



Rental House Management System: An Empirical Approach with Simulation

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Abstract

Housing Management System is a web based project through which a user can easily access all the rental houses around his workplace in just a few clicks. Customarily, people have to contact the brokers for finding the rental homes and also have to visit several places. This is a tedious process and can take a lot of time but our web page will create a direct link between a user and the owner with transparency.

As we all can see from the stats shown above, there are still a number of people who do not have their own homes and are accommodating in rental houses. Many people have to migrate from their residential area to some other place for a particular slot of time so they prefer to rent houses, PGs etc. People face difficulty finding places to stay in a city they are unaware of, so people will use our housing management platform for finding such assured places at their convenience.

Many people of different professions like students, working executive, households etc. faces a change of residence and have to shift to that particular area where they are needed, but finding a good and healthy house or property is a big task for them our housing management system will play a major role in these type of things and will help such citizens and made their life easier and simple.

Keywords: HTML; CSS; Java Script; UI; Web Application

Project objective

- To develop a Rental Housing Management System that allows users to view customers as well as data recorded of houses and hostels.
- It is a system that enables editing or saving the user and customers' data where they can edit and see their records also.
- By the increasing number of parental guidance or hostels.
- There are some people that are not even able to afford it and some for personal issues.
- So, to produce and secure sufficient supply of affordable rental housing to meet further needs. To provide a variety of house types, cost and location in cities and ensure too took a living for you.
- To develop an Rental Housing Management Website that is easy to access and secure.

Scope of the project

If we talk about the scope of the housing management system then the biggest reason for its impact is the rapidly growing cities and societies which will create bigger opportunities for the housing management. Residents or clients need good and affordable housing according to their needs, in which housing management will play a major role. The system will sustain because of the user, their demand and their contributions. We will upgrade the system time to time, will add more features as per the user convenience.

Development

As the user opens the web page there will be two options to register and login. When the user clicks the register option a new tab will open with two options. Register as tenant or register as owner.

User has to select his category and fill in a few details along with his mobile number and email ID. Then the OTP will be generated and the user has to enter that OTP and create a password to register. For log-in, the user has to use his mobile number or email-ID along with the password.

After Log-In users will have complete details along with the images of all the available rental flats and houses around the location which he has chosen. We will also provide the categories which will further help the user to find the place to live as per his convenience.

Once the user finds the place which fulfills his needs, he can directly contact the owner. There will be one more available option for the owner who can also add new rental homes as per availability. So our webpage will act as a broker between the owner and the tenant with no extra cost and transparency. Both the parties will be in direct contact and this will help in saving time and money for the users. Our webpage will use technologies such as HTML, CSS, and JavaScript. We will add new and powerful features to our webpage which will provide easy user friendly access and an attractive interface.

Role of authors

Dr. Rohit Rastogi played his role as project guide and mentored us on how to find the problem statement and contributed in project making with ensuring that the quality of the content written is profound. Mr. Prabhinav took the task of analyzing the data and contributed to the technical part. Mr. Rayush did the interpretation of data and Mr. Prabhinav and Mr. Rayush did the conception and design of the project. Mr. Prateek handled the task of assembling the literature survey with all the graphical presentations. The team contributed to the results and remarks.

Deliverables

Our Rental Housing Management System gives you free access and login and it is no paid website where a user can freely use it mostly the hostellers and renters used to see a rental house choice with their preference which make it easier for our website to show you your nearby rental apartment and houses that meet your recommendation and we have 24x7 chatbot that available to help you any time. In these Rental Housing Management systems, customers

or users can easily access without any advertisement while using our website also shows you the contact details of the rental apartment owner which make it easier to comfortably talk to the rental apartment owner.

- Help support chatbot
- 24x7 accessible to the website
- Show result on the basis of user preference.

Stakeholders

Our application can be used by anyone such as elders, students, etc. Because it does not have any limitation except the authentication of the user that he/she is a minimum of 18 years old. It requires less memory to install and is easy to operate, which is immensely helpful to the user. It only requires your sign-up when you want to see the seller's details or the house owner's details to contact. It is extremely helpful for those people who are unaware of the new place where he/she has not lived in here. It also provides you with a GPS location page which helps you to navigate to your destination safely.

Gantt chart

The above given Gantt Chart shows how the team managed all the work that has to be done in the given time limit of 16 weeks. The first few weeks were spent in the identification of the problem statement and then we worked on the technical and coding part of the project with report writing in continuation. In the last few weeks we analyzed the result and tested whether our application works effectively or not (as per Figure 1).

Introduction

What is rental housing management system

Housing management comprises two separate words one is housing and the other is management, as we can see in simpler terms managing houses is what should be called as housing management but it has a broader perspective. Traditionally, housing management was all about rent collecting, allocation and maintenance but if we talk about modern day scenarios many small tasks are also added in it like interactive sites, community involvement etc. So to tackle all these things we came up with an online Hous-

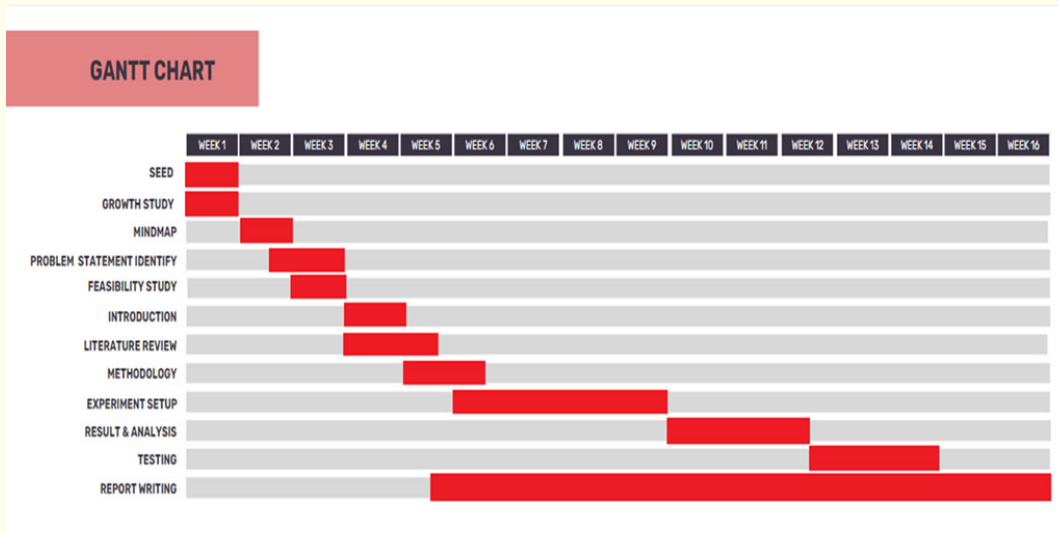


Figure 1: Gantt Chart showing the project plan of our team.

ing Management System in which the user will be free to explore various properties, rental houses etc. at their convenience which is an astonishing thing. The client can book their favorite property online with just a few clicks and they can also directly talk to the owner with details provided at their end (Voumick, D., et al. 2021) [7].

The above image shows us beautifully how we have taken a leap from normal housing management to an online housing management system. The house is connected to the laptop with a cable and the image of the house is shown in the laptop screen which shows that the house is up for rent or sale via online housing management system (as per Figure 2).



Figure 2: Online Housing Management System.

Source URL: <https://s3.amazonaws.com/assets.blog.rentpost.com/wp-content/uploads/2015/06/05003530/online-property-management.jpg>

Global records and statistics on RHMS

In the earlier times all the records were maintained in registers and booklets which was a very hideous task. But after the introduction of the online system the work has become easier and better. Earlier, people must be present physically at places if they want to ensure the status and quality of the property they are going to rent or buy but after the introduction of the online system all these things can be checked through online mode. Due to this much convenience many countries are using this online housing management system. If we see the records then an approximate of 30% people live on rent in India, 36% in the United States, 11% in Russia and many more countries. All these countries use online housing or property management systems for making their work easier (Voumick, D., et al. 2021) [7].

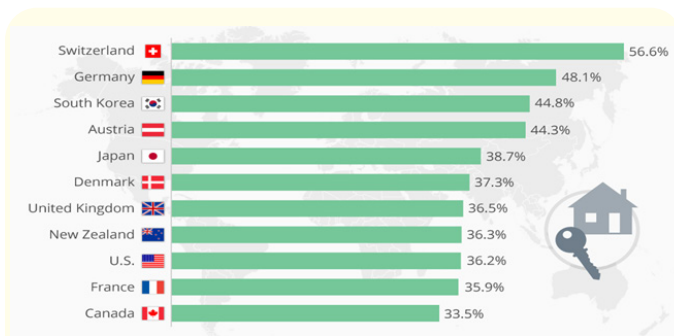


Figure 3: Countries with most renters.

Source:- <https://cdn.statcdn.com/Infographic/images/normal/13034.jpeg>

The above image shows us the statistics of how much renters are there in many different countries from the lowest to highest. The global analysis has shown that the U.S. and U.K. has shown a major growth in the number of households renting their homes which in turn results in the downturn of the country’s economy (as per Figure 3).

Need of rental housing management in 21st century Society

If we look at the present scenario, due to the decrease in the availability of land, there is a hike in the price of properties as well as rental homes especially in smart cities like Mumbai, Delhi, Bangalore and others. People from all over the country visit these places for jobs or for educational purposes and the wages of the people is less as compared to rent and also due to the less availability of the land the people also don’t know about the unknown places and places with less rent (Kirmani, J.A., *et al.* 2017) [4].



Figure 4: Finding the perfect house for yourself.

Source URL: https://www.baymngmtgroup.com/wp-content/uploads/2021/04/shutterstock_92285236-min-400x400.jpg

The above image shows us how we can easily find the perfect house according to our needs using the online rental house management system. The online rental house management system helps its user with various types of features which enhances the user experience and eases the task of finding the perfect house (as per Figure 4).

Automation and its need of HRMS in 21st century smart society

Rental Housing Management System Automation is needed in the 21st century for saving time, reducing human errors, and doing your work efficiently. Nowadays automation is in our daily lifestyle which we also see in our daily work like using applications and phones. The need for Rental Housing Management System to save or record data carefully and It’s a type of data collection where there is no chance of duplication where every data is stored on an online server where users are able to see it at any time. A Rental Housing Management System is also needed because of the daily increase of hostels that take charge of insignificant students which also resolved their problem and in our RMS you can easily open it with one web browser... It also shows you the nearby location according to your need and provides you various services like GPS, Retail food delivery, etc. In the 21st Century, it saves a lot of money and time (Gommans, H.P., *et al.* 2014) [2].



Figure 5: Checklist of House necessity.

Source URL: <https://brazenrealestate.com/wp-content/uploads/2019/10/rent-your-property-checklist.jpg>

The above image demonstrates that with the help of an automated rental house management system one can make a checklist of his/her demands and will sort out the best match from the online application which will save their time and money (as per Figure 5).

The Impact of housing management system in country’s development

Our webpage will provide a user friendly system that will be useful to all the classes of the society. So, it will help provide shelter to all the category of users. Hence it will be helpful to improve the quality of life of people and will also lead to the economic and social development of the nation. Our online rental housing management system will be very helpful for the citizens of the country in accommodating the house and property they want with proper chat and concern of the owner which will lead to minimum disputes between the citizens (Kirmani, J.A., *et al.* 2017) [4].



Figure 6: Satisfied user shaking hands with the property owner.
 Source URL: <https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSD8efqtUfDZKEHir5VESh5xoZyXhn3yN264w&usqp=CAU>

There is transparency between the owner and the tenant as both are in direct contact.

This leads to mutual trust and understanding between the tenant and the owner (as per Figure 6).

Literature Review

Rathore, K., *et al.* (2021) and his team demonstrated a Rental House Management System. They designed an online house renting system for the ease of the citizens. They found that nowadays finding an affordable renting house is a major issue and the leading

websites in these sectors such as 99 acres, Magicbricks are not well managed, So they came up with a new system which can simplify the work for its users and all their work such as rental house search and property dealings can be effective.

The system is operated on the Django framework with a user-friendly interface. When a user opens the application, the user must sign-up and log-in. If he/she wants to talk to the house owner and if someone wants to post their property online then they have to log-in as an owner on the application. The application is developed using the following:

- Django
- HTML CSS
- Java Scripting
- Python
- MySQL

The outcome of the project was that they developed an application that has improved the lifestyle of the people as they can easily find rental property. The owners on the other side can find tenants for their rental property. This application works as a matchmaker for both the tenants and the owners. The Web based Rental Housing Management System is an advantage for both tenants and landlords (Rathore, K., *et al.* 2021) [6].

Misyam, M.R., *et al.* (2021) and his team demonstrated that a house is a place where people gather, they can improve their lifestyle, and can grow economically as well as socially. Their team depicted that initially buying a house is a big task for an individual because it needs a very high capital amount, so a person has to first rent a house and then save a handsome amount for buying the house.

Their team researched and saw that there are some loopholes in the current management system such as the customers are unknown of the rental houses available in their area, they don’t know how to contact the owner of the property as a result a rental house management system was created to render out such shortcomings. The user interface is very easy to understand and very convenient for the customer; they simply have to login into the software and have to find out the correct house that matches all their needs.

The methodology that was used in creating their rental housing system was prototyping and the programming languages used

were Hypertext markup language (HTML), CSS, JS, Hypertext Pre-processor (PHP) and MySQL database.

The conclusion of their research was that they were successful in creating a web based application which will help the customers in making their lifestyle more convenient and their system is developed in the sight of all the requirements that were needed for the betterment of their online rental house management system (Misyam, M.R., *et al.* 2021) [5].

Kirmani, J., *et al.* (2017) and his team demonstrated that there is a need for an affordable housing system which will provide shelter to all the classes of the society and will increase the quality of life of people which will add to the country's prosperity and development. This software is based on spatial data and user specification based searching which will provide a user friendly interface.

The software is also provided with a cart system through which the user can select the properties which he likes to view for later. Space Spatial database is used for providing geographical information of the rental houses. This is a basic web based project where the user has to register and login and then he is eligible to rent, buy or sell the properties.

The developers have also tried to reduce the search time.

This rental housing software is based on the ASP.NET which is a part of Microsoft .NET with the help of C# and the database engine used is SQL 2008. It uses a client/server architecture based on the HTTP protocol.

This project provided customized software which will provide a database to store information with data security for the landlord. So it will be beneficial to both the user and the landlord (Kirmani, J.A., *et al.* 2017) [4].

Ikuomola A. J., *et al.* (2020) and his team demonstrated that there is a need to build a customized system to manage the property dealing due to increase in data and lack of data security. In this work, a secured mobile cloud-based house rental management system which will help landlord and tenant to overcome the hassles and manage tasks and issues easily in a more convenient way is designed.

This is a web based software which is used for making the renting easier for the user. The team has used the cloud service with components such as app server, payment engine, wallet engine, chat server, message engine and authentication server. Centralized databases using MYSQL and programming languages are angular js, PHP and laravel. A cloud based mobile application with user friendly interface and secure environment is established.

Integrated system can be used i.e. if the tenant does not have a device to contact the owner then he/she can use the smart door technique.

House rent countdown system can also be added to remind the tenant of the rent (Ikuomola,A. J., *et al.* 2020) [3].

Gommans, H.P., *et al.* (2014) and his team demonstrated that in all over the country housing plays an important role in revealing the economic growth in any country, being a shelter among the keys of development. And the Universal Declaration of Human Rights gives one of the basic human's rights as the right of decent living by the central government which allows us to live in decent housing (United Nations, The Human Rights-article 25,1948). The object of this research is to manage the housing for low income, medium and high incomes households that can allow a human to live in proper or standard housing which is affordable to pay the house rent. The advantages of this Rental Housing Management System is to easily calculate or manage the all over the data that takes several days to manage a large number of tenants that paid their rent.

This is a database type system that is able to access all the information and is to manage and it is especially bilt for rental home owners.

- HTML
- CSS
- JavaScript
- PHP

This project is a database type software that is used to help landlords to manage the records or pay history of tenants that's resolved the problem of storing records and also calculate the profits (Gommans, H.P., *et al.* 2014) [2].

Afzal, S., et al. (2021) and his team demonstrated that if you are a stranger in some city and wanted to rent a house. Then, it is very difficult to find a suitable house at a time that meets your requirements. The main motive to build an Online Rental Management System. So, this website helps users to register individual homes or apartments to help you in finding the perfect rental home that is also used for property selling, leasing, and buying. Which makes it easier for tenants to choose a desired house or property within budget and Landlords can easily sell their property by uploading and registering the website.

And the loopholes in the existing system only provide a text-based interface which is not very as user friendly as a Graphical user interface. Since the system is implemented manually the response is very slow. Hence, there is a need for the reformation of the current system to a new system that has more advantages and flexibility. The main objective of the system is to eliminate the limitation of the existing system.

- To remove the paper-based work.
- To save time for both landlords and tenants.

The methodology that they used to create in their Online Rental Management System is Structured Query Language (SQL), PHP will be used to collect or store the data in a database. And for web design they used html, css, bootstraps. It consists of three parts: Client, Web Server, Database Server.

The conclusion is that they were able to successfully developed and Online Rental Housing Management System that have also mostly very favorable for hostler and PG person that wanted to search a suitable house and it also have an GPS map system in it which also save a lot of time by searching it automatically show the direction of it which it is easy to navigate. It is an Online Website which is easy to use and also has the standards of current time (Afzal, S., et al. 2021) [1].

Methodology and setup of experiment

For the proper working of our web application we collected data from many resources. We talked to people (customers) so that we can understand the problems they are facing in the renting system. We also collected views of people on the current online websites which provide an online renting system and noted down the problems faced by them or anything that caused any kind of inconvenience, so that we can enhance the quality of our work.

Setup Steps

- Initially we started with the identification of the problem statement and analyzing the major faults and issues.
- Our team asked the opinion of various people on the current management system and asked if there was any kind of issue.
- We collected data from the current working websites on renting management systems and seek for any type of issue caused.
- We talked to various owners and their requirements like what they need for a better experience on the website.
- After collecting all the required data all the team members analyzed it, and started its interpretation.
- Then we start to learn HTML and CSS for making the front end of our web based application.
- After that we learned the languages required for making the back-end of our rental house management software.
- After gaining all the knowledge required the team divided the work and started to make the web application.

Use case diagram

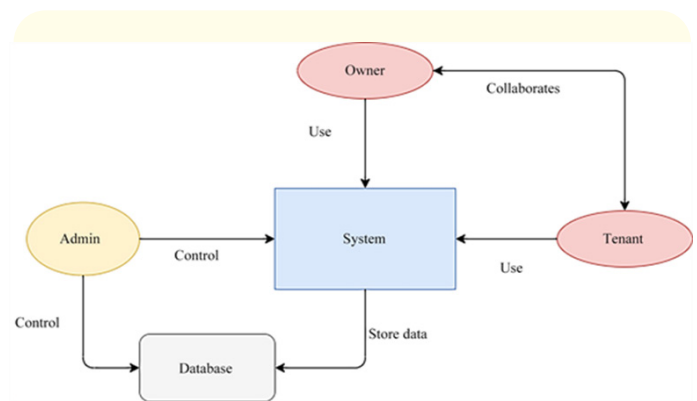


Figure 7: Basic use case diagram showing how the Rental House Management System works.

- This diagram explains how our website orientation will be like.
- The Admin or developer has the control access to the System and database and can modify the system.
- The tenant and the owner can collaborate if the needs of both are matched.
- They both will also have the user access to the system (as per Figure 7).

Paper Title and Author	Introduction	Methodology	Data Set and Algorithm	Conclusion	Future Scope
Rental House Management System (Rathore, K., et al. 2021) [3].	<p>Their team built a web based application which will make the online renting system more efficient and convenient.</p> <p>They resolved the issue of difficulty in finding affordable rental property.</p>	When the user opens the web application he must log-in and sign-up if he wants to talk to the owner and the same goes for the owner side if he wants to put his property on the web application.	MySQL Database on phpMyAdmin. Apache server on Xampp. ASP.NET using c#.	The outcome of the project was that they developed a web application that made the user lifestyle easier in finding rental houses and the owners can also find the tenants of their liking for the rental property.	In the current scenario there are a number of people who are living in rental houses and are finding rentals to live in so this web application will make their task of finding rental property easier and more convenient.
House Rental Management System (Misyam, M.R., et al. 2021) [5].	Their team built up a web based application which will help the customers to find the nearby rental properties and they also made sure that there is a proper gateway of conversation between the parties.	Their software works on a very simple method, the user has to login and have to find the proper rental house which meets their demands and can contact the owner of the property for further details.	The languages used to build their application were HTML,CSS,JS,PHP and the database used was MySQL database.	Their team concluded that they have finally built a software that meets all the requirements according to the demands and it will surely help in enhancing the lifestyle of the people.	Buying a house is not an easy task for an individual hence one has to first rent a house and then save up for buying a house. So, their web app will help such people who are in need of a convenient rental house. They will also add up new features for enhancing the user experience.
Rental Housing Management System (Kirmani, J.A., et al. 2017) [4].	This is a software based on ASP.NET. The base idea of this research is to provide "affordable" shelter to all the classes whether lower upper or middle class.	This software has user specified searching and direct contact between buyer and seller. Cart system is also provided. Easy addition, deletion and searching of houses with user -friendly interface.	ASP.NET using c#. Database used is SQP 2008. IIS and the .NET framework	This online software provides exact information and can be accessed easily from anywhere. cart system and mail based information increases its demand in the market.	This software uses 2010 .NET version which is now upgraded to .NET 2015 version. Dropdown searching and satellite/map based searching can also be added in this software.
Cloud Based Rental Housing Management System (Ikuomola,A.J., et al. 2020) [3].	This is a web based software which is used for making the renting easier for the user.	The team has used the cloud service with components such as app server, payment engine, wallet engine, chat server, message engine and authentication server.	Centralized databases using MYSQL and programming languages are angular J.s, PHP and Laravel.	A cloud based mobile application with user friendly interface and secure environment is established.	Integrated system can be used i.e. if the tenant does not have a device to contact the owner then he/she can use the smart door technique. House rent countdown system can also be added to remind the tenant of the rent.
Rental Housing Management System (Gommans,H.P., et al. 2014) [2].	Most of the work done by the housing managers is on paper and maintaining records is really difficult. So their webpage will basically help the user to maintain data in an organized way and will also prove a user friendly interface for both the owners and the tenants.	Firstly, you have to log in then you have to select an option that is visible on the website. It will show how the data is collected from the user through the system that has been kept in the system database.	Database system design, framework, server address, etc.	This software is used as an inventory to provide a framework that enables the managers to make only reasonable transactions made within a limited time of the framework.	This system software has to also give a pay slip and data that are directly connected to the Microsoft Access that automatically sends the slip of recorded payment to the tenants.
Online Rental Housing Management System (Afzal, S., et al. 2021) [1].	Their team make a website of Online Rental Housing Management System which is built on the basis of eliminate paper based word, save time and give an desirable result according to the user need	Firstly, they used web servers like SQL and PHP that enable the website to store or collect data in a database. And they used HTML, CSS, Bootstraps. That contains three parts: client, web server, database server that help to build an online website.	Structured Query Language (SQL), PHP, HTML CSS, Bootstraps.	This website is used for tenants, landlords, hostel, PG, etc. It is more flexible than the existing system. It has more accuracy and compatibility in terms of saving time and working output. It is an online website where a user has to firstly register and fill out the details then the recommendation of that similar output shows on the web page. It is very beneficial for students.	This is a modern Online Rental Housing Management System of Web application that is built by PHP and SQL. And it also has a client/server HTTPS protocol. For the future scope this system has a GPS server which helps to give the location of a house. It is a user-friendly system which makes it easy for a tenant to search a desired house and for landlords which just have to input the details of their properties.

Table 1: Summary of reviewed papers.

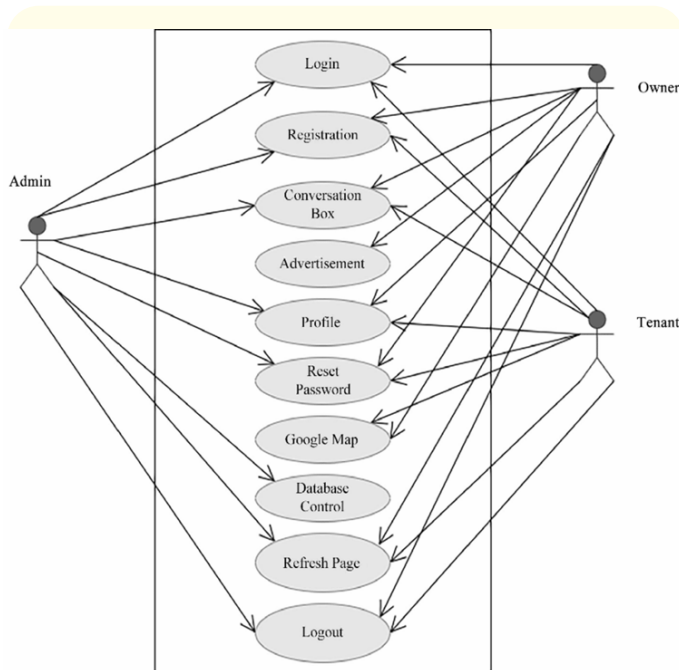


Figure 8: Total use case diagram of the Rental House Management System.

- All the functionalities are written in the oval shaped box and the access is shown by pointed arrows.
- This diagram describes the total functionality of the web-page and also shows who has the access to which function of the website (as per Figure 8).

E.R. diagram

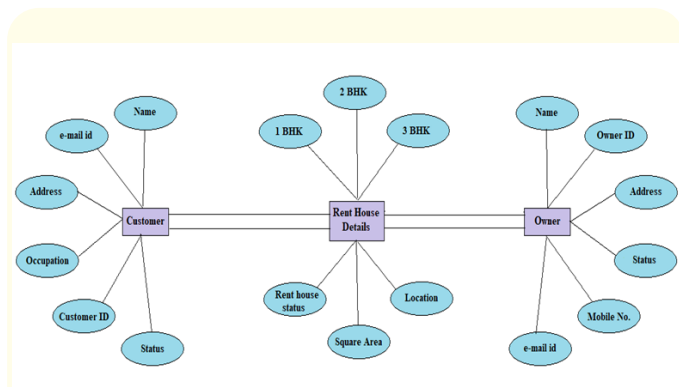


Figure 9: An ER diagram showing the working of Rental House Management System.

The above shown diagram is the E.R. (Entity Relationship) diagram of the Rental Housing Management System. It shows us the information that has to be given by the user end and also by the owner end for the proper working of the system. The user as well as owner have to give their basic details, the user must give the proper details of the house he/she wants and the owner should do the same for the property they want to rent out (as per Figure 9).

Data flow diagram

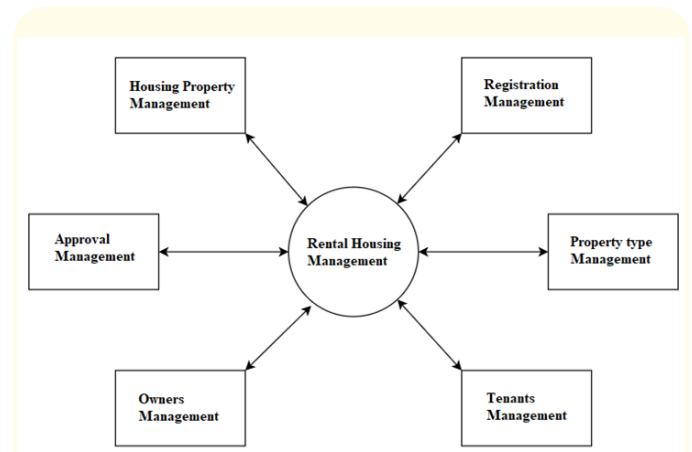


Figure 10: A DFD diagram showing the basic working of Rental House Management System.

The above shown diagram is a data flow diagram of Rental Housing Management System. It analyzes how the data flows in the rental housing management, the contents written in the rectangular boxes shows the input that is given to the software and the arrow depicts how the data flows (as per Figure 10).

Flowchart

The above shown diagram is the detailed flowchart of the Rental House Management System. It shows how the user will enter into our web application where he will sign up and proceed as shown in the above diagram (as per Figure 11).

Result and Discussion

Here a user can choose whether he/she comes for our website as a tenant or owner. It makes easy to categories between the tenants and the owners. We make it easy so anyone can use it (as per Figure 12).

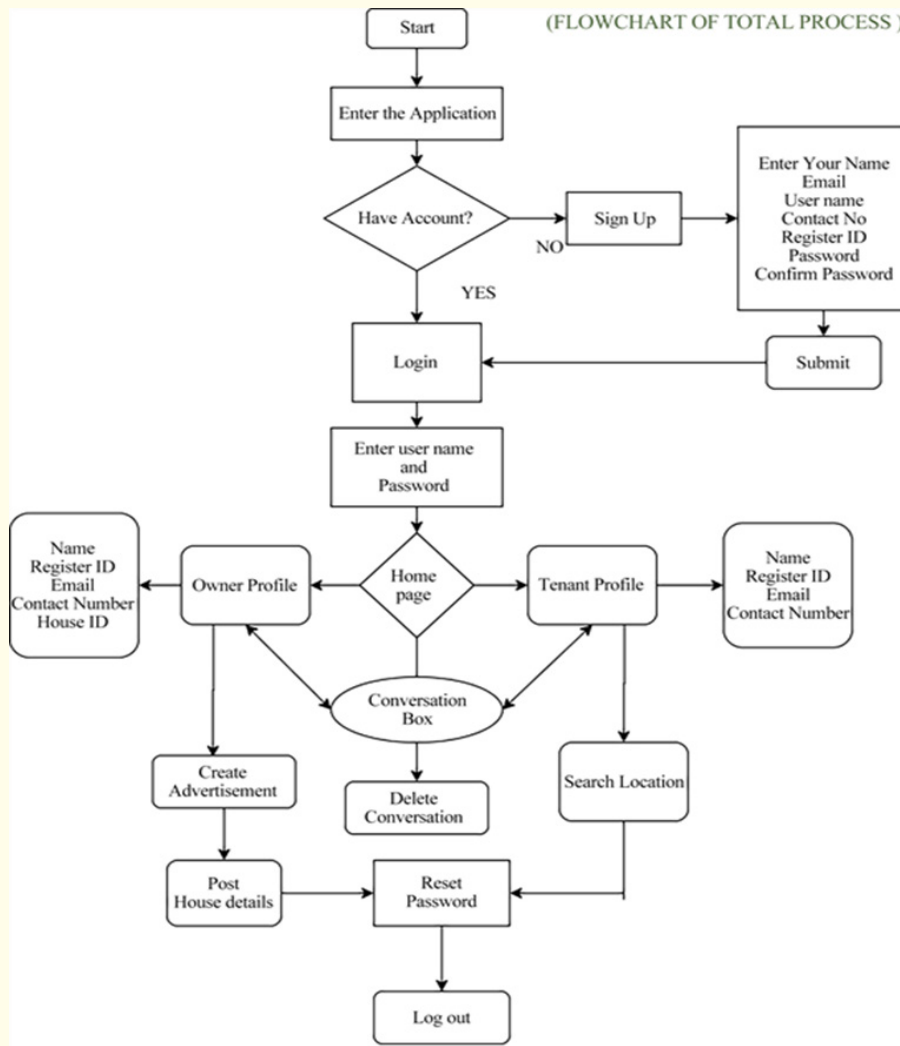


Figure 11: Flowchart showing the work flow of Rental House Management System.

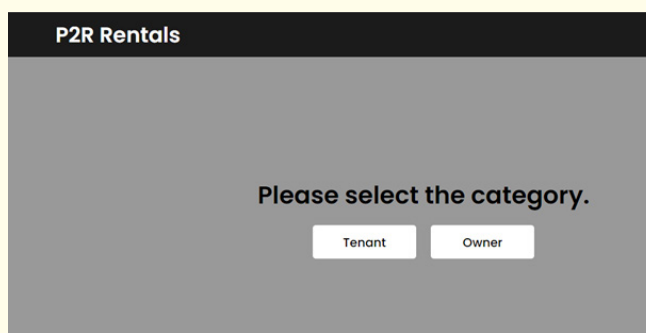


Figure 12: Selection between owner and tenant.

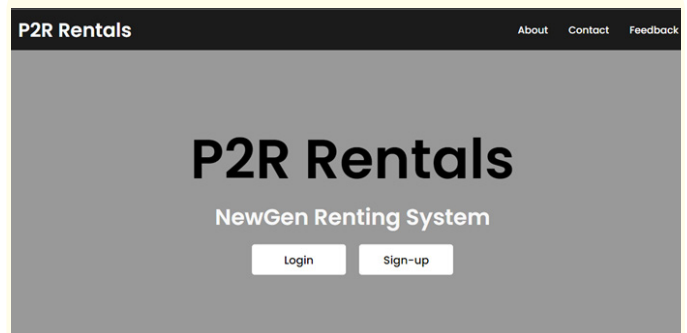


Figure 13: Login and Sign-up page.

In this page an individual person can access or create an user id by this following option Login and Sign-up which is directly linked to a page where he/she can make a user id, login the website (as per Figure 13).

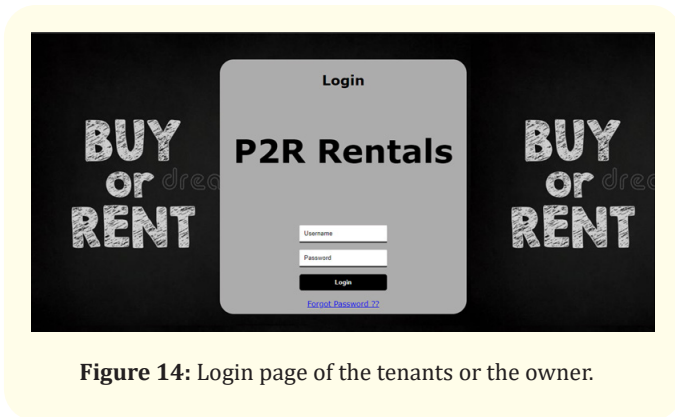


Figure 14: Login page of the tenants or the owner.

It is used after a person has created his user id so that he or she can access their data which is saved in our website. And it is highly secured which is also a user friendly and easy setup (as per Figure 14).

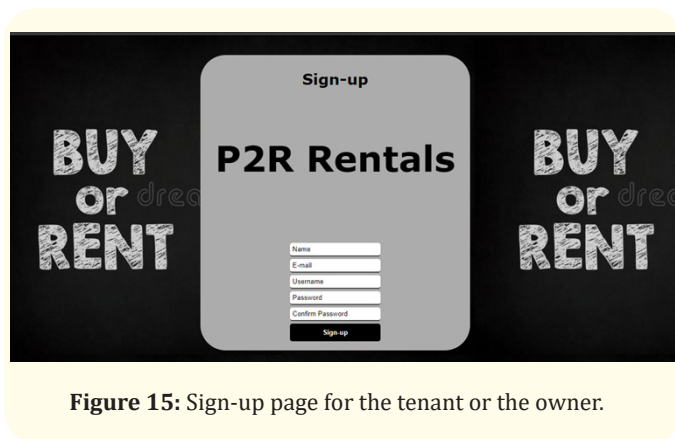


Figure 15: Sign-up page for the tenant or the owner.

This is the page where a person can create a user id for himself that is unique and secured his data. Sign-up is used to make a login id for a user that he/she can access from any browser just by searching our website and filling the log-in page (as per Figure 15).

It is the review page where a user can rate our website and how it feels after using our Rental management website and what we have to improve in it more. It is a page where a user can clarify its satisfaction and problems that occur in run time (as per Figure 16).

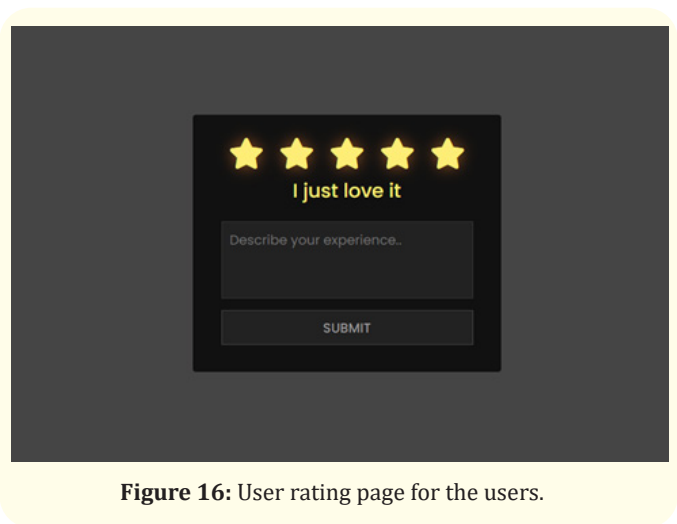


Figure 16: User rating page for the users.

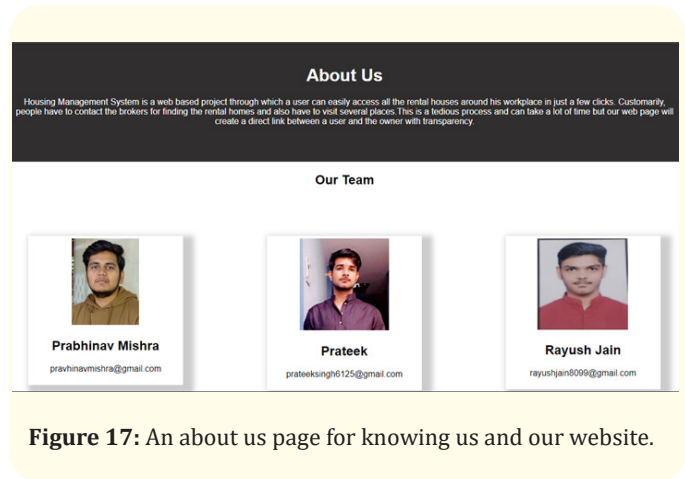


Figure 17: An about us page for knowing us and our website.

In this page we have given the information about yourself and mail so if any problem occurs in run time that a user can contact us and the main motive and what is the use our website and what it used for (as per Figure 17).

It is a payment gateway page where a user has to pay the price of the buying home/flat according to their preference. That's why we added a number of category modes in payment which make users comfortable to pay or buy a flat/home (as per Figure 18).

This is the front page view of our website which shows how the user will be interacting with us.

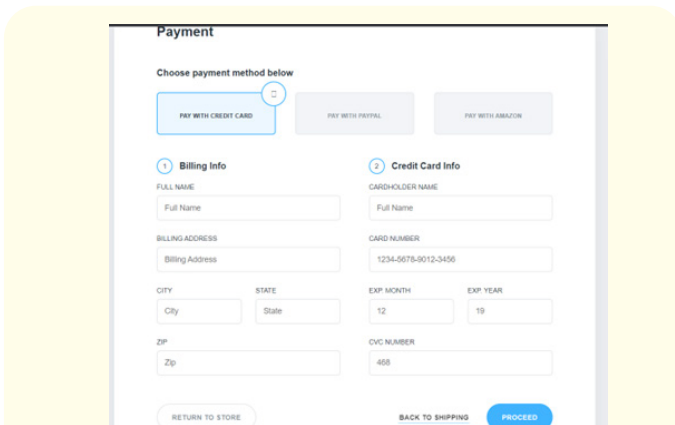


Figure 18: Payment gateway page for the convenience of users.

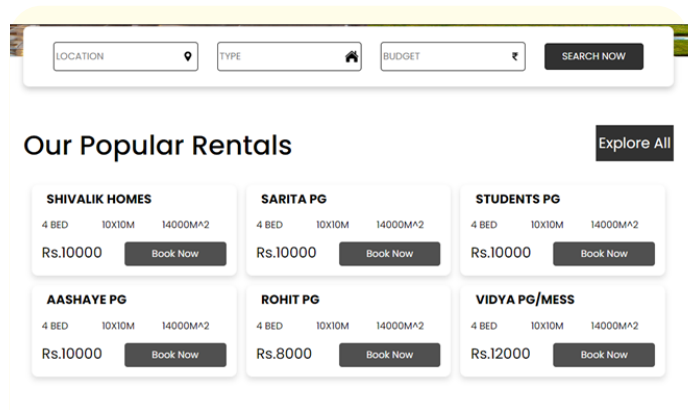


Figure 20: List of various popular rentals on our website.

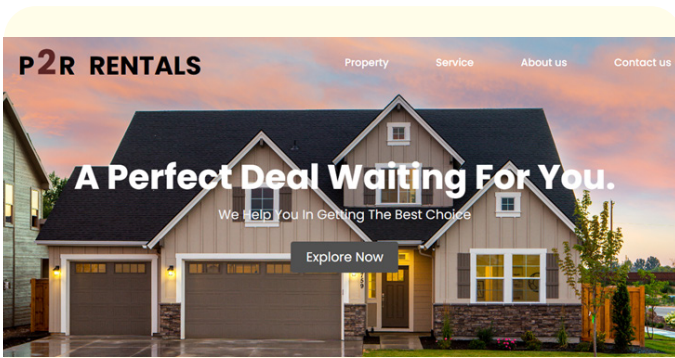


Figure 19: User Interface for the tenant to explore.

This is simple and an explorer option where a user clicks and it shows the number of details and flats on a different page. And in our front page view we also added property, service. About us, contact us because it is a necessary requirement of any website (as per Figure 19).

This is the page on our website where users can see the price and category the location and type of their flat by the following filter option in it which makes it easier for users to choose a good flat/home. And there is also a bargaining function in it where a buyer can bargain the price of a flat/home by the owner (as per Figure 20).

This is the page of our website which shows how the owner will fill the details of their home/flats.

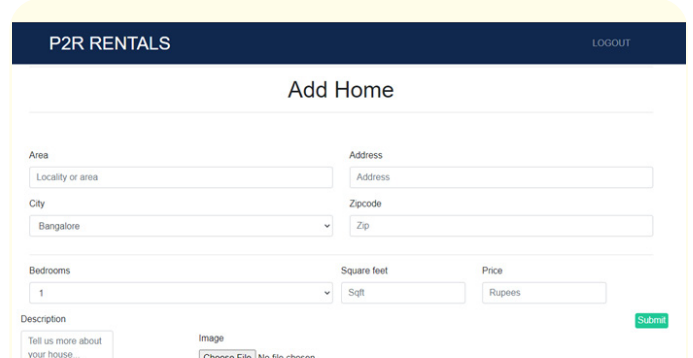


Figure 21: Add a homepage for the owner to upload info about their property.

In this the owner has to fill the following category where he/she also adds their photo of flats.

It is easy for a renter to know if the flat is in good condition or not (as per Figure 21).

Technical conclusions after results

This pie chart shows the feedback of people and their experience while using the website.

During our analysis we found out that the users were satisfied with our website as more then 75% of the rating was above 4 stars.

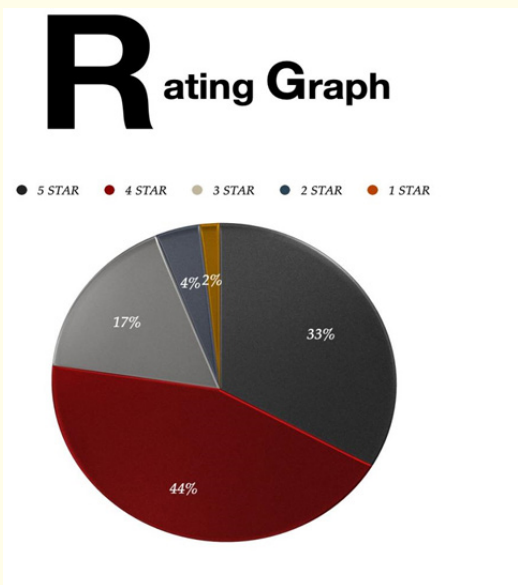


Figure 22: User Rating pie-chart.

Total Responses:182
 5 star: 60 4 star: 74 3 star: 36 2 star: 9 1 star: 3
 Average Rating: 4.0 (as per Figure 22)

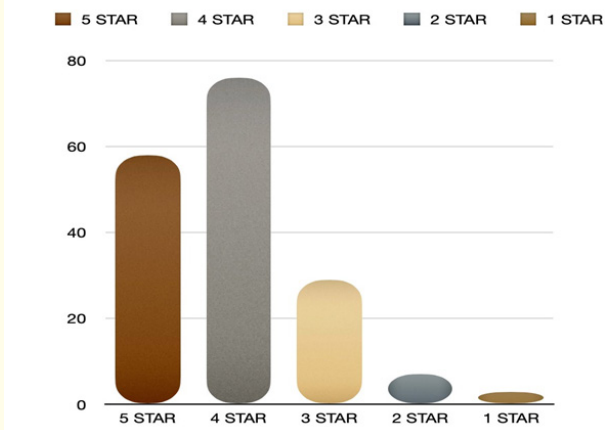


Figure 23: User rating bar graph.

The above graph represents the user rating in the bar graph (as per Figure 23).



Figure 24: User rating line graph.

This graph shows the analysis of the feedback of the tenants and the owner separately.

Our webpage has two different portals of tenant and owner and we have analyzed the feedback of both separately and found out that the average rating of both are almost the same.
 Average rating of tenants: 3.95
 Average rating of owner: 4.05 (as per Figure 24)

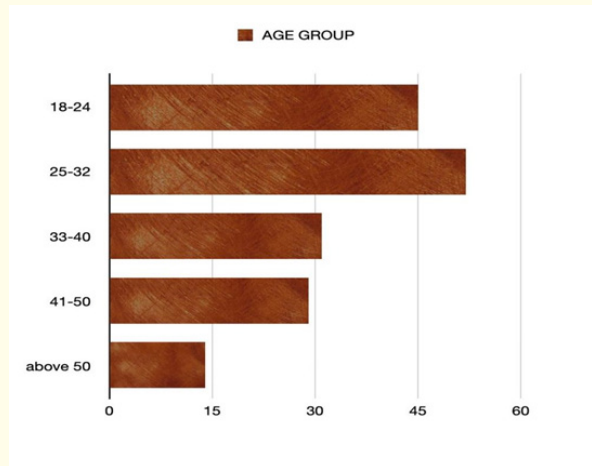


Figure 25: Bar graph showing age group using rental website.

This graph represents the different sections of age group using our website. On analysis we found out that the most number of users using our website lies between 18-32 which contains mostly bachelors and tenants.

We found that the age group of 33-50 were families and the age group above 50 were joint families (as per Figure 25) [8-12].

Novelties

- Our Rental House Management System will have a better user experience than many other current working websites.
- We will provide proper details of the owner as well as of the tenants for the proper assurance of background of the person.
- We will add a special bargain feature in our software so that if the customer wants to bargain on the price he can do it with assurances of the owner.
- Our rental house management software will also contain small scale properties such as PGs for the benefit of students coming to an unknown place.

Recommendation

Our webpage will provide an user-friendly interface and both the tenants and the owner can be benefited by the website. Users are provided with easy registration and login with OTP and password for security purposes. Separate portals are provided for both the buyers and the sellers. The search bar is provided with the filter search technique which recommends the user with the houses as per his/her requirements and budget. Our webpage will provide the recent images of the house and contact details of the owner for transparency.

Future research direction and limitations

Limitations

- A user can only access this web application not above than 2 or more portal access of the same user at a time.
- Our web application doesn't have dynamic visuals on it for now.
- It doesn't show the landlord's property which doesn't have a register on our web page.

- Our web application system database has a web storage which allow user to store or publicly upload their photos and video of property but the limit of the size of photos are 10MB and for video – 50MB.

Future directions

- To also provide service to a user like personal transportation support which are directly connected to Ola Cabs, Uber where a user can book a cab for its destination which with 2-4% discount.
- To make our online web application also for Android and IOS app systems.
- To add dynamic features and also create an AI Chat bot which helps you to solve your biggest problem regarding transaction, using this online web application.
- To make our application system on voice command also with different languages.

Conclusions

This Rental Housing Management System is a web application that is made by using HTML, CSS, JS, MySQL. All of this was developed in visual studio code by Microsoft. Our rental house software is a very convenient and user friendly software and it provides its users with various new features for enhancing their experience. The user will enter into our website and first he has to log-in or sign-up with their credentials and then they will be directed to our webpage where they will have to select the region in which they want to rent a house and then after that they will be shown all the available properties in that specific area, from there they can select the house that meet their demands. This rental software will enhance the renter owner relationship and will aim at making customers' lives easier.

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Annexure

Key Terms and Definitions

- **HTML** - HTML is a Hyper Text Markup Language which is used to structure your web page and its content. It helps to create your own website.
- **CSS** - Cascading Style Sheet is used to style and web pages. For eg:- colors, font, or adding animation and other decorative features.
- **Java Script** - JavaScript is often abbreviated as JS, it is a programming language that is one of the main core technologies of the World Wide Web, alongside HTML, CSS. It enables dynamic updating content, animated images and pretty much everything.
- **UI** - It stands for user interface, is anything a user interacts with on a website or any digital devices. It encompassed both the appearance and interactivity of an app or website.
- **Web Application** - Is an web application software that runs in a web browser. It is an application program that is stored on remote servers and delivered over the Internet through a web interface.

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