

Increase the Efficiency and Effectiveness of the Construction Field

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ABSTRACT

These days with extreme responsibility and occupied life, many professionals face problems that result in the loss of their clients or certain overheads that spoil the process of satisfying the client. The proposed web application will be utilized by interior designers, garden designers, or architects. This proposed research doubtlessly goes about as a powerful device that can diminish the hole between modern organizations and clients notwithstanding other relevant business networks. It will help in picturing architectural plans, garden designs, and interior designs. A virtual model of genuine climate can be planned before its actual execution, it will permit inside originators to carry out their thought in the given work area essentially and afterward view it in genuine climate, it will likewise architects, interior designers, and garden designers to see their 3D perceptions on their 2D drawings [1]. The application depends on my discoveries of the client's assumptions for an expanded reality inside plan administration, a help which is a mix of different uses of web-based entertainment, increased reality (AR) and three-dimensional displaying that encases the idea of the home plan. This concentration particularly spans all clients of applicable organizations to the client escalated plan of an expanded reality. The paper gives you the internal profundity on how the expanded reality can be carried out to work with the planners and interior creators and garden designers too it talks about the calculation used to accomplish the functionalities. Furthermore, in this paper the architects and interior designers, and garden designers as well discuss the algorithm used to achieve the functionalities.

Keywords— Construction, Employee, Architect, EJS, Design

I. INTRODUCTION

Development is a huge industry that is comprised of many kinds of building and structural design positions. The construction industry includes jobs in carpentry, road construction, bridge development, architecture design, interior design, and garden design. There are three significant parts to the development business. These are

general project workers, specialty exchange development, and structural designing development. Every region includes a particular capability inside the general business. architecture design, interior design, and garden design are important for the construction industry. Each plan is a speculation and a functional investigation. By its actual nature, a plan targets taking care of issues by mediating with a certain goal in mind. Both the plan speculation and mediation should be explained and together they are the establishment for research. Numerous garden designers, interior designers, and architects might find it challenging to express a plan since a significant part of the configuration process is instinctive and non-cognizant, depending on analogies and suggested information as opposed to unequivocal what's more, legitimate reasoning. The Architecture of Design Doing (ADD) is our proposed framework for achieving this. The motivation behind Architecture of Design Doing is to help experts and scientists with catching and portraying best practices in a sound and steady manner while maintaining an emphasis on planned clients of the system and ensuring that the setting delicate nature of techniques is held together. Through this cycle, associations can all the more likely deal with their dynamic plan abilities, work with hierarchical learning and increase their intensity. [2] Clients are now looking for designers who have strong knowledge and background in research methodologies for testing design outcomes.

What clients wanted from an interior designer fifteen or twenty years ago is different from what they are looking for today. As of now, clients look first at the designer's experience with their type of project, then at the firm's experience. They next assess the capacity to finish the undertaking on time and inside a set financial plan, and the accuracy in making estimates and specifications. Also down the list of their considerations is the kind of design work the firm does, the firm's quality of management, the size of the firm, and the in-house capabilities. Today in Europe, architecture design, garden design, and interior design profession focus on Knowledge, and the capacity of managing this Knowledge is increasingly important in the

activity and the team-based office, it is considered so important to the point that it can make or break a company.

Therefore, it is necessary to select employees with good qualifications and add only them to the system. It will develop the quality of the company and it will help the company in the development of the construction field. So, the first reason for research in interior design, garden design, and architecture design basically rely on the client's attitude to know who the firm is, what the firm does, how long it has been in business, where is the office located, what kind of services is the firm able to provide, and what types of consultants and other professionals would be brought to the project. They will want to know about recent jobs done that are similar to their project and how those projects were particularly successful.

Also, when a customer wants to build a new building, he has to meet interior designers, architecture designers, and garden designers separately. This is a problem for a client with a competitive lifestyle club. As a solution to this, this web software can be introduced so that the client can meet all the designers in one place. By using this web application, the problems faced by the customers can be solved satisfactorily and the client's design mind can be accomplished simply and easily by using this web application. Also from this new introduction, customer can do manual work automate. Finally, the purpose of this web application is to provide quick, easy, efficient, and reliable good service to clients.

II. LITERATURE REVIEW

This paper argues how much people need construction designing platforms as well as the difficulty of contacting professional designers for their dream buildings. The Builderz system offers a solution for customers to contact professional designers. And the developed system can be a good platform for freelance designers to contract projects. So this will be a good solution to the unemployment of the country.

There are some systems [3] that have addressed the gap between industrial companies and customers. And visualizing methods for designing plans for the customer. But in most of the applications, customers have to meet designers physically. This research going to develop a system that customers can give their requirements remotely. Similarly took the concept of the services that can supply in a construction company. But through the developed a system that can get all these services by online. And there are some systems[4]that provide predesign plans for building design. Rather than that our proposed solution mainly focused on customers' requirements.

Communication is a critical element of the entire design process especially in the schematic design phase or in the so-called comprehensive phase. Since the design concept relates to the initial client's requirements that state the quantitative and qualitative goals.

III. METHODOLOGY

A. Tools and Technology

Implementation deals with the building, assembling, and shaping of the system utilizing the design model, tools, and technology. This section mainly explains how technology and tools are used to create the needs of the client. EJS, Node JS, Express JS, and MongoDB are the most often utilized languages and technologies in the development of web applications. Three are the primary programming languages, and they are all part of the MERN stack. These days, many people speak those languages. The three languages are chosen because MERN stack is a high-performance, customized technology that enables the development of online apps and software.

EJS was used for the front-end development. EJS stands for Embedded JavaScript Templating, one of the most well-liked JavaScript template engines. As the name implies, it enables us to include JavaScript code into a template language that produces HTML. Another choice is Mern, as is any JavaScript front-end framework. Therefore, EJS has been employed for front-end development as it is also the best JavaScript framework that is more well-known among programmers. Software called a template engine combines templates and a data model to create real HTML code in our example. The front-end development framework or view engine template mentioned in figure 1 is called EJS.

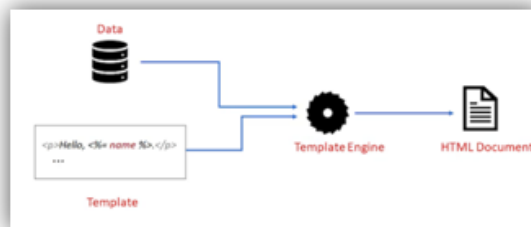


Figure 1: Procedure of working template

As the mentioned above frontend development is done by EJS JavaScript framework, Node JS is used as the backend language, Express JS is used as the backend framework and MongoDB helps to database management.

According to the high-level architectural diagram as shown in figure 2, the Express JS server-side framework is the first level and is installed inside a Node JS server[5]. Express JS offers a variety of capabilities for creating websites and mobile apps. Node JS is a quick JavaScript

runtime environment that we use to create server-side apps, but it lacks the ability to handle HTTP method processing, file serving, and request handling. Express JS can help in this situation. It makes Node JS quick, simple, affordable, asynchronous, and time effective. A single page, multipage, and hybrid web application were all created using Express JS. It is a layer that is added on top of NodeJS and aids in managing servers and routes. Express JS is used with Node JS because it is non-opinionated, customizable, and allows middleware to be used for request handling. Additionally, connecting it to databases like MongoDB, MySQL, etc. is quick[6]. The choice of Express JS and Node JS as the backend development language and framework comes from this reason.

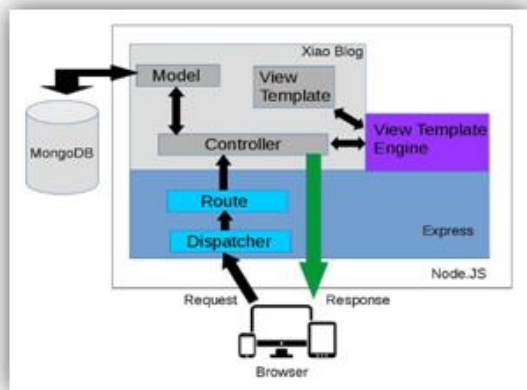


Figure 2: High-Level Architecture Diagram

Database development is the next rung in the architecture diagram. MongoDB, a document database utilized to create highly accessible and scalable web applications, is employed for that operation. Backend-as-a-Service database MongoDB is hosted by Google in the cloud (Bass). Key-value pairs are used to store data in this NoSQL database[7]. It's well-liked by agile development teams due to its flexible schema approach. Each record in a MongoDB database is a document described in BSON, a binary representation of the data, as opposed to tables of rows and columns like SQL databases. The data is then

accessible to applications in JSON format. The scale-out architecture that MongoDB is based on has gained popularity among developers of all stripes for creating scalable applications with changing data formats. Document databases are incredibly adaptable, allowing for differences in document structure and storing documents that aren't entirely finished. Other documents may be embedded within one. Similar to columns in a SQL database, fields in a document can also be indexed to improve search performance. In addition to all of its other benefits, MongoDB has always put a strong emphasis on giving developers a great user experience, which has helped it become a developer choice for a range of applications. Because it makes it simple for developers to store, manage, and retrieve data when designing apps using most programming languages, MongoDB has grown to become one of the most sought-after databases worldwide. The aforementioned benefits are what led developers to choose MongoDB as their database development language.

B. Designing

Systems design is the process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements. It is the process of defining, developing and designing systems which satisfies the specific needs and requirements of a business or organization. The development design can be divided into three stages.

- Architectural design
- Physical design
- Logical design

The views, models, behavior, and structure of the system are described by the architectural design. Our system is built on the data-flow architecture, which is employed when input data needs to be changed into output data by a number of computationally manipulating components. In figure 3The following flow chart will explain the data flowin the event that a customer logs in as a user and what steps the customer must take from the construction web application.

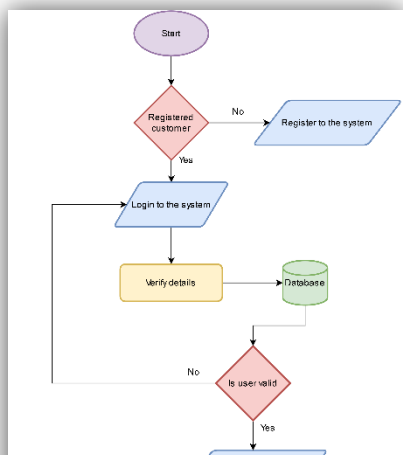


Figure 3 Flow chart of customer

Figure 4: Flow chart of customer

In the other way around employee also can log into the system can follow some steps as an employee to the system. It is different from the customer flow and the employee flow will be explained in figure4. Other than the customer and the employee the main management of the whole system is done by the administration. All the employee details a, customer details, requirement handling and the whole main functionalities are handled by the admin side. The flow which a user logging to the system as an admin is shown by the data flow diagram related to admin functions in figure 5.

An abstract illustration of the system's inputs, outputs, and data flow is referred to as logical design. It provides a format that satisfies the needs of the user when describing inputs (sources), outputs (destinations), databases (data storage), and processes (data flows). The system analyst specifies the user requirements at a degree of detail that essentially dictates the information flow into and out of the system as well as the necessary data sources when creating the logical design of a system.

E-R diagram modeling and data flow diagrams are employed. The system's real input and output operations are related to the physical design. It focuses on the methods used to input, validate, process, and output data from a system. It produces the working system by defining the design specification that specifies exactly what the candidate system does. It is concerned with user interface design, process design, and data design.

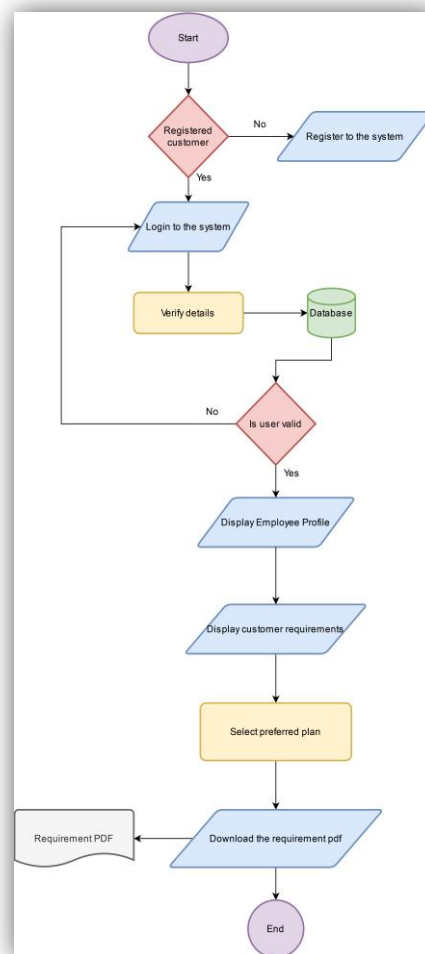


Figure 4: Flow chart of employee

There are some special packages which are used in the development series. For login authentication and authorization is done using "Passport" package. Passport is middleware for Node.js that makes it easy to implement authentication and authorization. Passport's sole purpose is to authenticate requests, which it does through an extensible set of plugins known as *strategies*. Passport does not mount routes or assume any particular database schema, which maximizes flexibility and allows application-level decisions to be made by the developer. The API is simple: you provide Passport a request to authenticate, and Passport provides hooks for controlling

what occurs when authentication succeeds or fails. Passport uses the concept of strategies to authenticate requests.

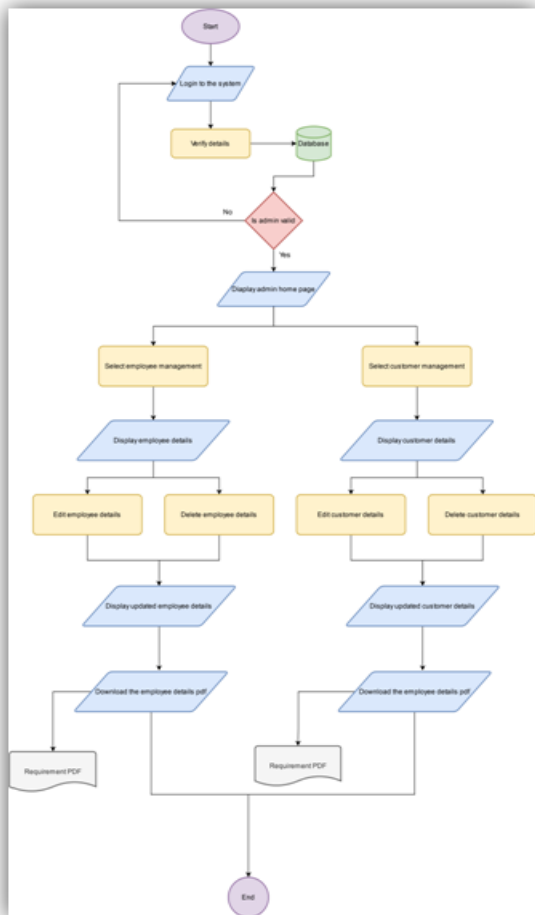


Figure 5: Flow chart of admin

Strategies can range from verifying username and password credentials, delegated authentication using OAuth or federated authentication using OpenID. Passport will maintain persistent login sessions. In order for persistent sessions to work, the authenticated user must be serialized to the session, and deserialized when subsequent requests are made. Another special npm package is used to image uploading process. It is called Multer. Multer is a npm package that makes it easy to handle file uploads. It does it very efficiently, thus it is quite popular. Another “html-pdf” package is used to generate a PDF file in the report generation part. It is pure html code which will generate a pdf. Also, filtering is done, and any user can filter data and generate PDF only for the filtered data. The procedure is described in figure 6 which is the flow of pdf generator.

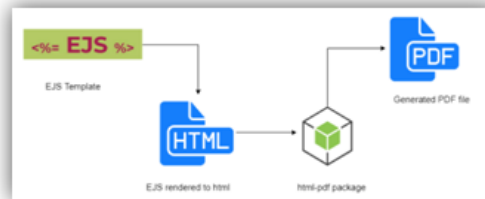


Figure 6: EJS handling pdf generator

C. Hardware Requirements

The proposed system requires.

- CPU: Core i3 or more
- RAM: 4GB or more
- Graphic: Intel HD Graphics or more
- Display Resolution: 1024 x 768 is minimum size
- Application window size: 1024 x 680 or larger
- Internet connection is required.

D. Special Tools

Code testing is a critical requirement for a good output. On behalf of that testing is done by Selenium. It is an automated software that tests web applications. Selenium is used to ensure high-quality web applications such as, whether they are responsive, progressive, or regular. Selenium can be used to automate functional tests and can be integrated with automation test tools such as Maven, Jenkins, & Docker to achieve continuous testing [8]. It can also be integrated with tools such as TestNG, &JUnit for managing test cases and generating reports. Other than that, another tool used is SonarQube. It is used as a code quality assurance tool that collects and analyzes source code and provides reports for the code quality of the projects. It combines static and dynamic analysis tools and enables quality to be measured continually over time. SonarQube also ensures code reliability, Application security, and reduces technical debt by making your code base clean and maintainable. That is why SonarQube is used in the development of web applications.

IV. PROPOSED SYSTEM

The "Builderz" construction site management system will give users the ability to manage the job site in a number of different ways. Basically, the system was used by users, administrators, and staff. The majority of construction sites lack suitable methods for managing staff and customer requirements, which was the issue that needed to be solved. [9]By addressing those issues, we were able to create a better web application and find a solution. In figure 7 the overall system overview diagram is included.

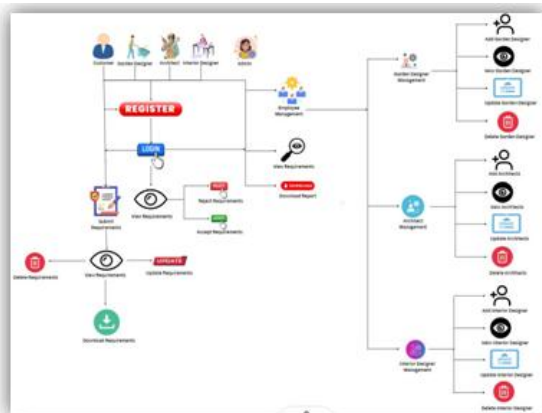


Figure 7: System Overview Diagram

The primary functions of this web application include login and registration, employee and client management, architect, garden and interior designer management, and report generating. Customers and staff can both register for the system using the login and registration features. The system allows registered users to login after registering with it. The customer will arrive at their home page after successfully logging into the system. The user has the choice to navigate to the Architect, Interior Design, or Garden Design pages from the customer home page. The user can choose their chosen designer to continue working after selecting the appropriate option. For the convenience of the client, a search option is also provided. The customer can view the work completed by the chosen designer as well as the form to submit their needs after choosing their preferred designer. The user can fill out the form and submit it to the appropriate designer with their specifications. The client views the submitted requirements after they have been submitted. The user can change, delete, or download the submitted requirements if they choose.

The administrator will access the admin dashboard after successfully logging into the system. The administrator can manage users, staff, architects, interior designers, and garden designers from the admin dashboard. Additionally, the admin can add the staff to the appropriate web sites. If the administrator so desires, the report may be updated, deleted, or generated as a PDF for download. The searching function provided on some pages is for the administrator's convenience. In figure 8 the class diagram of the system is included.

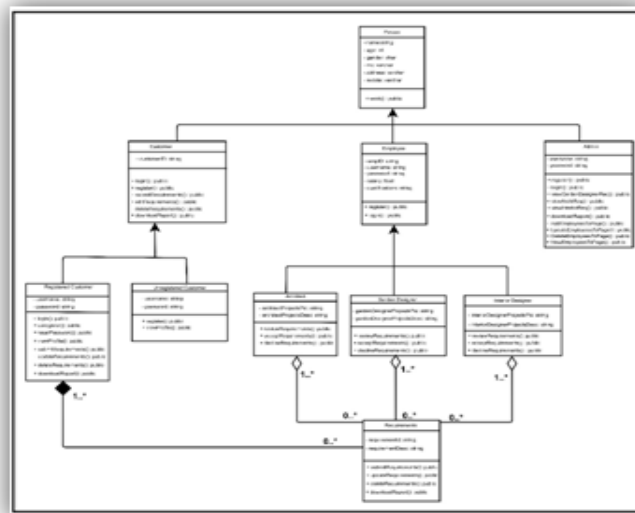


Figure 8: Class Diagram

V. DISCUSSION

Express is for the backend and an EJS template for the front end was used to create the Final Outcome. The database is made use of mongo DB. Due to the proposed system's four members' contributions GitHub is utilized as version control.

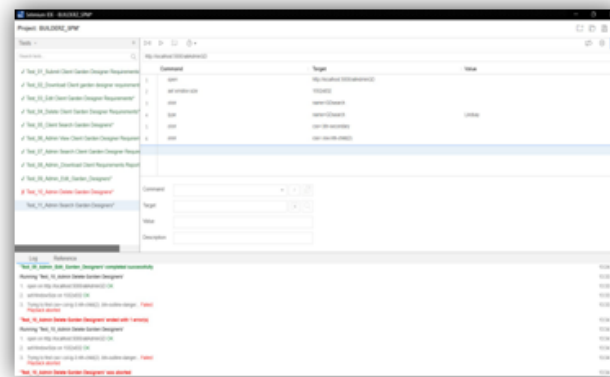


Figure 9: Screenshots of Selenium Test Cases

Selenium testing was performed on the developed project. Without having to learn a test scripting language, Selenium IDE offers a playback tool for creating functional tests across the majority of current web browsers [10]. To verify that the end result is an error-free product, the proposed system has test cases for each of its functions. 50 test cases were fully constructed for the entire system, and this allowed for the discovery and correction of any flaws before the final result. In figure 9 have displayed some test cases made for the developed system. Since the teams practice an agile methodology, it has to commit to writing acceptance tests before beginning development on stories.

Passing these tests signals completion of a story, so it has to write functional tests that capture these acceptance criteria. For a web application, a functional test could be simply that a user manually navigates through the application to verify the application behaves as expected. But since automating a test is the best way to make sure it is run often, For the proposed system tried to automate our functional acceptance tests whenever it can.

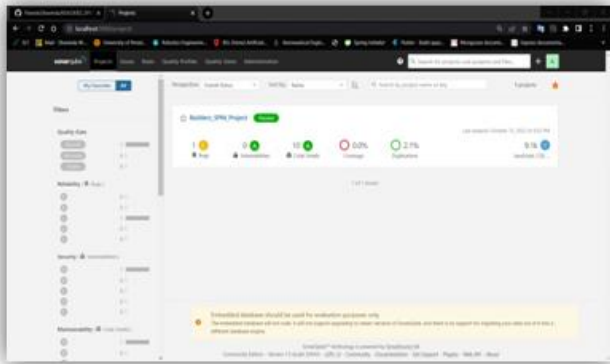


Figure 10: Screenshot of SonarQube

The code quality was checked with SonarQube. A technology called SonarQube is used to check software for errors, weaknesses, and bad code practices. Some minor issues were discovered in the suggested solution, but they were disregarded because they don't affect the primary functionality. Figure 10 shows source code analysis of SonarQube.

VI. FUTURE WORK

Different key directions of future research, including smart robotics, cloud virtual and augmented reality (cloud VR/AR), artificial intelligence of things (AIoT), digital twins, 4D printing, and block chains, are constantly facilitating the automation and intelligence in construction management [11]. This will help to further close the gap between customers and construction designers and make it easier to manage construction sites. Predicting construction costs [12] to cut down on time and risk assessment are essential steps in the managerial decision-making process. Attempting to publish publications that offer cost estimation using machine learning techniques in the future.

VII. CONCLUSION

Clients are now seeking designers with extensive experience and training in research approaches for evaluating design outcomes. "Builderz" is a solution for several employees. Garden designers, architects, interior designers. Those employees can register through the

system and then can be a member of the company. Through the web application customers are able to utilize their dream building by giving their requirements to the preferred designer.

Further we are supposed to deploy this application in Linux shared hosting. In this research we only discussed designing part of constructions. The In proposed system didn't have put any attention on development of building. For the future research we are planning to discuss building development. There are only three types of employees in the proposed system. In Future have planned to increase the employee capacity by adding other aspects in construction side. In the proposed system after the customer handover the requirements to the specific designer, the process will be over. There is a suggestion to improve the system by having an interconnection with the customer and the employees of the system until handover the building to the customer. Not only have that maintained the buildings and reconstruction the existing buildings facilities can be improve in the proposed system above.

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