Final Year Project Proposal

AUTOMATIC SHOPPING CART

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List of Abbreviations and Acronyms

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Description Page ***#***

Final Year Project Proposal

Section – 1

1.1 Project Identification

Project Title: **AUTOMATIC SHOPPING CART**				
Group Leader (GL):				
1.	Name:	**AHMED ALI RAZA**		
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Group Members (GM's):				
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	Signature:			

What technology is core to your product? *(Please mark □ where applicable)*

[ ] 3D/4D Printing
[ ] Augmented Reality / Virtual Reality
[ ] Big Data, Artificial Intelligence
[ ] Blockchain
[] Cloud
[ ] Neurotech
[ ] Robotics
[ ] Shared economy
[✓] The Internet of Things
[ ] Wearables, Implantable
[ ] Others (specify):

What is the target market(s) for the products?

[ ] Automotive, aviation, marine
[✓] Business, marketing, finance [ ] Defense, security, safety
[ ] Education and training
[ ] Environment, water management
[ ] Entertainment, tourism, sport/recreation
[ ], [✓] Food, livestock, agribusiness,
[ ] Healthcare
[ ] Infrastructure, housing & transport
[ ] Mining equipment technology & services
[ ] Oil, gas, energy
[ ] Textiles, clothing, footwear
[] Others (specify):

Other Organizations Involved in the Project:

Academic Organizations:

#	Organization Name	Role / Contribution
1.	IQRA UNIVERSITY, KARACHI	Bachelors in Compuer Science BS(CS)
2.	IQRA UNIVERSITY, KARACHI	Bachelors in Compuer Science BS(CS)

Industrial Organizations:

#	Organization Name	Role / Contribution
1.		
2.		

Funding Organizations:

#	Organization Name	Role / Contribution
1.		
2.		

Key Words:

Arduino, ESP8266, LCD, Desktop App, RFID Tags, RFID Reader.

Research and Development Theme:

No research theme but using Agile Development Method (Scrum framework)

Project Status: *(Please mark □)*

[✓] New [ ] Modification to previous Project [

] Extension of existing project

Project Duration: ***8-****Months*

Proposed Budget: *PKR; Rs – 13000/-*

The Problem:

Today shopping is becoming a time consuming, hectic activity in cities. There are long lines in marts on weekend/events in big cities. Therefore, at different marts because of this, after shopping the customer reach billing counter for bill but since using bar code for adding product and calculating bill the that is very time consuming and that increases the waiting queues for Bill. The ultimate goal is to develop a system consisting of a hardware device with a software that can be used in super marts to resolve the long queues at billing counter using RFID Technology with Arduino which calculate bill and show total amount on the LCD and at the end when customer done shopping the bill will generate at the counter, where customer will pay and will leave the store.

Following are some of the well-known (identify the best known if possible) existing solutions to this problem. Their known strengths and weaknesses are also provided.

In Pakistan there is no such system is being implemented yet, but research on this idea have been done. This is a new innovative idea that brings the relief to the people by save time. we are using RFID reader with Arduino and every product have RFID card number used for product identification which is connected to the Centralized data base which will calculate the bill of the customer bill with Cart ID give to the trolley when they reached the counter. The system performance is increased and speed but the weaknesses is about the hardware to get damaged and not work.

Our solution will address the following weaknesses of above-mentioned solutions.

The bar-code scanning system for billing which is most time consuming. So we are presenting the solution of billing system, replacing it with automatic billing by scanning the product in trolley since every product has its own identity of RFID card number, RFID tags have Unique products ID that will help to increase performance.

We will use the following techniques to achieve improvements mentioned above.

The use RFID reader with Arduino board with ESP8266 that will transmit data to the database and on the trolley the hardware is implemented, that will scan/read the product code in real time and will put the price on the LCD and in data base and will continue to add/remove the prices with respect to corresponding products and adding the total amount and display in LCD installed in trolley.

Synopsis:

The system that we are making can be used in super marts to minimize the waiting queues at billing counter using RFID technology, system designed this with RFID technology and Arduino, the system requires cost to design. This system displays the added product amount and total amount to the user so this system is easy to use and for user. When the customer scans the product and shows its price and total amount of bill on LCD, when customer want to remove it from the cart it needs to be scanned again and then remove it from the trolley. When the customer completes shopping, the data from the hardware is going to transfer to the centralized billing unit through ESP8266 (transmitter), when customer sends the data from trolley hardware to CBU, and customer can have their bill in printed form by providing the Cart ID trolley number, this will save the time of customers and customer will be satisfied.

Section – 2

2.1 Background

Scope of the Project:

The aim and objective are to develop RFID based billing system for supermarkets in order to make billing process convenient and easy. Implementing an Automatic shopping cart using RFID technology that will be saving time of customers and improving purchasing. In this RFID card is utilized by the RFID reader in the shopping cart when the customer wants to add product the cost of the product will be shown and the total amount of bill will display on the LCD, when the customer wants to remove the product from the Cart, you need to take product out from the Cart, the amount of that product by scanning it again and gets deducted from total amount. After customer finished shopping, the customer will press send button on the hardware device and the bill will be generated in the database which could be taken by providing the Cart ID trolley number. The main purpose of this system is to make it effectively adaptable for helping the customers, time will be saved at the billing counters avoiding the long waiting queues.

Literature Review:

(1) Smart Shopping System Using RFID:

International Engineering Research Journal (IERJ) Volume 2 Issue 3 Page 1418-1421, 2016, ISSN 2395-1621.

(2) SMART SHOPPING TROLLEY USING Smart Phone and Arduino:

Reference: Bedi HS, Goyal N, Kumar S, Gupta A (2017) Smart Trolley using Smart Phone and Arduino. J Electr Electron Syst 6: 223. doi: 10.4172/23320796.1000223.

(3) RFID Based Smart Trolley for Automatic Billing System:

International Research Journal of Engineering and Technology (IRJET)e-ISSN: 2395-0056 Volume: 04 Issue: 07 | July -2017, www.irjet.net, p-ISSN: 2395-0072.

(4) Design and Implementation of a Smart Shopping Cart by RFID Technology:

Smart shopping trolley application creates an automated central billing system in malls. By using the ZigBee.

(5) LIFI BASED AUTOMATED SMART TROLLEY USING RFID:

International Journal of Scientific & Engineering Research, Volume 7, Issue 3, March-2016,1026 ISSN 2229-5518

PROJECT DESCRIPTION:

Hardware Specification:

based on the ATmega328 microchip. Compatible Board. A microcontroller board

RFID Reader: A radio frequency identification **reader** (**RFID reader**) is a device used to read information from an RFID tags associated with object, which is used to read tags no# on objects. RFID reader is like transceiver and receiver with the use of radio frequency signals.

RFID Tags: Tags are important part of RFID system, because they store the information of the object being tracked. Object information, which has UID is stored in the memory of tags and is accessed via the radio signal of RFID readers. There are different types of Tags.

- Active
- Semi-passive
- Passive

Passive RFID Tags have no internal power supply since we are using passive tags. Passive tags signal by backscattering method from reader. Passive tags have practical read distances ranging from about 11 cm up to 10 meters.

Passive Tags (Ranges):
•LF: 125 kHz – 134.2 kHz: low frequencies,
•HF: 13.56 MHz: high frequencies,
•UHF: 860 MHz – 960 MHz: ultra-high frequencies,
•SHF: 2.45 GHz: super high frequencies

Frequency Ranges	**LF 125 KHz**	**HF 13.56 MHz**	**UHF 868-915 MHz**	**Microwave 2.45 GHz & 5.8 GHz**
Read Range (Passive Tags)	Shortest 1”-12”	Short 2”-24”	Medium 1’-10’	Longest 1’-15’
Data Rate	Slower	Moderate	Fast	Faster
Ability to read near metal or wet surfaces	Better	Moderate	Poor	Worse

Advantages of Passive Tags:
- Size is Optimized
- Lesser Cost
- More Flexibility
- Ability of Reading from Longer Range
- Lifelong capability.

Software requirements:

Programming Languages:
i. Embedded C
ii. C#

Platforms:

- Visual studio 2015(software)
- MySQL Server(database)

Functional Requirements;

System features;

- Every product in the mart will have an RFID tag on it.
- There will be a Centralized Server System and Database which holds the information of the products.
- The product RFID tags should be scanned and added to the bill.
- Cart will have an RFID reader with Arduino and ESP-8266 communication.
- When a customer wants to remove any product from the trolley, then that product needs to be scanned again, displays of items bill on the LCD and centralized database will be updated.
- Display Product price and total Bill amount.
- After the payment of money, the Cart will be reset with the button given in hardware. .
- The customer Cart ID will be verified and the product will be count before paying the bill.
- The customer will get the printed form of bill to pay and then items will be packed and customer can leave.

Non-Functional requirements:

System: Easy/Difficult for the Customers:

This implementation is used to assist a person while shopping and also to avoid standing in long queues and saving time

- Ease of use for customer: since we are using RFID reader and other components it will be new to the customer so it would be difficult for the customer to understand and use for the first time but once they have used it, they will know how to use and will make it easier when they constantly used it.
- The other factor that can affect project is the average time that what time from a customer entering a mart till the customer get bill on the cash counter without any difficulty or error in between.
- The customer can enter many products and remove any at time, since its centralized billing going on the Billing unit the workload of cash counter has been altered and can save 1 person pay and use it for increasing efficiency of product.
- First time customer used the project, some person has ease to understand and some have difficulty but for first time they will be showed how to use it and complete the task of what project is made for.
- As the multiple user will access the system at same time therefore the software need to be efficient and reliable.
- The accuracy of the project is calculated by the accuracy of calculating the bill of the customer.
- Security requirements should be fulfilled by only the data administrator has the rights to access the database with and ID and password.
- The automatic cart we are making which can add/remove product and update at the same time in database and calculating the total bill of all the customers separately that uses our project in the mart. Performance is that quality that shows you how responsiveness is the system and database updated at equal time and bill is generated in CBU, user interactions

with product decides the performance of product. Poor performance leads to negative user experience. The system security can fail when it gets overloaded.

System Availability:

- Availability of the product is defined that all the hardware components are available that being used in system the RFID reader, RFID tags, Arduino kit, ESP8266 etc.
- Availability of the services that the RFID reader read the tags and added in the cart which also being edit in database and bill will generate at the CBU and given to the customer, ensures that will work properly.
- Availability of the database and hardware app and CBU work together at the same time.

System Scalability:

- It's being defined that the technology can grow with positive performance and since its increasing in last few years, we can make hardware compatible and software that can take load and database does not fail. The automatic cart we are making which can add/remove product and update at the same time in database and calculating the total bill of all the customers separately that uses our project in the mart.
- The memory size of the system memory can be expanded. Algorithm can be used for the system for giving recommendation for the customers of the products, but we are not using algorithms.

Current State of the Art:
Research & Articles and Projects:

1. Smart Shopping Trolley Using RFID (International Engineering Research Journal (IERJ) Volume 2 Issue 3 Page 1418-1421, 2016, ISSN 2395-1621).

2. SMART SHOPPING TROLLEY USING RFID (International Journal of Pure and Applied Mathematics Volume 118 No. 20 2018, 3783-3786).

3. A Review on Automatic Billing Trolley (International Journal of Research in Advent Technology (IJRAT) (E-ISSN: 2321-9637) Special Issue National Conference "CONVERGENCE 2017", 09th April 2017).

4. RFID Based Smart Trolley for Automatic Billing System (Volume 7 Issue No.6, ISSN XXXX XXXX © 2017 IJESC).

5. Design and Implementation of a Smart Shopping Cart by RFID Technology (by Nemalidinne Sai Megana A thesis submitted in partial fulfillment of the requirements for the degree of Master of Engineering in Microelectronics and Embedded Systems).

6. RFID BASED SMART TROLLEY FOR SUPERMARKET AUTOMATION (International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 07 | July 2017 www.irjet.net p-ISSN: 2395-0072).

7. A SMART TROLLEY WITH RFID IMPLEMENTATION: A SURVEY AMONG CUSTOMERS (VOL. 12, NO. 4,

FEBRUARY 2017 ISSN 1819-6608, ARPN Journal of Engineering and Applied Sciences ©2006-2017 Asian Research Publishing Network (ARPN). All rights reserved. www.arpnjournals.com) .

8. Developing a Multitasking Shopping Trolley Based on RFID Technology (International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-6, January 2014).
9. Smart Shopping Trolley using RFID (Volume 8 Issue No.3, ISSN XXXX XXXX © 2018 IJESC).
10. SMART SHOPPING TROLLEY FOR SUPERMARKETS USING RECHARGEABLE SMART CARD (International Journal of Scientific & Engineering Research Volume 8, Issue 7, July-2017 ISSN 2229-5518)
11. SMART SHOPPING TROLLEY USING RFID (International Journal of Pure and Applied Mathematics Volume 118 No. 20 2018, 3783-3786 ISSN: 1314-3395 (on-line version) URL: http://www.ijpam.eu).

Challenges:

There are and will be challenges after implementation of RFID regarding Radio frequencies to take permission from the local regulations, and problem identified in the similar projects and research paper are many like developing the software is easy but maintaining it is still a challenge in the real world.

The 2nd Challenge is the product is not the same in super marts it changes and when it will be changed the RFID tags will also be changed and maintaining the Data changes in database regularly is challenging.

The 3rd Challenge is that the RFID tags is difficult to identify near metal and wet surfaces the therefore research is going on this we need a better technology then RFID to work on it.

The 4th Challenge is that we could not assign RFID tags to vegetable and metals to overcome this we have come up with a solution that metals things are not available in open so therefore we are assigning tags to metal items with boxes according to their size.

The 5th Challenge how can the items in carts and items in bill be verified the counter person will verify cart ID and count the number of product and then print the bill after verifying.

The 6th Challenge is vegetables in the market are the fresh item which are openly put we could not assign tags to it but we can fix the price to quantity and then assigned RFID tags to it or not.

other challenges found in the similar project that is being made is that the product security is compromised since every product has RFID tags and it could be read when in range of the reader if someone try to stole the item and left the store nothing could be done but to overcome this problem we are installing and RFID reader at the end of the end of counter if someone tries to go without paying the alarm will start with sound.

2.2 Outcomes and Benefits

Expected Outcomes:

The system is becoming smarter, the requirement of manpower will decrease, and therefore it's benefiting the customers, which further adds to the cost efficiency. The time efficiency will increase since this system will eliminate the long waiting queues. More customers can be served in same time thus benefiting the retailers and customers as well, the customer can pay the bill and leave with a smile.

Key Benefits and Beneficiaries:

The proposed model is easy to use, for the first time because to add scan the product and to remove again scan the product and when done shopping press the send button on hardware to end bill to the database. As the whole system is becoming smart, the printed bill will generate at the cash counter, the time efficiency will increase, more customers can be served in same time thus benefiting the retailers and customers as well.

Technology Transfer/Diffusion Approach:

RFID technology used in the smart cart is use full because it saves time and increase performance as compare to the barcode system.

	RFID (proposed)	**Barcode(existing)**
Read Rate	It can read Multiple tags. it has fast data throughput	Tags can only read one at a time. It has low data throughput.
Line of Sight	Line of sight not required	Line of sight not required
Read/Write Capability	Ability to read, write, modify, And update.	Ability to read items and Nothing else.
Durable	Highly durable and better protected.	Less durable. Easily damaged, cannot be read if dirty or greasy.
Security	Difficult to change the data which can be encrypted	Easier to change the data and which is changeable. .
Event Triggering	Can be used to trigger certain events (e.g.: alarms etc.)	Not capable can't be used for events triggering.

Objectives:

This proposed system works on improving customer satisfaction as on customer enter in the super-mart first customers take a cart which has a Cart ID number, Cart have hardware application with a RFID reader with Arduino and LCD. Customer wants to add products in the Cart by scanning tags of the product that will be read by the reader. If the Tags matches with the product ID, then the cost of that product will be displayed on the LCD in the Cart. If the customer wants to remove product from the cart, the customer can take away that product from Cart and scanned again and cost of that product will be reduced from the total amount, and after shopping the products data with total amount gets transferred to the CBU through ESP-8266. The database at the central billing system will be updated when add/remove from the cart. And at the end the customer sends the data by pressing send button on hardware, which generate the bill associated with trolley Cart ID. The cashier will verify Cart ID and customer will pay the bill without hectic of queues.

- **Research Objectives:**

-No

- **Academic Objectives:**

-Final Year Project (Automatic shopping cart)

- **Commercial Objectives:**

-No

- **Other Objectives:**

-No

2.1 Risk Analysis

Risk	***Likelihood (Low, Med, High)***	***Impact***	***Mitigation***
• Easy to Hardware to be broken.	High	The impact will be system will not work	Installing hardware in Cart where any external factor can affect it.
• Difficult to manage the data in big supermarkets	High	The changes in data is being constantly managed	Only the data admin has the authority to Change the data.
• RFID tags in water and metals are difficult to identify	High	This will impact on the product related to water and metals.	To use RFID tags on wet surface like oil research is still going on but for metals items we can give tags to the boxes of screw according to sizes.
• Difficult to assign the RFID tag to a couple of items like coconut,	Medium	This will have impact but less on fruits and vegetables assigning tags to them.	We will assign RFID tags according to their weight's

Team Structure:

Title/Position **(of each member)**	**Role/Key** **Responsibilities**	**Minimum** **Qualification Required**	**Expertise /** **Background Required**	**Minimum Experience Required (years)**
Ahmed Ali Raza	Database/Hardware / Documentation	BS(CS)		
Bilal Ahmed	Desktop App/Hardware/ Documentation	BS(CS)	Pakistan Oxygen Ltd Karachi shipyard	1 year
Hamza Arif	Desktop App/Hardware/ Documentation	BS(CS)		

Remarks:

1. *Name & Signature of Supervisor:*

MISS RIDAH FATIMA

Name & Signatures of FYP Coordinator:

DR AARIJ MAHMOOD HASSAAN

Annexure–B: Proposed Budget: *The budget that we came up with is buy surveying the market and collecting the items amount from different shops and calculated the amount that needed for the hardware and it does only hold the hardware part prices, not the whole project budget which includes all other things costs.*

SR.	Description			
	Heads of Expenditure		Amount (Rs)	Qty
1	Arduino KIT	800---(1)		
2	RFID Reader	4000----(2)		
3	ESP8266	500-----(1)		
4	12V Battery:	800-----(1)		
5	Wires:	300-----(1)		
6	Trolley	3000------(1)		
7	RFID Tags	3000 to 6000		
8	Display (LCD)	600------ (1)		
	Total Budget	13,000		

Bibliography:

(Resources)

- Smart Shopping Trolley Using RFID (International Engineering Research Journal (IERJ) Volume 2 Issue 3 Page 1418-1421, 2016, ISSN 2395-1621).
- SMART SHOPPING TROLLEY USING RFID (International Journal of Pure and Applied Mathematics Volume 118 No. 20 2018, 3783-3786).
- A Review on Automatic Billing Trolley (International Journal of Research in Advent Technology (IJRAT) (E-ISSN: 2321-9637) Special Issue National Conference "CONVERGENCE 2017", 09th April 2017).
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- Design and Implementation of a Smart Shopping Cart by RFID Technology (by Nemalidinne Sai Megana A thesis submitted in partial fulfillment of the requirements for the degree of Master of Engineering in Microelectronics and Embedded Systems).
- RFID BASED SMART TROLLEY FOR SUPERMARKET AUTOMATION (International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 07 | July 2017 www.irjet.net p-ISSN: 2395-0072).
- A SMART TROLLEY WITH RFID IMPLEMENTATION: A SURVEY AMONG CUSTOMERS (VOL. 12, NO. 4, FEBRUARY 2017 ISSN 1819-6608 , ARPN Journal of Engineering and Applied Sciences ©2006-2017 Asian Research Publishing Network (ARPN). All rights reserved. www.arpnjournals.com) .
- LIFI BASED AUTOMATED SMART TROLLEY USING RFID (International Journal of Scientific & Engineering Research, Volume 7, Issue 3, March-2016 , 1026 ISSN 2229-5518 IJSER © 2016 http://www.ijser.org).
- Developing a Multitasking Shopping Trolley Based on RFID Technology (International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-6, January 2014).
- Smart Shopping Trolley using RFID (Volume 8 Issue No.3, ISSN XXXX XXXX © 2018 IJESC).
- SMART SHOPPING TROLLEY FOR SUPERMARKETS USING RECHARGEABLE SMART CARD (International Journal of Scientific & Engineering Research Volume 8, Issue 7, July-2017 ISSN 2229-5518)
- SMART SHOPPING TROLLEY USING RFID (International Journal of Pure and Applied Mathematics Volume 118 No. 20 2018, 3783-3786 ISSN: 1314-3395 (on-line version) URL: http://www.ijpam.eu).