

IronMan: An Android-Web Based Application for Laundry Services

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Abstract—The majority of people despise the chore of ironing clothes but enjoy wearing nice, crisp, wrinkle-free clothes. IronMan provides steam ironing services right to your door. IronMan is a service that supplies ironing and laundry services online. In this work, the system allows to create an innovative Internet of Things (IoT)-based Laundry Services E-commerce business model. This work will bring laundry service right to your door, in the palm of your hand. This work will include a proper Android app for accessing nearby laundry shop services from home and a related website to this android app. In this application, a machine learning model was used to create intelligent logistic management systems. Using this application, people can easily access laundry services while staying at home. Nowadays people are more inclined to market from online shops rather than going outside. The current initiative follows the same pattern for laundry service providers and consumers. In most laundry shops, they do not keep records of their customers. So there is a possibility that the clothes of the customers may mix up with one another. This system helps users to not only track their orders but also physically scan their items using image classification into their list with an image proof to avoid any mismatch and help customers claim if a mix-up happens. This application has a location tracker for riders to accept the nearest order so that the customer gets a smooth experience. It also has a website for users to create their account and check their services display and customers can order from both web and phone.

Keywords—Android-Web, Internet of Things (IoT), Image Classification, Machine Learning.

I. INTRODUCTION

Trying to imagine life without technology is nearly impossible. People have become so reliant on technology that it has become an inseparable part of our lives. The internet of things or IoT [1] influences people's lifestyle from how people react to how people behave from air conditioners that all people can control with smartphones, from using smartphones to get area addresses, ordering food using smartphones, etc. IoT method collects data from different uses of different software and devices and uses that data to make another software or device work better. The method IoT in recent days was implemented on other E-commerce platforms to have the best outcomes for the business. For this application, this method is used and an E-commerce platform [2] is built named Ironman which will provide laundry services from nearby accessible

shops. An application that acts as a go-between all the iron-laundry shops and people. IronMan allows you to order from anywhere at any time without having to pause everything. Scroll through the app to find your favorite shop and tap to order. This project includes a customer application, as well as a shop owner and delivery application. Alongside the project also have a website relevantly. In Bangladesh, approximately 50 million people use the internet on a daily basis.

People are increasingly inclined to use various technologies and applications. The objective of this work is to generate a smart iron-laundry application that will allow people to order from anywhere at any time. Delivery partners will arrive in less than 20 minutes to pick up your clothes. The entire washing, ironing, and folding process are completed quickly and efficiently. IronMan assignees are equipped with an app that indicates successful pickups and deliveries.

An Android application will be used to access the services. Using the shop owners' application, shop owners can create shops and add items to the database. Users can access it through the customer app; Riders will use the rider application. There is an image classification model [3] which can classify customer clothes to track the clothes' identity. There has been implemented a logistic regression machine learning model [4], for which a set of data was collected from people who were thinking about this project via a survey. This model can predict the sustainability of IronMan.

II. LITERATURE REVIEW

According to the most recent studies and research, many familiar applications and research journals are already related to this research work. However, those studies had some gaps that are hoped to be filled with the current initiative. Extensive research has been done and a few research articles are here to compare this work.

The authors in [5] describe Laundry Applications, and the primary goal of developing Laundry Applications is to create employment. The intended application is also helpful for working people, students, and people who live outside their homes and do not have time to wash their clothes. So, in essence, they are attempting to connect people (customers and

Dhobis) so that they can benefit from one another. There is a decent amount of services available in this application, so the customer can easily select the services, date of service, time of service, etc. They are creating their laundry shop and intend to help unemployed people.

They targeted people who are willing to order laundry services online. They are the administrator as well as the shop owner. Consequently, the customer does not have the option of selecting a specific shop from their list of options. They tried to be available everywhere, but they were not adaptable.

Here IronMan solved the problem with the shops. Because it is an open platform, and the primary goal is to act as a middleman between laundry shops and people. As a by-product, the app allows multiple shop owners to register their businesses. As a necessary consequence, people can select and order from any shop. IronMan also provides image classification, so people do not have to fear losing their clothes. It is a machine learning model that can detect Images from the database and verify the owner of the cloth.

B. Project Background Related Application

According to our most recent observation on research journals, there are already a plethora of well-known applications are gettable on Google Play and the Apple App Store.

Here are a few examples of popular and similar applications:

- Sheba.xyz [6]
- Laundry Vai [7]

In Bangladesh, many more related applications are available. Those applications have a lot in common, but they also have some differences and limitations. For instance, in the Sheba.xyz app, one can only communicate with one store, and there is no other laundry shop. Laundry Vai and Sheba.xyz are nearly identical applications to ours, but both have some limitations. These applications only contain information about their own services, only available within Dhaka.

On the other hand, IronMan is a fantastic platform for laundry services, with information on all local laundry shops throughout Bangladesh. The earlier apps also do not allow customers to track their orders or provide convenient payment gateway services. The plan is to develop an application that would give the same benefits across the country.

C. Project Background Related Literature

The theoretical literature review of this project reviewed what other researchers had written related to our topic to compile, categorize, and evaluate it.

The authors in [8] discuss big data analytics, smart logistics management, and machine learning techniques used on an IoT platform for laundry services based on e-commerce. Data capture, storage, analysis, search, sharing, migration, visualization, tracking, updating, data privacy, and data sources are significant data analysis challenges. Data capture, storage,

analysis, search, sharing, migration, visualization, tracking, updating, data privacy, and data sources are all big data analysis challenges. Using this data to make the program better is the central concept. Intelligent logistics [9] in real-time value networks enable customers to accurately navigate the entire life cycle of the transportation process, including purchases and contracts, shipment planning, execution and tracking, yard management, appointment schedules, and financial and claims settlement - all individually, cloud-based platform. A single connection to a real-time value network can connect to the thousands of companies already signed on, including partners and carriers. This is the network's worth. Other advantages include lower annual freight costs, better customer service, streamlined transportation processes, and reduced network inventory. In the work [10], the authors implemented big data analytics, intelligent logistics management, and machine learning to make the laundry service into an innovative IoT based e-commerce platform. They used Dijkstra's algorithm to find the shortest path with the least amount of traffic and the least amount of distance. They collected the data and then analyzed it using big data analytics. An idea was taken and tried to put into action in this work. This application also used machine learning techniques to test the sustainability of this idea by using people's thoughts about it as datasets.

The second paper was "Food panda: Changing the Way Bangladeshis Eat Meals" [11]. We selected this paper to understand the marketing better and promoting strategies and how to gather traffic and audiences so that our work "IronMan" can turn into a successful project. The following paper covers the part of the relationship between early business practices and companies' medium and long-term challenges and opportunities. It can give us an insight into our future challenges in building an e-commerce app, IronMan. The paper also discusses the food order process and delivery system. So we can use those ideas on this app to have a better delivery process so that this app can be sustainable and durable.

The third paper was "Customers' Use Intentions of Using Online Laundry Service" [12]. The journal depicts the customer psychology of choosing an online laundry service. The following study aims to understand customers' intentions to use online laundry services through one-on-one interviews as the qualitative research method approach. The findings revealed that customers' preferences to use online laundry services were primarily influenced by the effectiveness and efficiency of such services. It is simple to use and save time. As a result, an outcome of customers' behavior and attitude towards accepting this project was found.

The authors in[13] researched to develop Android-based laundry services that are more efficient in terms of time to process laundry pickup, records of incoming and outgoing garments, and information on their own laundry OXY. The method employed includes a literature review, interviews, questionnaires, design, and testing. The paper assisted in providing information such as price, type of service, and

preferred laundry branch. It also aided in the monitoring of applications and operations.

The fifth research paper is "Laundry Services Application" [14]. It shows a smart application that enhances the stipulation of a service that every home requires, mainly washing clothes and household items in specialized laundry centers, as their application facilitates linking the user to the nearest laundry center. It would be easy for them to communicate with each other and provide the laundry service online via an online request submitted by the user. To accomplish this, they created an Android application that works on smartphones connected to the Internet.

III. METHODOLOGY

This application has three types of mobile applications to help each user to complete those tasks efficiently, which are basically for shop owners, riders, and customers. The Android Studio is used as an android framework for development, and fire-base is used for the database framework. And the Google Cloud Platform to integrate Google Maps into the application.

A. Android Application

Shop Owner App: After logging into the system, the shop owners have the luxury too:

- add their products
- remove any product
- modify the products
- edit the price list

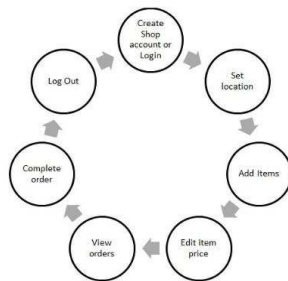


Fig. 1. Shop Owner App Diagram

Customer App: Customers must first create an account and log in to the system using their email or phone number. Customers can see a variety of shops and their names after logging into the system. Customers can edit their profiles by clicking my profile bar if they desire. They can then choose any payment method, such as card, mobile banking, or cash on delivery. Customers can view the order status after confirming their order.

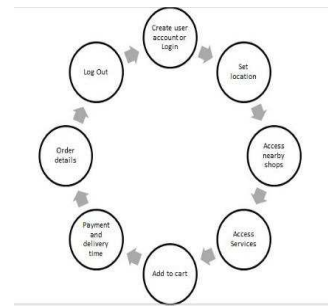


Fig. 2. Customer App Diagram

Rider App: When a customer orders, a notification will appear for the rider closest to that customer. The rider can then accept the pickup request. After picking up the products from the customer, the rider must deliver them to the shop chosen by the customer. After finishing the laundry, the shop owner can direct contact with the rider to provide the product to the

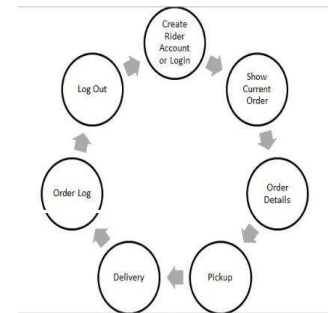


Fig. 3. Rider App Diagram

customer.

The details of the flow of different applications are given in Fig.1-Fig.3.

B. Web Based Application

The IronMan website will include a user panel with product showcasing, login and signup application, and a search of laundry shops nearby. On the other hand, there will be a Shop user panel where owners can decorate their shop by creating an account and adding all their services. These sections will have an administrator who will connect these users and enable the E-laundry service.

It all started with HTML and CSS as web development tools. Then React JS was used for the back-end operation. And Django as a framework. So that the HTML page of the website can easily create and stored the database in the Django administration, from there admin can control the whole website and do have access to read and write and modify anything. DialogFlow and Kommunicate is used to implement Chatbot.

For the machine learning model dataset, a survey was created with questions about people's opinions on the idea of an E-commerce-based laundry service [15]. Then the responses

were converted into CSV files and used as datasets. We convert all the categorical data into numeric data [16]. For Yes and No, 1 and 0 was set. Score set calculation is given in Fig.4

```

a=0
b=0
c=0
result = []
for score in finalScore:
    if score>8 :
        result.append('Sustainable')
    elif score>= 6 and score <= 8:
        result.append('Preferable')
    elif score<6:
        result.append('Not Sustainable')

```

Fig. 4. Score Set Code

The logistic regression model [17] was trained. 70 percent data were given into the train set and 30 percent data into the test set for training. The results from Logistic Regression with no regularization gives a test accuracy 86%. Fig.5 presents the confusion matrix.



Fig. 5. Confusion Matrix

TensorFlow Lite [18] and a teachable machine were used to implement image classification. In TensorFlow Lite, some models were deployed to classify the images. It is one kind of machine learning process to object detection. In the models, we have deployed some images related to a shirt, pants, t-shirt, etc. Then we converted the model, optimized it, and deployed that model in the android studio project. The datasets of images and imported the model were trained as .tflite in android studio. DialogFlow [19] is used to understand natural language that makes it easy to create and integrate a conversational user interface into a mobile app, web app

IV. RESULTS

It was discovered that our current work almost performs flawlessly after individually analyzing our system. It successfully implemented the prototype of the entire system, as

planned initially. We divided into two parts. The final application demonstration will be used for the result, to analyze this project, and also to conduct some qualitative research.

A. Analysis of Results of Web Development

For the website, the user has to create a signup page at first. Then after registering, the customer can sign in to the system.

Fig. 6. Sign Up Page

Fig. 7. Login Page

After logging into the website, customers can view the whole dashboard. There are different products from different custom laundry and iron shops.

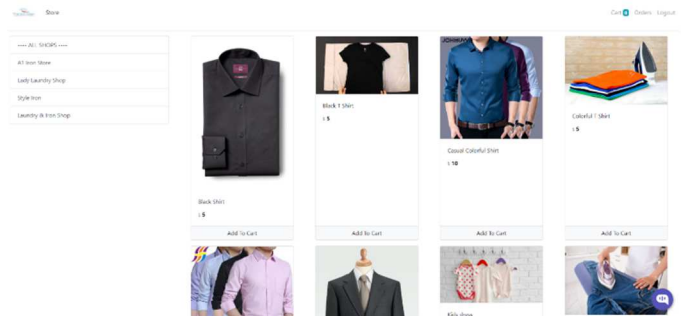


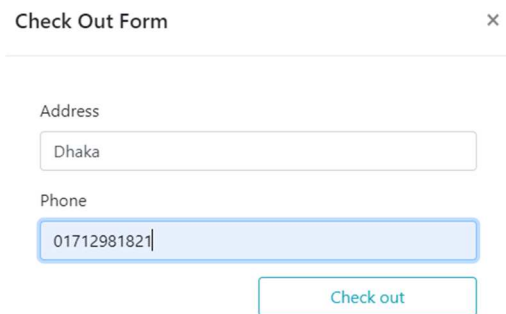
Fig. 8. Home Dashboard

Then the customer can select any products from any shops they like to order. They can increase or decrease the order. After ordering the products, they view them in the cart. The system will show the details like price, quantity, and total amount.

Your Cart					
Sno.	Image	Product	Price	Quantity	Total
1		Black T-Shirt	₹ 15	2	₹ 30
2		Jeans	₹ 15	2	₹ 30
3		Shirts	₹ 15	2	₹ 30
Total					₹ 90
Check out					

Fig. 9. Cart

After that, the customer can check out by giving the related information like their address and phone number.



Check Out Form

Address
Dhaka

Phone
01712981821

Check out

Fig. 10. Check Out Form

There is an order menu to view the orders or check the orders. From there, customers can view the products they ordered. Also, they can check the order status.

Your Orders




Sno.	Image	Product	Date	Price	Quantity	Total	Status
1		Black T Shirt	April 23, 2022	₳ 5	2	₳ 10	Pending
2		Jeans	April 23, 2022	₳ 5	2	₳ 10	Pending
3		Saree	April 23, 2022	₳ 15	2	₳ 30	Pending

Fig. 11. Order Status Pending

There is also a system where the admin can control the order status. If the order is done, the page will show the completed status.

Your Orders




Sno.	Image	Product	Date	Price	Quantity	Total	Status
1		Black T Shirt	April 23, 2022	₳ 5	2	₳ 10	Completed
2		Jeans	April 23, 2022	₳ 5	2	₳ 10	Completed
3		Saree	April 23, 2022	₳ 15	2	₳ 30	Completed

Fig. 12. Order Status Complete

All the steps from signup and order are described vividly through figures 6-12.

This application also has a Chabot where people can ask their queries (Fig.13).

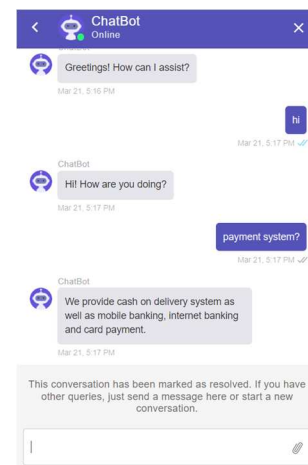


Fig. 13. Chatbot

B. Analysis of Result of Android Development

• Shop Owner App:

For Android development, the user has to create the shop owner app first. Any shop owner can register their shops by filling out the signing up page.

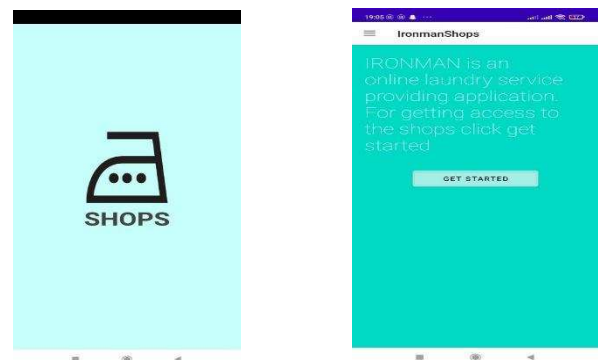


Fig. 14. Shop Owner App Interface

Shop owners can view their profiles as well as the orders. They can update the products and prices also. After updating, it will show the updated details on the product page. These are described in Fig14-15.

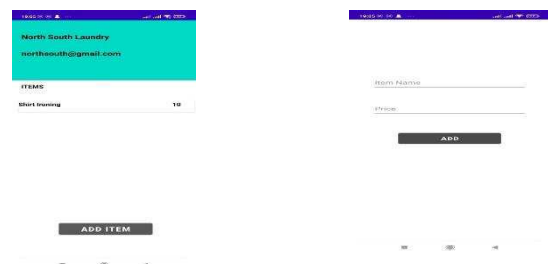


Fig. 15. Shop Owner Customizing Product

When the shop owner clicks on the 'Get Started' button, he can see the new page where he can update the products and their price. After filling those items, he must click on the 'Add' button. Then the product and its' price will be updated.

• Pricing of The Products:

Initially, the shop owners can update the prices of the products according to their preferences. However, there has been made a template for updating the name of the products and prices. After registering in the app, shop owners have the authority to edit them. A survey was made asking different questions to different shop owners. They answered that they had set different prices for other products. They have asked us whether they could update the pricing as per their liking or not. This system assured them that that feature is available and flexible in the app.

• Rider App:

The next android application is for the rider. The rider will pick up the products from the customer's home, and after completing the ironing at the shops, he will deliver them to the customer. But firstly, the rider has to sign in to the app. Then he can see the orders that have come from the customers. After that, he can see the order details and prices through orders.

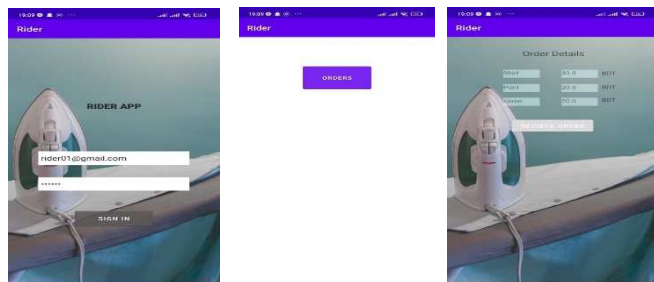


Fig. 16. Rider App Interfaces

The rider also has access to the image classification tool. He can check the clothes through image classification. It will assure the customer that their products will not be lost. Image classification will show the percentage of confidence whether that is the correct product.

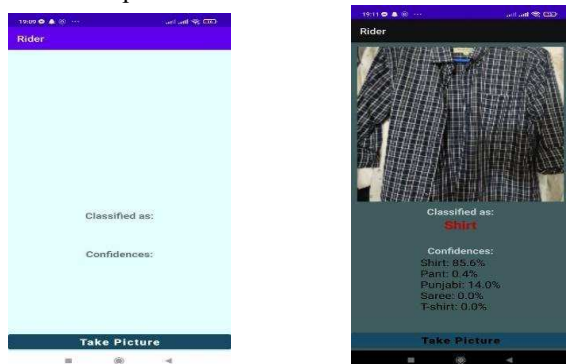


Fig. 17. Image Classification for Rider App

• Customer App:

There is also an app for the customer. Customers need to register through their mail, and then they can access their profile.

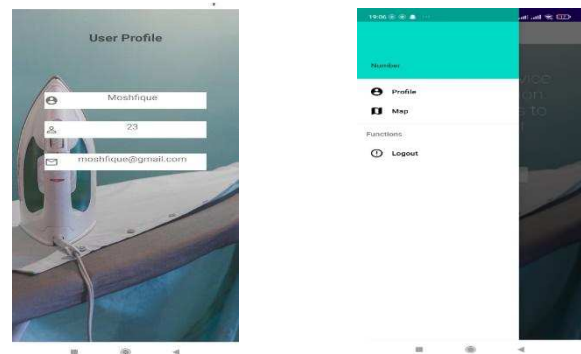


Fig. 18. Customer Profile

Customers can have access to Google Maps, where they will be able to see the current location. Also, they see different laundry shops that are registered through the app. Then they can choose any shop and order from that shop (Fig16-20).

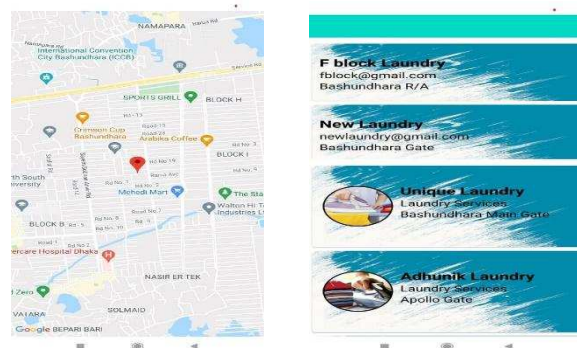


Fig. 19. Current Location and Registered Shops

After ordering from their particular liking shop, customers can view the cart and total amount of money.

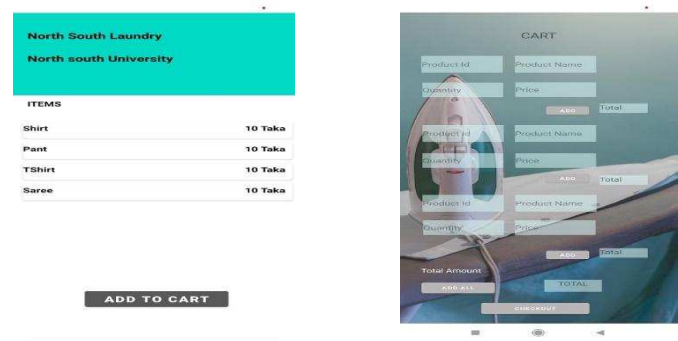


Fig. 20. Customer Cart

• Image Detection:

TensorFlow Lite is used for image classification. Our idea was to keep an image classifier in the rider app for instantly taking an image in real-time when picking order and adding the Image to the user's database for a future claim. The application has used machine learning to train the model by gathering images of categories like shirts, T-shirts, saree, Punjabi, etc. And then used TensorFlow Lite to add it to the Rider app and save the data to individual customer's databases using Firebase.

Image classification is an essential concern in which a set of target classes is defined, and a model is trained to identify them using labeled example photos. The system used numpy, Opencv, and PIL (Python Imaging Library) libraries for training.

Training the model requires the following steps[26]

1. First, it needs to provide the model with some training data.
2. Then the model tries to immaculate the provided images and labels.
3. After that, the model predicts the test sets.
4. Lastly, the model verifies whether the predictions match the labels or not.

The output of The Rider App is given in Fig.21.



Fig. 21. Image Classification

As shown in the above Fig. 21, after the rider takes a picture of items, the model can recognize the Shirt with 80.7% confidence, Punjabi with 100%, and Pant with 86.1%. The accuracy of the model will increase as more data gets added.

When the rider captures the images after taking the clothes from the customer, the photos will be saved to our database. When the rider is about to deliver the product back to the customer, he can check the product. The rider will click the images, and then the app will search the photos from the database. There will be the owner's name saved by their clothes images in the database. After that, the app will show the name of the owner of the clothes. Some snapshot of the image detection is given in Fig.22.

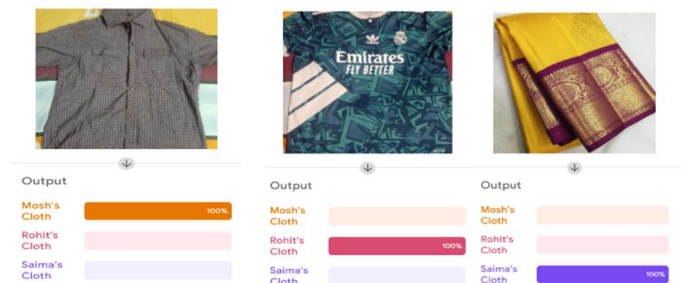


Fig. 22. Clothes Owner Image Detection

As shown in Fig. 22, the app will detect the owner's name through the database, then it will return the name of the owner matched by the Image of the clothes. After completing the ironing, the shop owner can check the owner of the clothes by using the feature of image detection from the database. Thus, every clothe will be scanned and will reach its actual owner, and there will not be any situation of mixing up any clothes.

V. QUALITATIVE SURVEY

The survey explains the view of the local laundry shop owners regarding the project 'IronMan.' We showed our demonstration of the application to them and asked them how they felt about our app. They were also asked about the sustainability of the project idea and if they are convenient and comfortable enough to use the mobile application.

After gathering the information and data from the different shop owners from other places, we realized that they were initially not sure or were not clear enough about the project process. They thought it would be an extra burden for them to appoint a delivery man, or some thought it would negatively impact their business. But when the method of the project was explained thoroughly, that is when they seemed clear about the project. So the majority of the shop owners are willing to participate in this project and appreciate the ideas. In short, the small shop owners see this as an opportunity to grow their business and set up a solid customer base. Whereas middle and large shop owners appreciate our project, they are currently not ready to be involved in our project. From the survey, an idea was found to appoint a go-between or delivery man, most of the shops are willing to be involved instantly. Overall, our current initiative seems sustainable to them. It is an excellent possibility that this project might be successful in the near future.

VI. CONCLUSION AND FUTURE WORK

Iron-Laundry Services is a service that is required regularly. People increasingly rely on e-commerce and internet-based jobs to help them manage their lives. This project aims to make laundry services more accessible to the general public. There has been developed e-commerce laundry services and brought all local laundry shops together on a single platform. In addition, the project contains Android and web-based applications. And to improve the user experience, it has been planned to add features related to big data analytics, intelligent

logistics management, and machine learning models. We have already taken people opinions on this project idea as a survey and turned them into datasets, which were used to train our logistic regression model and determine whether or not this work will be successful. To launch this as a pilot project, it needed to conduct qualitative research among local laundry shops to see if they are interested in such an idea or are ready to take their businesses online. This application needs to do fieldwork before launching as a pilot project. The main question, in the beginning, will be feasibility; will need to teach local shop owners how this project will work, its benefits and drawbacks, and so on. We hope that ecommerce based laundry can make a considerable change in the e-commerce industry.

REFERENCES

- [1] L. D. Xu, W. He and S. Li, "Internet of Things in Industries: A Survey," in *IEEE Transactions on Industrial Informatics*, vol. 10, no. 4, pp. 2233-2243, Nov. 2014.
- [2] S. Singh and N. Singh, "Internet of Things (IoT): Security challenges, business opportunities & reference architecture for E-commerce," 2015 International Conference on Green Computing and Internet of Things (ICGCIoT), 2015, pp. 1577-1581.
- [3] Congzheng Song, Thomas Ristenpart, and Vitaly Shmatikov. 2017, "Machine Learning Models that Remember Too Much. In *Proceedings of the 2017 ACM SIGSAC Conference on Computer and Communications Security (CCS '17)*". Association for Computing Machinery, New York, NY, USA, 587–601.
- [4] Duncan McFarlane, Vaggelis Giannikas, Wenrong Lu, *Intelligent logistics: Involving the customer*, Computers in Industry, Volume 81, 2016, Pages 105-115, ISSN 0166-3615.
- [5] Gupta. Akanksha. et al, "Development of Mobile Application for Laundry Services Using Android Studio". Volume 13, Number 12 (2018) pp.10623-10626.
- [6] Sheba Platform Limited, "Sheba.xyz," 2020. [Online]. Available:Sheba.Xyz. [Accessed 16 February 2022].
- [7] Inc, Griho, "Laundry Bhai - Apps on Google Play".Available:Laundry Bhai. play.google.com, 8 Nov 2020.
- [8] Chang Liu, Yongfu Feng, Dongtao Lin, Liang Wu & Min Guo (2020) Iot based laundry services: an application of big data analytics, intelligent logistics management, and machine learning techniques, *International Journal of Production Research*, 58:17, 5113-5131.
- [9] "Transportation Management System TMS". Consumer-Driven Digital Supply Chain Management, www.onenetwork.com, 13 Oct 2020.
- [10] A Fitriansyah et al 2019 J. Phys.: Conf. Ser. 1338 012044
- [11] Akter, Mohinur & Disha, Nadia. (2021). Exploring Consumer Behavior for App-based Food Delivery in Bangladesh During COVID-19. *Bangladesh Journal of Integrated Thought*
- [12] Afifah, Hana, and Norlaile binti Salleh . "Customers' Use Intentions of Using Online Laundry Service." *International Journal of Business and Management*, 0 0 2018
- [13] Primawaty, Christine, and Sufa atin. "LAUNDRY SERVICE APPLICATION DEVELOPMENT ANDROID BASED."
- [14] Saati, Ibrahim. (2020). Laundry Services Application
- [15] "https://forms.gle/98DETKx5yLg8k8xc8".
- [16] Al Aghbari, Zaher, "Classification of Categorical and Numerical Data on Selected Subset of Features" .2010.
- [17] "Logistic Regression | Building an End-to-End Logistic Regression Model."
- [18] "Image Classification | TensorFlow Core."
- [19] Pykes, Kurtis, "How To Create A Conversational Agent with Dialogflow by Kurtis Pykes Towards Data Science". 5 May 2021. Medium, towardsdatascience.com.