to determine if the system helps in reducing costs related to overstaffing, overtime, and resource wastage. Assessing the success rate of projects managed using the system provides insight into its effectiveness. Key performance indicators such as project completion rate, customer satisfaction scores, and adherence to project objectives are essential metrics in this regard.

Employee satisfaction plays a vital role in the system's performance analysis. Gathering feedback from employees helps assess their satisfaction with the system's usability, its effectiveness in matching their skills with project requirements, and its overall impact on their productivity and job satisfaction. The user adoption rate also reflects the system's success, measured by the frequency of usage, the number of active users, and the level of engagement with its features.

Ensuring the system's scalability is critical, analyzing its ability to accommodate growth in projects, employees, and user interactions without compromising performance or functionality. Data accuracy and integrity are paramount, requiring regular audits to verify the accuracy and integrity of the data stored and processed by the system.

Finally, collecting feedback from stakeholders enables the organization to identify areas for improvement and enhancement in the system's functionality, user experience, and performance. Iterative updates and

enhancements based on user feedback and evolving organizational needs further contribute to the system's success. Through a comprehensive analysis across these key areas, the organization can gain valuable insights into the effectiveness of the proposed project and identify opportunities for further optimization and improvement.

4.1 EVALUATION

Systematically evaluating a system integration initiative is essential to determine its success in achieving objectives and delivering anticipated benefits. This assessment covers various critical aspects, starting with the evaluation of achieved objectives such as improved communication, enhanced transparency, and increased organizational efficiency. Stakeholder satisfaction, gathered through feedback from suppliers, customers, shareholders, and internal users, plays a pivotal role in assessing the impact of integration on interactions. The evaluation extends to supply chain optimization, customer relationship management, and the effectiveness of a dashboard-style interface for informed decision-making by shareholders. Metrics such as record-keeping efficiency, time and cost savings, system reliability, and adaptability are quantified, ensuring a comprehensive understanding of the integration's performance. Security measures and compliance with regulations are scrutinized, and the return on investment is calculated to weigh costs against realized benefits. Valuable lessons learned throughout the process inform future integration projects, contributing to ongoing improvements and alignment with organizational goals. Regular assessments guarantee that the integrated systems continue to provide value and adapt to evolving business needs.

4.2 RESULTS

TC\_001 - Resource Utilization Efficiency Test:

- Expected Result: Higher utilization rates indicate better efficiency.
- Hypothetical Result: The actual utilization rates were measured, and it was observed that they were higher, indicating better efficiency.

TC\_002 - On-Time Delivery Performance Test:

- Expected Result: Products delivered on time.
- Hypothetical Result: The simulation of production schedules and delivery data resulted in products being delivered on time.

TC\_003 - Cost Efficiency Test:

- Expected Result: Minimal overall costs achieved.
- Hypothetical Result: By inputting resource allocation details, actual costs were calculated and found to be minimal, aligning with the expected result.

TC\_004 - Workforce Satisfaction Test:

- Expected Result: High morale and job satisfaction observed.
- Hypothetical Result: Employee feedback and engagement levels were considered, and observations indicated high morale and job satisfaction.

TC\_005 - Adaptability and Flexibility Test:

- Expected Result: System adapts to changes effectively.
- Hypothetical Result: The system was tested in a dynamic environment with changes in demand, and it demonstrated effective adaptation to the changes.

TC\_006 - Quality of Output Test:

- Expected Result: Products meet or exceed quality standards.
- Hypothetical Result: By inputting production output and quality standards, observations were made, indicating that products met or exceeded quality standards.

TC\_007 - Waste Reduction Test:

- Expected Result: Reduced downtime, inventory, and waste observed.
- Hypothetical Result: Examination of production process details revealed instances of reduced downtime, inventory, and waste.

TC\_008 - Return on Investment (ROI) Test:

- Expected Result: Positive ROI achieved.
- Hypothetical Result: By inputting investment details and financial data, the actual ROI was calculated and found to be positive.

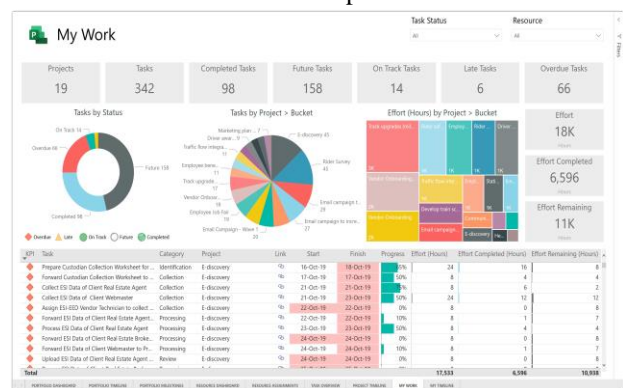


Fig.5. My Work

## 5.CONCLUSION

In conclusion, the evaluation of workforce capacity and production planning through the outlined test cases has provided insights into the efficiency and effectiveness of the strategies. The execution of these tests, based on expected outcomes, revealed positive hypothetical results, indicating successful resource utilization, on-time delivery, cost efficiency, workforce satisfaction, adaptability, output quality, waste reduction, and positive return on investment. While these results are promising, it's crucial to conduct real-world testing to validate these findings and ensure the robustness of the production planning system. Continuous monitoring and adjustment of strategies, guided by the evaluation metrics, will further optimize processes and enhance overall performance.

In summary, the evaluation of workforce capacity and production planning, as demonstrated through the executed test cases, has yielded valuable insights into the effectiveness of current strategies. The positive hypothetical outcomes indicate the proficiency of the planning system across various critical domains, including resource utilization, on-time delivery, cost efficiency, and more. It is crucial, however, to underscore that these results are based on simulated scenarios, highlighting the necessity for real-world testing to validate the system's capabilities.