SYSTEM DESIGN FOR EFFECTIVE CONSTRUCTION INVENTORY MANAGEMENT

Submitted in partial fulfilment of the requirements of the degree of

MASTER OF ENGINEERING

in

CIVIL ENGINEERING

(With specialization in Construction Engineering and Management)

By

Kazi Abdul Aziz Faroq
(PRN: 2014016402637003)

Under the guidance of

Prof. Fauwaz Parkar

Department of Civil Engineering

School of Engineering and Technology

Anjuman-I-Islam's Kalsekar Technical Campus

New Panvel, Navi Mumbai – 410206

Mumbai University

2021

SYSTEM DESIGN FOR EFFECTIVE CONSTRUCTION INVENTORY MANAGEMENT

DISSERTATION

Submitted in partial fulfilment of the requirements of the degree of

Master of Engineering

in

Civil Engineering

(With specialization in Construction Engineering and Management)

By

Kazi Abdul Aziz Faroq
(PRN: 2014016402637003)

Kazi Abdul Aziz Faroq	**Prof. Fauwaz Parkar**
(Candidate)	(Project Guide)
Dr. Rajendra Magar	**Dr. Abdul Razak Honnutagi**
(Head of Department)	(Director, AIKTC)

Department of Civil Engineering

School of Engineering and Technology

Anjuman-I-Islam's Kalsekar Technical Campus

New Panvel, Navi Mumbai – 410206

Mumbai University

2021

CERTIFICATE

This is to certify that the project entitled **"System Design for Effective Construction Inventory Management"** is a bona fide work of **Mr. Kazi Abdul Aziz Faroq (Roll No.:18CEM04)** submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of **"Master of Engineering"** in **"Civil Engineering (with specialization in Construction Engineering and Management)".**

Prof. Fauwaz Parkar
(Project Guide)

Dr. Rajendra Magar
(Head of Department)

Dr. Abdul Razak Honnutagi
(Director, AIKTC)

PROJECT REPORT APPROVAL

This project report entitled **"System Design for Effective Construction Inventory Management"** by **Mr. Kazi Abdul Aziz Faroq (Roll No.:18CEM04)** submitted to the University of Mumbai is approved for the degree of **"Master of Engineering"** in **"Civil Engineering (with specialization in Construction Engineering and Management)".**

Examiners:

1. _____

2. _____

Supervisors:

1. _____

2. _____

Date:

Place: Navi Mumbai

DECLARATION

I hereby declare that this written submission entitled **"System Design for Effective Construction Inventory Management"** represents my ideas in my own words and where others' ideas or words have been included; I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed**.**

_____

Kazi Abdul Aziz Faroq

(Roll No.: 18CEM04)

Date:

ACKNOWLEDGEMENT

Before I indulge into the actual topic of this project, I would like to add a few unfeigned words for the people who have given everlasting contribution and support right from the genesis of the project till the end. I am indebted to a number of people who have assisted and furnished me with the constructive guidance and acknowledge with a deep sense of gratitude their encouragement in the form of substantial assistance.

I express my sincere and heartfelt gratitude to my guide Prof. Fauwaz Parkar (Assistant Professor, AIKTC) for providing me the needed technical assistance, guidance and support which has helped me to expand my horizon of thoughts and experience and has aided me to complete my project work successfully.

I would like to thank Dr. Rajendra Magar (Head of the Civil Engineering Department, AIKTC) for his guidance, suggestions and for connecting me to various resource people. I would also like to thank Dr. Abdul Razak Honnutagi (Director, AIKTC) for providing me the required infrastructure and administrative support.

I am grateful to all the Professors of M.E. (CEM) and other Staff Members who have helped me directly or indirectly during this course of work.

Last, but not the least, I thank my parents Mr. Faroq Kazi and Mrs. Maizabin Kazi for providing me with continual strength and encouragement throughout the dissertation work. I also thank my friends and family for their whole hearted support and co-operation.

ABSTRACT

Construction industry is the most crucial industry for any nation with respect to its economic growth and development. This industry is complex and hence susceptible to disputes, delays and cost overruns. As a thumb rule, in developing countries, it is estimated that construction materials alone account for more than 60 percent of the total expenditure of a project. Therefore, effective and efficient material management is paramount for successful completion of a construction project within the estimated budget and time. This study in the initial phase compares various available techniques of material/inventory management, such as ABC Analysis, Economic Ordering Quantity (EOQ), Material Requirements Planning (MRP), Just-In-Time (JIT) concept, etc., and their feasibility in the construction industry. Even after having a number of techniques developed for material/inventory management that are efficiently applied to other types of industries, it is observed that most of these techniques seem to have limitations in case of construction industry due to its complex and highly uncertain nature. The methods are applied to construction industry to some extent, but straightforward and holistic application is not feasible, i.e., impractical and perhaps impossible. This can be owed to the fact that each construction project is unique and construction processes are often demand driven. Work stoppages and sometimes crippled schedules due to overlapping of activities is a common phenomenon observed in construction. Therefore, a need is felt that a reliable system, flexible enough to take into account the changing inventory requirement pattern be devised, so that material wastage is avoided, as well as associated under-stocking and over-stocking costs are eliminated.

Keywords: inventory; material management; ABC; EOQ; MRP; JIT; flexibility; programming; html.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

LIST OF ABBREVIATIONS

EOQ	–	Economic Ordering Quantity
MRP	–	Material Requirement Planning
JIT	–	Just In Time
EPC	–	Engineering Procurement and Construction
LIFO	–	Last in, First out
FIFO	–	First in, First out
MIS	–	Management Information System
RFID	–	Radio Frequency Identification
RMC	–	Ready Mixed Concrete
HTML	–	HyperText Markup Language
PHP	–	Hypertext Preprocessor
CSS	–	Cascading Style Sheets
MSP	–	Microsoft Project
UI	–	User Interface

Chapter 1

INTRODUCTION

1.1. General

Construction industry is one of the most crucial industries for any nation, and is the second largest industry in India after agriculture. It is a sector which contributes maximum Gross Domestic Product (GDP) to any nation and hence plays a vital role in its economic growth. The extent of infrastructure growth in a country significantly depends on how pronounced its construction activities are, since it provides significant employment to large masses. In addition, it is a high-risk industry which constitutes a wide variety of activities involving schedules, designs, plans, constructions, modifications, maintenance and repairs, demolition of buildings, civil engineering works, electrical and mechanical engineering works and other similar works.

Construction industry is susceptible to cost exceeding, delays and disputes due to its complex nature. Failure in adherence to a timely implementation of various building and infrastructure project stages leads to cost and time overrun, which ultimately has an adverse effect on the overall project. With the advent of computers and electronics in construction, although there is tremendous technological advancement in various aspects of construction, such innovations are not being adopted practically in most aspects of the project. This can be attributed to reluctance of the contractors to change, each construction project being unique, as well lack of trained manpower to facilitate such techniques to be implemented holistically. This stuns the growth of construction industry. Therefore, construction becomes a difficult job and often overshoots the time and budget

earmarked for its completion. This leads to a compounding problem of claims, disputes, mistrust between various parties and reduced profit sharing or even losses by some parties to construction.

Each construction project has a number of activities and sub-activities involved. And each sub-activity when broken into distinct work packages and tasks has a number of materials associated with it. Construction materials constitute a major chunk of the cost (to the tune of around 60%) in most construction project. Therefore, to reduce construction costs, effective and efficient materials management is most crucial. The principal aim of materials management is to ensure that materials are available in time at their point of use when needed, thus leading to timely completion of the work. As a result, organizations need to understand the ill-effects of improper materials management techniques, and how they would stretch project costs and timelines. Effectively implemented material management plans can ensure a timely flow of materials to the job-site when desired, thereby facilitating efficiency, enhanced work face planning, increased labour productivity, better schedules and lower project costs.

Material management is an essential feature paramount towards maximizing productivity in infrastructure projects. Monitoring and controlling the materials' procurement and its usage for each and every activity and keeping a track of the inventory without implementing a proper system is quite tedious. Thus, numbers of systems are developed and being used in contemporary projects, but still there is a lot of scope to improve the efficiency of those systems.

1.2. Motivation behind Topic

Apart from project management as a whole, since materials account for a major chunk (more than 60 percent) of the total cost of a construction project, it is extremely important to manage materials effectively so that the cost overruns are kept under control to a certain extent, at least with respect to material management. It is an undeniable fact that much lack of synchronization of construction activities leads to either under-stocking or over-stocking of material, both of which are not advisable. Under-stocking leads to opportunity loss due to unavailability of materials as and when required, whereas over-stocking leads to blocking of capital, along-with escalated material storage, handling and transportation costs. Hence, it is desired to have a very precise material requirement calculation, so that construction processes are streamlined and materials are procured and brought to site as and when required.

1.3. Problem Statement

Construction projects are often plagued by additional inventory under-stocking and over-stocking costs owing to improper activity planning and random inventory ordering. Thus, construction sector often suffers either from unnecessary locking of capital or lost opportunities due to a shortage of materials. Therefore, a need is felt to overcome such random material planning in construction industry by the way of efficient system design based on correct inputs of inventory requirements by the stakeholders.

1.4. Aim and Objectives

The primary aim of this research is to design a system and a working computer interface/tool for construction inventory management which can be feasibly applied on construction sites. Thus, the following objectives are set:

1. To formulate logic for linking most suitable material management techniques.
2. To develop a system through computer interface incorporating all the necessary techniques of material management by using formulated logic which can be feasibly applied on construction sites.

1.5. Scope of Proposed Work

The scope of the work carried out under this dissertation to prove the applicability of the proposed system will include the following:

1. Study the currently used material management techniques on local construction sites and select the most suitable techniques
2. Link selected techniques by formulating logic so that it can be used as a framework for developing a system for management of materials.
3. Develop a working computer interface for the system either by developing a website or a computer application by coding in the most preferred programming language.
4. Use the developed interface on actual construction sites for effective management of materials.
5. Validate the results by comparing with various traditional material ordering criteria, based on economic order quantity, minimum order quantity, re-order point, cash in hand, liquidity, etc.

Chapter 2

REVIEW OF LITERATURE

The work done by various researchers and scholars is referred and summarized in this chapter as per their relevance to the work carried out under this dissertation. The various journals, conference papers, reports and articles that were referred are presented here with respect to the following:
Inventory and Supply Chain management in Construction,
Evaluation of material management in Construction and Manufacturing Industries,
Methods and techniques used for material management in Construction.

2.1. Overview of Literature Review

Bell and Stukhart, (1987) compared two projects with respect to their costs, characteristics and perks of well-planned and executed material management systems. The research was carried out in two phases. The key findings were that project planning, support from top management and communication is the prime reasons for successful material management. Further, if a robust material management system preferably in digital form is present, it would lead to much more savings as compared to conservatively accepted traditional methods. Other substantial benefits in their order of significance comprise: decline in bulk materials surplus, decrease in management manpower, improvements in procurement, savings in cash flow and reduction in warehouse space requirement. Eventually the anticipated profits will definitely be more than the system costs even under the most conservative assumptions.

Kini, (1999) observed how material management is done in a typical Engineering Procurement and Construction (EPC) project. EPC project is divided into phases such as planning, design, procurement, subcontractor control, construction, and closeout. The project manager must oversee the various phases of the project to ensure that the material management is carried out effectively among the teams. Thus, subcontract some part of the work and/or procuring materials through a robust competitive tendering process will eventually lead to risk sharing and best price in the market for the desired quality. Thus, once a list of vendors is finalized for different materials, the schedule of activities must be updated with the most precise material requirement data to meet exact construction needs, so that the loss of revenue due to under-stocking and blocking of inventory due to over-stocking are avoided.

Vrijhoef and Koskela, (2000) investigated the status of construction supply chain management. They compared previous case studies and found out how futile attempts were made to improve the construction supply chains, which were neither economically nor functionally viable. They observed how the "construction factory" is a typical build-to-order supply chain, which is set up around a single product, whereas on the contrary, in manufacturing industries, various products are distributed to customers after being produced in the factory, leading to better and quality-controlled product delivery. Thus, whenever projects of a particular kind are carried out, the procedures can be alike in construction too, which will enhance the production rate. Thus, the wastages seen in the construction supply chains are immense even when situations are normal, which cannot be detected early due to inappropriate and obsolete control of the construction supply chains. Thus, if properly applied, efficient Supply Chain Management promises to give a practical solution to all the obstacles in construction and helps in the overall growth and development in construction.

Thomas *et al.*, (2005) argued on the lack of fundamental principles for the management of construction sites. There is enough awareness when it comes to the consequences of unproductive decision-making and about the things that go wrong and the risks associated with it. But controlling the time overruns and cost overruns becomes very tedious as there isn't sufficient knowledge or published data when it comes to this topic. As a result, site material management practices are most affected. Lean construction is often resorted to as it promises to deliver optimum management of material. Although most of these principles are difficult to carry out at the site level as they are unclear and laborious to decipher. However, the efficiency and labour productivity is hampered if there is any interference to the normal flow of material and this is the only aspect which is clear. Studies on about 125 construction projects revealed problems related to material management, which often cause chaos on construction sites. 40% loss in daily productivity due to material

management deficiencies was observed due to various reasons. Research needs to be encouraged to investigate different material that can be directly transported to site without having the need of storing in godowns, which will reduce the requirement of storage space on the site considerably. Alternatively, studies on high level of co-ordination, improved visualization, FIFO, LIFO, JIT etc. shall be studied and applied to construction projects.

Segerstedt *et al.,* (2010) through this paper throws light to a distinct problem regarding the management of its supply chains in construction industry. The main focus was to deliberate the resemblances and variances that they have with the traditional manufacturing industry and its supply chains. In the manufacturing industry, the customer can place an order for a product through specifications in various degrees such as: i. engineer to order, ii. modify to order, iii. configure to order, iv. select a variant. On the other hand, the construction subcontracts most of the work and carries out only a small part of the project with the help of its own resources. This is mainly done for risk mitigation and dispersion for the sake of compensating for an unstable market.

Singh, (2011) remarked that one of the most important elements for the growth and competitiveness of businesses is Supply Chain Management. Due to inefficient planning, improper directions and lack of resources, medium and small industries in most of the developing countries face problems in coordinating their supply chains. Thus, a framework for improvement of coordination through the formulation of an index for coordination in the supply chain was developed. It was observed that the commitment of top management is an essential driving force in enhancing the coordination among various factors.

Patel and Vyas, (2011) studied the lack of proper material management techniques on construction sites in Ahmedabad. Material management of three eminent developers were examined. It was deduced that control of wastage of building materials was of the utmost importance for which benchmarking is necessary. Proper co-ordination between the site and the organization is very crucial and hence they suggested that a centralized material management team must be formed, which should be responsible and accountable. Once an efficient Management Information System (MIS) is set up, adequate control, tracking and monitoring of the system will be possible which will merge all the features of material management. It was seen that efficiency increases by about 35% when enterprises employ proper materials management systems.

Shin *et al.,* (2011) investigated the ability of a seamless integrated information management framework to provide logistics information to stakeholders of the project for the ease of their

decision making. It was revealed in the pilot test of the developed structure that time efficiency can be enhanced by over 32% as compared to traditional supply chain management. Radio-frequency identification (RFID) based construction supply chain management environments can prove to be a boon in construction logistic management. Intelligent equipment incorporating RFID technology can be implemented to accumulate and communicate data in the supply chain, leading to a seamless material flow.

Caldas *et al.*, (2014) identified materials management strategies that represent contemporary and futuristic trends in the capital projects sector. Surveys, interviews and case studies were executed in about 54 organizations revealed that the contractors have much lesser developed processes and procedures than owner organizations. A massive impact is seen on materials management due to advancement in technology and fully automated systems are used to generate materials requirements. 3D modelling is used to directly calculate quantities and this material requirement data is further shared with the teams handling procurement. Assessment of innovative and efficient materials management methods, as well as emerging factors and challenges for the sector, was documented. In the initial stages of planning of the project, the role of materials management is very critical, where real-time co-ordination, monitoring and digital modifications is paramount. In the initial phases of Material Requirement Planning (MRP) and project procurement plan development, documented quality processes and performance continue to be a major component of systematic material management of contemporary construction entities

Pande and Sabihuddin, (2015) had conducted this study in two segments, the first of which was a Qualitative analysis and the second of which was a Quantitative analysis. Qualitative analysis was performed through S-Curve analysis by utilizing Microsoft Project software wherein predicted and actual material consumption was evaluated. The S-shaped graph depicts the planned and actual project path which is generated by the cumulative of specific factors (in this instance, materials cost) versus time. Throughout the project cycle, this analysis is performed to compare budgeted and actual material costs. Quantitative analysis was performed with the major focus being on inventory control approaches like ABC categorization and EOQ analysis. It was established that the overall cost of inventory was lower after implementation of EOQ analysis as compared to that without implementing the same.

Subramani *et al.*, (2015) carried out a questionnaire-based survey in this research in order to get a clear understanding of the approach of all the stakeholders which include clients, consultants and contractors towards the factors that impact the progress of construction projects. The main objective

was analyzing the utilization of inventory and inventory management and control techniques adopted at construction sites. Tracking and locating materials at the time of their need becomes extremely difficult and time consuming when their storage on construction sites is improper. Contractor engagement in material management is a plausible solution for implementing an effective inventory management system. Contractors must adhere to project requirements and specifications to avoid conflicts, delays, and cost overruns, and they must keep track of stocks and procurements, as well as evaluate material usage on the site.

Rathinakumar *et al.,* (2018) conducted this research by studying an ongoing Stilt+4 storeyed Residential apartment project. The said project was subjected to S-Curve Analysis, ABC Analysis, and EOQ Analysis. The findings of the S-Curve analysis showed that material costs fluctuate between the estimated and actual costs. The actual material cost is greater than the estimated material cost, as indicated by the S-Curve graphs. Improper work schedule and planning, insufficient market projections and field conditions, material shortages, damages due to material transportation, handling and storage in stock yards, substandard quality, ineffectual material consumption planning, interference of client, and changes in financial and legal conditions are all factors that contribute to variations in estimated and actual material costs. It is clear from the findings that both internal as well as external variables contribute to the materials cost escalation. To reduce overall inventory costs while maintaining inventory at an ideal level, EOQ analysis provides solutions for how much A-class material such as steel, cement, sand, aggregates, bricks/blocks, etc. should be ordered and how often the order should be placed. The use of ABC classification and EOQ analysis can help to alleviate stock-out issues for A and B class materials on the construction site as well as eliminate the additional costs due to over-stocking. Following the use of ABC and EOQ analysis, the overall cost of inventory is discovered to be lower. According to the report, employing appropriate material management boosted the project's total efficiency by 35 percent.

Madhavrao *et al.,* (2018) discussed the strategies utilized for material management in building construction projects in this study. For a thorough knowledge of management of essential construction materials, S-Curve Analysis and ABC Analysis are employed. The authors discovered an optimal approach to minimize the project's cost by applying these concepts to a (G+6) Residential building. The S-curve analysis was used to evaluate the difference between the projected and actual cost of materials ultimately justifying the gap between the project’s estimated and actual cost. The quantity and costing of the materials were identified via ABC analysis. This approach allows for the usage of specified materials according to schedule and timely acquisition of

material for every particular activity. Materials can be pre-planned from the beginning of the construction process, and procurement can be done based on the periodic costs. Quantities of material may be determined with better precision using this method. Weather conditions, natural disasters, incorrect material procurement, and market material volatility all contribute to higher construction budgets and cost overruns. The causes for the project's cost variance might be related to late material deliveries, inconsistencies in plans and drawings, errors in RCC design, and so forth. Proper planning and scheduling can help save money and time. Delays caused by poor project scheduling and management will contribute additional time and cost overruns to the project. If a variation in materials happens, it has an impact on material procurement as well as the overall project budget.

Sarovar *et al.*, (2018) discussed the pros and cons of various material management methods used on construction sites, as well as how they influence the project's economy. It was observed that only major construction businesses in India utilize standard protocols and software for material management, therefore least issues are encountered by them. Small and medium enterprises, on the other hand, fall behind in material management due to a lack of use of modern software or a lack of understanding of material management techniques. Further, they seldom have a material management department. Much research still needs to be done in the sector, as results reveal that even after using material management techniques, softwares, etc. many problems in material management are still faced by big construction players. The lack of material management ultimately results in wastage of materials, decrease in labour productivity, delay in work and project cost overruns.

2.2. Inferences / Gaps from Literature

Even after having a number of methods and techniques developed for Material and Inventory Management such as Material Requirement Planning (MRP), Just-In-Time (JIT) Concept, etc., that are efficiently applied to other types of industries, none of the techniques seem to be holistically applicable to the construction industry due to its highly uncertain nature. The methods and techniques can be applied to the construction industry to some extent, but straightforward and complete application is not feasible i.e., impractical and perhaps impossible. This can be owed to the fact that each construction project is unique and construction processes are often demand driven. Work stoppages and sometimes crippled schedules due to overlapping of activities is a common phenomenon observed in construction. Therefore, a need is felt that a reliable method, flexible enough to take into account the changing inventory requirement pattern be devised, so that material wastage is avoided, as well as associated under-stocking and over-stocking costs are eliminated.

Chapter 3

METHODS AND METHODOLOGY

3.1. Methods

As comprehended from the literature review, various different methods and techniques are available which can be used for management of material in different phases of the project. The following conceptual methods serve as key indicators for designing the material management system for construction industry:

A. S-Curve Analysis

S-curve is a numerical theory which can be described as “an indicator of cumulative costs/labour hours/other quantities plotted against time or other parameters”. It depicts the usage of materials across the project's entire time frame. The curve indicates how actual time and cost components compare to projected expenses and time permitted for certain resources. It is used to keep track of the project's progress as well as monitoring expenditure. Some of the most essential building materials, such as steel, cement, and bricks, are subjected to S-curve analysis.

Figure 3.1 shows a typical S-Curve of Timeline vs Quantity/Cost/Labour hours.

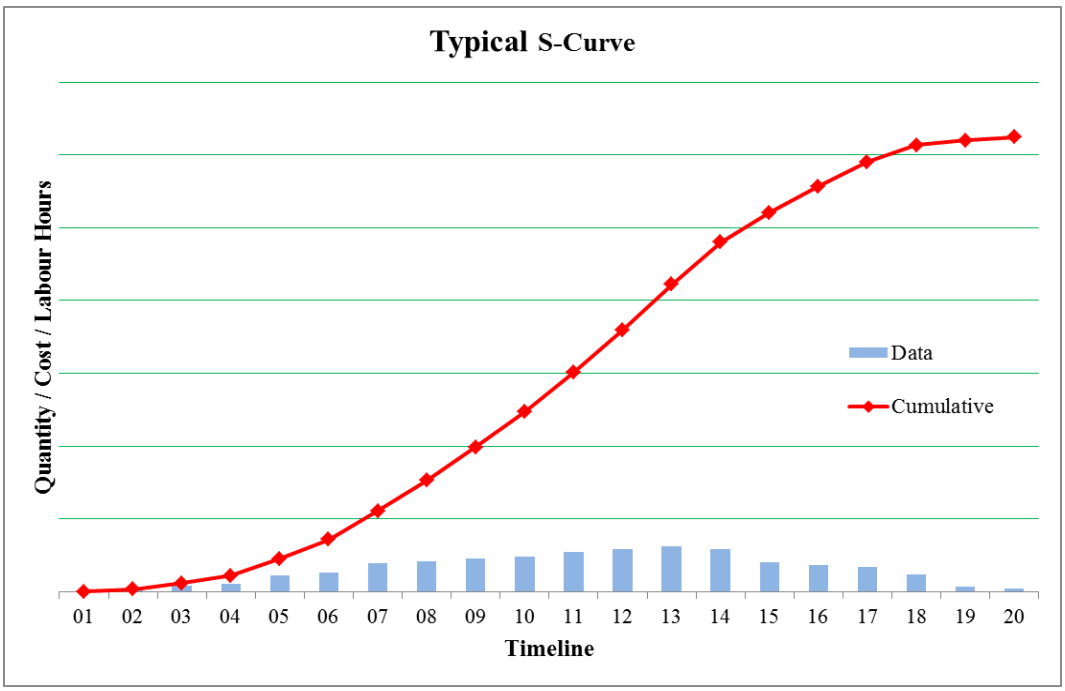

Figure 3.1: *Typical S-Curve of Timeline vs Quantity/Cost/Labour hours*

B. ABC Analysis

Categorizing materials according to their significance and value is an essential characteristic. Classifying inventory items allows us to determine inventory which needs proper control and management. Moreover, it helps to ensure that resources are used efficiently, thus minimizing wastage. ABC analysis is the foundation for managing commodities, calculating stocking levels, and determining inventory check intervals. It is an analytical method for keeping track of various inventory items. Pareto's law asserts that "a small proportion of items account for a large proportion of value", which is the basis for ABC analysis. Materials are categorized under three classes namely A, B and C as shown in Table 3.1.

Table 3.1: *Classification of Materials*

Class of Material	%age of Inventory	Money Value
A Class	20%	70%
B Class	30%	25%
C Class	50%	5%

In order to carry out ABC analysis, first and foremost, various materials needed for the project are identified and their estimated quantities are calculated. Also, unit rates of these materials are found and their usage values are calculated by multiplying the rate with the estimated quantity. These values are then converted into percentage of total annual usage or total project cost and arranged in descending order of their ranking.

C. EOQ Analysis

The two most significant types of inventory expenses are ordering costs and carrying or holding costs. Ordering costs are incurred by establishing a list, such as conveying the order, shipping charges, supplier selection costs, and so on. The costs of retaining the list are represented by carrying costs. It covers warehousing costs, spoilage charges, pilferage, insurance and taxes, among other expenses. Ordering costs and Carrying costs are diametrically opposed. Smaller orders should be placed to reduce carrying costs; however, this increases ordering costs and conversely larger orders minimizes ordering costs but that in turn increases the carrying cost. EOQ methodology aids in reducing overall inventory expenditure. "Economic Order Quantity (EOQ) is defined as an inventory-related model that is used to obtain the optimum quantity that can be purchased to reduce both the inventory carrying cost and the cost of processing of purchase orders." [Rathinakumar *et al.*, 2018]

The following formula is used to determine the optimum quantity: [Pande and Sabihuddin, 2015]

$$\boldsymbol{Q = \frac{\sqrt{2 * C_O * S}}{\sqrt{C_U * I}}}$$

- C_O = Ordering Cost
- S = Total Consumption
- C_U = Unit Cost of Item
- I = Inventory Carrying Cost

D. Re-ordering Point

Re-ordering point is a level of quantity of material available in the inventory at which order for further supply of material should be placed with the supplier. "This level is fixed somewhere between the maximum level and the minimum level in such a way that the quantity of materials represented by the difference between the re-ordering level and the minimum level will be sufficient to meet the production requirement until the materials are replenished." [Subramani *et al.*, 2018]

E. Materials Requirements Planning (MRP)

The process of identifying, quantifying, and scheduling the procurement of equipment and materials required for the project is known as Materials Requirement Planning (MRP). This function is essential to the project's success. The determination of the materials and equipment necessary for the project as well as their procurement, have a major impact on all project operations. All the lead times linked with material and equipment procurement have an impact on the entire project timeframe, from the chronology of engineering processes to the scheduling of construction

activities. Owners, engineers, contractors, fabricators, and suppliers are among the organizational classes encompassed within MRP.

F. Just-In-Time Concept (JIT)

Just-in-Time (JIT) production philosophy is a manufacturing concept that focuses on increasing the production speed. The JIT concept states that a company produces just what is required, when it is required, and in the quantity that is required. The industry just manufactures what the client demands as per actual orders, not what is forecasted. JIT may alternatively be defined as manufacturing the required units in the requisite quantities at the very last safe moment, with appropriate quality. It indicates that the business can simply manage the production with its own resources and allocate them efficiently and easily.

3.2. Methodology

Considering the nature of the construction industry, especially for small and medium companies which are not as familiar with material management techniques, it is very important to start employing certain techniques in order to efficiently complete projects within the specified time and budget. Based on the inference of literature review, a computer system/tool can be developed for construction inventory management by combining various material management techniques. This system can either be a website, a computer application or a smartphone application. Stoppage of work and crippled schedules are the main issues in the construction works. Hence the material management methodology needs to be flexible enough to accommodate all activities, some of which may either be delayed or started ahead of time depending on the conditions of the site. Due to this, the system should not be completely automated and the main control should be given to the site manager and the procurement team. Material Requirements Planning should be carried out in the initial phases of the project life cycle so that the quantities of required material at various phases of the project along with lead times are estimated. Also, it is important to maintain the record of the inventory and the stock on a daily basis. The material stock should be updated as per the consumption and activities performed on the site. The interface should have a list of all activities of project. Similarly, the user should be able to split activities as per site conditions. It can be done by integrating the interface with other project management software such as Microsoft Projects (MSP), Primavera P6, and Navisworks, etc., for the better management of materials. Economic Ordering Quantity and ABC Analysis should be incorporated so that the manager is able to easily understand the requirement of materials according to upcoming activities.

Figure 3.2 shows the detailed logic for ordering the materials for construction processes.

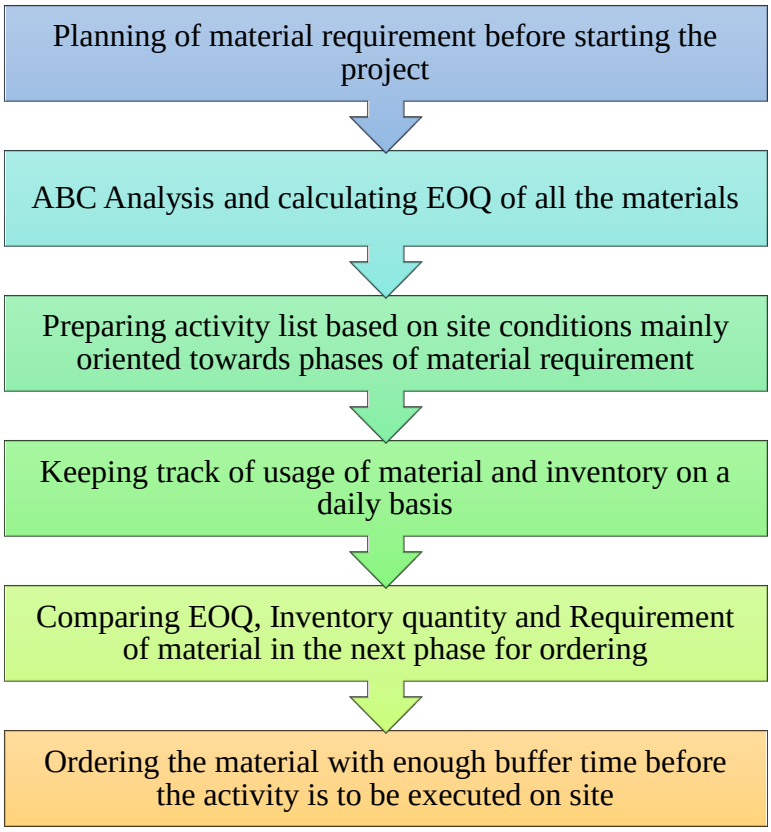

Figure 3.2: *Logic for ordering materials for construction process*

Logic should thus be formulated for linking 'Economic Ordering Quantity', 'Stock Quantity', 'Required Quantity' and 'To Be Ordered Quantity' so that the exact quantity of material can be ordered at the required time without increasing material carrying costs or ordering costs. Cost per unit of materials can be added in the system so that the user can directly get the total cost amount for ordering the required material at that particular stage so that funds can be mobilized for the same. List of suppliers can be maintained into the system itself so that the contact details are readily available to the user for placing the order.

Chapter 4

EXPERIMENTAL PROGRAMME

4.1. Logic Formulation

From the methods and methodology, it is evident that Economic Ordering Quantity, Stock Quantity, Required Quantity and To Be Ordered Quantity of materials are most critical as inputs for formulation of logic for framework. Once these inputs are correctly determined based on inventory and the next set of activities on site, the management of materials will be lot more efficient. Based on this, logic can be formulated as below:

EOQ = Economic Ordering Quantity of a material
Stock Quantity = Quantity of material available in stock
Required Quantity = Actual quantity of material required for the next selected activity/phase
To Be Ordered Quantity = Quantity of material that is to be ordered

IF: Required Quantity ≤ Stock Quantity
THEN: To Be Ordered Quantity = 0
ELSE IF: Required Quantity > Stock Quantity
THEN:
Case I - IF: Required Quantity ≤ EOQ
THEN: To Be Ordered Quantity = EOQ
Case II - ELSE IF: Required Quantity > EOQ
THEN: To Be Ordered Quantity = Required Quantity

On analyzing the above formulated logic, it can be interpreted that the quantity of material to be ordered will be zero if the quantity of material required for selected activities is available in stock. In case the required quantity is not available in stock, then the required quantity will be compared with the economic ordering quantity of the selected material. If the required quantity is less than or equal to the economic ordering quantity, then the quantity to be ordered will be equal to the economic ordering quantity and if the required quantity is more than the economic ordering quantity, then the quantity to be ordered will be equal to the required quantity. The inventory stock quantity and economic ordering quantity of materials which cannot be kept in stock (e.g., RMC) will always be zero. In such cases, the quantity of material to be ordered will always be equal to required quantity.

4.2. Interface Development

4.2.1. Basic Architecture of Web-based Material Management System

A web-based Material Management System is basically comprised of three main components: a client, a server and a database. A client is a computer application or a web browser through which everything is operated. A server is a web server with the ability to store material data and send queries to the database. A database stores all the input data in various formats. The web browser has a unique Hypertext Transfer Protocol by which the client sends requests to the web server in a standard format. The web server sends a request to the database which carries out the requested operation and sends back the results to the web server which in turn is sent to the client which can be viewed on the web browser. Figure 4.1 represents the interactions between a web browser, web server and a Material Management database.

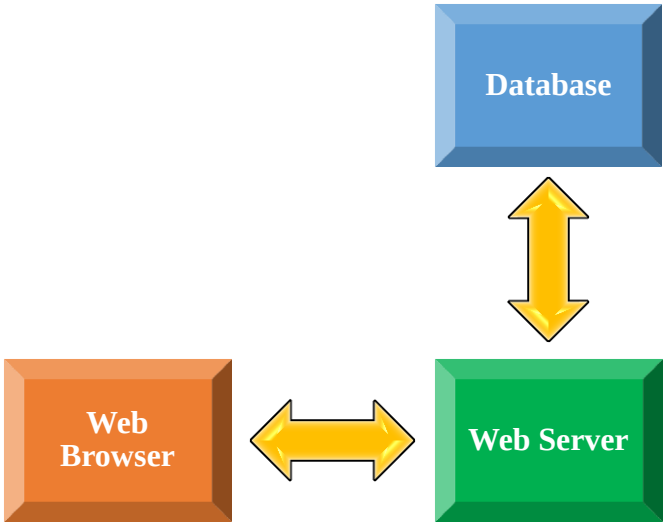

Figure 4.1: *Basic working of Web-based Material Management System*

Various programming languages are required to design a web mapping system. They include HyperText Markup Language (HTML), Hypertext Preprocessor (PHP), Cascading Style Sheets (CSS) and JavaScript. HTML is used to construct the overall structure and layout of a web page, PHP is used for making dynamic and interactive web pages and can be embedded into HTML, CSS is used to style the web page developed by HTML, and JavaScript is used to handle dynamic queries made on the web page. JavaScript is also used to develop various functions that determine how the web page operates, such as a function that displays a certain pop-up when a user clicks an icon etc.

4.2.2. Logical Data Model

The computer interface is developed in the form of a website based on the formulated logic. The most essential components for the interface are Material list which includes all the required materials for the project along with their specifications, Activity list which includes schedule and material quantities required for particular activities, Supplier list which includes details of suppliers along with lead times, Inventory which includes stock quantities of materials and Requirement page which will compute material quanties based on inputs depending on site activities. Figure 4.2 shows the logical data model of how the different lists and data are connected/mapped and the functioning of the website.

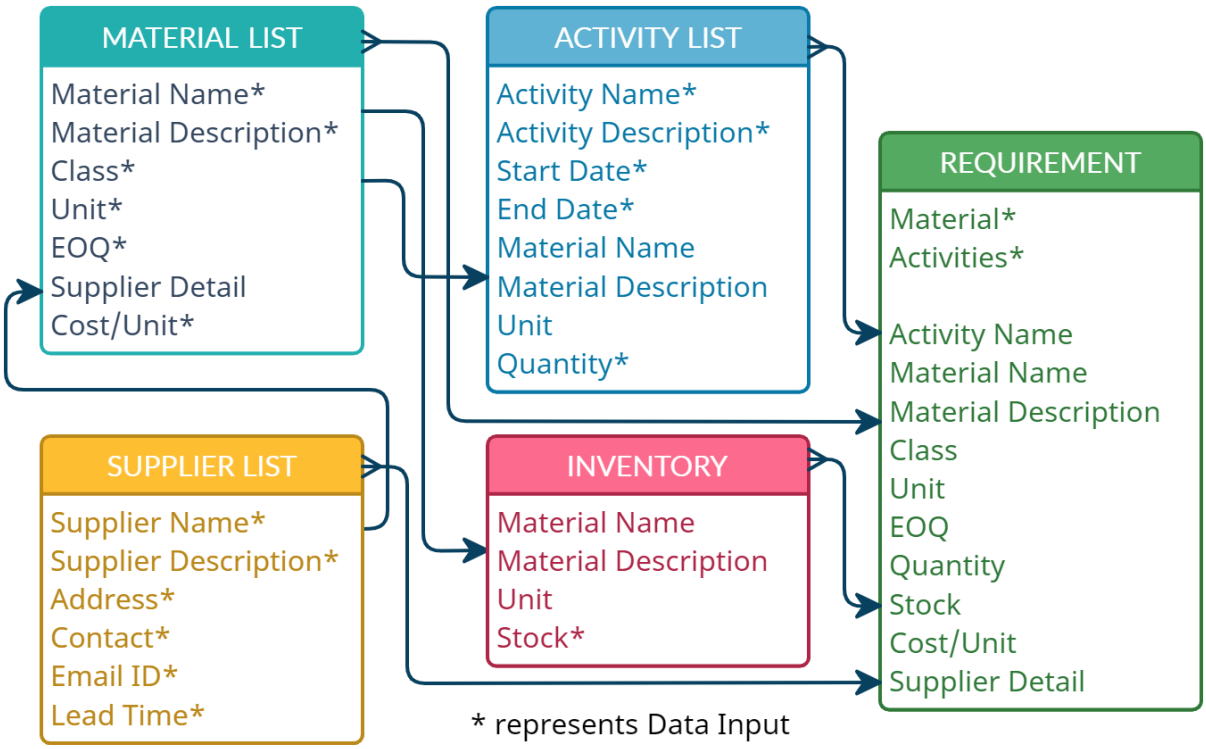

Figure 4.2: *Logical Data Model*

4.2.3. Detailed Working of Web-based Material Management System

A. Material List

Material list mainly includes the list of all the materials that are required for the completion of the project. These materials are added in the database along with all their specifications and details such as Description, Class, Unit, EOQ and Cost/Unit. Also, supplier detail for a particular material if already available can be mapped directly from the Supplier list. The material details if required can be edited or deleted. The EOQ of all the materials to be used in the project needs to be calculated beforehand. Figure 4.3 shows Material list page UI outline which will include all materials along with their specifications and EOQ.

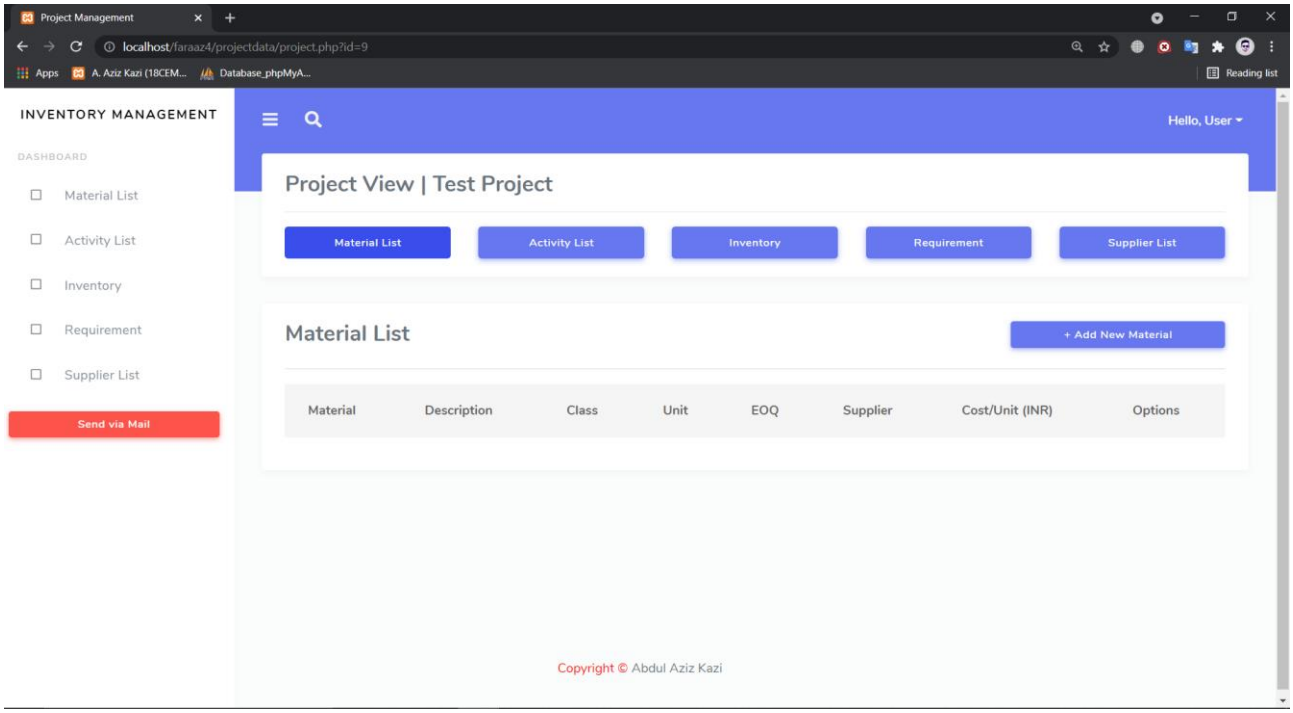

Figure 4.3: *Material List page UI outline*

B. Activity List

Activity list includes the list of all the activities that are to be executed on site. This is basically a schedule of activities which will also include the quantity of different materials required for various activities. Care should be taken that the activity list here is prepared more material consumption oriented rather than project management oriented. The list includes data such as Activity description, Start Date, End Date and Quantities of materials required. The list of material and their details can be mapped from the Material list and the quantity as per the activity can be added thereafter. The activity details if required can be edited or deleted. The quantity of materials required for each activity in the project needs to be estimated beforehand. Figure 4.4 shows Activity list page UI outline which will include schedule and material quantities required for activities.

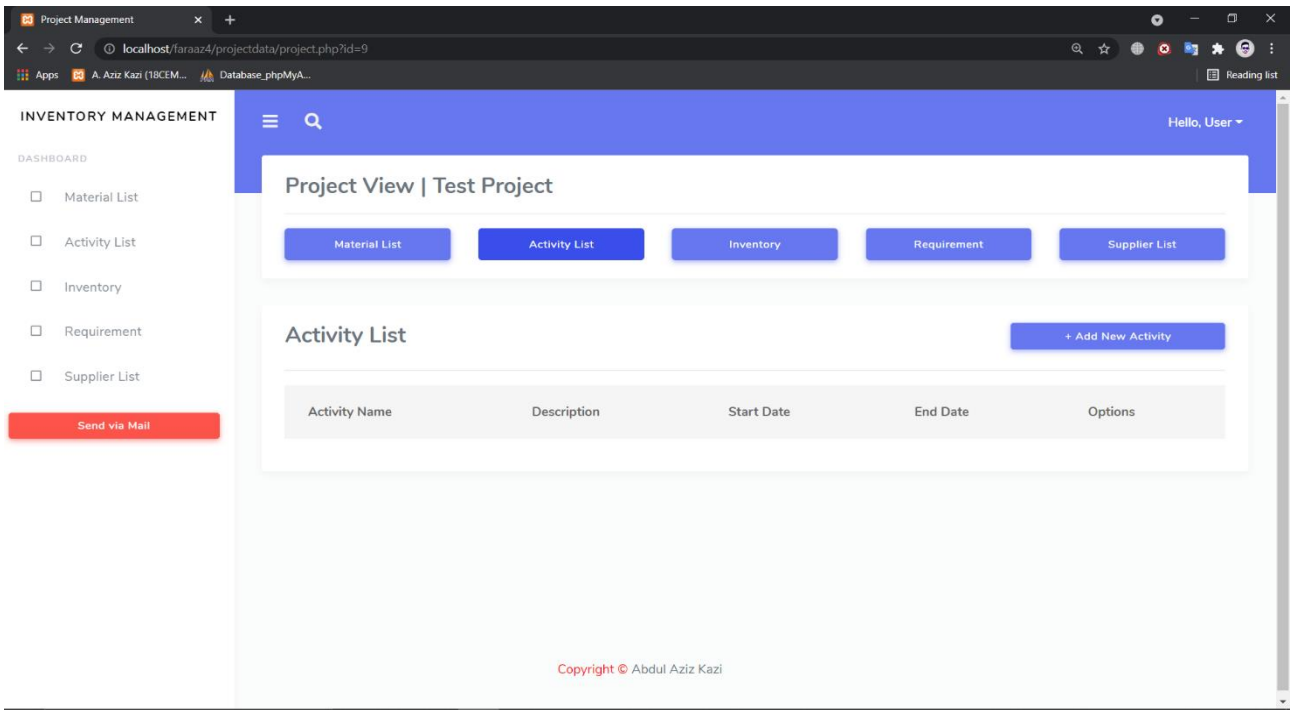

Figure 4.4: *Activity List page UI outline*

C. Inventory

Inventory list includes current stock quantities of material available in the inventory. The list of material and their details can be mapped from the Material list and the stock quantity can be added into the database thereafter. Furthermore, the stock data can be updated as per changes in inventory quantities as per new orders or consumption on site. Figure 4.5 shows Inventory page UI outline which will include current stock quantities of material.

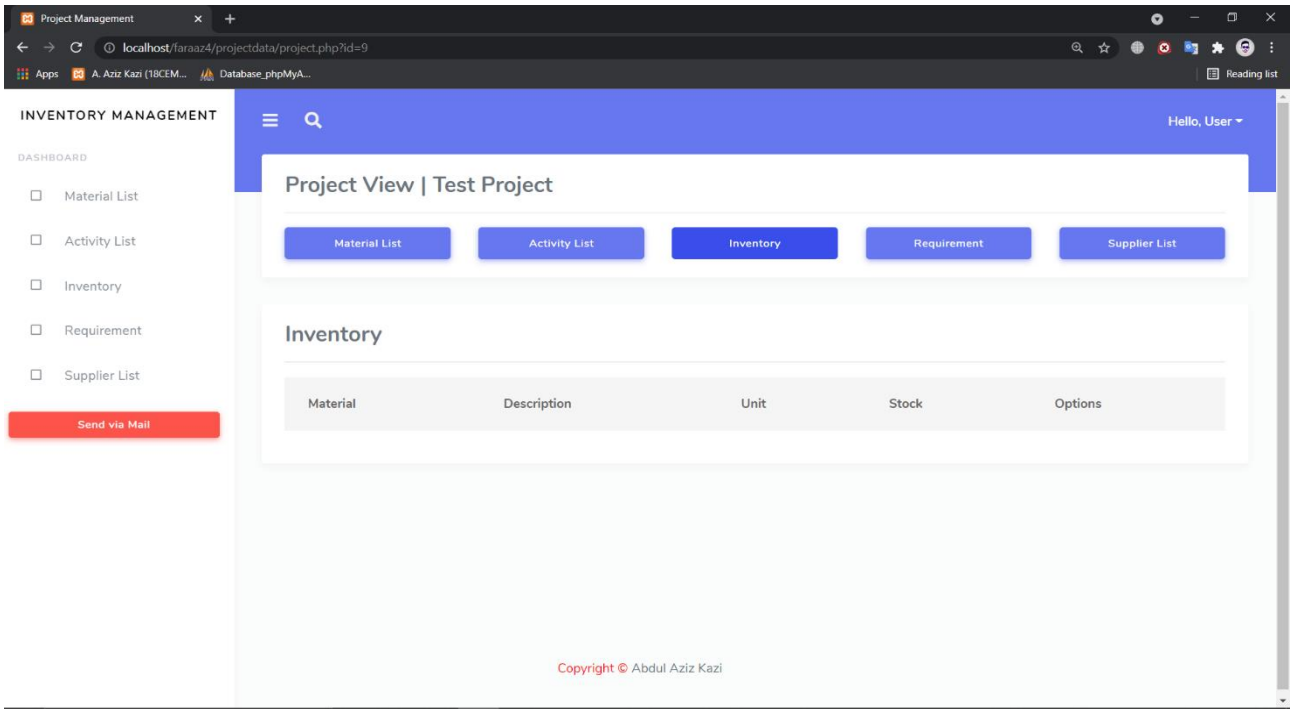

Figure 4.5: *Inventory page UI outline*

D. Supplier List

Supplier list mainly includes the list of all the suppliers or vendors supplying different materials to the site. The list consists of data such as Supplier description, Address, Contact details, Email ID and Average delivery time or Lead time. The supplier details if required can be edited or deleted from the database. Figure 4.6 shows Supplier list page UI outline which will include details of material suppliers along with lead times.

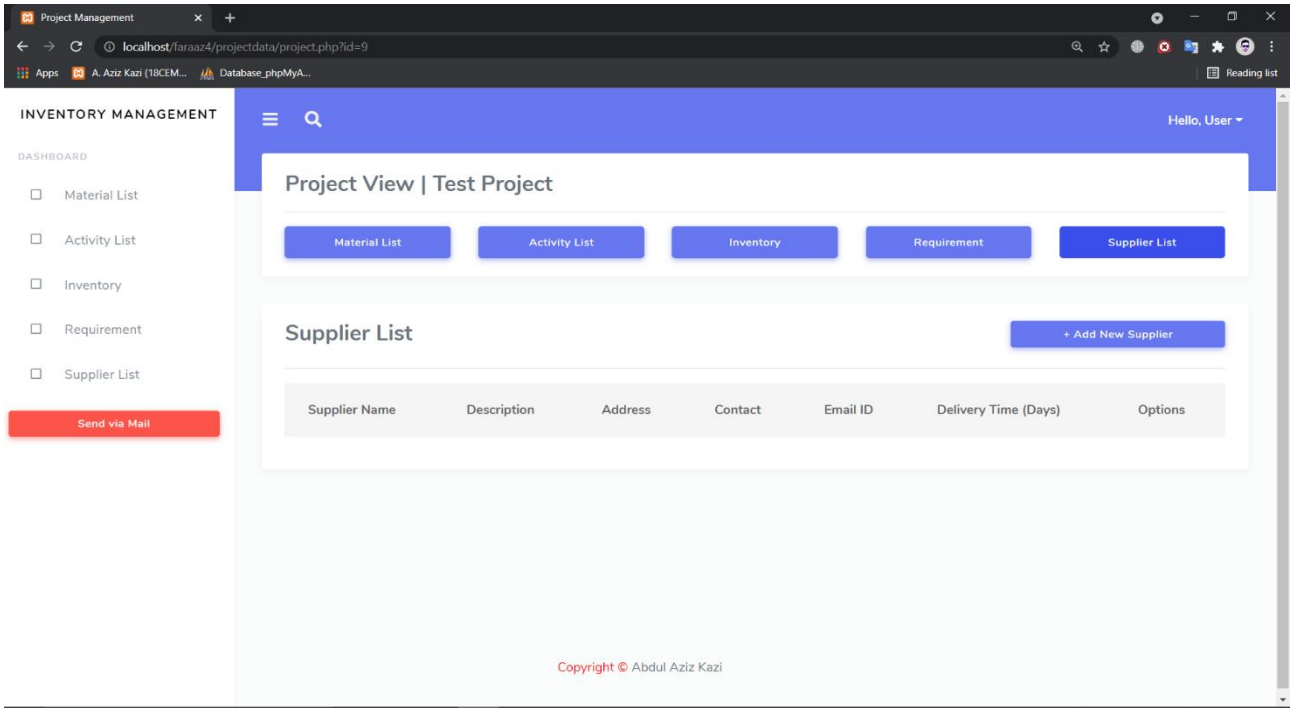

Figure 4.6: *Supplier List page UI outline*

E. Requirements Page

The Requirements page is used to get the requirement of material for particular activities based on dynamic inputs by the user. The user has to first select the material from the list of materials in the drop-down for which he needs to find the required quantity. The names of materials in the drop-down list can be mapped from the Material list. The user then selects the activities for which he needs the total quantity of the selected material. These activities can be mapped from the Activity list. The user then clicks ‘Submit’ to get the total quantity of the material for the selected activities based on the earlier formulated logic. Figure 4.7 shows Requirements page UI outline which will compute material quanties based on inputs depending on site activities.

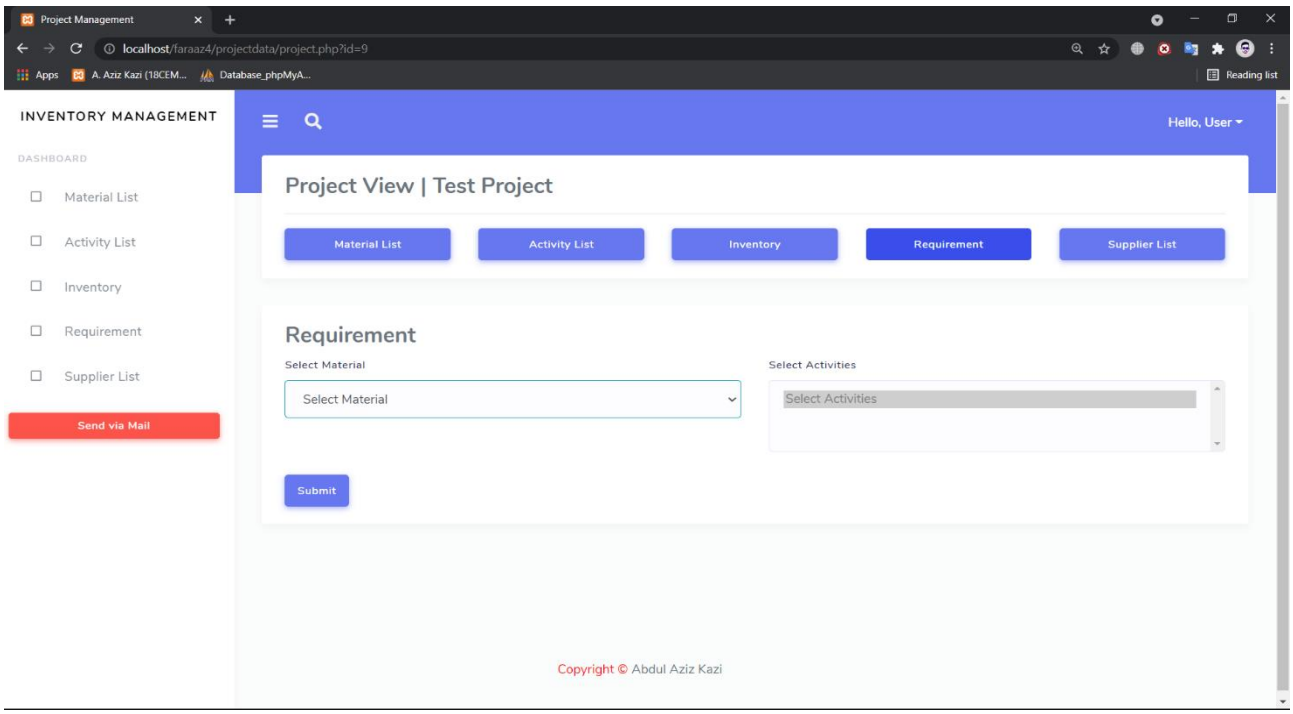

Figure 4.7: *Requirement page UI outline*

F. Database

Tables are created in the database for storing input data of all the lists efficiently. The database stores or retrieves the data from the tables as per dynamic queries from the server. This data is then processed to display the results as per requests made by the client. Figure 4.8 shows the Database that stores all the data in various lists.

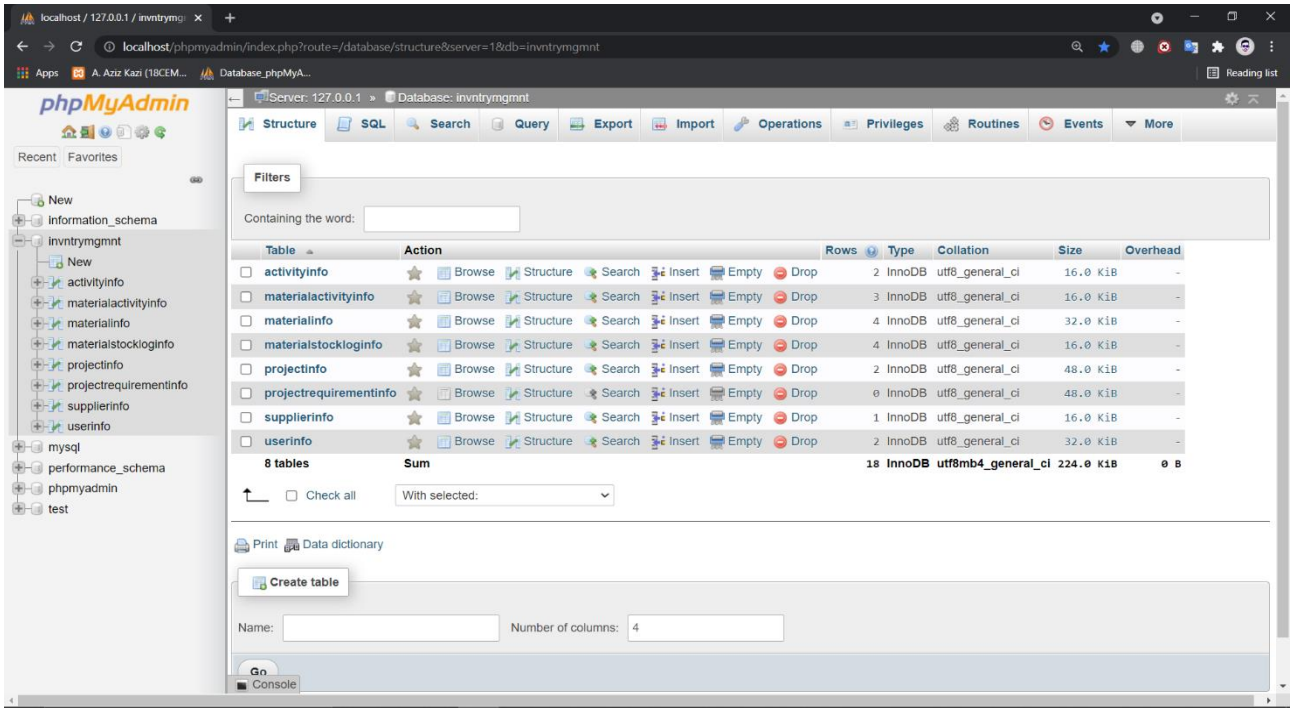

Figure 4.8: *Database*

Chapter 5

RESULTS AND DISCUSSION

5.1. Results

The work done under this study involved preparing a construction material management tool which can be feasibly applied on construction sites. To meet this aim, two objectives were set, which involved formulating logic for linking most suitable material management techniques and developing a system through computer interface incorporating all the necessary techniques of material management by using formulated logic which could be accessed by the material management team over the internet. Both the objectives could be successfully met and the developed web-based tool helps in material management efficiently since it is flexible enough to accommodate any updating of schedule. Hence, it is bound to give better control of material to the site manager or the material management team. Further, it helps in tracking the material flow on site and improves record keeping. Thus, the hassle associated with physical documentation of materials is eliminated. The material data is retrieved through running digital queries as and when required. The outcomes can be stated as below:

Outcomes of Web-based Material Management System

A. Login/Landing and Register Page

The login or the landing page includes Email ID and Password tab where a registered user will enter the respective credentials. Once the credentials are verified, they will be logged in to the system and

redirected to the main profile page. A link to recover password is also present on the page in case a user forgets their login credentials. Figure 5.1 shows the Login page for existing users.

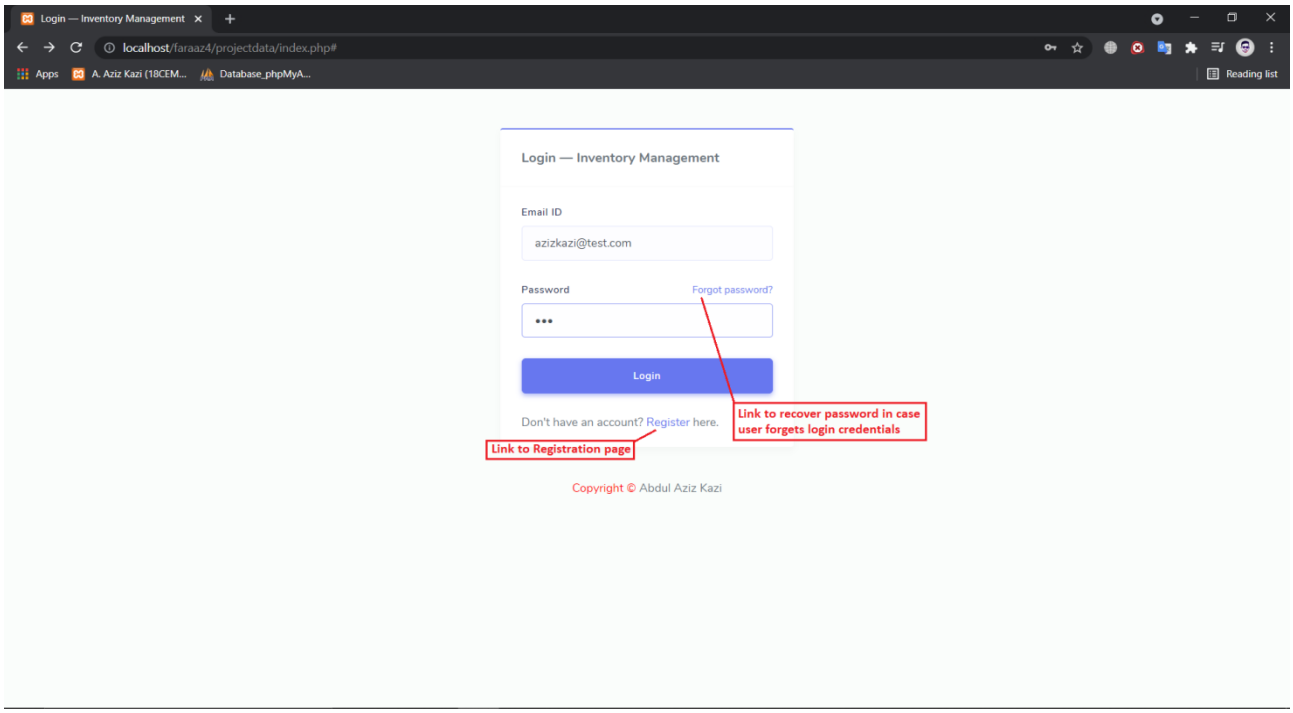

Figure 5.1: *Login Page*

For new users, a registration link is present at the bottom of the login page clicking on which will take them to the registration page. New users will have to fill in the data such as Project Name, Username, Email ID and Password. Once registered, new users can now go back to the login page and use the registered Email ID and Password to login. Figure 5.2 shows the Registration page.

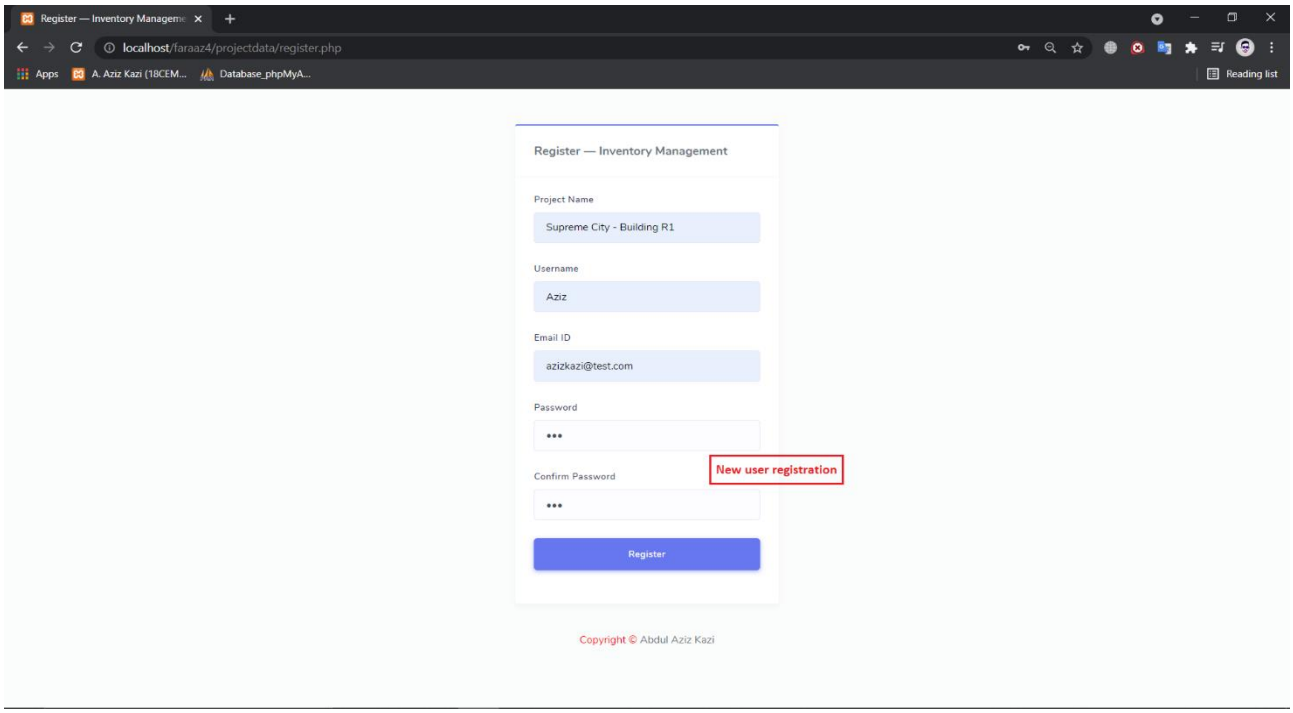

Figure 5.2: *Registration Page*

B. Profile Page and Dashboard

The profile page shows data such as the name of the project and user details. A text box is provided on this page in order for the user to add description, any critical details or notes related to the project. These details are saved on the profile page and will be available for the user at a glance every time they log into the system. The user can edit or delete these details as and when required. Figure 5.3 shows the Profile page.

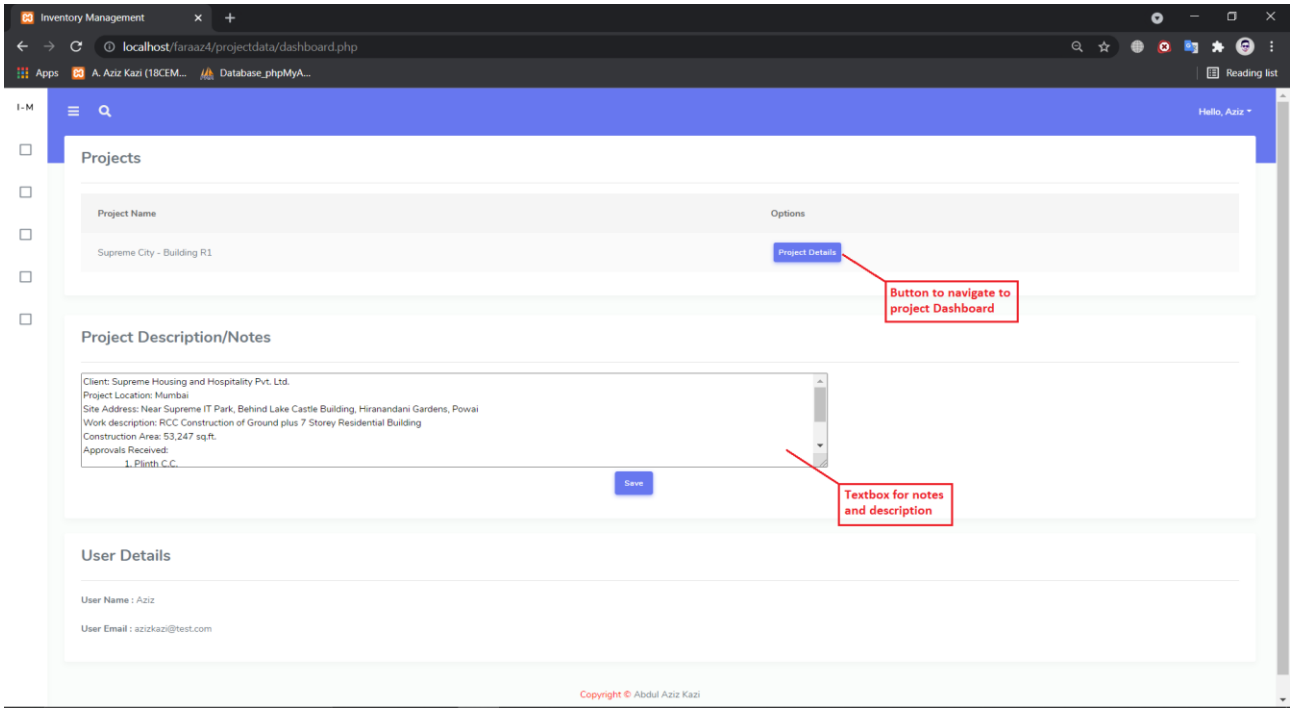

Figure 5.3: *Profile Page*

A project details button is present on the profile page clicking which will redirect the user to the actual project dashboard which includes tabs to navigate to all the different lists. Checkboxes are present on the dashboard to select and share various lists directly via mail or other modes. Drop-down menu is present on the top right corner which includes options to Logout or to navigate back to the Profile page. Figure 5.4 shows the project Dashboard.

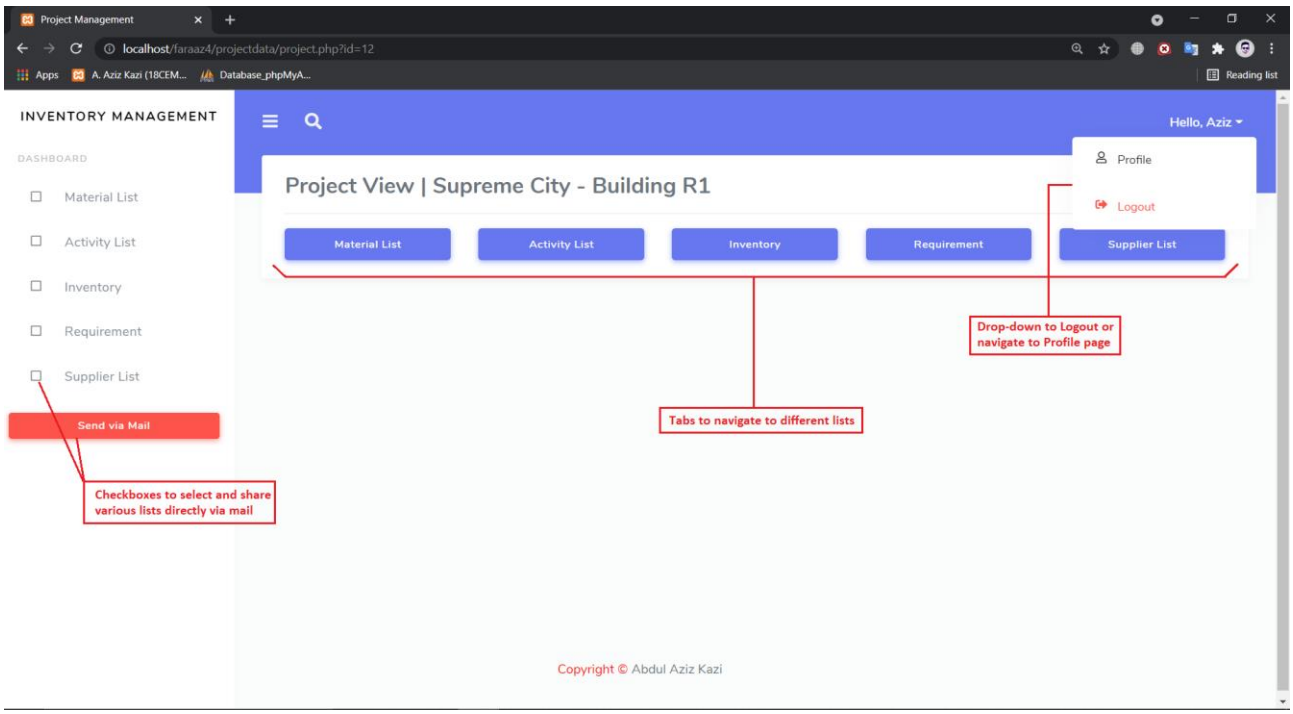

Figure 5.4: *Dashboard*

C. Material List Page and Add/Edit Material Details

The material list page includes a list of all the materials required for various activities along with all the details. The material details can be added by clicking on add new material button which will open a new material pop-up. The user has to enter details such as Material Name, Material Description, Unit, EOQ and Cost/Unit. Also, the user can select Material Class from the drop-down list in the pop-up. After entering all the material details, the user has to click on save changes button which will add the material data to the database and the same details will be visible in the material list. In this manner the user has to add all the materials required for the project in the database. In case the user wants to change the entered data for a particular material, they can click on the edit button in front of that particular material and edit the same. Similarly, the user can delete a particular material from the list by clicking on the delete button. Figure 5.5 and Figure 5.6 show Material List and New Material pop-up respectively.

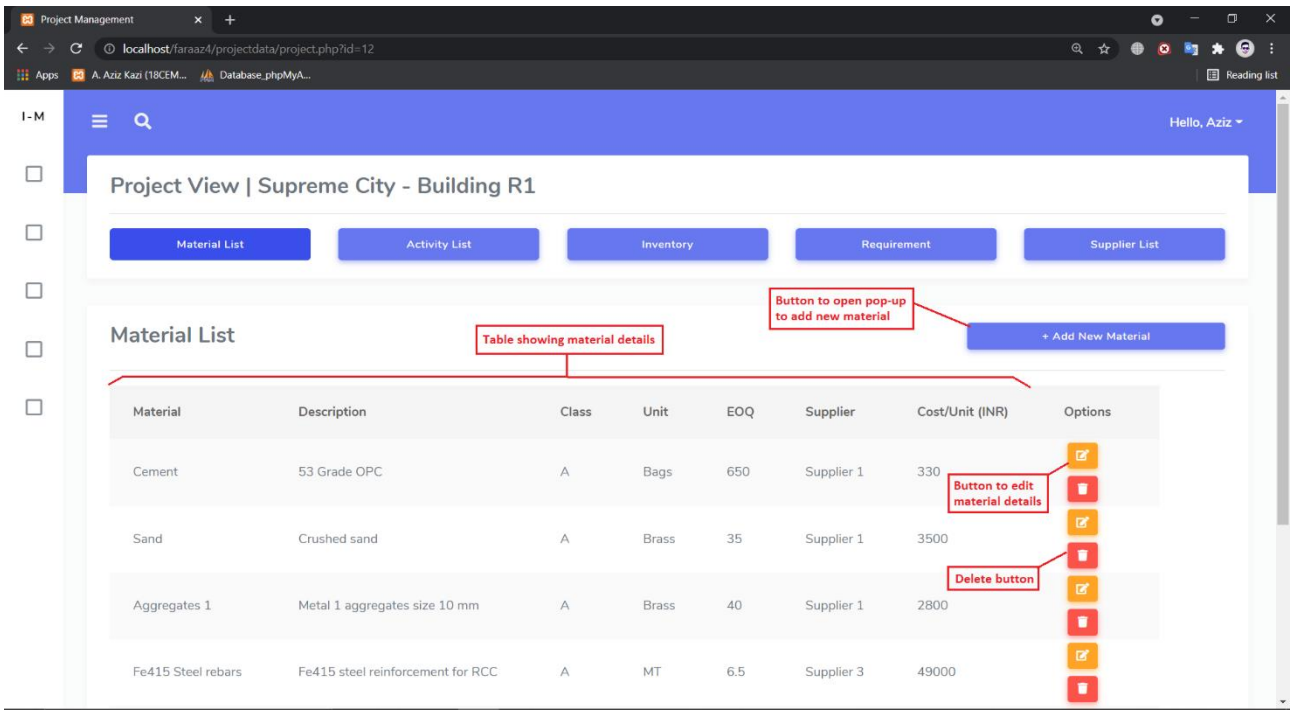

Figure 5.5: *Material List*

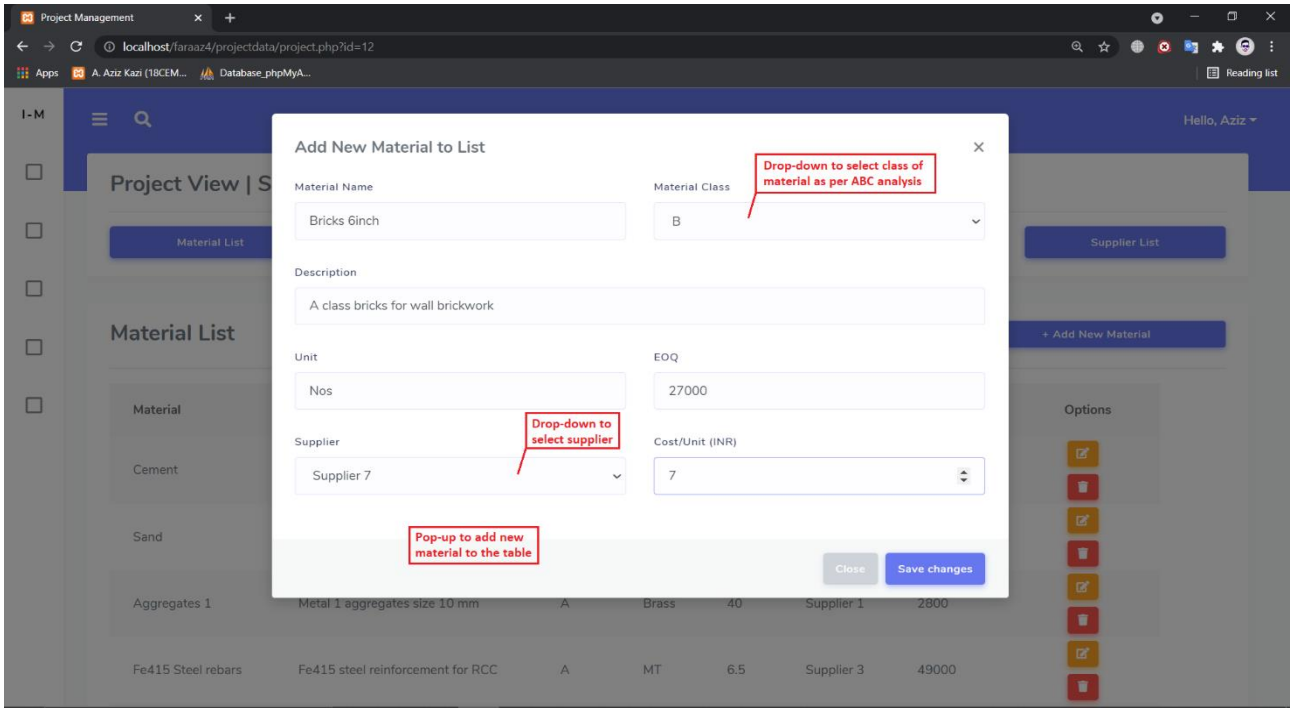

Figure 5.6: *New Material pop-up*

D. Activity List Page and Add/Edit Activity Details

The activity list page includes a list of all the activities that are to be executed on the site along with the start and end date. The activity details can be added by clicking on add new activity button which will open a new activity pop-up. The user has to enter details such as Activity Name, Activity Description, Start Date, End Date and Material Quantities required for that particular

activity. After entering all the activity details, the user has to click on save changes button which will add the activity data to the database and the same details will be visible in the activity list. In this manner the user has to add all the activities of the project in the database. In case the user wants to change the entered data for a particular activity, they can click on the edit button in front of that particular activity and edit the same. Similarly, the user can delete a particular activity from the list by clicking on the delete button. Figure 5.7 and Figure 5.8 shows Activity List and New Activity pop-up respectively.

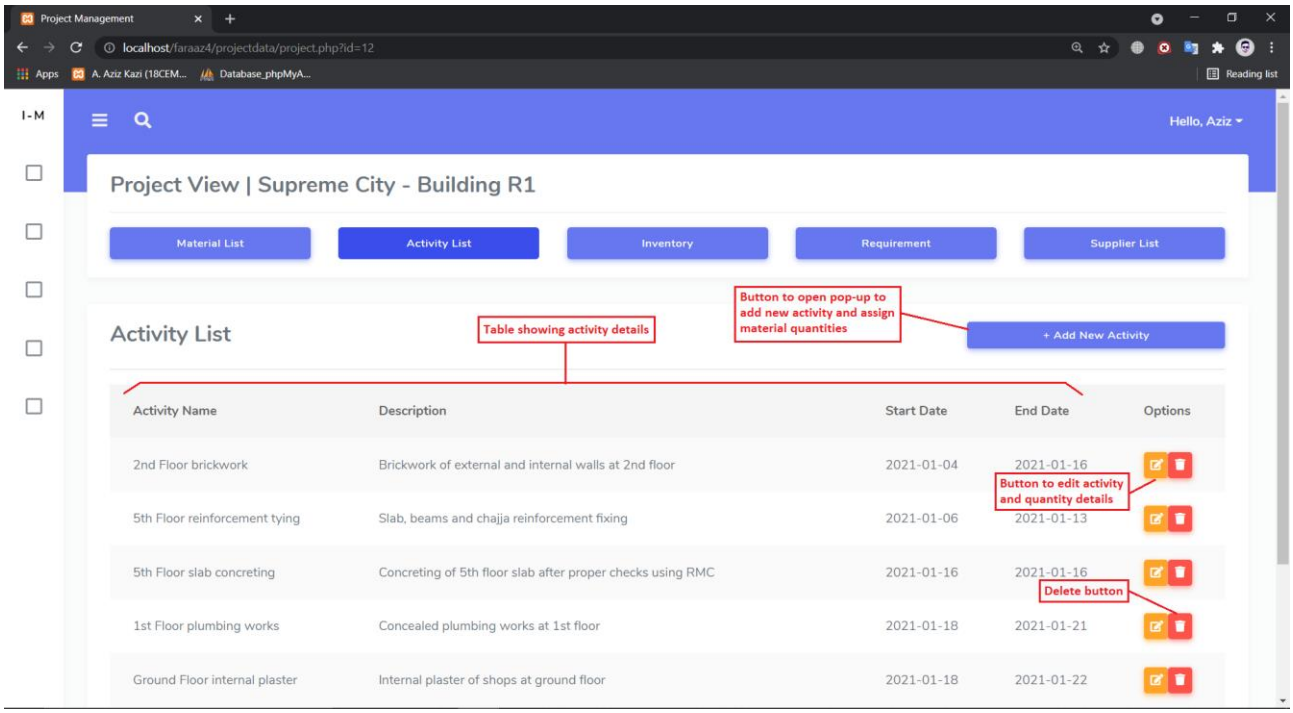

Figure 5.7: *Activity List*

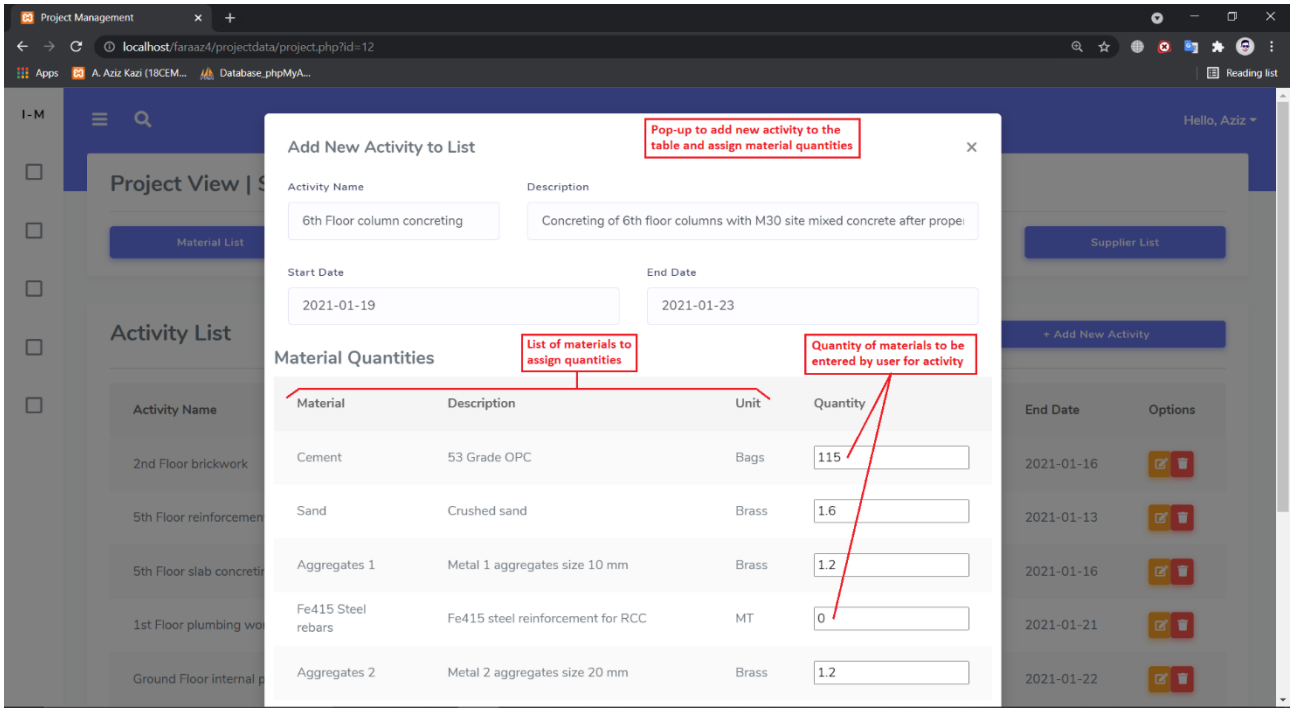

Figure 5.8: *New Activity pop-up*

E. Inventory Page and Update Stock

The inventory page includes a list of all the materials which are saved in the material list along with a column for stock quantities of those materials in the inventory. Initially the stock value is zero. The user has to enter the values of quantity of materials in stock in front of that particular material. This material stock data will be updated in the database along with the date of update. The user has to update the material stock quantities at fixed intervals of time preferably daily, as per the activities performed on site, as per the usage of materials and on delivery of materials by supplier. The user can thus keep a track of quantities of materials in stock as per the list of materials required for the project. Figure 5.9 shows the Inventory page.

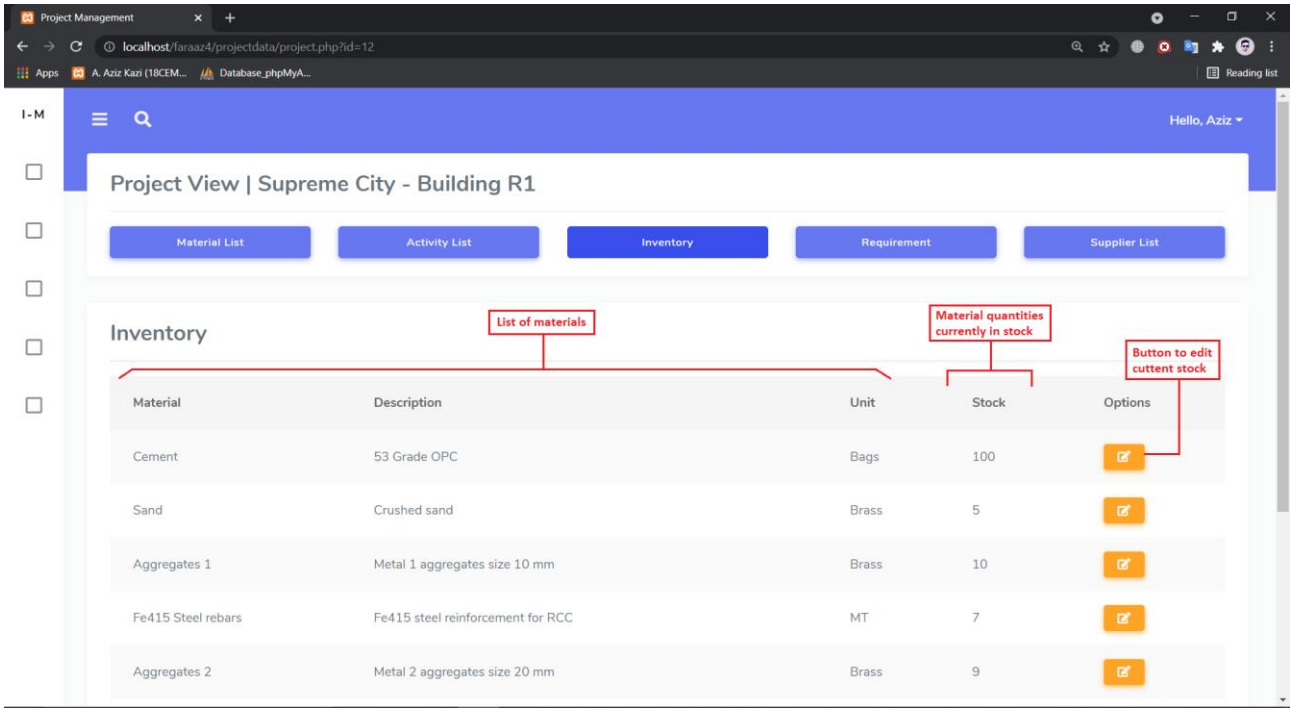

Figure 5.9: *Inventory page*

F. Supplier List Page and Add/Edit Supplier Details

The supplier list page includes a list of all the material suppliers along with all their details. The supplier details can be added by clicking on add new supplier button which will open a new supplier pop-up. The user has to enter details such as Supplier Name, Supplier Description, Address, Contact, Email ID and Average Delivery Time or Lead Time in days. Apart from contact details, lead time helps the user to plan the reordering of materials accordingly. After entering all the supplier details, the user has to click on save changes button which will add the supplier data to the database and the same details will be visible in the supplier list. In this manner the user has to add all the suppliers/vendors that supply materials on the site in the database. In case the user wants to change the entered data for a particular supplier, they can click on the edit button in front of that particular supplier and edit the same. Similarly, the user can delete a particular supplier from the list

by clicking on the delete button. The user can assign a particular supplier to particular materials in the material pop-up. Figure 5.10 and Figure 5.11 show Supplier List and New Supplier pop-up respectively.

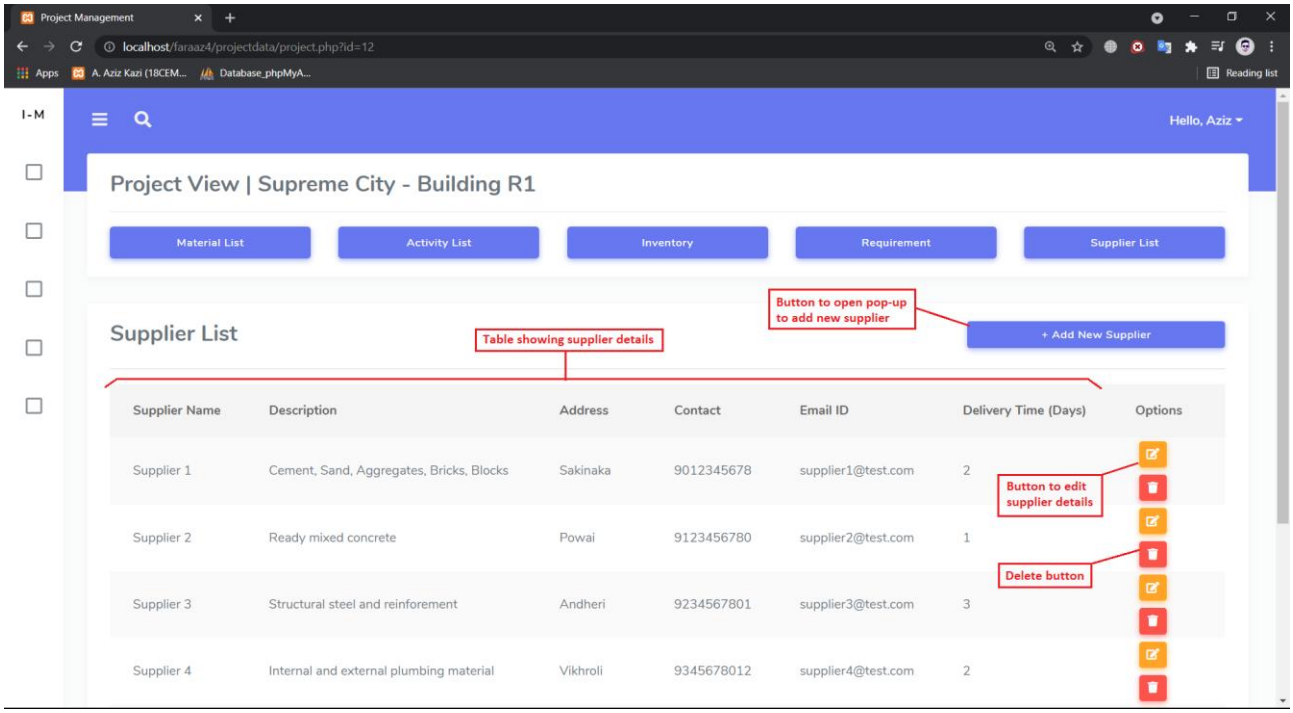

Figure 5.10: *Supplier List*

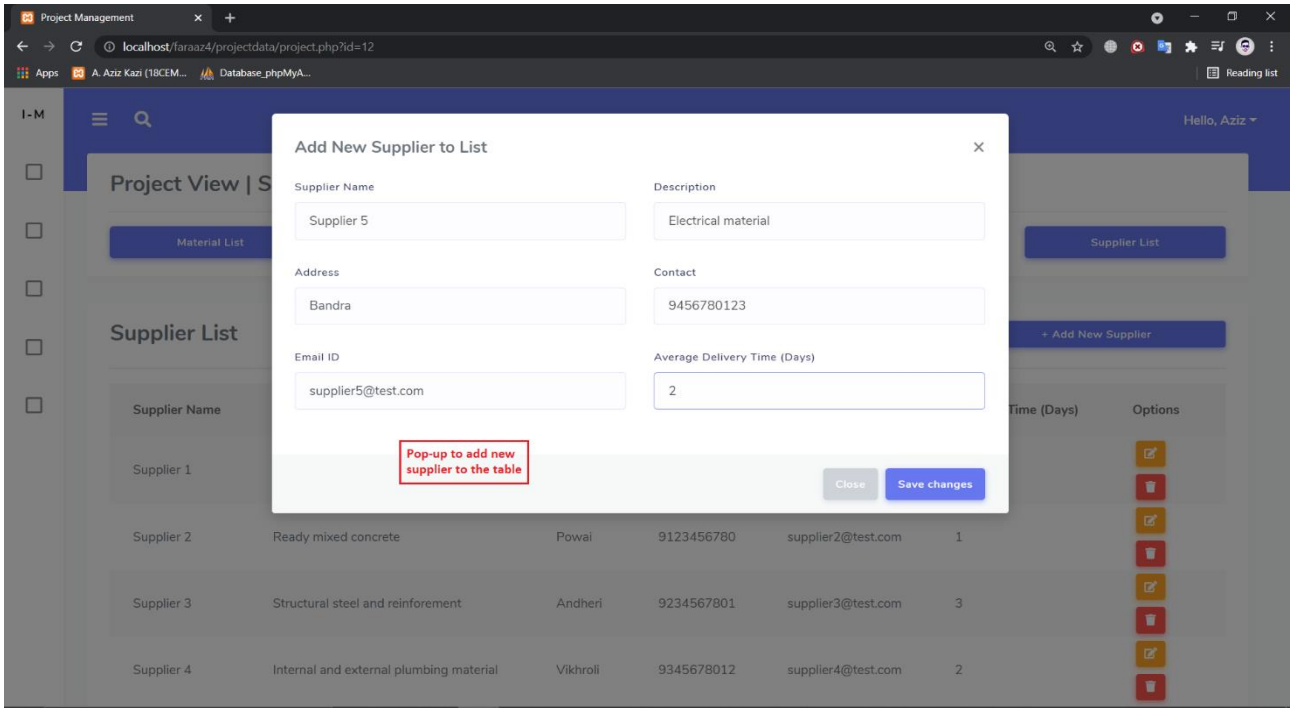

Figure 5.11: *New Supplier pop-up*

G. Requirement Page and Output Report

The requirement page is where the user can find the material requirement based on activities. The user has to first select the material for which he/she desires to find the requirement from the drop-down list which included a list of all the materials. After selecting material, the user has to select an activity or multiple activities for which the requirement of that particular material is to be found. After selecting the activities, the user has to click on the submit button which will generate a requirement report of the material. The report includes data such as current Date and Time, selected Material Name, Description, Unit, Class, Economic Ordering Quantity of the selected material, Supplier assigned to that particular material, Cost/Unit of the selected material, selected Activities, Total Quantity of the selected material required for the selected activities (which is computed by the system by adding the selected material quantities entered in the activity list for selected activities), In Stock Quantity of the selected material (which is mapped from the inventory list for the selected material), To Be Ordered Quantity of the selected material (which is computed by the system by applying the formulated logic) and Total Cost of the quantity of selected material to be ordered for the selected activities (which is computed by the system by multiplying To Be Ordered Quantity of the selected material with Cost/Unit). The report can be printed or downloaded in PDF format. This report can then be used for record keeping or can be shared with the management/procurement team. The user can generate a number of reports depending on the material for which the requirement is to be found and the activities to be executed. Figure 5.12 and Figure 5.13 show Requirement page and Output Report respectively.

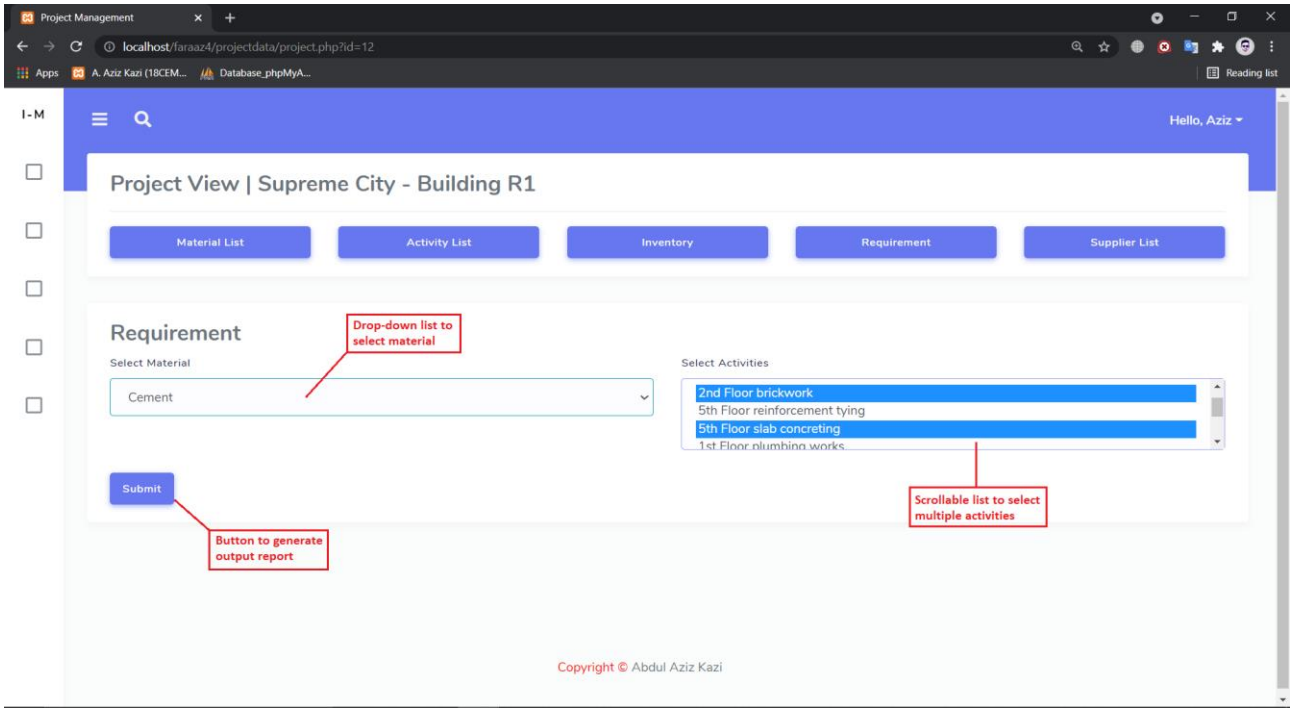

Figure 5.12: *Requirement page*

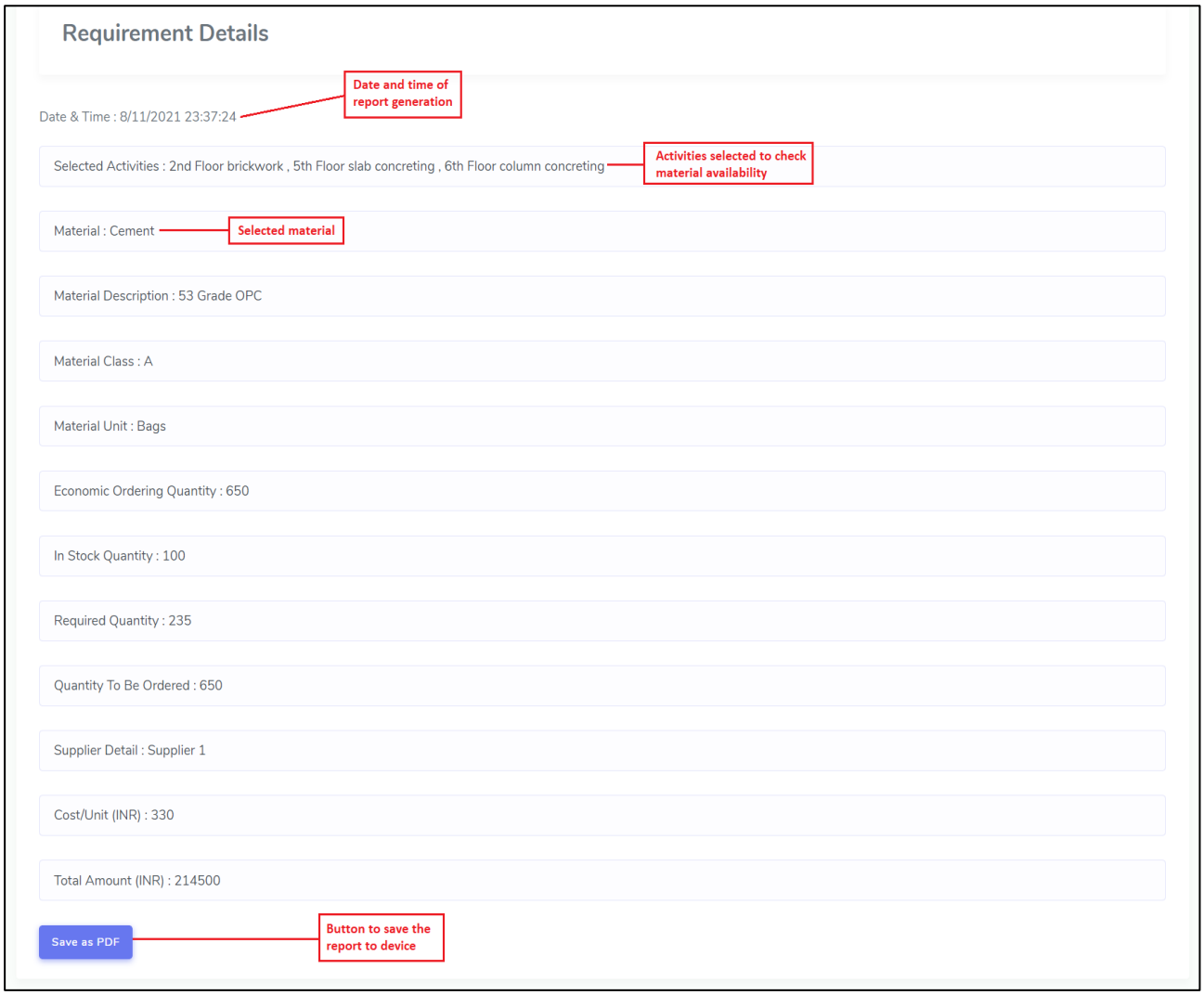

Figure 5.13: *Output Report*

5.2. Discussion

The study entails development of a tool, which will prove extremely beneficial to solve the menace caused due to improper material management. The program developed here will not only help in systemizing the inventory management on construction sites, but also serve as an important step towards optimizing the associated supply chain cost with an added advantage of having regular material flows as and when desired on construction sites.

Chapter 6

CONCLUSIONS AND SUMMARY

6.1. Conclusions

The conclusions of this dissertation are as follows:

1. Most suitable material management techniques were selected for formulating the logic for a robust material-cum-inventory management system.
2. A website was developed by incorporating the formulated logic and database as a framework for effective material and inventory management which can be feasibly applied on construction sites.

6.2. Summary

This entire study comprised of dealing with an unaddressed problem faced by construction industry related to management of material on construction sites. It is observed that most of the material/inventory management techniques seem to have limitations in case of construction industry due to its complex nature. Since each construction project is unique as well as due to the highly uncertain nature of the industry, it is not possible to automate the process of material management on construction sites as opposed to that of the production industry. Hence, in this dissertation a tool is developed in the form of a website which gives the procurement team better control on the inventory, requirement and flow of material, thus significantly reducing the additional costs due to inventory under-stocking and over-stocking.

6.3. Scope of Future Work

- In this dissertation, a website is developed for construction inventory management by formulating logic to link various material management techniques.
- The same can be further extended to develop an Android application or a Computer application thus eliminating the requirement of continuous internet connection for running the website. Hence, it can be used even at remote locations.
- Notification system can be integrated into the framework that notifies the user at regular/critical intervals regarding the stocks and requirements.
- The tool can be updated to include manpower and equipment/machinery requirement apart from material requirement.
- Activity list can be updated to include Work Breakdown Structure and Gantt Chart.
- The interface can be integrated with other project management softwares such as Microsoft Projects (MSP), Primavera P6, and Navisworks, etc., for better management of materials.
- The interface can be updated as per regular advancements in technology and management techniques.

REFERENCES

[1] Balwai S.M., Hussain S.A., Ansari A., Haris N. (2010). "Supply chain management in construction." International Journal on Recent and Innovation Trends in Computing and Communication; Vol. 3, Issue 2, 2010.

[2] Bell L.C., Stukhart G. (1987). "Costs and benefits of materials management systems." Journal of Construction Engineering and Management; Vol. 113, No. 2, June 1987, pp. 222-234.

[3] Caldas C.H., Menches C.L., Reyes P.M., Navarro L., Vargas M. (2015). "Materials management practices in construction industry." Practice Periodical on Structural Design and Construction; Vol. 20, Issue 3, August 2015.

[4] Gilaninia S., Ganjinia H., Alihosseini O. (2013). "Studying the factors affecting supply chain management and provide proper strategies for improving it. (Case study poultry farming industry)" International Journal of Innovative Research in Science, Engineering and Technology; Vol. 2, Issue 11, November 2013.

[5] Ibn-Homaid N.T. (2002). "A comparative evaluation of construction and manufacturing materials management." International Journal of Project Management; No. 20, 2002, pp. 263-270.

[6] Kanchana S., Sneha P. (2018). "A study on supply chain management in construction projects." International Research Journal of Engineering and Technology; Vol. 5, Issue 11, November 2018, pp. 993-996.

[7] Kini D.U. (1999). "Materials management: The key to successful project management." Journal of Management in Engineering; January 1999, pp. 30-34.

[8] Kumar U.N., Nayak H. (2018). "Construction material management on project sites." International Journal for Research in Applied Science & Engineering Technology; Vol. 6, Issue 1, January 2018, pp. 1371-1378.

[9] Madhavarao B., Mahindra K., Asadi S.S. (2018). "A critical analysis of material management techniques in construction project." International Journal of Civil Engineering and Technology; Vol. 9, Issue 4, April 2018, pp. 826-835.

[10] Pande A.A., Sabihuddin S. (2015). "Study of material management techniques on construction project." International Journal of Informative & Futuristic Research; Vol. 2, Issue 9, May 2015, pp. 3479-3486.

[11] Patel K.V., Vyas C.M. (2011). "Construction materials management on project sites." National Conference on Recent Trends in Engineering & Technology; May 2011.

[12] Thomas H.R., Riley D.R., Messner J.I. (2005). “Fundamental principles of site material management.” Journal of Construction Engineering and Management; Vol. 131, No. 7, July 2005, pp. 808-815.

[13] Rathinakumar V., Lalithapriya K., Prasannakumar I., Ravekumar C. (2018). “Construction material management through inventory control techniques.” International Journal of Engineering and Technology; No. 7, 2018, pp. 899-903.

[14] Sarowar P.P., Surdkar K.S., Chaudhari C.K. (2018). “Importance of material management on construction sites.” International Journal of Engineering Research in Mechanical and Civil Engineering; 2018, pp. 66-69.

[15] Segerstedt A., Olofsson T. (2010). “Supply chains in the construction industry.” Supply Chain Management: An International Journal; Vol. 15, Issue 5, pp. 347-353.

[16] Shin T., Chin S., Yoon S., Kwon S. (2011). “A service oriented integrated information framework for RFID/WSN based intelligent supply chain management.” Automation in Construction; No. 20, 2011, pp. 706-715.

[17] Singh R.K. (2011). “Developing the framework for coordination in supply chain of SMEs.” Business Process Management Journal; Vol. 17, Issue 4.

[18] Subramani T., Nair V.B., David A., Ghouse B.M., Sivakumar N. (2017). “A study of inventory management system in construction industry.” International Journal of Application or Innovation in Engineering and Management; Vol. 6, Issue 5, May 2017, pp. 304-311.

[19] Vrijhoef R., Koskela L. (2000). “The four roles of supply chain management in construction.” European Journal of Purchasing and Supply Management; No. 6, 2000, pp. 169-178.

[20] Yeo K.T., Ning J.H. (2002). “Integrating supply chain and critical chain concepts in engineer-procure-construct (EPC) projects.” International Journal of Project Management; No. 20, 2002, pp. 253-262.

APPENDIX

Source Code of Web-based Material Management System

```
<?php
include "./staticPages/conn.php";
session_start();
if (!isset($_SESSION['userid'])){
session_destroy();
header('location: ./index.php');
}
$user_id = $_SESSION['userid'];
$project_id = $_SESSION['project_id']
;
$result = mysqli_query($conn, "SELECT
 * FROM UserInfo WHERE `user_id` = '$
user_id'; ");
$row = mysqli_fetch_array($result);
$username = $row['user_name'];

if(isset($_GET['id'])){
$project_id = $_GET['id'];

$Query = "SELECT * FROM ProjectInfo W
HERE  `project_id` = '$project_id'; "
;
$result=mysqli_query($conn,$Query);
$rowcount=mysqli_num_rows($result);
if($rowcount != 1){
header('location: ./dashboard.php');
}
$row = mysqli_fetch_array($result);
$project_name = $row['project_name'];
}

?>
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta content="width=device-
width, initial-scale=1, maximum-
scale=1, shrink-to-
fit=no" name="viewport">
<title>Project Management</title>

<!-- General CSS Files -->
<link rel="stylesheet" href="assets/m
odules/bootstrap/css/bootstrap.min.cs
s">
<link rel="stylesheet" href="assets/m
odules/fontawesome/css/all.min.css">

<!-- CSS Libraries -->
<link rel="stylesheet" href="assets/m
odules/izitoast/css/iziToast.min.css"
>
<link rel="stylesheet" href="assets/m
odules/select2/dist/css/select2.min.c
ss">
<link rel="stylesheet" href="assets/m
odules/jquery-
selectric/selectric.css">
<link rel="stylesheet" href="assets/m
odules/bootstrap-
timepicker/css/bootstrap-
timepicker.min.css">
<link rel="stylesheet" href="assets/m
odules/bootstrap-
tagsinput/dist/bootstrap-
tagsinput.css">
<link rel="stylesheet" href="assets/m
odules/bootstrap-
daterangepicker/daterangepicker.css">
<link rel="stylesheet" href="assets/m
odules/bootstrap-
colorpicker/dist/css/bootstrap-
colorpicker.min.css">
<link rel="stylesheet" href="assets/m
odules/select2/dist/css/select2.min.c
ss">
<link rel="stylesheet" href="assets/m
odules/jquery-
selectric/selectric.css">
<link rel="stylesheet" href="assets/m
odules/bootstrap-
timepicker/css/bootstrap-
timepicker.min.css">
<link rel="stylesheet" href="assets/m
odules/bootstrap-
```

```
tagsinput/dist/bootstrap-
tagsinput.css">

<!-- Template CSS -->
<link rel="stylesheet" href="assets/c
ss/style.css">
<link rel="stylesheet" href="assets/c
ss/components.css">
</head>

<body>
<div id="app">
<div class="main-wrapper main-
wrapper-1">

<?php include './staticPages/navbar.p
hp'; ?>
<?php include './staticPages/sidebar.
php'; ?>

<!-- Modal Views-->
<div class="modal fade" tabindex="-
1" role="dialog" id="MaterialListAddM
odal">
<div class="modal-dialog modal-
lg" role="document">
<div class="modal-content">
<div class="modal-header">
<h5 class="modal-
title">Add New Material to List</h5>
<button type="button" class="close" d
ata-dismiss="modal" aria-
label="Close">
<span aria-
hidden="true">&times;</span>
</button>
</div>
<div class="modal-body">
<div class="row">
<div class="col-md-6">
<div class="form-group">
<label>Material Name</label>
<input class="form-
control" type="text" id="ModalMateria
lName">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Material Class</label>
<select class="form-
control" id="ModalMaterialType">
<option selected disabled>Select Clas
s</option>
<option value="A">A</option>
<option value="B">B</option>
<option value="C">C</option>
<option value="NA">N/A</option>
</select>
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<label>Description</label>
<input class="form-
control" type="text" id="ModalMateria
lDescription">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Unit</label>
<input class="form-
control" type="text" id="ModalMateria
lUnit">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>EOQ</label>
<input class="form-
control" type="number" id="ModalMater
ialEOQ">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Supplier</label>
<select class="form-
control" id="ModalMaterialSupplier">
<option selected disabled>Select Supp
lier</option>
<?php
$sql = mysqli_query($conn, "SELECT *
FROM SupplierInfo WHERE `supplier_sta
tus` = 'active' and project_id=$proje
ct_id; ");
while($row = mysqli_fetch_array($sql)
){
$supplier_id = $row['supplier_id'];
```

```
$supplier_name = $row['supplier_name'
];
echo '<option value="'.$supplier_id.'
">'.$supplier_name.'</option>';
}
?>
</select>
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Cost/Unit (INR) </label>
<input class="form-
control" type="number" id="ModalMater
ialCostUnit">
</div>
</div>
</div>
</div>
<div class="modal-footer bg-
whitesmoke br">
<button class="btn btn-
secondary" data-
dismiss="modal">Close</button>
<button class="btn btn-
primary" id="MaterialListModalAdd">Sa
ve changes</button>
</div>
</div>
</div>
</div>
<div class="modal fade" tabindex="-
1" role="dialog" id="ActivityListAddM
odal">
<div class="modal-dialog modal-
lg" role="document">
<div class="modal-content">
<div class="modal-header">
<h5 class="modal-
title">Add New Activity to List</h5>
<button type="button" class="close" d
ata-dismiss="modal" aria-
label="Close">
<span aria-
hidden="true">&times;</span>
</button>
</div>
<div class="modal-body">
<div class="row">
<div class="col-md-4">
<div class="form-group">
<label>Activity Name</label>
<input class="form-
control" type="text" id="ModalActivit
yName">
</div>
</div>
<div class="col-md-8">
<div class="form-group">
<label>Description</label>
<input class="form-
control" type="text" id="ModalActivit
yDescription">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Start Date</label>
<input class="form-
control datepicker" type="text" id="M
odalActivityStartDate">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>End Date</label>
<input class="form-
control datepicker" type="text" id="M
odalActivityEndDate">
</div>
</div>

<h5>Material Quantities</h5>
<hr>
<div class="table-responsive">
<input type="hidden" value='' id="mat
erialQuantityList" />
<table class="table table-
striped" id="InventoryListDisplayTabl
eInAddNewActivity">
<thead>
<tr>
<th class="d-
none" id="ModalAMID">ID</th>
<th class="align-
middle" id="ModalAMM">Material</th>
<th class="align-
middle" id="ModalAMD">Description</th
>
<th class="align-
middle" id="ModalAMU">Unit</th>
```

```
<th class="align-
middle" id="ModalAMQ">Quantity</th>
</tr>
</thead>
<tbody>

</tbody>
</table>
</div>

</div>
</div>
<div class="modal-footer bg-
whitesmoke br">
<button class="btn btn-
secondary" data-
dismiss="modal">Close</button>
<button class="btn btn-
primary" id="ActivityListModalAdd">Sa
ve changes</button>
</div>
</div>
</div>
</div>
<div class="modal fade" tabindex="-
1" role="dialog" id="SupplierListAddM
odal">
<div class="modal-dialog modal-
lg" role="document">
<div class="modal-content">
<div class="modal-header">
<h5 class="modal-
title">Add New Supplier to List</h5>
<button type="button" class="close" d
ata-dismiss="modal" aria-
label="Close">
<span aria-
hidden="true">&times;</span>
</button>
</div>
<div class="modal-body">
<div class="row">
<div class="col-md-6">
<div class="form-group">
<label>Supplier Name</label>
<input class="form-
control" type="text" id="ModalSupplie
rName">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Description</label>
<input class="form-
control" type="text" id="ModalSupplie
rDescription">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Address</label>
<input class="form-
control" type="text" id="ModalSupplie
rAddress">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Contact</label>
<input class="form-
control" type="text" id="ModalSupplie
rMobile">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Email ID</label>
<input class="form-
control" type="text" id="ModalSupplie
rEmail">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Average Delivery Time (Days)</
label>
<input class="form-
control" type="text" id="ModalSupplie
rTime">
</div>
</div>
</div>
</div>
<div class="modal-footer bg-
whitesmoke br">
<button class="btn btn-
secondary" data-
dismiss="modal">Close</button>
<button class="btn btn-
primary" id="SupplierListModalAdd">Sa
ve changes</button>
</div>
```

```
</div>
</div>
</div>


<!-- Main Content -->
<div class="main-content">
<section class="section">
<div class="card">
<div class="card-body">
<h4>Project View | <?php echo $projec
t_name; ?></h4>
<hr>
<!-- Button View-->
<div class="row">
<div class="col">
<button class="btn btn-block btn-
primary" id="MaterialList">Material L
ist</button>
</div>
<div class="col">
<button class="btn btn-block btn-
primary" id="ActivityList">Activity L
ist</button>
</div>
<div class="col d-none">
<button class="btn btn-block btn-
primary" id="Schedule">Schedule</butt
on>
</div>
<div class="col">
<button class="btn btn-block btn-
primary" id="Inventory">Inventory</bu
tton>
</div>
<div class="col">
<button class="btn btn-block btn-
primary" id="Requirement">Requirement
</button>
</div>
<div class="col">
<button class="btn btn-block btn-
primary" id="SupplierList">Supplier L
ist</button>
</div>
</div>
</div>
</div>

<!-- Material List-->
<div class="card" id="MaterialListVie
w">
<div class="card-body">
<div class="row">
<div class="col-md-9">
<h4>Material List</h4>
</div>
<div class="col-md-3">
<button class="btn btn-sm btn-
primary btn-block" data-
toggle="modal" data-
target="#MaterialListAddModal">+ Add
New Material</button>
</div>
</div>
<hr>
<div class="row mx-
2" id="MaterialViewRow">
<div class="col-md-12 border">
<br>
<h6>Update Material</h6>
<hr>
<div class="row">
<div class="col-md-2 d-none">
<div class="form-group">
<input type="" id="MaterialViewId" na
me="" value="">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Material Name</label>
<input class="form-
control" id="MaterialViewMaterial" ty
pe="text" placeholder="Material">
</div>
</div>
<div class="col-md-5">
<div class="form-group">
<label>Description</label>
<input class="form-
control" id="MaterialViewDescription"
 type="text" placeholder="Description
">
</div>
</div>
<div class="col-md-3">
<div class="form-group">
<label>Material Class</label>
<select class="form-control border-
info" id="MaterialViewType">
```

```
<option selected disabled>Select Clas
s</option>
<option value="A">A</option>
<option value="B">B</option>
<option value="C">C</option>
<option value="NA">N/A</option>
</select>
</div>
</div>
<div class="col-md-3">
<div class="form-group">
<label>Unit</label>
<input class="form-
control" id="MaterialViewUnit" type="
text" placeholder="Unit">
</div>
</div>
<div class="col-md-3">
<div class="form-group">
<label>EOQ</label>
<input class="form-
control" id="MaterialViewEOQ" type="n
umber" placeholder="EOQ">
</div>
</div>
<div class="col-md-3">
<div class="form-group">
<label>Supplier</label>
<select class="form-control border-
info" id="MaterialViewSupplier">
<option selected disabled>Select Supp
lier</option>
<?php
$sql = mysqli_query($conn, "SELECT *
FROM SupplierInfo WHERE `supplier_sta
tus` = 'active'and project_id=$projec
t_id;");
while($row = mysqli_fetch_array($sql)
){
$supplier_id = $row['supplier_id'];
$supplier_name = $row['supplier_name'
];
echo '<option value="'.$supplier_id.'
">'.$supplier_name.'</option>';
}
?>
</select>
</div>
</div>
<div class="col-md-3">
<div class="form-group">
<label>Cost/Unit (INR)</label>
<input class="form-
control" id="MaterialViewCostUnit" ty
pe="number" placeholder="Cost/Unit">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-block btn-
sm btn-
success" id="MaterialViewUpdateButton
">Update</button>
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-block btn-
sm btn-
warning" id="MaterialViewCancelButton
">Cancel</button>
</div>
</div>
</div>
</div>
</div>
<div class="row mt-3">
<div class="col-md-12">
<div class="table-responsive">
<table class="table table-
striped" id="MaterialListDisplayTable
">
<thead>
<tr>
<th class="d-none">Material ID</th>
<th class="align-
middle">Material</th>
<th class="align-
middle">Description</th>
<th class="align-middle">Class</th>
<th class="align-middle">Unit</th>
<th class="align-middle">EOQ</th>
<th class="align-
middle">Supplier</th>
<th class="align-
middle">Cost/Unit (INR)</th>
<th class="align-middle">Options</th>
</tr>
</thead>
<tbody>

</tbody>
```

```
</table>
</div>
</div>
</div>
</div>
</div>

<!-- Activity List-->
<div class="card" id="ActivityListVie
w">
<div class="card-body">
<div class="row">
<div class="col-md-9">
<h4>Activity List</h4>
</div>
<div class="col-md-3">
<button class="btn btn-sm btn-
primary btn-block" data-
toggle="modal" data-
target="#ActivityListAddModal">+ Add
New Activity</button>
</div>
</div>
<hr>
<div class="row" id="ActivityViewRow"
>
<div class="col-md-12 border">
<br>
<h6>Update Activity</h6>
<hr>
<div class="row">
<div class="col d-none">
<div class="form-group">
<label>Activity ID</label>
<input class="form-
control" id="ActivityViewId" type="te
xt" placeholder="ID">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Activity Name</label>
<input class="form-
control" id="ActivityViewActivity" ty
pe="text" placeholder="Activity">
</div>
</div>
<div class="col-md-8">
<div class="form-group">
<label>Activity Description</label>
<input class="form-
control" id="ActivityViewDescription"
 type="text" placeholder="Description
">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Activity Start Date</label>
<input class="form-
control datepicker" id="ActivityViewS
tartDate" type="text" placeholder="St
art Date">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Activity End Date</label>
<input class="form-
control datepicker" id="ActivityViewE
ndDate" type="text" placeholder="End
Date">
</div>
</div>
<h5>Material Quantities</h5>
<hr>

<div class="table-responsive">
<input type="hidden" value='' id="edi
tMaterialQuantityList" />
<table class="table table-
striped" id="InventoryListDisplayTabl
eInEditActivity">
<thead>
<tr>
<th class="d-
none" id="ModalAMID">ID</th>
<th class="align-
middle" id="ModalAMM">Material</th>
<th class="align-
middle" id="ModalAMD">Description</th
>
<th class="align-
middle" id="ModalAMU">Unit</th>
<th class="align-
middle" id="ModalAMQ">Quantity</th>
</tr>
</thead>
<tbody>

</tbody>
```

```
</table>
</div>

<div class="col-md-6">
<div class="form-group">
<button class="btn btn-block btn-
sm btn-
success" id="ActivityViewUpdateButton
">Update</button>
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-block btn-
sm btn-
warning" id="ActivityViewCancelButton
">Cancel</button>
</div>
</div>
</div>
</div>
</div>
<div class="row mt-3">
<div class="col-md-12">
<div class="table-responsive">
<table class="table table-
striped" id="ActivityListDisplayTable
">
<thead>
<tr>
<th class="d-none">Activity ID</th>
<th class="align-
middle">Activity Name</th>
<th class="align-
middle">Description</th>
<th class="align-
middle">Start Date</th>
<th class="align-
middle">End Date</th>
<th class="align-middle">Options</th>
</tr>
</thead>
<tbody>

</tbody>
</table>
</div>
</div>
</div>
</div>
</div>
```

```
<!-- Schedule -->
<div class="card d-
none" id="ScheduleView">
<div class="card-body">
<h4>Schedule</h4>
<hr>
<div class="row">
<div class="col-md-12">
<div id="chart_div"></div>
</div>
</div>
</div>
</div>

<!-- Inventory -->
<div class="card" id="InventoryView">
<div class="card-body">
<h4>Inventory</h4>
<hr>
<div class="row mx-
2" id="InventoryViewRow">
<div class="col-md-12 border">
<br>
<h4>Update Inventory</h4>
<hr>
<div class="row">
<div class="col-md-4 d-none">
<div class="form-group">
<label></label>
<input type="text" id="InventoryViewI
d" class="form-control">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Name</label>
<input type="text" id="InventoryViewN
ame" class="form-control" readonly>
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Unit</label>
<input type="text" id="InventoryViewU
nit" class="form-control" readonly>
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Stock</label>
```

```
<input type="text" id="InventoryViewQ
uantity" class="form-control">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-sm btn-
warning btn-
block" id="InventoryViewCancelButton"
>Cancel</button>
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-sm btn-
success btn-
block" id="InventoryViewUpdateButton"
>Update</button>
</div>
</div>
</div>
</div>
</div>
<div class="table-responsive">
<table class="table table-
striped" id="InventoryListDisplayTabl
e">
<thead>
<tr>
<th class="d-none">ID</th>
<th class="align-
middle">Material</th>
<th class="align-
middle">Description</th>
<th class="align-middle">Unit</th>
<th class="align-middle">Stock</th>
<th class="align-middle">Options</th>
</tr>
</thead>
<tbody>

</tbody>
</table>
</div>
</div>
</div>

<!-- Requirement -->
<div class="card" id="RequirementView
">
<div class="card-body">
```

```
<h4>Requirement</h4>
<div class="row">
<div class="col-md-6">
<div class="form-group">
<label>Select Material</label>
<select class="form-control border-
info" id="ModalMaterialRequirement">
<option value="" selected disabled>Se
lect Material</option>
<?php
$sql = mysqli_query($conn, "SELECT *
FROM materialinfo WHERE `material_sta
tus` = 'active' AND `project_id`='$pr
oject_id'; ");
while($row = mysqli_fetch_array($sql)
){
$material_id = $row['material_id'];
$material_name = $row['material_name'
];
echo '<option value="'.$material_id.'
">'.$material_name.'</option>';
}
?>
</select>
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<label>Select Activities</label>
<select class="form-
control" style="height: 80px;" id="Mo
dalActivityRequirement" multiple >
<option value="" selected disabled>Se
lect Activities</option>
<?php
$sql = mysqli_query($conn, "SELECT *
FROM activityinfo WHERE `activity_sta
tus` = 'active' AND `project_id`='$pr
oject_id'; ");
while($row = mysqli_fetch_array($sql)
){
$activity_id = $row['activity_id'];
$activity_name = $row['activity_name'
];
echo '<option value="'.$activity_id.'
">'.$activity_name.'</option>';
}
?>
</select>
</div>
</div>
```

```
</div>
<div class="row">
<div class="col-md-6">
<button class="btn btn-
primary" onClick="submitDetails()">Su
bmit</button>
</div>
</div>

<div class="row" id="ReqDetails">
<div class="col-md-12">
<div class="card">
<div class="card-body">
<h4>Requirement Details</h4>
</div>
</div>
</div>
<div class="col-md-12">
<p id="CurrentDateTime"></p>
</div>
<div class="col-md-12">
<div class="form-group">
<!-- <label>Activity List</label> -->
<p  id="RequirementActivityList" clas
s="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terial" class="form-control"> -->
</div>
</div>

<div class="col-md-12">
<div class="form-group">
<!-- <label>Material</label> -->
<p  id="RequirementMaterial" class="f
orm-control"></p>
<!--
 <input type="text" id="RequirementMa
terial" class="form-control"> -->
</div>
</div>

<div class="col-md-12">
<div class="form-group">
<!-- <label>Description </label> -->
<p  id="RequirementMaterialDescriptio
n" class="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialDescription" class="form-
control" > -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!-- <label>Material Type</label> -->
<p  id="RequirementMaterialType" clas
s="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terial" class="form-control"> -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!-- <label>Unit </label> -->
<p  id="RequirementMaterialUnit" clas
s="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialUnit" class="form-control" > --
>
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!--
 <label>Economic Ordering Quantity </
label> -->
<p  id="RequirementMaterialEoq" class
="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialEoq" class="form-control" > -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!--
 <label>In Stock Quantity </label> --
>
<p  id="RequirementMaterialStock" cla
ss="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialStock" class="form-control" > -
->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
```

```
<!--
 <label>Required Quntity </label> -->
<p  id="RequirementMaterialReqQty" cl
ass="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialReqQty" class="form-
control" > -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!--
 <label>Quantity to be Ordered </labe
l> -->
<p  id="RequirementMaterialOrderedQty
"  class="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialOrderedQty" class="form-
control" readonly> -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!--
 <label>Supplier Details </label> -->
<p  id="RequirementMaterialSupplier"
 class="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialSupplier" class="form-
control" readonly> -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!--
 <label>Cost/Unit (INR) </label> -->
<p  id="RequirementMaterialCostUnit"
 class="form-control"></p>
<!--
 <input type="text" id="RequirementMa
terialCostUnit" class="form-
control" readonly> -->
</div>
</div>
<div class="col-md-12">
<div class="form-group">
<!--
 <label>Total Amount (INR) </label> -
->
<p  id="RequirementCost"  class="form
-control" ></p>
<!--
 <input type="text" id="RequirementCo
st" class="form-control" readonly> --
>
</div>
</div>
</div>
<div>
<button class="btn btn-
primary" id="pdfdownload" onClick="do
wnloadPdf()" >Save as PDF </button>
</div>
<div id="elementH"></div>
</div>
</div>

<!-- Supplier List-->
<div class="card" id="SupplierListVie
w">
<div class="card-body">
<div class="row">
<div class="col-md-9">
<h4>Supplier List</h4>
</div>
<div class="col-md-3">
<button class="btn btn-sm btn-
primary btn-block" data-
toggle="modal" data-
target="#SupplierListAddModal">+ Add
New Supplier</button>
</div>
</div>
<hr>
<div class="row mx-
2" id="SupplierViewRow">
<div class="col-md-12 border">
<br>
<h6>Update Supplier</h6>
<hr>
<div class="row">
<div class="col-md-4 d-none">
<div class="form-group">
<input type="text" id="SupplierViewId
" class="form-control">
</div>
</div>
```

```
<div class="col-md-4">
<div class="form-group">
<label>Supplier Name</label>
<input type="text" id="SupplierViewNa
me" class="form-control">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Description</label>
<input type="text" id="SupplierViewDe
scription" class="form-control">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Address</label>
<input type="text" id="SupplierViewAd
dress" class="form-control">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Contact</label>
<input type="" id="SupplierViewMobile
" class="form-control">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Email ID</label>
<input type="text" id="SupplierViewEm
ail" class="form-control">
</div>
</div>
<div class="col-md-4">
<div class="form-group">
<label>Average Delivery Time (Days)</
label>
<input type="text" id="SupplierViewTi
me" class="form-control">
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-block btn-
sm btn-
success" id="SupplierViewUpdateButton
">Update</button>
</div>
</div>
<div class="col-md-6">
<div class="form-group">
<button class="btn btn-block btn-
sm btn-
warning" id="SupplierViewCancelButton
">Cancel</button>
</div>
</div>
</div>
</div>
</div>
<div class="row mt-3">
<div class="col-md-12">
<div class="table-responsive">
<table class="table table-
striped" id="SupplierListDisplayTable
">
<thead>
<tr>
<th class="d-none">Supplier ID</th>
<th class="align-
middle">Supplier Name</th>
<th class="align-
middle">Description</th>
<th class="align-middle">Address</th>
<th class="align-middle">Contact</th>
<th class="align-
middle">Email ID</th>
<th class="align-
middle">Delivery Time (Days)</th>
<th class="align-middle">Options</th>
</tr>
</thead>
<tbody>

</tbody>
</table>
</div>
</div>
</div>
</div>
</div>


</section>
</div>
<?php include './staticPages/footer.p
hp'; ?>
</div>
</div>
```

```
<!-- General JS Scripts -->
<script src="assets/modules/jquery.mi
n.js"></script>
<!-- jsPDF library -->
<script src="assets/js/jsPDF/dist/jsp
df.min.js"></script>
<script src="assets/modules/popper.js
"></script>
<script src="assets/modules/tooltip.j
s"></script>
<script src="assets/modules/bootstrap
/js/bootstrap.min.js"></script>
<script src="assets/modules/nicescrol
l/jquery.nicescroll.min.js"></script>
<script src="assets/modules/moment.mi
n.js"></script>
<script src="assets/js/stisla.js"></s
cript>

<!-- JS Libraies -->
<script src="assets/modules/sweetaler
t/sweetalert.min.js"></script>
<script src="assets/modules/izitoast/
js/iziToast.min.js"></script>
<script src="assets/modules/select2/d
ist/js/select2.full.min.js"></script>
<script src="assets/modules/jquery-
selectric/jquery.selectric.min.js"></
script>
<script src="assets/modules/bootstrap
-
daterangepicker/daterangepicker.js"><
/script>
<script src="assets/modules/bootstrap
-timepicker/js/bootstrap-
timepicker.min.js"></script>
<script src="assets/modules/bootstrap
-tagsinput/dist/bootstrap-
tagsinput.min.js"></script>
<script src="assets/modules/select2/d
ist/js/select2.full.min.js"></script>
<script src="assets/modules/jquery-
selectric/jquery.selectric.min.js"></
script>

<!-- Page Specific JS File -->

<!-- Template JS File -->
<script src="assets/js/scripts.js"></
script>
<script>
```

```
$(document).ready( function(){

//Initial Page Setup
function sendSuccessToast(msg){
iziToast.success({
title: 'Success',
message: msg,
position: 'topRight',
timeout: 6000
});
}
function sendWarningToast(msg){
iziToast.warning({
title: 'Error',
message: msg,
position: 'topRight',
timeout: 6000
});
}
HideAllViews();
MaterialListTable();
ActivityListTable();
InventoryListTable();
SupplierListTable();
InventoryListDisplayTableInAddNewActi
vity();
// InventoryListDisplayTableInEditAct
ivity()

function MaterialListTable(){
var dataString = "getMaterialList=1&p
roject_id=<?php echo $project_id; ?>"
;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
console.log("result::getMaterialList:
:",result)
$("#MaterialListDisplayTable > tbody"
).empty();
while(result[i]){
var material_id = result[i];
i++;
var material_name = result[i];
i++;
```

```
var material_description = result[i];
i++;
var material_type = result[i];
i++;
var material_Unit = result[i];
i++;
var material_eoq = result[i];
i++;
var supplier = result[i];
i++;
var material_Cost_Unit = result[i];
i++;
var supplier_id_ref = result[i];
i++;
console.log("supplier_id_ref::",suppl
ier_id_ref)
$('#MaterialListDisplayTable > tbody:
last-
child').append('<tr><td class="d-
none materialId">'+ material_id +'</t
d><td class="align-
middle materialName">'+ material_name
 +'</td><td class="align-
middle materialDescription">'+ materi
al_description +'</td><td class="alig
n-
middle materialType">'+ material_type
 +'</td><td class="align-
middle materialUnit">'+ material_Unit
 +'</td><td class="align-
middle materialEOQ">'+ material_eoq +
'</td><td class="align-
middle">'+ supplier+' </td><td class=
"align-
middle materialCostUnit">'+ material_
Cost_Unit +'</td><td><button class="m
-1 btn btn-warning btn-sm col-
5 MaterialListViewTableEdit"><i class
="fa fa-
edit"></i></button><button class="m-
1 btn btn-danger btn-sm col-
5 MaterialListViewTableDelete"><i cla
ss="fa fa-
trash"></i></button></td> <td class="
hide supplierRef">'+supplier_id_ref+'
</td></tr>');
}
$('.MaterialListViewTableDelete').on(
'click', function(){
var id = $(this).closest('tr').find('
.materialId').text();
console.log(id);
var dataString = "deleteMaterial=1&ma
terialId="+ id;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
var result = $.parseJSON(statusVar);
if($.trim(result[0]) != "error"){
sendSuccessToast("Done");
MaterialListTable();
}else if($.trim(result[0]) == "error"
) {
sendWarningToast("Failure");
}
}
});
});
$('.MaterialListViewTableEdit').on('c
lick', function(){
$('#MaterialViewRow').show();
var materialId = $(this).closest('tr'
).find('.materialId').text();
var materialName = $(this).closest('t
r').find('.materialName').text();
var materialDescription = $(this).clo
sest('tr').find('.materialDescription
').text();
var materialType = $(this).closest('t
r').find('.materialType').text();
var materialUnit = $(this).closest('t
r').find('.materialUnit').text();
var materialCostUnit = $(this).closes
t('tr').find('.materialCostUnit').tex
t();
var materialEOQ = $(this).closest('tr
').find('.materialEOQ').text();
var materialSupplierId = $(this).clos
est('tr').find('.supplierRef').text()
;
console.log(materialType);
console.log("MaterialViewSupplier",ma
terialSupplierId)
$('#MaterialViewId').val(materialId);
$('#MaterialViewType').val(materialTy
pe);
$('#MaterialViewMaterial').val(materi
alName);
```

```
$('#MaterialViewDescription').val(materialDescription);

$('#MaterialViewUnit').val(materialUnit);
$('#MaterialViewCostUnit').val(materialCostUnit);
$('#MaterialViewEOQ').val(materialEOQ);
$('#MaterialViewSupplier').val(materialSupplierId);
});
}
});
}

function ActivityListTable(){
var dataString = "getActivityList=1&project_id=<?php echo $project_id; ?>";
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#ActivityListDisplayTable > tbody").empty();
while(result[i]){
var activity_id = result[i];
i++;
var activity_name = result[i];
i++;
var activity_description = result[i];
i++;
var activity_start_date = result[i];
i++;
var activity_end_date = result[i];
i++;
$('#ActivityListDisplayTable > tbody:last-
child').append('<tr><td class="d-
none activityId">'+activity_id+'</td><td class="align-
middle activityName">'+activity_name+'</td><td class="align-
middle activityDescription">'+activity_description+'</td><td class="align-
middle activityStartDate">'+activity_start_date+'</td><td class="align-
middle activityEndDate">'+activity_end_date+'</td><td class="align-
middle"><button class="btn btn-
warning btn-sm col-
5 ActivityListViewTableEdit"><i class="fa fa-
edit"></i></button><button class="btn btn-danger btn-sm col-
5 ActivityListViewTableDelete"><i class="fa fa-
trash"></i></button></td></tr>');
}
$('.ActivityListViewTableDelete').on('click', function(){
var id = $(this).closest('tr').find('.activityId').text();
console.log(id);
var dataString = "deleteActivity=1&activityId="+ id;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
var result = $.parseJSON(statusVar);
if($.trim(result[0]) != "error"){
sendSuccessToast("Done");
ActivityListTable();
}else if($.trim(result[0]) == "error") {
sendWarningToast("Failure");
}
}
});
});
$('.ActivityListViewTableEdit').on('click', function(){
$('#ActivityViewRow').show();
var activityId = $(this).closest('tr').find('.activityId').text();
InventoryListDisplayTableInEditActivity(activityId);

var activityName = $(this).closest('tr').find('.activityName').text();
var activityDescription = $(this).closest('tr').find('.activityDescription').text();
```

```
var activityStartDate = $(this).closest('tr').find('.activityStartDate').text();
var activityEndDate = $(this).closest('tr').find('.activityEndDate').text();
$('#ActivityViewId').val(activityId);
$('#ActivityViewActivity').val(activityName);
$('#ActivityViewDescription').val(activityDescription);
$('#ActivityViewStartDate').val(activityStartDate);
$('#ActivityViewEndDate').val(activityEndDate);
});
}
});
}

function InventoryListTable(){
var dataString = "getInventoryList=1&project_id=<?php echo $project_id; ?>";
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#InventoryListDisplayTable > tbody").empty();
while(result[i]){
var inventory_material_id = result[i];
i++;
var inventory_material_name = result[i];
i++;
var inventory_material_description = result[i];
i++;
var inventory_material_Unit = result[i];
i++;
var inventory_material_stock = result[i] === null ? 0 : result[i];
i++;
$('#InventoryListDisplayTable > tbody :last-child').append('<tr><td class="d-none inventoryMaterialId">'+inventory_material_id+'</td><td class="align-middle inventoryMaterialName">'+inventory_material_name+'</td><td class="align-middle inventoryMaterialDescription">'+inventory_material_description+'</td><td class="align-middle inventoryMaterialUnit">'+inventory_material_Unit+'</td><td class="align-middle inventoryMaterialStock">'+inventory_material_stock+'</td><td class="align-middle"><button class="btn btn-warning btn-sm col-5 InventoryListViewTableEdit"><i class="fa fa-edit"></i></button></td></tr>');
}
$('.InventoryListViewTableEdit').on('click', function(){
$('#InventoryViewRow').show();
var inventoryMaterialId = $(this).closest('tr').find('.inventoryMaterialId').text();
var inventoryMaterialName = $(this).closest('tr').find('.inventoryMaterialName').text();
var inventoryMaterialUnit = $(this).closest('tr').find('.inventoryMaterialUnit').text();
var inventoryMaterialQuantity = $(this).closest('tr').find('.inventoryMaterialStock').text();
$('#InventoryViewId').val(inventoryMaterialId);
$('#InventoryViewName').val(inventoryMaterialName);
$('#InventoryViewUnit').val(inventoryMaterialUnit);
$('#InventoryViewQuantity').val(inventoryMaterialQuantity);
});
}
});
}
```

```
function InventoryListDisplayTableInAddNewActivity(){
var dataString = "getInventoryListInAddNewActivity=1&project_id=<?php echo $project_id; ?>";
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#InventoryListDisplayTableInAddNewActivity > tbody").empty();
while(result[i]){
var inventory_material_id = result[i];
i++;
var inventory_material_name = result[i];
i++;
var inventory_material_description = result[i];
i++;
var inventory_material_Unit = result[i];
i++;
//var inventory_material_stock = 0;
//i++;
$('#InventoryListDisplayTableInAddNewActivity > tbody:last-child').append('<tr><td class="d-none inventoryMaterialId">'+inventory_material_id+'</td><td class="align-middle inventoryMaterialName">'+inventory_material_name+'</td><td class="align-middle inventoryMaterialDescription">'+inventory_material_description+'</td><td class="align-middle inventoryMaterialUnit">'+inventory_material_Unit+'</td><td><div  contenteditable><input id="quantity'+i+'" type="text" value="0" onChange="getQuantityByMaterialWise('+inventory_material_id+',value)" /></div></td></tr>');
}
}
});
}
function InventoryListDisplayTableInEditActivity(activityId){
var dataString = "getInventoryListInEditActivity=1&Activity="+activityId;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#InventoryListDisplayTableInEditActivity > tbody").empty();
while(result[i]){
var inventory_material_id = result[i];
i++;
var inventory_material_name = result[i];
i++;
var inventory_material_description = result[i];
i++;
var inventory_material_Unit = result[i];
i++;
var material_current_stock = result[i];
i++;
var material_activity_assign_id=result[i];
i++;
//var inventory_material_stock = 0;
//i++;
$('#InventoryListDisplayTableInEditActivity > tbody:last-child').append('<tr><td class="d-none editInventoryMaterialId">'+inventory_material_id+'</td><td class="align-middle editInventoryMaterialName">'+inventory_material_name+'</td><td class="align-middle editInventoryMaterialDescription">'+inventory_material_description+'</td><td class="align-
```

```
middle editInventoryMaterialUnit">'+i
nventory_material_Unit+'</td><td><div
  contenteditable><input id="quantity
Edits'+i+'" type="text" value="'+mate
rial_current_stock+'" onChange="getEd
itQuantityByMaterialWise('+inventory_
material_id+','+material_activity_ass
ign_id+',value)" /></div></td></tr>')
;
}
}
});
}

function SupplierListTable(){
var dataString = "getSupplierList=1&p
roject_id=<?php echo $project_id; ?>"
;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#SupplierListDisplayTable > tbody"
).empty();
while(result[i]){
var supplier_id = result[i];
i++;
var supplier_name = result[i];
i++;
var supplier_description = result[i];
i++;
var supplier_address = result[i];
i++;
var supplier_mobile = result[i];
i++;
var supplier_email = result[i];
i++;
var supplier_avg_delivery_time = resu
lt[i];
i++;
$('#SupplierListDisplayTable > tbody:
last-
child').append('<tr><td class="align-
middle d-
none supplierId">'+supplier_id+'</td>
<td class="align-
middle supplierName">'+supplier_name+
'</td><td class="align-
middle supplierDescription">'+supplie
r_description+'</td><td class="align-
middle supplierAddress">'+supplier_ad
dress+'</td><td class="align-
middle supplierMobile">'+supplier_mob
ile+'</td><td class="align-
middle supplierEmail">'+supplier_emai
l+'</td><td class="align-
middle supplierTime">'+supplier_avg_d
elivery_time+'</td><td><button class=
"m-1 btn btn-warning btn-sm col-
5 SupplierListViewTableEdit"><i class
="fa fa-
edit"></i></button><button class="m-
1 btn btn-danger btn-sm col-
5 SupplierListViewTableDelete"><i cla
ss="fa fa-
trash"></i></button></td></tr>');
}
$('.SupplierListViewTableDelete').on(
'click', function(){
var id = $(this).closest('tr').find('
.supplierId').text();
console.log(id);
var dataString = "deleteSupplier=1&su
pplierId="+ id;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
var result = $.parseJSON(statusVar);
if($.trim(result[0]) != "error"){
sendSuccessToast("Done");
MaterialListTable();
}else if($.trim(result[0]) == "error"
) {
sendWarningToast("Failure");
}
}
});
});
$('.SupplierListViewTableEdit').on('c
lick', function(){
$('#SupplierViewRow').show();
var supplierId = $(this).closest('tr'
).find('.supplierId').text();
```

```
var supplierName = $(this).closest('t
r').find('.supplierName').text();
var supplierDescription = $(this).clo
sest('tr').find('.supplierDescription
').text();
var supplierAddress = $(this).closest
('tr').find('.supplierAddress').text(
);
var supplierMobile = $(this).closest(
'tr').find('.supplierMobile').text();
var supplierTime = $(this).closest('t
r').find('.supplierTime').text();
var supplierEmail = $(this).closest('
tr').find('.supplierEmail').text();

$('#SupplierViewId').val(supplierId);
$('#SupplierViewName').val(supplierNa
me);
$('#SupplierViewDescription').val(sup
plierDescription);
$('#SupplierViewAddress').val(supplie
rAddress);
$('#SupplierViewMobile').val(supplier
Mobile);
$('#SupplierViewTime').val(supplierTi
me);
$('#SupplierViewEmail').val(supplierE
mail);
});
}
});
}

//Tab Working Logic
$('#MaterialList').on('click', functi
on(){
HideAllViews();
$('#MaterialListView').show();
});
$('#ActivityList').on('click', functi
on(){
HideAllViews();
$('#ActivityListView').show();
});
$('#Schedule').on('click', function()
{
HideAllViews();
$('#ScheduleView').show();
});
$('#Inventory').on('click', function(
){
HideAllViews();
$('#InventoryView').show();
});
$('#Requirement').on('click', functio
n(){
HideAllViews();
$('#RequirementView').show();
$('#ReqDetails').hide();
$('#pdfdownload').hide();
$("#ModalMaterialRequirement").val("
");
$("#ModalActivityRequirement").val("
");

});
$('#SupplierList').on('click', functi
on(){
HideAllViews();
$('#SupplierListView').show();
});
function HideAllViews(){
$('#MaterialListView').hide();
$('#ActivityListView').hide();
$('#ScheduleView').hide();
$('#InventoryView').hide();
$('#RequirementView').hide();
$('#SupplierListView').hide();

$('#MaterialViewRow').hide();
$('#ActivityViewRow').hide();
$('#InventoryViewRow').hide();
$('#SupplierViewRow').hide();
}

//MaterialListView Logic
$('#MaterialListModalAdd').on('click'
, function(){
$('#MaterialListAddModal').modal('hid
e');
var MaterialName = $("#ModalMaterialN
ame").val();
var MaterialType = $("#ModalMaterialT
ype").val();
var MaterialDescription = $("#ModalMa
terialDescription").val();
var MaterialUnit = $("#ModalMaterialU
nit").val();
var MaterialEOQ = $("#ModalMaterialEO
Q").val();
var MaterialSupplier = $("#ModalMater
ialSupplier").val();
```

```
var MaterialCostUnit = $("#ModalMaterialCostUnit").val();
var dataString = "addMaterial=1&MaterialName=" + MaterialName + "&MaterialType=" + MaterialType + "&MaterialDescription=" + MaterialDescription + "&MaterialUnit=" + MaterialUnit + "&MaterialEOQ=" + MaterialEOQ + "&MaterialSupplier=" + MaterialSupplier + "&MaterialCostUnit=" + MaterialCostUnit;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
sendSuccessToast(MaterialName + " added to System");
MaterialListTable();
loadProjectDetails();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast(MaterialName + " could not be added to Sysetm");
}
}
});
});
$('#MaterialViewUpdateButton').on('click', function(){
var materialId = $('#MaterialViewId').val();
var materialName = $('#MaterialViewMaterial').val();
var materialDescription = $('#MaterialViewDescription').val();
var materialUnit = $('#MaterialViewUnit').val();
var materialCostUnit = $('#MaterialViewCostUnit').val();
var materialEOQ = $('#MaterialViewEOQ').val();
var materialSupplier = $('#MaterialViewSupplier').val();
var materialType = $('#MaterialViewType').val();
var dataString = "updateMaterial=1&MaterialId="+ materialId +"&MaterialName=" + materialName + "&MaterialType=" + materialType + "&MaterialDescription=" + materialDescription + "&MaterialUnit=" + materialUnit + "&MaterialEOQ=" + materialEOQ + "&MaterialSupplier=" + materialSupplier + "&MaterialCostUnit=" + materialCostUnit;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
sendSuccessToast(materialName + " Updated!");
MaterialListTable();
$('#MaterialViewRow').hide();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast(materialName + " - ERROR - " + result[1]);
}
}
});
});
$('#MaterialViewCancelButton').on('click', function(){
$('#MaterialViewRow').hide();
$(':input').val('');
});

//ActivityListView Logic
$('#ActivityListModalAdd').on('click', function(){
$('#ActivityListAddModal').modal('hide');
let materialQtyList=[]
if($('#materialQuantityList').val() !== ''){
materialQtyList=  JSON.parse($('#materialQuantityList').val());
}
console.log('materialQtyList:',materialQtyList)
```

```
var ActivityName = $("#ModalActivityName").val();
var ActivityDescription = $("#ModalActivityDescription").val();
var ActivityStartDate = $("#ModalActivityStartDate").val();
var ActivityEndDate = $("#ModalActivityEndDate").val();
var MaterialQty =$('#materialQuantityList').val();
var dataString = "addActivity=1&ActivityName=" + ActivityName + "&ActivityDescription=" + ActivityDescription + "&ActivityStartDate=" + ActivityStartDate + "&ActivityEndDate=" + ActivityEndDate+"&MaterialQty="+MaterialQty;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
sendSuccessToast(ActivityName + " added to System");
ActivityListTable();
loadProjectDetails();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast(ActivityName + " could not be added to Sysetm");
}
}
});
});
$('#ActivityViewUpdateButton').on('click', function(){
let materialQtyList=[]
if($('#editMaterialQuantityList').val() !== ''){
materialQtyList=  JSON.parse($('#editMaterialQuantityList').val());
}
console.log('materialQtyList:',materialQtyList)
var ActivityId = $('#ActivityViewId').val();
var ActivityName = $('#ActivityViewActivity').val();
var ActivityDescription = $('#ActivityViewDescription').val();
var ActivityStartDate = $('#ActivityViewStartDate').val();
var ActivityEndDate = $('#ActivityViewEndDate').val();
var MaterialQty  = $('#editMaterialQuantityList').val();
var dataString = "updateActivity=1&ActivityId="+ ActivityId +"&ActivityName=" + ActivityName + "&ActivityDescription=" + ActivityDescription + "&ActivityStartDate=" + ActivityStartDate + "&ActivityEndDate=" + ActivityEndDate+"&MaterialQty="+MaterialQty;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
sendSuccessToast(ActivityName + " Updated!");
ActivityListTable();
$('#ActivityViewRow').hide();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast(ActivityName + " - ERROR - " + result[1]);
}
}
});
});
$('#ActivityViewCancelButton').on('click', function(){
$('#ActivityViewRow').hide();
$(':input').val('');
});

//InventoryListView Logic
$('#InventoryViewUpdateButton').on('click', function(){
var InventoryViewId = $('#InventoryViewId').val();
```

```
var InventoryViewQuantity = $('#Inven
toryViewQuantity').val();
var dataString = "updateInventory=1&I
nventoryViewId="+ InventoryViewId +"&
InventoryViewQuantity=" + InventoryVi
ewQuantity;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
sendSuccessToast("Qunatity Updated!")
;
InventoryListTable();
$('#InventoryViewRow').hide();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast("ERROR -
 " + result[1]);
}
}
});
});
$('#InventoryViewCancelButton').on('c
lick', function(){
$('#InventoryViewRow').hide();
$(':input').val('');
});

//SupplierListView Logic
$('#SupplierListModalAdd').on('click'
, function(){
$('#SupplierListAddModal').modal('hid
e');
var SupplierName = $("#ModalSupplierN
ame").val();
var SupplierDescription = $("#ModalSu
pplierDescription").val();
var SupplierMobile = $("#ModalSupplie
rMobile").val();
var SupplierAddress = $("#ModalSuppli
erAddress").val();
var SupplierEmail = $("#ModalSupplier
Email").val();
var SupplierTime = $("#ModalSupplierT
ime").val();
var dataString = "addSupplier=1&Suppl
ierName=" + SupplierName + "&Supplier
Description=" + SupplierDescription +
 "&SupplierMobile=" + SupplierMobile
+ "&SupplierAddress=" + SupplierAddre
ss + "&SupplierEmail=" + SupplierEmai
l + "&SupplierTime=" + SupplierTime;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
loadProjectDetails();
sendSuccessToast(SupplierName + " add
ed to System");
SupplierListTable();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast(SupplierName + " cou
ld not be added to Sysetm");
}
}
});
});
$('#SupplierViewUpdateButton').on('cl
ick', function(){
var SupplierId = $('#SupplierViewId')
.val();
var SupplierName = $('#SupplierViewNa
me').val();
var SupplierDescription = $('#Supplie
rViewDescription').val();
var SupplierTime = $('#SupplierViewTi
me').val();
var SupplierAddress = $('#SupplierVie
wAddress').val();
var SupplierEmail = $('#SupplierViewE
mail').val();
var SupplierMobile = $('#SupplierView
Mobile').val();
var dataString = "updateSupplier=1&Su
pplierId="+ SupplierId +"&SupplierNam
e=" + SupplierName + "&SupplierDescri
ption=" + SupplierDescription + "&Sup
plierTime=" + SupplierTime + "&Suppli
erAddress=" + SupplierAddress + "&Sup
```

```
plierEmail=" + SupplierEmail + "&Supp
lierMobile=" + SupplierMobile;
console.log(dataString);
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log("add - "+statusVar);
var result = $.parseJSON(statusVar);
if(result[0] != "error"){
sendSuccessToast(SupplierName + " Upd
ated!");
SupplierListTable();
$('#SupplierViewRow').hide();
$(':input').val('');
}else if(result[0] == "error"){
sendWarningToast(SupplierName + " -
 ERROR - " + result[1]);
}
}
});
});
$('#SupplierViewCancelButton').on('cl
ick', function(){
$('#SupplierViewRow').hide();
$(':input').val('');
});
});

function getQuantityByMaterialWise(ma
terialId,value){
console.log("materialId:::",materialI
d)
console.log("value:::",JSON.stringify
(value))
$('materialQuantityList').val();
let listData=$('#materialQuantityList
').val();
let list=[]
if(listData !== ''){

console.log("value:::",JSON.parse(lis
tData))
let dupList=[]
dupList=JSON.parse(listData)
list=dupList
let data=dupList.find(p=>p.materialId
 === materialId)
console.log("data:::",data)
if(data !== undefined){
let index=dupList.findIndex(p=>p.mate
rialId === materialId)
let obj={
'materialId':materialId,
'quantity':value
}
console.log("obj",obj)
list[index]=obj
console.log("list",list)
}else{
let obj={
'materialId':materialId,
'quantity':value
}
console.log("obj",obj)
list.push(obj)
console.log("list",list)
}

}else{

let obj={
'materialId':materialId,
'quantity':value
}
console.log("obj",obj)
list.push(obj)
console.log("list",list)
}

$('#materialQuantityList').val(JSON.s
tringify(list))

}
function getEditQuantityByMaterialWis
e(materialId,materialActivityAssignId
,value){
console.log("materialId:::",materialI
d)
console.log("value:::",JSON.stringify
(value))
$('materialQuantityList').val();
let listData=$('#materialQuantityList
').val();
let list=[]
if(listData !== ''){

console.log("value:::",JSON.parse(lis
tData))
```

```
let dupList=[]
dupList=JSON.parse(listData)
list=dupList
let data=dupList.find(p=>p.materialId
 === materialId)

console.log("data:::",data)
if(data !== undefined){
let index=dupList.findIndex(p=>p.mate
rialId === materialId)
let obj={
'materialId':materialId,
'quantity':value,
'materialActivityAssignId':materialAc
tivityAssignId
}
console.log("obj",obj)
list[index]=obj
console.log("list",list)
}else{
let obj={
'materialId':materialId,
'quantity':value,
'materialActivityAssignId':materialAc
tivityAssignId
}
console.log("obj",obj)
list.push(obj)
console.log("list",list)
}

}else{

let obj={
'materialId':materialId,
'quantity':value,
'materialActivityAssignId':materialAc
tivityAssignId
}
console.log("obj",obj)
list.push(obj)
console.log("list",list)
}

$('#editMaterialQuantityList').val(JS
ON.stringify(list))
}

function submitDetails(){
// console.log("value::"+value)
```

```
var material=$('#ModalMaterialRequire
ment').val();
var activityList=$('#ModalActivityReq
uirement').val();
// alert(activityList)
if(material !== null){
if(activityList !== null && activityL
ist !== ""){
var dataString = "getRequirementDetai
ls=1&MaterialId="+material+"&Activity
="+activityList;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
//  $("#InventoryListDisplayTableInEd
itActivity > tbody").empty();
while(result[i]){
var requiredQty = result[i];
i++;
var material_name = result[i];
i++;
var material_description = result[i];
i++;
var material_Unit = result[i];
i++;
var stock = result[i];
i++;
var supplier = result[i];
i++;
var orderQty = result[i];
i++;
var eoq=result[i];
i++;
var costUnit=result[i];
i++;
var materialType=result[i];
i++;
var activityList=result[i];
i++;
//var inventory_material_stock = 0;
//i++;
var cost=Number(orderQty) *Number(cos
tUnit)
var currentdate = new Date();
```

```
var datetime =  currentdate.getDate()
 + "/"
+ (currentdate.getMonth()+1)  + "/"
+ currentdate.getFullYear() + "  "
+ currentdate.getHours() + ":"
+ currentdate.getMinutes() + ":"
+ currentdate.getSeconds();
// alert(datetime)
$('#RequirementMaterial').text("Mater
ial : "+material_name);
$('#RequirementMaterialDescription').
text("Material Description : "+materi
al_description);
$('#RequirementMaterialUnit').text("M
aterial Unit : "+material_Unit);
$('#RequirementMaterialStock').text("
In Stock Quantity : "+stock);
$('#RequirementMaterialSupplier').tex
t("Supplier Detail : "+supplier);
$('#RequirementMaterialEoq').text("Ec
onomic Ordering Quantity : "+eoq);
$('#RequirementMaterialOrderedQty').t
ext("Quantity To Be Ordered : "+order
Qty);
$('#RequirementMaterialReqQty').text(
"Required Quantity : "+requiredQty);
$('#RequirementMaterialCostUnit').tex
t("Cost/Unit (INR) : "+costUnit);
$('#RequirementMaterialType').text("M
aterial Class : "+materialType);
$('#RequirementActivityList').text("S
elected Activities : "+activityList);
$('#CurrentDateTime').text("Date & Ti
me : "+datetime);
$('#RequirementCost').text("Total Amo
unt (INR) : "+cost);
$('#ReqDetails').show();
$('#pdfdownload').show();
}
});
}else{
iziToast.warning({
title: 'Error',
message: "Please select activity",
position: 'topRight',
timeout: 6000
});
}
}else{
// this.sendWarningToast("Please sele
ct material first");
iziToast.warning({
title: 'Error',
message: "Please select material firs
t",
position: 'topRight',
timeout: 6000
});
}
}

function downloadPdf(){
// alert("joo")
var doc = new jsPDF();
var elementHTML = $('#ReqDetails').ht
ml();
var specialElementHandlers = {
'#elementH': function (element, rende
rer) {
return true;
}
};
doc.fromHTML(elementHTML, 15, 15, {
'width': 170,
'elementHandlers': specialElementHand
lers
});

// Save the PDF
var currentdate = new Date();
var datetime =  currentdate.getDate()
 + "-"
+ (currentdate.getMonth()+1)  + "-"
+ currentdate.getFullYear() + "  "
+ currentdate.getHours() + ":"
+ currentdate.getMinutes() + ":"
+ currentdate.getSeconds();
doc.save('REQUIREMENTS-
'+datetime+'.pdf');
}

function loadProjectDetails(){
MaterialListTable();
ActivityListTable();
InventoryListTable();
SupplierListTable();
InventoryListDisplayTableInAddNewActi
vity();

function MaterialListTable(){
```

```
var dataString = "getMaterialList=1&p
roject_id=<?php echo $project_id; ?>"
;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
console.log("result::getMaterialList:
:",result)
$("#MaterialListDisplayTable > tbody"
).empty();
while(result[i]){
var material_id = result[i];
i++;
var material_name = result[i];
i++;
var material_description = result[i];
i++;
var material_type = result[i];
i++;
var material_Unit = result[i];
i++;
var material_eoq = result[i];
i++;
var supplier = result[i];
i++;
var material_Cost_Unit = result[i];
i++;
var supplier_id_ref = result[i];
i++;
console.log("supplier_id_ref::",suppl
ier_id_ref)
$('#MaterialListDisplayTable > tbody:
last-
child').append('<tr><td class="d-
none materialId">'+ material_id +'</t
d><td class="align-
middle materialName">'+ material_name
 +'</td><td class="align-
middle materialDescription">'+ materi
al_description +'</td><td class="alig
n-
middle materialType">'+ material_type
 +'</td><td class="align-
middle materialEOQ">'+ material_eoq +
'</td><td class="align-
middle">'+ supplier+' </td><td class=
"align-
middle materialCostUnit">'+ material_
Cost_Unit +'</td><td><button class="m
-1 btn btn-warning btn-sm col-
5 MaterialListViewTableEdit"><i class
="fa fa-
edit"></i></button><button class="m-
1 btn btn-danger btn-sm col-
5 MaterialListViewTableDelete"><i cla
ss="fa fa-
trash"></i></button></td> <td class="
hide supplierRef">'+supplier_id_ref+'
</td></tr>');
}
$('.MaterialListViewTableDelete').on(
'click', function(){
var id = $(this).closest('tr').find('
.materialId').text();
console.log(id);
var dataString = "deleteMaterial=1&ma
terialId="+ id;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
var result = $.parseJSON(statusVar);
if($.trim(result[0]) != "error"){
sendSuccessToast("Done");
MaterialListTable();
}else if($.trim(result[0]) == "error"
) {
sendWarningToast("Failure");
}
}
});
});
$('.MaterialListViewTableEdit').on('c
lick', function(){
$('#MaterialViewRow').show();
var materialId = $(this).closest('tr'
).find('.materialId').text();
var materialName = $(this).closest('t
r').find('.materialName').text();
var materialDescription = $(this).clo
sest('tr').find('.materialDescription
').text();
```

```
var materialType = $(this).closest('t
r').find('.materialType').text();
var materialUnit = $(this).closest('t
r').find('.materialUnit').text();
var materialCostUnit = $(this).closes
t('tr').find('.materialCostUnit').tex
t();
var materialEOQ = $(this).closest('tr
').find('.materialEOQ').text();
var materialSupplierId = $(this).clos
est('tr').find('.supplierRef').text()
;
console.log(materialType);
console.log("MaterialViewSupplier",ma
terialSupplierId)
$('#MaterialViewId').val(materialId);
$('#MaterialViewType').val(materialTy
pe);
$('#MaterialViewMaterial').val(materi
alName);
$('#MaterialViewDescription').val(mat
erialDescription);
$('#MaterialViewUnit').val(materialUn
it);
$('#MaterialViewCostUnit').val(materi
alCostUnit);
$('#MaterialViewEOQ').val(materialEOQ
);
$('#MaterialViewSupplier').val(materi
alSupplierId);
});
}
});
}

function ActivityListTable(){
var dataString = "getActivityList=1&p
roject_id=<?php echo $project_id; ?>"
;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#ActivityListDisplayTable > tbody"
).empty();
while(result[i]){
var activity_id = result[i];
i++;
var activity_name = result[i];
i++;
var activity_description = result[i];
i++;
var activity_start_date = result[i];
i++;
var activity_end_date = result[i];
i++;
$('#ActivityListDisplayTable > tbody:
last-
child').append('<tr><td class="d-
none activityId">'+activity_id+'</td>
<td class="align-
middle activityName">'+activity_name+
'</td><td class="align-
middle activityDescription">'+activit
y_description+'</td><td class="align-
middle activityStartDate">'+activity_
start_date+'</td><td class="align-
middle activityEndDate">'+activity_en
d_date+'</td><td class="align-
middle"><button class="btn btn-
warning btn-sm col-
5 ActivityListViewTableEdit"><i class
="fa fa-
edit"></i></button><button class="btn
 btn-danger btn-sm col-
5 ActivityListViewTableDelete"><i cla
ss="fa fa-
trash"></i></button></td></tr>');
}
$('.ActivityListViewTableDelete').on(
'click', function(){
var id = $(this).closest('tr').find('
.activityId').text();
console.log(id);
var dataString = "deleteActivity=1&ac
tivityId="+ id;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
var result = $.parseJSON(statusVar);
if($.trim(result[0]) != "error"){
sendSuccessToast("Done");
ActivityListTable();
```

```
}else if($.trim(result[0]) == "error"
) {
sendWarningToast("Failure");
}
}
});
});
$('.ActivityListViewTableEdit').on('c
lick', function(){
$('#ActivityViewRow').show();
var activityId = $(this).closest('tr'
).find('.activityId').text();
InventoryListDisplayTableInEditActivi
ty(activityId);

var activityName = $(this).closest('t
r').find('.activityName').text();
var activityDescription = $(this).clo
sest('tr').find('.activityDescription
').text();
var activityStartDate = $(this).close
st('tr').find('.activityStartDate').t
ext();
var activityEndDate = $(this).closest
('tr').find('.activityEndDate').text(
);
$('#ActivityViewId').val(activityId);
$('#ActivityViewActivity').val(activi
tyName);
$('#ActivityViewDescription').val(act
ivityDescription);
$('#ActivityViewStartDate').val(activ
ityStartDate);
$('#ActivityViewEndDate').val(activit
yEndDate);
});
}
});
}

function InventoryListTable(){
var dataString = "getInventoryList=1&
project_id=<?php echo $project_id; ?>
";
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#InventoryListDisplayTable > tbody
").empty();
while(result[i]){
var inventory_material_id = result[i]
;
i++;
var inventory_material_name = result[
i];
i++;
var inventory_material_description =
result[i];
i++;
var inventory_material_Unit = result[
i];
i++;
var inventory_material_stock = result
[i] === null ? 0 : result[i];
i++;
$('#InventoryListDisplayTable > tbody
:last-
child').append('<tr><td class="d-
none inventoryMaterialId">'+inventory
_material_id+'</td><td class="align-
middle inventoryMaterialName">'+inven
tory_material_name+'</td><td class="a
lign-
middle inventoryMaterialDescription">
'+inventory_material_description+'</t
d><td class="align-
middle inventoryMaterialUnit">'+inven
tory_material_Unit+'</td><td class="a
lign-
middle inventoryMaterialStock">'+inve
ntory_material_stock+'</td><td class=
"align-
middle"><button class="btn btn-
warning btn-sm col-
5 InventoryListViewTableEdit"><i clas
s="fa fa-
edit"></i></button></td></tr>');
}
$('.InventoryListViewTableEdit').on('
click', function(){
$('#InventoryViewRow').show();
var inventoryMaterialId = $(this).clo
sest('tr').find('.inventoryMaterialId
').text();
```

```
var inventoryMaterialName = $(this).closest('tr').find('.inventoryMaterialName').text();
var inventoryMaterialUnit = $(this).closest('tr').find('.inventoryMaterialUnit').text();
var inventoryMaterialQuantity = $(this).closest('tr').find('.inventoryMaterialStock').text();
$('#InventoryViewId').val(inventoryMaterialId);
$('#InventoryViewName').val(inventoryMaterialName);
$('#InventoryViewUnit').val(inventoryMaterialUnit);
$('#InventoryViewQuantity').val(inventoryMaterialQuantity);
});
}
});
}

function InventoryListDisplayTableInAddNewActivity(){
var dataString = "getInventoryListInAddNewActivity=1&project_id=<?php echo $project_id; ?>";
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#InventoryListDisplayTableInAddNewActivity > tbody").empty();
while(result[i]){
var inventory_material_id = result[i];
i++;
var inventory_material_name = result[i];
i++;
var inventory_material_description = result[i];
i++;
var inventory_material_Unit = result[i];
i++;
//var inventory_material_stock = 0;
//i++;
$('#InventoryListDisplayTableInAddNewActivity > tbody:last-child').append('<tr><td class="d-none inventoryMaterialId">'+inventory_material_id+'</td><td class="align-middle inventoryMaterialName">'+inventory_material_name+'</td><td class="align-
middle inventoryMaterialDescription">'+inventory_material_description+'</td><td class="align-
middle inventoryMaterialUnit">'+inventory_material_Unit+'</td><td><div  contenteditable><input id="quantity'+i+'" type="text" value="0" onChange="getQuantityByMaterialWise('+inventory_material_id+',value)" /></div></td></tr>');
}
}
});
}

function InventoryListDisplayTableInEditActivity(activityId){
var dataString = "getInventoryListInEditActivity=1&Activity="+activityId;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#InventoryListDisplayTableInEditActivity > tbody").empty();
while(result[i]){
var inventory_material_id = result[i];
i++;
var inventory_material_name = result[i];
i++;
var inventory_material_description = result[i];
i++;
```

```
var inventory_material_Unit = result[
i];
i++;
var material_current_stock = result[i
];
i++;
var material_activity_assign_id=resul
t[i];
i++;
//var inventory_material_stock = 0;
//i++;
$('#InventoryListDisplayTableInEditAc
tivity > tbody:last-
child').append('<tr><td class="d-
none editInventoryMaterialId">'+inven
tory_material_id+'</td><td class="ali
gn-
middle editInventoryMaterialName">'+i
nventory_material_name+'</td><td clas
s="align-
middle editInventoryMaterialDescripti
on">'+inventory_material_description+
'</td><td class="align-
middle editInventoryMaterialUnit">'+i
nventory_material_Unit+'</td><td><div
  contenteditable><input id="quantity
Edits'+i+'" type="text" value="'+mate
rial_current_stock+'" onChange="getEd
itQuantityByMaterialWise('+inventory_
material_id+','+material_activity_ass
ign_id+',value)" /></div></td></tr>')
;
}
}
});
}

function SupplierListTable(){
var dataString = "getSupplierList=1&p
roject_id=<?php echo $project_id; ?>"
;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
console.log(statusVar);
var result = $.parseJSON(statusVar);
var i = 0;
$("#SupplierListDisplayTable > tbody"
).empty();
while(result[i]){
var supplier_id = result[i];
i++;
var supplier_name = result[i];
i++;
var supplier_description = result[i];
i++;
var supplier_address = result[i];
i++;
var supplier_mobile = result[i];
i++;
var supplier_email = result[i];
i++;
var supplier_avg_delivery_time = resu
lt[i];
i++;
$('#SupplierListDisplayTable > tbody:
last-
child').append('<tr><td class="align-
middle d-
none supplierId">'+supplier_id+'</td>
<td class="align-
middle supplierName">'+supplier_name+
'</td><td class="align-
middle supplierDescription">'+supplie
r_description+'</td><td class="align-
middle supplierAddress">'+supplier_ad
dress+'</td><td class="align-
middle supplierMobile">'+supplier_mob
ile+'</td><td class="align-
middle supplierEmail">'+supplier_emai
l+'</td><td class="align-
middle supplierTime">'+supplier_avg_d
elivery_time+'</td><td><button class=
"m-1 btn btn-warning btn-sm col-
5 SupplierListViewTableEdit"><i class
="fa fa-
edit"></i></button><button class="m-
1 btn btn-danger btn-sm col-
5 SupplierListViewTableDelete"><i cla
ss="fa fa-
trash"></i></button></td></tr>');
}
$('.SupplierListViewTableDelete').on(
'click', function(){
var id = $(this).closest('tr').find('
.supplierId').text();
console.log(id);
```

```
var dataString = "deleteSupplier=1&su
pplierId="+ id;
$.ajax({
type: "POST",
url: "php/project.php",
data: dataString,
cache: false,
success: function(statusVar){
var result = $.parseJSON(statusVar);
if($.trim(result[0]) != "error"){
sendSuccessToast("Done");
MaterialListTable();
}else if($.trim(result[0]) == "error"
) {
sendWarningToast("Failure");
}
}
});
});
$('.SupplierListViewTableEdit').on('c
lick', function(){
$('#SupplierViewRow').show();
var supplierId = $(this).closest('tr'
).find('.supplierId').text();
var supplierName = $(this).closest('t
r').find('.supplierName').text();
var supplierDescription = $(this).clo
sest('tr').find('.supplierDescription
').text();
var supplierAddress = $(this).closest
('tr').find('.supplierAddress').text(
);
var supplierMobile = $(this).closest(
'tr').find('.supplierMobile').text();
var supplierTime = $(this).closest('t
r').find('.supplierTime').text();
var supplierEmail = $(this).closest('
tr').find('.supplierEmail').text();

$('#SupplierViewId').val(supplierId);
$('#SupplierViewName').val(supplierNa
me);
$('#SupplierViewDescription').val(sup
plierDescription);
$('#SupplierViewAddress').val(supplie
rAddress);
$('#SupplierViewMobile').val(supplier
Mobile);
$('#SupplierViewTime').val(supplierTi
me);
$('#SupplierViewEmail').val(supplierE
mail);
});
}
});
}

}
</script>
</body>
</html>
```

PUBLICATION DETAILS

Kazi Abdul Aziz, Parkar Fauwaz. “Effective Construction Inventory Management” abstract accepted and review paper submitted for NICMAR 5th International Conference On Construction, Real Estate, Infrastructure and Project (CRIP) Management to be held on December 17 & 18, 2021.

Due to the uniqueness of the work done under this dissertation, it is being applied for a Copyright to the Copyright office of the Government of India located in Delhi. Therefore, the work has not been published in any other Conference or Journal publications.