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Literature Review

A Smart Tool for Laundry Management System: An Integrated Way for Next Gen. Society 4.0

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Abstract

This research work represents an online working website of laundry containing a management system and payment gateway. Many of the laundry firms don't have a proper management system to store the records, which include many problems such as, mixing up customer's clothes or sometimes losing up the record register. This system helps the users to have to keep track of their requests/orders, they can also set drop off time at their convenience. Two login portals will be there one for admin and one for users. User portal will be used by the customers to make orders whereas from the admin portal admin can see all the users' information and the status of the orders.

Rates of laundry can be changed by the admin from the admin portal according to market price, occasionally the discounts/offers will also be provided. As the payment gateway is also included on the website customers can use that for making payments. Each customer is assigned with a unique ID on registration to avoid contrasting information and their rest information is kept safe. The technical skills include PHP/nodeJS, mongoDB/MySQL, Python, HTML, CSS and JavaScript.

This solution solves many problems and brings ease to operating the business. All the customers' information is managed properly as well as their service requests/orders and record of the orders can never be lost. The design of the website is also unique and has a user friendly interface. Therefore, it will also be fun for the users to interact with the website and providers of the service have an opportunity to run the business smoothly.

Keywords: Database; HTML; SQL; MongoDB; Python; Customer Satisfaction; Interface; Management

Motivation

Most people do not get enough time to manage their clothes properly and face difficulty with them. Students and Job professionals are the main ones who got much affected. This motivated us to design a project on a laundry management system that can overcome the workload of a majority of people. Not only some people but every individual has the use of it. One can use it in one way or another, it only provides them with the benefit of it. This generation is very busy doing their daily tasks due to which they eventually end up forgetting things. This project binds them with their work.

Scope of the Study

LAUNDRY MANAGEMENT SYSTEM WITH PAYMENT GATEWAY can be implemented by many organisations like Residential Society, College hostel, School hostel, Hotels, and private companies. This project will automate the major part of operations related to laundry services.

Role of authors

Dr. Rohit Rastogi acted as team leader and coordinated among all co-authors. He has guided the team with his enlightening knowl-

edge and put effort into every step. His managing skills and countless efforts helped the whole team through thick and thin.

Mr. Pranav did the task division process and the whole project analysis, graphical representation and sombe development too. Ms. Manvi and Mr. Pranjal did the tasks like front-end and back-end development with enthusiasm. Every member fulfilled their responsibility perfectly and the role of every member played a great role in the completion of the project.

Stakeholders

The major and direct stakeholders in a Laundry management system are

- **Customers**: These are the ones who request for on demand services for their use. It comprises mostly college and school hostels or any other organisation with more people to use laundry services.
- **Business Owner:** The owner of service who is bringing laundry service to the platform, to grow and provide its services to customers.
- **Driver or Agents:** Those people who are connecting the customers with service providers directly or indirectly. Like drivers work to deliver and pick up items from customer and service providers.
- **Linked Laundry Firms:** Those laundry firms which are collaborating with the developers and owner of the platform provider.

Deliverables

- It provides the user a secure payment system.
- Payment can be done through online mode.
- There is garment barcode scanning.
- The service provided to people is more than enough.
- There will be OTP verification at the time of registration process.
- There will be a proper and correct record of each and every individual.
- There is a proper order management system.
- The customer and admin modules will be there to manage the details in an efficient way.

Gantt chart

The Gantt chart was represented of this work for 4 months which is 16 weeks. As we started this project in our second year therefore we planned it accordingly. The blue bars show the time given for particular tasks. We will try to work on multiple tasks at the same time so it can be finished in the given time (as per figure 17).

Management system

Management system is useful for Managers\Owners, Administrators, Staff members and Users. It can be used to maintain records of customers, staff members, billing data and services cost.

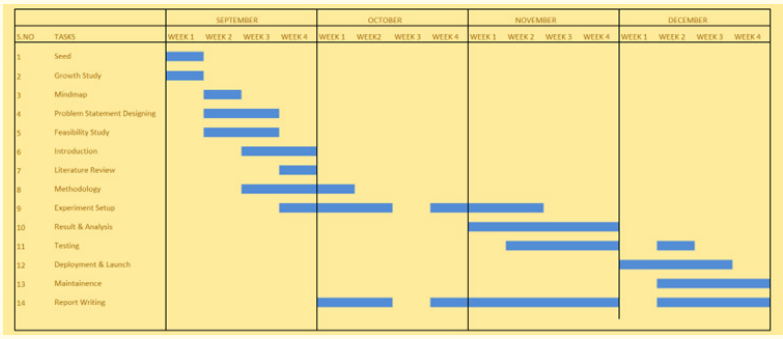

Chart 1

Manager or owner of the company has the ability to view staff member's information and update their information.

Administrators can observe the functioning of the laundry services and manage workers accordingly. He is the one with all privileges available within the management system.

Users can use the management service to add or delete items, monitor the progress of their laundry. They can also change their login password and details using management system services.

Figure 1: Laundry Management System

Introduction

Laundry management system: a needed software in Indian colonies

A Laundry Management System is a set of laundry software solutions that keep operations flowing. This helps in automating and simplifying the day-to-day laundry related tasks like washing, cleaning, drying and air drying the clothes. This is developed to control or to manage the front-office capabilities like booking reservations, clothes check-in/check-out from the laundry centre, managing the washing rates and billing.

As most Indian colonies still rely on old techniques like - colonies hire a single laundry organisation to manage their laundry system (it is extremely hard for a single organisation to complete tasks on time). And this is a time consuming and not very trusted process as mixing and losing of items are very common in this process. Thus arising the need of this advanced and more efficient technology in our society to make laundry a simple and effective task (Primawaty, C., *et al*. 2013) [6].

This figure represents the starting page of this project. As observed in figure 1, multiple machines indicates that this project tends to implement automation of laundry service at a larger scale and minimise the complications involved in the laundry management system (as per Figure 1).

Source_URL: https://raw.githubusercontent.com/abhishek-bvs/laundry-management-system/master/ScreenShots/HomePage.png

Approach for laundry management system: global statistics

Our project represents an online laundry management system through which customers can place orders for their laundry. The interface of the website is created by using HTML, CSS and Java Script. The user will register and then login to his account from where he can place the orders. From the admin portal prices of the laundry can be manipulated and all the users' information can be accessed. Users' information will be stored in the database created by using MySQL or mongoDB. After successfully adding the laundry items user will proceed to the payment page, this payment gateway is created by python by importing Django. After successful payments the laundry process will begin and status can be updated by admin via admin portal.

Since almost everything is online in the current decade many laundry firms also made their websites and applications in order to provide the services through the internet. Taking laundry online improved the system drastically by increasing the number of users. Expenses which were included in the offline system are removed and laundry is now done at very cheap prices. Due to many advantages of the online laundry management system, online laundries are increasing day by day globally. And by 2026 the online on-demand laundry service market size is expected to grow by USD 98.6 billion (Primawaty, C., *et al*. 2013) [6].

This image tells the full process of the project. First the customers will log in to their account and make the order of laundry by providing all the necessary details. Then the firm will do the given tasks in the given time and after the clothes have been washed and dried, customers can come and pick them up at their convenience(as per Figure. 2).

Souce_URL:https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.semanticscholar.org%2Fpaper%2FAn-implementation-of-Laundry-Management-

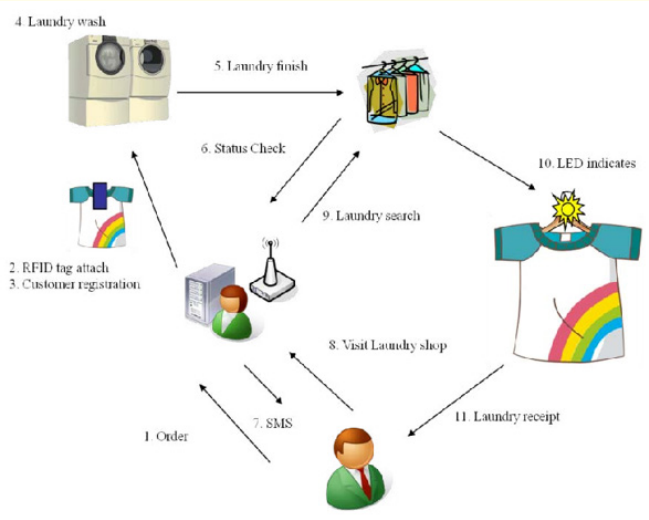

Figure 2: Functioning of Laundry Management System.

System-onVanLee%2Fbe310bd1e2e5e37d23d73dece2a4caa4de0b46a9%2Ffigure%2 F0&psig=AOvVaw1i-2-gfnkUucndUB4zhkyv&ust=1664113864486000&source=images&cd=vfe&ved=0CAwQjRx qFwoTCNCOj7bJrfoCFQAAAAAdAAAAABAT

Societal scenario of LMS: Needs and advantages

These days' people are too busy in their personal as well as professional life due to which they don't get enough time for their daily chores. Our project provides them with the facility of doing it on time. It provides the collected information to users on a single platform. Each user can easily access the data and get the required update on time. The overall system is easy to use and secure.

Laundry Management System is used these days to manage day-to-day operations, delivery and billing of orders. It is used by the people in a way as they can place orders, receive the bill and get the clothes back after required time as soon as the payment is done successfully. The use and demand of Laundry Management System is increasing fast. It can be used from small to large scale (Celikkan, U., *et al*. 2017) [4].

This figure shows the student facing a problem in managing his clothes.

Students and working professionals are the main ones who mainly faces such problems. Here, the student showing in the figure is tensed due to improper management of his clothes (as per Figure. 3).

Figure 3: Problems Faced by People.

Source URL:

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.consumerreports.org%2Fcro%2Fnews%2F2012%2F09%2Flaundry-tips-for-college-students-help-them-take-a-load-off%2Findex.htm&psig=AOvVaw2XFbVRw9RqB45PpBCM8kdl&ust=1664128051086000&source=images&cd=vfe&ved=0CAwQjRxqFwoTCKC315X-rfoCFQAAAAAdAAAAABAE

Technologies used for designing LMS: in 21st century smart society

Skills sets required to develop this project (LAUNDRY MANAGEMENT SYSTEM) include knowledge of some coding languages like - HTML, PYTHON, CSS, JAVA and to develop the database some knowledge of MongoDB, SQL. The extra feature of payment gateway required skills like Django and Python.

To operate this project the skill set required is minimal. Users just need to login to this website and start exploring the features as per their use which are provided within this project.

To further enhance the functioning of this project, features like prediction can be added to it. For the implementation of prediction features Artificial Intelligence (AI) and Machine Learning (ML) is required. Prediction features will further extend the scope of this project as it is useful for laundry firms to analyse and predict the market conditions for their growth. The data of customers recorded in the management system can benefit laundry firms to compare their progress and work on their weak points to grow their

business and make their services more affordable and enhance the user experience (Celikkan, U., *et al*. 2017) [4].

Figure 3: Skills required to Manage and develop the Laundry Management System Project.

The technical skills implemented on this project. This project is made possible because of a combination of more than one technology and implementation of our knowledge in different languages and branches of computing (as per Figure 4).

Source_URL: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.interviewbit.com%2Fblog%2Ffull-stack-developer-skills%2F&psig=AOvVaw2DVlbw5lM_i3LPJKgZhGC6&ust=1664132813811000&source=images&cd=vfe&ved=0CAwQjRxqFwoTCLCYuYOQrvoCFQAAAAAdAAAAABAD

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

Our Project (The Laundry Management system) can be used by everyone, from students to business professionals. This serves an important role in saving time and helping those who don't know how to wash and manage clothes. It can be used by hospitals, residential societies etc. Factories has the main usage of this project.

As most people are shifting to the smart usage and utilisation of the products available in the market. This project is a benefit for them, it saves time and money as it works fast and anyone can afford it. People are so involved in their lives that they need this kind of thing to make their task easier and faster. This complete project helps them to explore new technology and platforms (Upadhyaya, B.R., *et al*. 2022) [8].

Figure 5: Laundry Management System used in Different Fields.

Figure showing the usage of Laundry Management systems in hospitals how the clothes of doctors, nurses and patients are managed. This system is used widely just to enhance the quality of work done in less time. Hospitals using it on a large scale, it all makes it more demandable and work efficient (as per Figure 5).

Source URL:

https://www.google.com/url?sa=i&url=https%3A%2F%2Fshubhram.com%2Fhospital-linen-management%2F&psig=AOvVaw1lpr1Yx8zokSvuY4_M_QNh&ust=1664127554461000&source=images&cd=vfe&ved=0CAwQjRxqFwoTCPD8p6X8rfoCFQAAAAAdAAAAABAP

Problems faced and features of a maintenance software

Since this was our first project the major problem we faced was to have enough confidence to do the project. As we were in second year when we started working we faced many difficulties with skills and technologies. We had to learn required languages like HTML, CSS, JavaScript, nodeJS etc. that are used in the project.

Currently our project only involves a management system and payment gateway but in future we plan to involve a GPS system for navigation, which will help to provide door to door services to customers. Other services can also be added to the project in future such as updates of the order can be given through SMS or email. Verification via OTP, through SMS or email can be included which will increase the security of the user's data. Or the system can be transferred to an app from the website which will help in increasing the number of users and customers will find it more easy to use (Shoewu, O., *et al*. 2016) [7].

Figure 6: Door to Door Services.

The image shows a delivery boy on a vehicle making home deliveries of the products. If home delivery services are included in the project then someone can be hired for delivering the laundry to the customers' home (as per Figure. 6).

Source_URL: https://www.google.com/url?sa=i&url=https%3A%2F%2Fshriambikalogistics.in%2Fdoor-to-door-services%2F&psig=AOvVaw3XdWVCO6IK5ePnXVdjSazX&ust=1664115575124000&source=images&cd=vfe&ved=0CAwQjRxqFwoTCNCp_vnPrfoCFQAAAAAdAAAAABAD

Literature Review

Shoewu, O., *et al*. (2016) and his team exhibited a project on a laundry management system which has the goal to automate the management of the laundry firm making it more efficient and error free. Project included HTML at the front end and provided the graphical user interface, while the SQL database was at the backend to store the user's information.

The advantages their system had over the existing system were the less amount of paper work and more efficiency thereby improving productivity. It also reduced the cost of printing and purchasing registration materials annually. The system has been designed in such a way the users only need to input their customer data which is then entered into a computer database. Customers will be assigned a specific id on registration.

Tools used in the project are Graphical User Interface (GUI), Hyper-Text Mark-up Language (HTML), Cascading Style Sheets (CSS), Client-side Script (JAVASCRIPT), Structured Query Language.

User Requirements to gain the access to the laundry management system resources were a personal Computer, A username, a genuine password.

User-Interfaces consists the Login page, Product page, View customers, View records, Search for customers, Register a new user, Print receipt. Conclusion that can be deduced from the project consists of below: Since the whole process is automated hence it provides great efficiency.

- The user interface in the project is very attractive and fun to use when compared to existing systems.
- Only the authorised users can get access to the system.
- Updating information in the previous records becomes much easier..
- System Security, data security and reliability are the striking features.

Limitations of the project are that it doesn't have any authentication system like OTP or verification code that can be sent to the user's mobile number or email id. Providing OTP verification security can be improved and data can be kept safe. Another limitation of the project is it should have an online payment gateway to make the payments more reflexive and convenient. If the payment gateway is included then customers can make cashless transactions and record of payments will also be kept safe. The major improvements that can be done in the project are instead of a website an app can be developed which will be more easy to use and the number of users will also increase. Another possible addition is providing door to door service so that customers don't have to go for drops and pick-ups. These services, if included can bring a major change to the project and will improve the project quality drastically (Shoewu, O., *et al*. 2016) [7].

Ibrahim, L.A., *et al*. (2017) exhibits a Laundry Management System which aims toward managing laundry services and providing recovery and backup for security management. It is a client-server system that can be accessed by staff, the database administrator, and the manager. For security purposes, only authorized users can log in to the system. It mainly focuses on database management services. Its interface is designed according to the current needs of the client. It is a two-sided architecture system that involves a client and an application server. It aims towards the problem arising

these days. The methodology involves System Development Life Cycle. It is a prototyping model. They identified the problems.

Time management

Manual System consumes a lot of time to manage and update the system manually.

Improper communication: In manual LMS, employees and managers write down the services processed in the laundry. With LMS there are fewer chances of mistakes. Wok was done with aim and objective;

- It aims towards the development of a system that can handle the operations involved in the LMS.
- It focuses on the computerised system
- To increase the performance with time.
- The user gets many options to choose.

Hardware requirements

The basic requirements involves: Processor 1.66 GHz processor speed, RAM 256 MB, Flash File for file transfer, Printer for printing receipt, backup storage hard disk.

Software requirements

The Operating system, Windows 7/8/10, Microsoft Access 2013/2016.

Programming language

VISUAL BASIC FOR APPLICATION (VBA). It enables the Rapid Application Development (RAD) of GUI, access to databases using Remote Data Objects etc.

Limitations and future scopes found were **t**here were financial constraints as all the activities were self-done. Time factor was also the barrier in successful completion of the project.

- To increase the security setup that will be embedded into all login pages.
- A fast and good internet backup.
- To allow internet transactions (Ibrahim, L.A., *et al*. 2017) [5].

Ashwani, K. (2017) and her team exhibited the project named Laundrokart which is laundry management software (LMS). LMS is created in order to make the management easier in the laundry firms. It improves business efficiency and reduces the expenses spent on inventory, printing laundry slips etc.

The existing system has many problems like repetition of the details of customers every time when they arrive to give clothes. Another issue is when searching for a particular customer, staff members have to go through all the customers' details in order to search for an individual. Other problems include mixing of clothes and data, due to which the productivity of the laundry shop decreases. Whereas Laundrokart applies the computerised system through which the business process will be more productive and efficient. The software also has backup and recovery procedures to make sure that all data is kept safe.

Tools used in the project are Graphical User Interface (GUI), Hyper Text Mark-up Language (HTML) Cascading Style Sheet (CSS), JavaScript (JS), Hyper Text Pre-processor (PHP), MySQL, XAMPP, Codeigniter.

Minimum Hardware Requirements Processor: Intel Pentium III, Hard disk drive: 500 GB, RAM: 4GB.

Minimum Software Requirements are Operating System: WINDOWS 7, Front-end: HTML, CSS and JavaScript, Back-end: PHP, MySQL.

Dataset of Customer Table Through the project it is concluded that it can overcome all the drawbacks that were there in previously existing systems. The application has a friendly user interface (GUI) which develops interest of the user and makes the application more attractive. Updating information in the system becomes easier and manageable. Security of the data and information is also increased in the project.

The project also has some limitations which include:

- The staff members must have some technical knowledge to interact with software
- Both user and employee has to do the registration from the login page
- Multiple information cannot be updated at the same time
- This system cannot be applied in a client server setup or online

- This project still can have many developments in future like:
- Instead of generating paper bill receipts, SMS would be provided
- Using SMS or email, status of the order can be sent to customer
- Pick-up and delivering services can be provided (Ashwani, K., 2017) [3].

Upadhyaya, B.R., *et al*. (2022) and her team demonstrated a study on Laundry Management and Environment in which they told the concept of laundry management, how it is needed in today's society with the concerns that arise due to laundry firms. In introduction the author tells the history of washing that is how in old times people were used to wash their clothes with their bare hands. And then how from 1900 wringers came into existence from 1900 to 1947 many machines came to the world where, in 1947 first automatic washing machine was built by whirlpool. After the history of machines they tell us about soaps and detergents how they came into existence and how soaps are different from detergents. In the later 20th Century laundry services came where people would give their clothes to another person for doing the washing for him in exchange of money. But these laundry shops faced many problems in managing the data and records of the customer there for an automated management system has been introduced. Which consists of taking orders, managing records, transportation and payment mechanism.

Key features include, customers can place their orders using a mobile app. Payments can be also done by the app itself as payment gateway has been included. They even provide refund or rewash if required. Laundry management system provides many opportunities like easy management of business and flexibility to customers. The author and her team has collected the data through an extensive survey of literature and the opinions of people like students who reside in hostel away from homes or employees living far away from home. Other data is also collected via various articles. Conclusion of the project is these laundry shops will be much more beneficial with a proper management system and if the waste of laundry is disposed some better place than rivers then water pollution can also be avoided therefore saving lives of aquatic animals. Limitations that author state in their article are, initial capital requirement is high, cut throat competition in the market and investment on assets required is high (Upadhyaya, B.R., *et al*. 2022) [8].

Adekola, O.D., *et al*. (2021) and his team exhibited a project of Online Laundry Management System (OLMS) for organisations. The aim of their project is to overcome the major issues faced in Laundry domain such as similar and multiple data is stored in laundry firm database, which lead to problems such as mixing of customer data and their clothing data, mishandling of customer clothes, delivery not on time, not able to entertain certain customer items, inefficient methods to control system, insufficient collation of data for better dataset formation and company use, etc.

The advantages of this project include the leverage provided by digital automation to increase labour productivity and expand operations at marginal cost, this helps in minimising the need for manual workers. Also it is environment friendly as it reduces the use of paper work by storing the data over the laundry management infrastructure.

Tools used in the project were Hyper Text Mark-up Language (HTML), Cascading Style Sheet (CSS), JavaScript (JS), Hyper Text Pre-processor (PHP) and My Structured Query Language (MySQL).

User Requirements to gain the access to the laundry management system resources were a personal Computer, A username, a genuine password.

User-Admin interaction consists the following Login page, Product page, View customers, View records, Search for customers, and Register a new user, Billing and Manage delivery.

Dataset of database there will be a customer table in database design which will consist of customer database design. It will include the field name, format type and width (that is the maximum size possible). And the table data will include Customer ID, full name, phone no., email, address, No clothes brought, Service duration and service charge.

There will be a Staff table in database design and its attributes will be field name, format type and width or size. And the included table data will be Surname, Other names, department, staff number, post and date.

There will be service data in database design with field name, type and width. The included table data are service type, price and ID.

Conclusions of the present work can be explained as the improvement in technology is always helpful and in constant demand to enhance the working life of business people and operatives. Every customer gets a platform to utilise the services with ease and at their own comfort without compromising the quality of the service. From the implementation of this project we can conclude that an online laundry management system would make life easier. This implementation is a web application with a view of providing services, technology and methods to users and providers of laundry services.

The project also consists of some limitations which are

- Tracking of item can be provided to customer
- Both user and provider has to register to utilise the features
- Notification system to notify customers of process completion
- Skilled labour is required to implement this project

This project still can have many developments in future like:

- More improved receipt processing technique can be added
- Using SMS or email, status of the order can be sent to customer
- Live tracking of customer items can be added
- Pick-up and delivering services can be provided (Adekola, O.D., *et al*. 2021) [1].

Afzal, N.I.B.M., *et al*. (2020) exhibited a project of Laundry Digital Ordering System (LDOS). The aim of his project is to overcome the flaws or problems in existing laundry digital ordering systems. As laundry is one of the most common tasks in everyone's life, it needs to be more easy and convenient for the user to order the services. His project aims to order laundry services by using speech recognition which will be helpful to overcome the problems such as many users are not confident and are not able to express their desire through text communication, many users are not able to use keyboard and computers, and overcoming these problems makes this project more user friendly than ever before.

Tools used in development of the system are

Xampp server for database, Laravel as the framework. Notepad++, Java, XML, PHP, MySQL for the database, Microsoft Word 2016 used for documentation of applications and Google Chrome a browser to run the local host and search for information.

Hardware used for the implementation of this project were

Laptop - Lenovo Ideapad, Processor - Intel ® Core (TM) i5-7200u CPU 2.50Ghz 2.70Ghz, Memory - 4GB RAM, Operating system - Windows 10, System type - 64-bit operating system, Pen drive - Kingston 16GB and Mobile phone - Iphone 7 Plus.

For the working of this project the literature review included study of iLaundry, Maurice Dry Cleaners, Google assistant, Google cloud speech-to-text and technique of speech recognition.

The project also had some limitations such as

- Does not manage or store the audio files
- Cannot locate the customer address
- Different accent might be problem for the system
- Only English language is entertained
- Only supported on google chrome (Afzal, N.I.B.M., *et al*. 2020) [2].

The Summary of Research work can be found in table 1.

Methodology and setup of experiment

Methodology is a method used to develop a system and define this system as a set of procedures. This project Laundry Management System with Payment Gateway is based on agile methodology.

Methodology is important to achieve the success of the project. Agile methodology is a method that consists of different procedures to be followed to achieve the end product.

- **Plan:** In this phase, the project title is selected. The selected title for the project was Laundry Management System with Payment Gateway. Abstract and introduction to the project was done and also Gantt chart was given the guideline and references to the project. Besides all this, the phase included collecting information and methods and techniques suitable

Paper title and author's name	Introduction	Methodology	Dataset and algorithm	Conclusion	Future scope
Design and Implementation of a laundry management system (Shoewu, O., *et al*. 2016) [7]	Laundry firms currently use a manual system for the management and maintenance of critical information. The goal of the laundry management system is to automate the management of the laundry firm making it more efficient and error free.	HTML, CSS are used at the front end and provide the graphical user interface that relates with the user, while the SQL database is at the backend to handle the data storage process.	The dataset is created by using SQL which stores the user's information like unique registration id, name, phone number and other essential details. First the user registers himself and provides the required details after successful registration the user is ready to use the services of the project.	Conclusion of the project is that it provides a better and friendly graphical user interface compared to existing systems. Updating information becomes very easy, system security and data security also increases.	In future many other services can be included in the product such as online payments and home delivery by the laundry firms. Technology for OTP verification can also be included to increase data security.
Laundry Management System (Ibrahim, L.A., *et al*. (2017)	It is a Laundry Management System which aims toward managing laundry services and providing recovery and backup for security management. It is a client-server system that can be accessed by staff, the database administrator, and the manager.	The methodology involves System Development Life Cycle. It is a prototyping model.	The dataset is created by using SQL which stores the user's information like unique registration id, name, phone number and other essential details.	It provides a better and friendly graphical user interface compared to existing systems. Updating information becomes very easy, system security and data security also increases.	To increase the security setup that will be embedded into all login pages. A fast and good internet backup. To allow internet transactions
LaundroKart, Laundry Management System (Ashwini, K. 2017) [3]	LaundroKart is a laundry management software which is developed in order to facilitate management in laundry shops. It improves business efficiency and reduces the expenses spent on inventory, printing laundry slips etc.	The methodology of this system is System Development Life Cycle (SDLC) which is a prototype model.	Dataset is created using MySQL which stores the customers' information like id, name, gender mobile etc. Other datasets that are included in ItemTable, ServiceTable, ItemServiceTable, ItemServicePriceTable, InVoiceItemTable and CustomerInvoiceTable.	Conclusion of the project is that it provides a better and friendly graphical user interface compared to existing systems. Updating information becomes very easy, system security and data security also increases.	Many services can be improved and added in future like using SMS or email for status updates on laundry. Pick-up and delivery services can be provided.
Laundry Management and ment(Upadhyay, B.R., et al. (2022)) [8]	In laundry Management and Environment the authors told the requirements of laundry Management system in societies and how the laundry firms impact our environment. Then he tells us about the evolution of washing machines time to time.	They simply used php and MySQL in their project for developing the system. And they took the surveys of many laundry firms so they can have a better analysis of how these laundry firms are causing damage to the environment.	Datasets have been created in their projects. All the basic datasets were already included like customer details etc., But in addition they also included the datasets for environmental health like amount of harmful chemicals and detergents released from the firms.	Conclusion from the project is harmful detergents need to be avoided and some other alternatives need to be introduced in order to avoid water pollution. As due to these harmful chemicals lives of many aquatic animals are in danger.	In future the harmful chemicals can be replaced by some eco friendly chemicals. and the management system can be improved with some other changes also so that it can be sold to laundry firms.

Online Laundry Management System: OLMS (Adekola, O.D., *et al*. 2021) [1]	This online laundry management system (OLMS) aims to simplify management and working of laundry firms, automating most of the operations available and improving its efficiency. Its main target is to restore time efficiency, structured management, data security and to remove any inconsistency from the present laundry management system.	The agile model was adopted for their study and project. The proposed methods include user registration and log in, placing order, receiving and billing.	Dataset is created using MySQL and python which is sufficient to store the customers details, staff members details like Name, gender, address, age, mobile, etc. Some other dataset that are included are Service type details set.	Conclusion of the project was that it is helpful in providing a platform for laundry firms to operate and connect to customers easily and at their convenience. This project further provides customers with satisfaction of security and management of their items.	In near future many other features can be added to this project to make it more interesting and more useful in daily life of users and providers. Technology like tracking systems to reveal real time location of customers' items and more advanced payment methods can be introduced.
Laundry Digital Ordering System(Afzal, N.I.B.M. 2020) [2]	Laundry Digital Ordering System(LDOS) is developed in order to remove complications in daily life of users in ordering the laundry system by implementing a speech recognition system to order services online.	The methodology of this system is agile methodology. This method includes a set of procedures which are followed for implementation of the system.	Xampp server for database, Laravel as the framework. The languages used are Notepad++, Java, XML, PHP and MySQL for database purposes.	Conclusion of the project is that it provides more user friendly system to users to order online laundry services as per their requirements by speech recognition	Many limitations are still in this project which can be worked upon to further enhance the user experience like adding more languages other than English, add database to store audio files, etc.

Table 1: Summary of Reviewed Papers.

Figure 7: Agile methodology.

Source_url: https://interqualitybg.com/en/resources/scrum-and-agile-resources/agile-methodology

for our project through research papers, articles.

- **Design:** In this phase, all the gathering and collected data from the plan phase is transformed into the design. Diagrams to depict the flow of the system will be created in this phase such as Class Diagrams, Data Flow Diagram level 0 and 1, Entity diagram. These diagrams are designed to guide in future development of the system.
- **Develop:** In this phase, all the designs created in the design phase are implemented through coding. In this project, a website will be created to provide an interface between the user and the service provider. This is the most critical phase because the end result and connection to the user is dependent on the coding executions.
- **Test:** In this phase, when all other phases mentioned above are successfully completed testing is required to be done to check the implementation and running of the system as a whole together. All errors and bugs, if any, are omitted in this phase and testing is run continuously until all the func-

tions run in a desired manner.

- **Deploy:** This is the phase when all the implemented functions work accordingly as desired by the developer. The system is now ready to be deployed and finally the system can be published to the user for their use.
- **Review:** In this phase, the developer gets the feedback and review from the user for any required maintenance. It is after this phase that users receive updated versions of the system.
- **Launch:** This is the last phase, here the system is launched in masses and everyone who wishes to use the system can access all across the world (as per figure 7).

Execution Setup

- All the members started contributing by learning frontend development. At first everyone focused on HTML only which took around 3-4 days as it is the easiest among all the other skills.
- After learning HTML we practice some basic layouts that can be made by it. When we gained confidence we moved to CSS.
- CSS plays the most important role at any website's frontend as it is brings the beauty to the website and makes it more attractive. It tool around 1-1.5 weeks to learn CSS completely, then another 2-3 days in practicing few basic projects.
- When we all were confident in both HTML and CSS we divided the rest of the skills among us.
- Manvi Tyagi started learning Bootstrap which helped a lot in making our website more attracting.
- Pranav and Pranjal Vaidywan began working on backend development.
- Pranjal learnt MongoDB and SQL through which we were able to to make the required databases
- Whereas side by side Pranav started working on NodeJS and JavaScript which is used to connect databases with the website
- After successfully learning the skills all three team members began with the project. We contributed simultaneously each day and made the complete and working website
- After successfully completing the website Manvi worked on including OTP verification while Pranjal and Pranav learnt Django in python so that payment gateway can be included.
- Working for almost two months we finally completed our project which is completely working and satisfactory.

Proposed Method Different diagrams in this work have been represented below.

Use case diagram

When a client registers himself the request goes to the admin and when the admin approves the client's registration then he will be able to log in to the website. After attempting the login process the client will be able to make an order and both client and admin will be able to check the status of an order. The payment is done by the client and the order is successfully placed when the admin approves the billing (as per Figure 8).

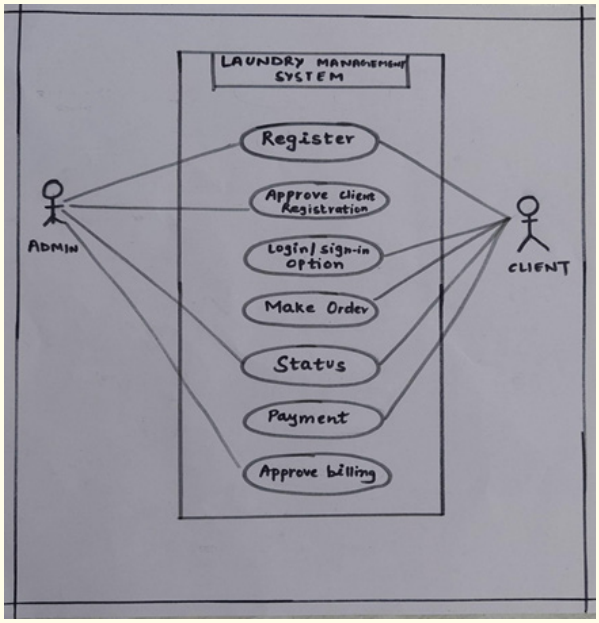

Figure 8: Use Case Diagram.

Entity relationship diagram

As per figure 12 above we can see all the datasets that are included in the LMS. The first data set is of the customer which stores all the basic information of a customer like customer_ID which is the unique key of the dataset. Rest of the details are like name, address, phone_no etc. After this comes the second dataset named order consisting of all the details of orders such as order_id an unique key and customer_id which is also the unique key. Rest are just attributes which can be common for various orders like number of

clothes, payment and many more. Last dataset is for staff of the corporation including the details like name, Mobile_no, address etc., where staff_id is the unique key (as per figure 9).

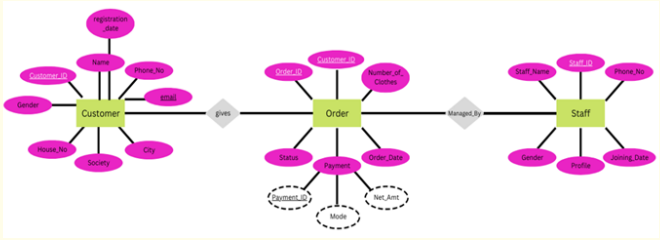

Figure 9: Entity Relationship Diagram.

Class diagram

This diagram represents the relation and the workflow of the Laundry Management System. As shown in figure 13 Laundry staff is connected directly to customers and also responsible for reservation and maintaining reservation record. Also staff members can manage the delivery. Whereas customers can operate search operations and search information (as per figure 10).

Data flow diagram

Level 0 DFD

Figure 14 represents the 0 level data flow diagram which shows the basic structure of LMS. Where customer, staff and admin is the strong entity. Customer places the order in LMS where it is received

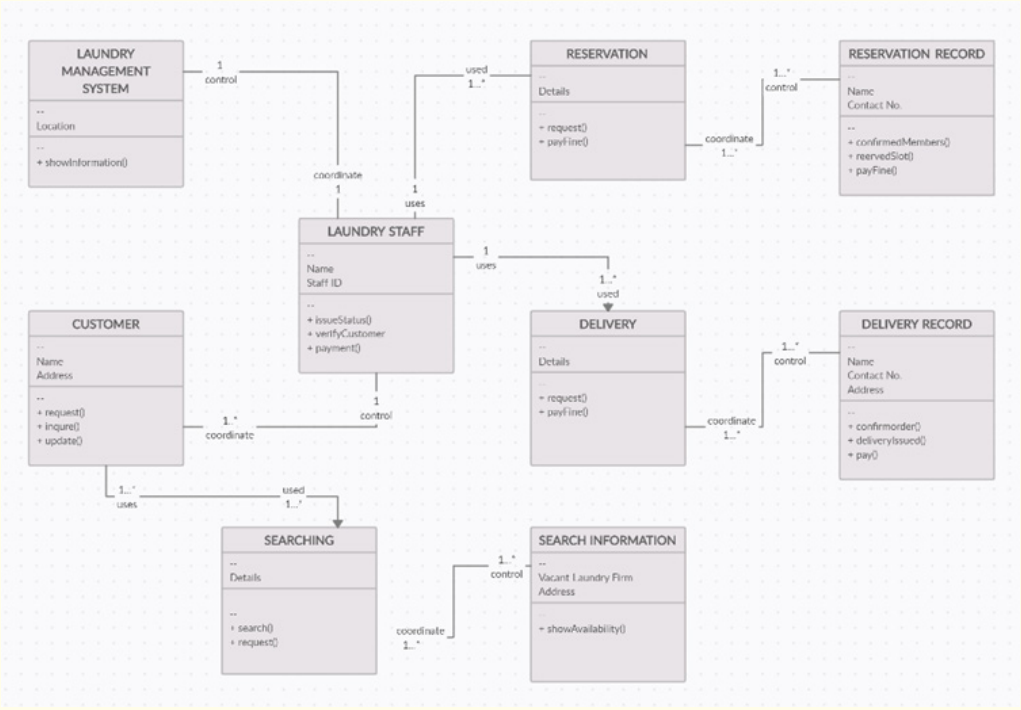

Figure 10: Class Diagram.

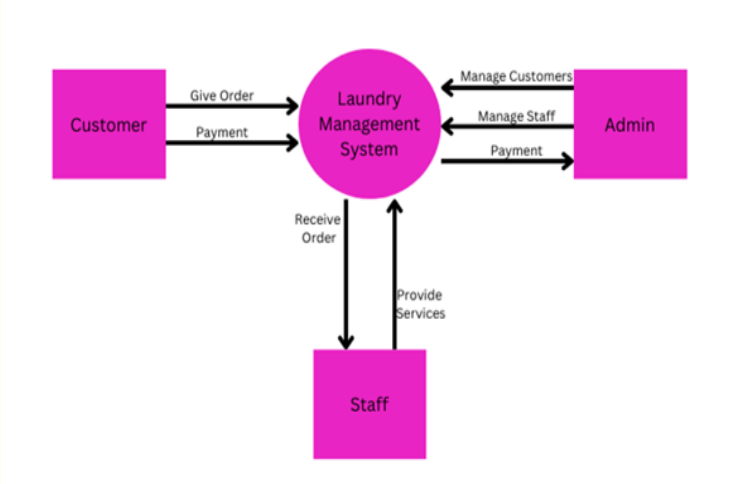

Figure 11: Level 0 Data Flow Diagram.

by the staff and then the staff provides the services. Payment is done by the customers which is received by the admin. Admin also managed customer details and staff details. This is how our LMS works (as per figure 11).

Level 1 DFD

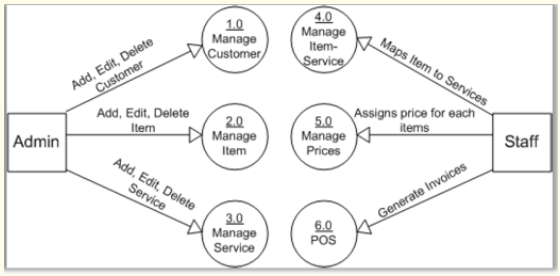

Figure 12: Level 1 Data Flow Diagram.

Figure 15 represents the Level 1 data flow diagram of LMS. Which shows a more deep structure of the system than 0 level DFD. It shows that an admin has many abilities like he/she can add, edit or delete any customer. He can even manage item details and services too in the same way as customer details. Whereas the staff manages the services, prices and payments of the orders and items (as per figure 12).

Flowchart

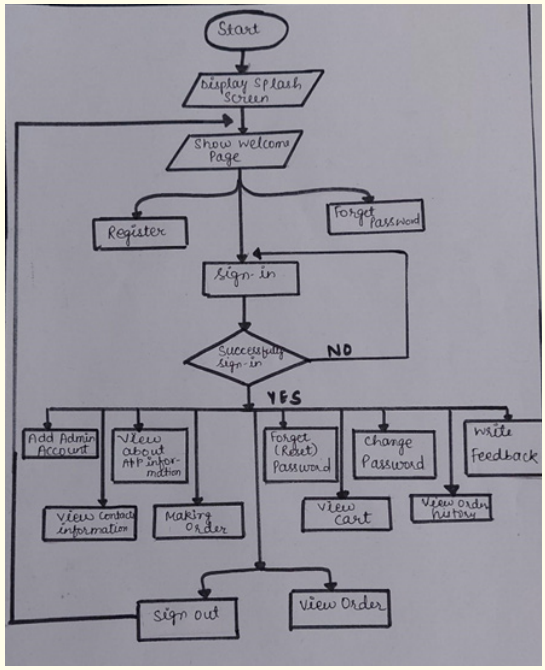

Figure 13: Level 1 Data Flow Diagram.

When a user clicks on the website the welcome page will be there. Then there will be two options available for him- to sign in and to register. If he is already registered he can choose the sign-in option to proceed and if not, he can go with the registration process. After successfully signing in a person can go with various options like viewing contact information, regarding making an order, app information, and admin account.

Other than these features there are various other services like changing passwords, resetting passwords in case one forgets, viewing order history and cart and you can write the feedback too. At last, you can sign out when you're done with the whole process (as per figure 13).

Results and Discussions

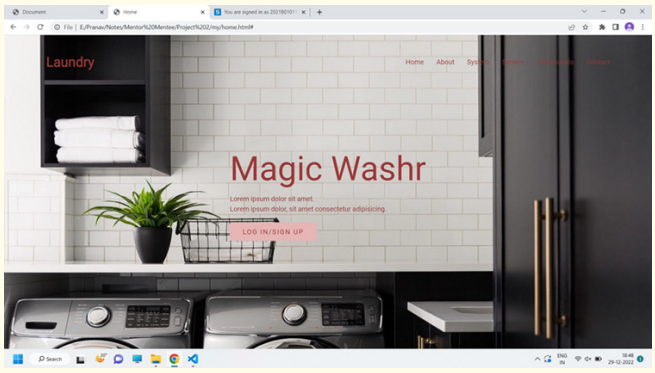

Figure 14: Welcome Page.

This is the first view of our website which shows how the user will be interacting with us. There users can choose any of the options to login/sign-up accordingly.

The sign in/up form will appear as soon as the user selects any of the provided option (as per Figure 14).

This is a page which shows the sign in form where the user is asked to fill the details like username and password to continue. If the details entered are correct, the user is ready to proceed with us. If the user is not registered to the website then he/she can go to the sign up page and can get themselves registered by providing the required details (as per Figure 15).

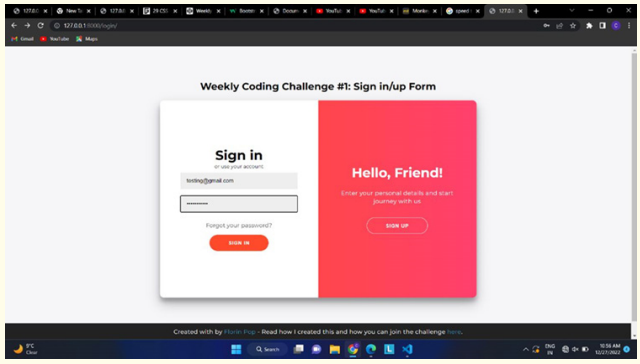

Figure 15: login Page.

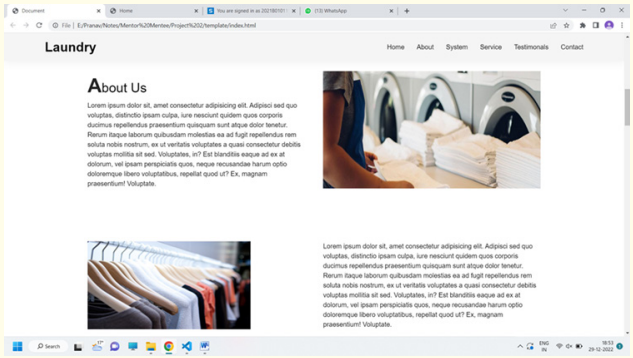

Figure 16: Image showing details about our website.

There is an option in the Navigation bar named 'About Us' which redirects the user to this page which shows the details about Magic Washr like what are the main features that are provided here. Or what are the benefits of this system? Each and every information about the website required to know by the user is available on this page (as per Figure 16).

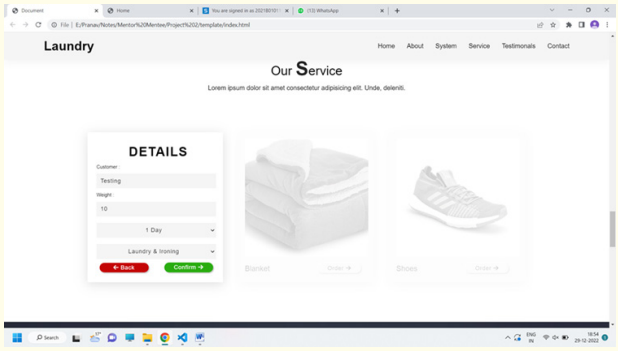

Figure 17: Image for customers to enter their details regarding their clothes.

After successful login the customers are ready to use the services provided by Magic Washr. Hence, customers will provide their names, the weight of their laundry and other mentioned details which will directly be registered to the admin once it is confirmed. There is an option for going to the back page too. All these options makes the use of website easy for the customer (as per Figure 17).

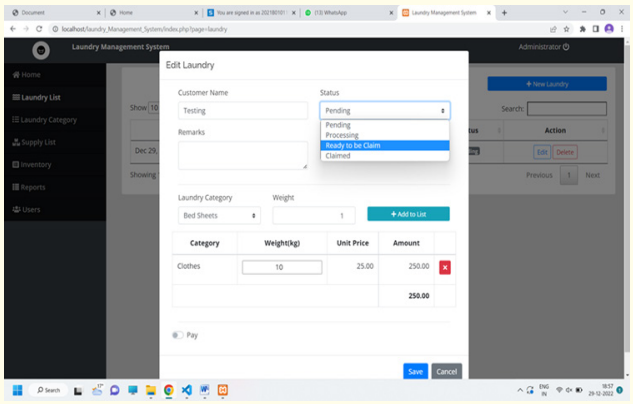

Figure 18: Edit Page for Staff Member.

Edit page allows staff members to update the status of the customer's laundry and also create the bill which is required to be paid for the delivered services. This also helps in confirming the number of clothes received and delivered to prevent any misplacing of laundry items of the customer (As per Figure 18).

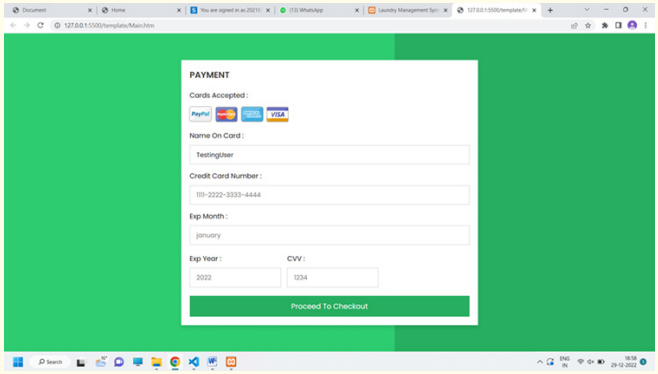

Figure 19: The Payment Gateway Page.

Through this page the customers can pay their bills for the respective laundry services they consumed. The page offers multiple options to choose from to pay the bill. Different company Credit and Debit cards are accepted to pay the bill. The user needs to provide a few details of the card and the transaction is done simply online (As per Figure 19).

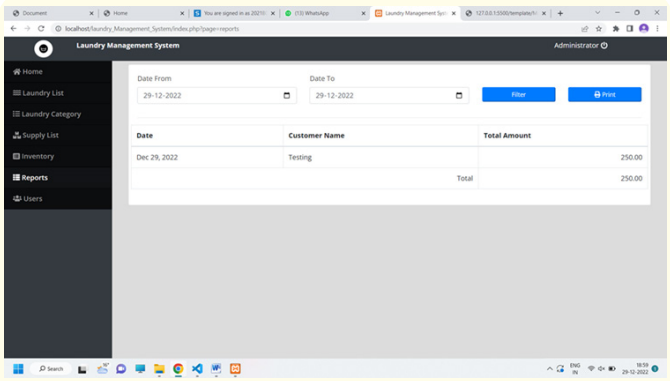

Figure 20: The reports section.

This is the section in which all the transactions and services provided are recorded for future reference and security purposes. The report consists of the Customer name and the date on which they delivered their laundry items for service and the date on which the laundry items were delivered back to them along with the total amount paid by them (as per Figure 20).

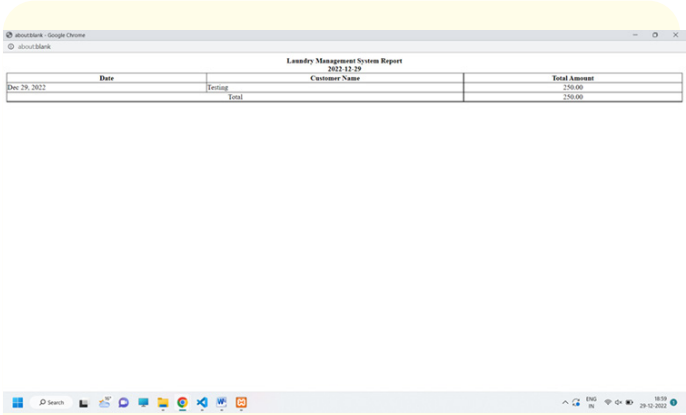

Figure 21: The recorded data in report.

This is the snapshot which shows how the data is recorded and stored in the form of tabular data in the report section (as per Figure 21).

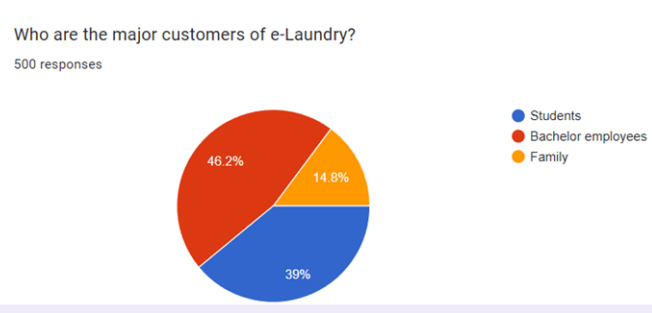

Figure 22: Stakeholders of e-laundry.

We took a total 500 responses from different users of our laundry services asking them one simple question i.e. Who are the major customers of e-laundry? After getting responses, the majority of them voted for Bachelor employees (46.2%). Students got a total of 39% votes and families got the least number of votes. Hence we can clearly see that this service will be highly beneficial for the unmarried employees or the employees living far away from home (as Per Figure 22).

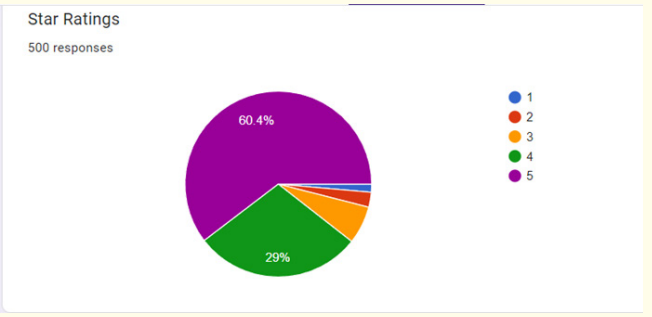

Figure 23: User Ratings.

As one can see in the above chart, the total percentage of the 5 star ratings is 60.4% which shows that many users liked using this management system. Very few opted for 1, 2 or 3 star ratings which clearly indicates many users are satisfied with the project. The average when calculated is 4.4 rating which is overall a good rating. The detailed information of all the ratings is given below: (as per Figure 23).

5 stars: 302 users, 4 stars: 145 users, 3 stars: 33 users, 2 stars: 13 users, 1 star: 7 users.

5 novelties

- This system helps the user to keep track of their orders and set drop-off time as per their convenience.
- Using payment gateway customers can directly make payments.
- Simplifies the task of the laundry manager, as everything is stored in a database.
- Using the admin portal admin can easily check all users' details and status of orders. Even the rates of laundry can be modified by admin.
- In future positioning systems can be added to this system so that users can have real time location of their clothes delivery. This can also be used to navigate nearby laundry services.
- Chatbots can be included to further enhance the system and navigate the new users.
- A Recommendation system can be introduced for suggestions.

Recommendations

Laundry Management system is a website and database based project. Which includes the management system which is used to store the records of customers' laundries. It saves a lot of time for the staff and all the records are stored safely and securely. The details of customers, orders and staff will never be lost and can be accessed at any time from wherever the admin wants. Since we have included an OTP verification in the project therefore the security has been increased and no faulty customer can login to someone else's account. The total amount of order and by the time your laundry will be done, all such necessary details are shown to the customer through the website itself which is a great feature of this project. As we have included the payment gateway in the website itself hence customers can easily pay the laundry amount through the internet easily and due to that e-receipt will also be generated automatically. Record of transaction can also be accessed from anywhere at any time which gives too much flexibility in bills. Hence we suggest every laundry firm to use such a type of management system as ours as it will be very much beneficial for their business.

Future Research Directions and Limitations

Limitations

- There could be an app for this Laundry Management System Gateway.
- Door-to-Door services could have been added to the website as a feature to make it more reliable.
- A feature in the website to analyze the cleanliness percentage of the clothes.
- Customer needs to access the website every time whenever he/she wants to see the status of their laundry.

Future Directions

- A better payment system with more security and facilities can be included.
- A feature for the authentication of user by clothes can be the next step ahead.
- A GPS system can also be introduced in the future for time saving purpose.
- Door-to-Door services can be included to put customer at ease.
- Notification via emails will be a great feature if introduced in future.

Conclusions

The project Laundry Management System with Payment Gateway is an online working website that was designed to resolve the major problems experienced by the laundry sector workers and users. Many problems such as mixing of data, mixing up customer's clothes and even sometimes losing the record were causing trouble in laundry services. As now in the 21st century mostly everyone is so busy in their day to day life they don't get time to waste on managing their laundry and this creates the need of technology for convenience in the way business is operated. This project helps in ordering laundry service with the help of the internet and users can directly pay for their services online using the payment gateway feature. As the demand for laundry services is increasing exponentially in recent times the need for a laundry management system is also increasing. At the end the main task of this system is to provide an easier and convenient way to manage their laundry.

Additional Readings

- DESIGN AND IMPLEMENTATION OF A LAUNDRY MANAGEMENT SYSTEM: https://www.modishproject.com/design-and-implementation-of-a-laundry-management-system/
- An implementation of Laundry Management System based on RFID hanger and wireless sensor network: https://www.semanticscholar.org/paper/An-implementation-of-Laundry-Management-System-on-Van-Lee/be310bd1e2e5e37d23d73dece2a4caa4de0b46a9
- Best Laundry Management System | Laundry Business To The Next Level: https://www.bhupendralodhi.com/laundry-management-system/
- What is a laundry management system?: https://emojicut.com/articles/what-is-a-laundry-management-system
- Hotel Laundry Management Guide: Process, Tips and Checklists: https://www.xenia.team/articles/hotel-laundry-management-guide-checklist
- Online Laundry Management System in PHP MySQL Source Code: https://www.campcodes.com/downloads/online-laundry-management-system-in-php-mysql-source-code/
- Laundry Management Application using Augmented Reality: https://www.ijsrd.com/articles/IJSRDV5I110301.pdf

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