# Impact Assessment Web Application for Resource Utilisation Efficacy in Construction Projects

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*Abstract—* **web applications have different uses in construction industry because, many construction projects are commissioned day by day. Many problems created in construction industry due to the improper utilisation of major resources like material, labour and equipment's. The quantification of causes of improper utilization of material, labour and equipment in construction industry, is essential for the building practitioners to properly plan and control the disposal. The web application is effectively used to determine the total impact of resource wastage in each of the companies that help clients to choose and create an understanding of resource wastage in the construction industry.**

*Index Terms—* **construction industry construction projects*, *resource wastage**
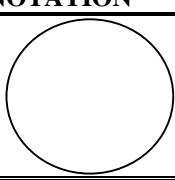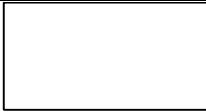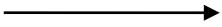_____

## I. INTRODUCTION

The construction industry also faces chronic problems such as time and cost overruns, low productivity, poor safety, inferior working conditions, insufficient quality, lack of skilled manpower etc. In construction industry many problems are created due to the improper utilisation of major resources like material, labour and equipment. Their impact can be measured with the help of a web application. Web infrastructure provide convenience and ease to end user. Client needs only one application Web Browser to access any sort of website or web application which means that there is no need for a client application to be deployed and maintained. Users can easily access the application from any computer connected to the Internet using a standard browser. A web-based application is any application that uses a website as the interface or front-end.

## II. DATA FLOW DIAGRAM (DFD)

A Data Flow Diagram (DFD) is a graphical representation of the "flow" of data through an Information System. A data flow diagram can also be used for the visualization of Data Processing. A DFD represents flow of data through a system. Data flow diagrams are commonly used during problem analysis. It views a system as a function that transforms the input into desired output. A DFD shows movement of data through the different transformations or processes in the system. The appropriate register saved in database and maintained by appropriate authorities.

**TABLE 1**
**Symbols Used in DFD Diagram**

| NOTATION | COMPONENT | DESCRIPTION |
|---|---|---|
| (oval/circle) | Process | An oval represents a process or transform that is applied to data or control and changes it in some way. |
| (rectangle) | External Entity | A rectangle is used to represent an external entity, that is, a system element that produces information for transformation by the software or receives information produced by the software. |
| (arrow) | Data Flow | An arrow represents one or more data items or data objects. |

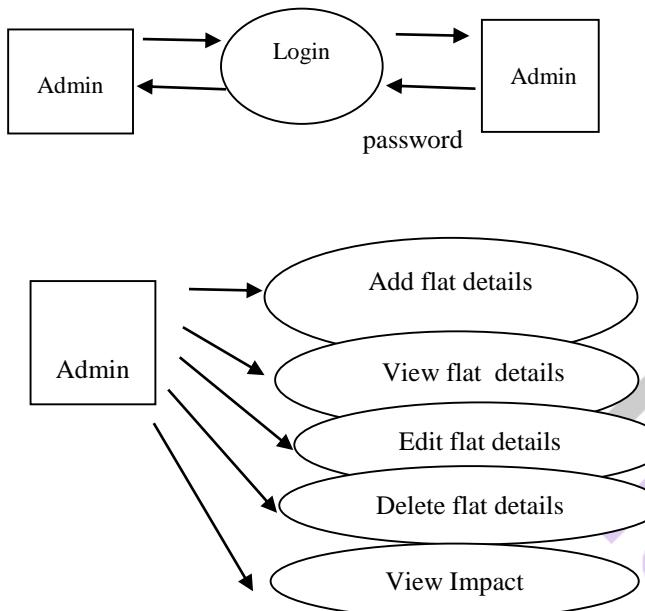| | Data Store | The open box represents data store-stored information that is used by the software. |
|---|---|---|





**Fig 1 Flow chart data flow diagram**

## A PROGRAM DESIGN

The main component of this web application is the 'Administrator':

The role of administrator is given below;

Administrator

### *Admin*

Step 1: Login to the application.
Step2: Add villa details.
Step3: View villa details.
Step 4: Edit villa details.
Step 5: Delete villa details.
Step 6: View Impact.

## B DATABASE DESIGN

The most important aspect of building software systems is database design. The highest level in the hierarchy is the database. It is a set of inter-related files for real time processing. It contains the necessary data for problem solving and can be used by several users accessing data concurrently. The general objective of database design is to make the data access easy, inexpensive and flexible to the user. Database design is used to define and then specify the structure of business used in the client/server system. A business object is nothing but information that is visible to the users of the system. The database must be a normalized one. Database management system (DBMS) allows the data to be protected and organized separately from other resources like hardware, software and programs. DBMS is a software package, which contains components that are not found in other data management packages. The significance of DBMS is the separation of data as seen by the programs and data as stored on the direct access storage devices, i.e. the difference between logical and physical data.

## III. HARDWARE AND SOFTWARE REQUIREMENTS

For Application Installation
C P U Speed: 1ghz Dual Core.

Main Memory: 512mb / Higher
Internal Storage: 1gb
Software Requirements
Os: Windows 7 / 8 / Higher,Linux
Front End - Html,Css
Back End - Python/Django
Database - Sqlite3/Postgresql

## A SELECTION OF SOFTWARE

Front End:
  1) HTML
 First developed by Tim Berners-Lee in 1990, HTML is short for Hyper Text Markup  Language. HTML is used to create electronic documents (called pages) that are displayed on the World Wide Web. Each page contains a series of connections to other pages called hyperlinks. Every web page you see on the Internet is written using one version of HTML code or another.

HTML code ensures the proper formatting of text and images so that your Internet browser may display them as they are intended to look. Without HTML, a browser would not know how to display text as elements or load images or other elements. HTML also provides a basic structure of the page, upon which Cascading Style Sheets are overlaid to change its appearance. One could think of HTML as the bones (structure) of a web page, and CSS as its skin (appearance).

2) CSS
    Stands for "Cascading Style Sheet." Cascading style sheets are used to format the layout of Web pages. They can be used to define text styles, table sizes, and other aspects of Web pages that previously could only be defined in a page's HTML. While CSS is great for creating text styles, it is helpful for formatting other aspects of Web page layout as well. For example, CSS can be used to define the cell padding of table cells, the style, thickness, and color of a table's border, and the padding around images or other objects. CSS gives Web developers more exact control over how Web pages will look than HTML does. This is why most Web pages today incorporate cascading style sheets

Back End:
  *1) Python*

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.
Often, programmers fall in work with Python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast. Debugging Python programs is easy: a bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception. When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on. The debugger is written in Python itself, testifying to Python's introspective power. On the other hand, often the quickest way to debug a program is to add a few print statements to the source: the fast edit-test-debug cycle makes this simple approach very effective.

  *2) Django*

Django is a free, open source web framework written in the Python programming language and used by millions of programmers every year. Its popularity is due to its friendliness to both beginners and advanced programmers: Django is robust enough to be used by the largest websites in the world–Instagram, Pinterest, Bitbucket, Disqus–but also flexible enough to be a good choice for early-stage startups and prototyping personal projects.
A web framework is a collection of modular tools that abstracts away much of the difficulty–and repetition–inherent in web development. For example, most websites need the same basic functionality: the ability to connect to a database, set URL routes, display content on a page, handle security properly, and so on.

Django inherited Python's "batteries-included" approach and     includes out-of-the box    support    for common tasks in web development:

- user authentication
- templates, routes, and views
- admin interface
- robust security
- support for multiple database backends

### B DATABASE MANAGEMENT SYSTEM (DBMS)

A Database is defined as a collection of interrelated data, stored together without necessary redundancy to serve multiple applications. It can be defined as a large, interrelated, shared pool of information in a form that is suitable for handling by a computer. The data are stored so that they are independent of programs that use the data. A common and controlled method is followed for manipulating the data in the database.

#### 1) POSTGRESQL

PostgreSQL is a powerful, open source object-relational database system. It has more than 15 years of active development and a proven architecture that has earned it a strong reputation for reliability, data integrity, and correctness. It runs on all major operating systems, including Linux, UNIX (AIX, BSD, HP-UX, macOS, Solaris), and Windows. It is fully ACID compliant, has full support for foreign keys, joins, views, triggers, and stored procedures (in multiple languages). It includes most SQL:2008 data types, including INTEGER, NUMERIC, BOOLEAN, CHAR, VARCHAR, DATE, INTERVAL, and TIMESTAMP. It also supports storage of binary large objects, including pictures, sounds, or video. It has native programming interfaces for C/C++, Java, .Net, Perl, Python, Ruby, Tcl, ODBC, among others.

An enterprise class database, PostgreSQL boasts sophisticated features such as Multi-Version Concurrency Control (MVCC), point in time recovery, tablespaces, asynchronous replication, nested transactions (savepoints), online/hot backups, a sophisticated query planner/optimizer, and write ahead logging for fault tolerance. It supports international character sets, multibyte character encodings, Unicode, and it is locale-aware for sorting, case-sensitivity, and formatting. It is highly scalable both in the sheer quantity of data it can manage and in the number of concurrent users it can accommodate. There are active PostgreSQL instances in production environments that manage many terabytes of data, as well as clusters managing petabytes. Some general PostgreSQL limits are included in the table below.

**Table 2**
**Postgresql Limits**

| Limit | Value |
|---|---|
| Maximum Database Size | Unlimited |
| Maximum Table Size | 32 TB |
| Maximum Row Size | 1.6 TB |
| Maximum Field Size | 1 GB |
| Maximum Rows per Table | Unlimited |
| Maximum Columns per Table | 250 - 1600 depending on column types |

In any software development, testing is a process to show the correctness of the program and it meets the design specifications. Testing is needed to prove correctness, to show completeness, to improve the quality of the software and to provide the maintenance aid. Some testing standards are therefore necessary to ensure completeness of testing, improve the quality of the software, and reduce the testing costs and to reduce study needs and operation time. Testing software extends throughout the coding phase and it represents the ultimate review of configurations, design and coding. A series of test cases are created that are intended to demolish the software that has been built.

Based on the way the software reacts to these tests, we can decide whether the configuration that has been built is study or not. It is essential that all components of an application be tested, as the failure to do so many result in a series of bugs after the software is put to use. Several methods of testing exist in software Engineering, which enable a programmer to make sure that the configuration built is free of bugs.

## C  TESTING DETAILS AND RESULTS

The various level of testing is as follows

### 1)  Unit Testing

The primary goal of unit testing is to take the smallest piece of testable software in the application, isolate it from the remainder of the code, and determine whether it behaves exactly as you expect. Each unit is tested separately before integrating them into modules to test the interfaces between the modules. Unit testing has proven its value in that a large percentage of defects are identified during its use.

The most common approach to unit testing requires drivers and stubs to be written. The driver simulates a calling unit and the stub simulates a called unit. The investment of developer time in this activity sometimes results in demoting unit testing to a lower level of priority and that is almost always a mistake. Even though the drivers and stubs cost time and money, unit testing provides some undeniable advantages. It allows for automation of the testing process, reduces difficulties of discovering errors contained in more complex pieces of the application, and test coverage is often enhanced because attention is given to each unit.

### 2)  Integration Testing

Integration testing (sometimes called Integration and Testing, abbreviated as "I&T") is the phase in software testing in which individual software modules are combined and tested as a group. It occurs after unit testing and before system testing. Integration testing takes place as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.

The purpose of integration testing is to verify functional, performance, and reliability requirements placed on major design items. These "design items" i .e. assemblages (or groups of units) are exercised through their interfaces using Black box testing, success and error cases being simulated via appropriate parameter and data inputs. Simulated usage of shared data areas and inter-process communication is tested and individual subsystems are exercised through their input interface. Test cases are constructed to test that all components within assemblages interact correctly, for example across procedure calls or process activations, and this is done after testing individual modules, i.e. unit testing. The overall idea is a "building block" approach, in which verified assemblages are added to a verified base which is then used to support the integration testing of further assemblages.

**Table 3**
**Test Result**

| Test Case | Test Procedure | Precondition | Expected Result | Passed/ Failed (Yes/No) |
|---|---|---|---|---|
| Login Page | To check whether the control from the login screen goes to the main menu | Enter a valid user name and password on the login screen | The control should go to the home page | Yes |
| Adding Villa Details | To check whether the control goes to the villa home page and add details. | Select Add villa page from the home page | The control should go to Add villa page | Yes |
| View Villa page | To check whether the control goes to theedit,view,delete page | Select view villa page from home page | The control should go to Add villa page | Yes |
| View Impact | To check whether the control goes to Impact button and displays the corresponding impact. | Select Impact button from View villa page | The control should go to Impact result. | Yes |

## IV. Test Results

The authentication is tested effectively and only valid users can enter the application. User can perform their functionalities successfully without any errors. Data store is correctly populated as and when required. Data retrieval is also up to the mark. The application is working properly without any errors and the admin can use the application effectively.
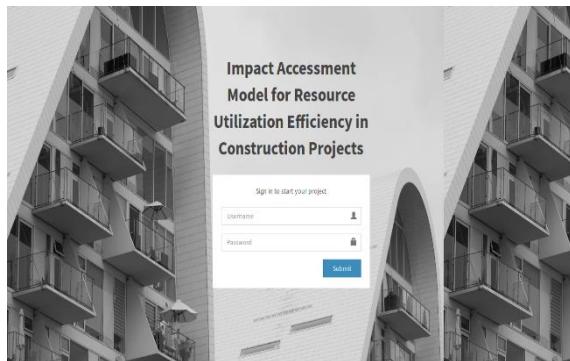


**Fig.2. Screenshot showing Login p**



**Fig.4.Screenshot of villa details**
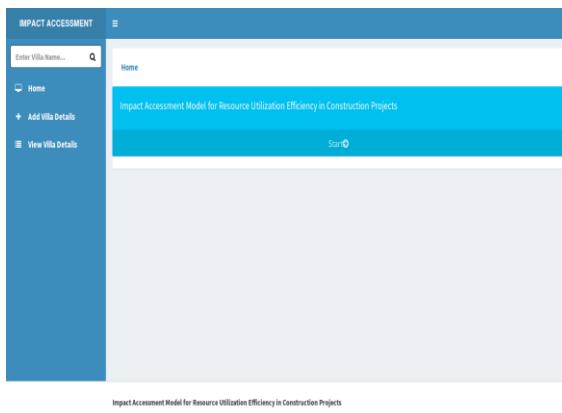


**Fig.2. Screenshot showing start of project**



**Fig.5. Screenshot of impact assessment**



**Fig.3. Screenshot showing filling up of villa details**

## V. CONCLUSION

- An impact assessment web application was created using python and a registered admin can use the application effectively.
- The model developed is for villa projects and similar construction projects and hence the web application can be applied only to more type of projects.

- The developed model is aimed for real time control of the materials, labour, equipment management in the construction sites. It is recommended for the residential building projects in the Kerala region. The model becomes more useful for the project managers to be aware of factors that will lead to cost overrun and extended project duration. Thus aiding them to become efficient by proper utilization of resources.

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