A Review of Smart Shopping Systems

Sagar Sojitra[1], Asst. Prof. *Rahul* G. Patel[2]

[1]PG Scholar, EC Dept., SPCE, Visnagar, Gujarat, India.
[2]Assistant Professor, EC Dept., SPCE, Visnagar, Gujarat, India.

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Abstract - *This paper reviews different proposed techniques to overcome the long queues at billing counter. The limitations of the reviewed options are also presented. In current retail shopping systems one witness's long queues at the counter primarily due to limited barcode scanners for production identification and billing system. This causes inconvenience to the customers as well as can be regarded as a waste of time. Furthermore, the barcode system is getting outdated due to memory constraints. Design of a novel shopping cart and system is required.*

***Key Words*: IoT, Shopping, Cart, RFID, NFC**

1. INTRODUCTION

Presently, most of the retail supermarkets use product identification based on barcode scanning. The major disadvantages associated with this technology are

• Inconvenience in managing good shelves

• Replenishment earlier than time

• Inadequacy in quickly reviewing product information

• One by one product barcode scans resulting in more analysis time

• Long queues at the counter for bill payment

The idea is to decoding the QR codes, thereby launching a URL in the web browser. This is because in today's retail environment, products come with label tags for unique identification and theft protection. Novelty underlies in the idea of linking retail item identifiers to network application. This also helps in exposing the customers to rather detailed information regarding the product to be purchased. This in turn gives rise to in-store marketing and access to information. The impact of IoT comes in the case of mobile payment where by enabling NFC, one may get access to systems and virtual wallets. From a retailer's point of view this increases the convenience and simplicity, these kinds of transactions are beneficial in providing opportunities for personal interaction with the customers.

2. Paper Reviewed

2.1 Irene Cappiello Stefano Puglia Andrea Vitaletti [1] authors have presented a ubiquitous touch based remote grocery shopping process. This fits well with the advantages and characteristics of RFID as well as NFC. Design and implementation of prototype system software is proposed to test the process of customer's touch based approach. Evaluation of the process has been carried out in an initial study on a group of 5 customers, comprising of trained as well as non-trained computer users. The shopping was carried out with an NFC equipped mobile phone for various RFID tagged items. Average completion of time was estimated to be 40 seconds while the error rate was calculated to be quite low. Qualitative study disclosed that the percentage of users that considered the web-based approach to be more convenient was much higher than the other ones.

The approach undertaken by the author was quite successful but following limitations has to be considered:

- Limitation 1: This research paper is mainly focused on comparison between web based shop-ping experience and in-house shopping experience

- Limitation 2: There is no any hardware model proposed in this paper, which can be in application.

Based on the study in this paper, a working prototype needs to be designed. The benefits and percent-age acceptance rates of the technology have already been estimated to be far beyond the acceptance level. Hence, the next step will be practical implantation of the concept in working reality.

2.2 Pascal Urien Selwyn Piramuthu [2] in the present paper, authors have considered the identification and communication technologies as well as their advances. RFID (Radio Frequency Identification), smart phones, real- time response, and automated checkout systems have been considered in devising an NFC equipped

smart phone. LLCPS protocol has been used as an envelope in order to establish communication between the Smartphone and the NFC reader, A suite of authentication protocols i.e. SISO has been developed for secure processing of payment in a retail store.

- This paper provide better light on secure transaction between two devices, w h i c h uses NFC for secure transaction.

- LLCPS provide better security to authenticate transaction between to device which uses P2P protocol for communication.

2.3 Dylan Hicks et. Al [3], in this paper, the authors have presented a feasibility study for incorporating smartness, in products or items found in retail stores. Internet of Things (IoT) technology will prove helpful for this by enabling these items to automatically register and update their location information in a retrieval system. This will allow the customers to search, map and locate the products on the store floor using their mobile phones. A freely accessible Android-based mobile app named 'SmartArt' has been developed to demonstrate the promise of this preliminary work.

- Limitation 1: This paper provides brief view on how we can create map dictionary of product placed in the store. But does not provide any access to object or billing.

- Limitation 2: There is no any solution provided on how to read product localization using RFID.

The research carried out in this paper will be helpful in developing a better application by adding personalized searching options feature to the proposed design.

2.4 Mr. P. Chandrasekar Ms.T. Sangeetha [4] main aim of the authors in this paper was to devise a system with automatic billing. This avoids the long queues in supermarkets and shopping malls. The use of Radio has been proposed in this work. This paper proposes a centralized, feasible and automated system for billing using RFID and ZigBee communication. This requires assigning an RFID tag to each and every product of super markets. This will enable its unique identification. Each shopping cart containing components like microcontroller, an RFID reader, EEPROM, LCD and ZigBee module, is designed with a Product Identification Device (PID). RFID reader enables reading product information associated with the product being purchased. Meanwhile, EEPROM stores the product

information attached to it and the data is sent to Central System for billing via ZigBee module. Central system gets access to information like the cart and EEPROM data, thereby allowing easy calculation of payment amount.

The following points were noted in this research paper:

- Limitation 1: In this paper I found out that microcontroller they are using does not support I2c protocol

- Limitation 2: Authors didn't specify that how they will access their database to read and write data.

Apart from this, the system can be modified as per requirement to develop a complete working proto-type.

2.5 Dashmir Istrefi, Betim Cico [5] present paper examined the idea of implementing additional security layer that will enable protecting NFC transactions. Also, idea for improving customer's online shopping experience has been proposed. The proposed solution will help to reduce the supply and demand side barriers, which provides an added value, compared to the existing payment system. Customers would not replace the existing methods of making payments to any retail shop unless a quicker and more beneficial way is provided. That was the purpose of the paper to add value added services on top of the existing shopping experience with a model that merchants and customers would be interested in participating. Recent announcements and speculation regarding the increasing incorporation of near-field communications (NFC) support in mobile phones suggests there will be more mechanisms and modes for making connections between the physical and digital worlds. As future work for the topic is planned to develop ticketing and couponing services as a value added service for special events and improvement of the Personal Assistant application.

- Limitation: This system is applicable only for smart phone users. It does not incorporate any provision for NFC reader on the shopping cart, which serves as a better alternative.

2.6 Rong Chen, Li Peng, Yi Qin [6] in the present research paper, the authors have undertaken the issue f product identification in shopping malls and supermarket. It has been accomplished by using electronic tags along with wire-less communication

and Internet of Things. The proposed system has been designed keeping the consumer's convenience in mind. A combination of RFID and ZigBee technology has been presented successfully. The system is targeted at reducing the queuing up and wastage of time in supermarkets as a result of product searching and bill payment. Thus using the above-mentioned technologies, an automated list will be generated as per the shopping requirements of the consumer by automatically updating the true product information. Thus, the design of Internet of things Supermarket Shopping guide system has been proposed. The benefits like facilitating people's shopping experience, time management, greater efficiency will be derived on completion and evaluation of this research paper. Also, this design will make the supermarket 'smarter' thereby promoting business sales.

• Limitation: Expense for electronic tags, formulation of regulations for IoT applications, security constraints.

3. CONCLUSIONS

After reviewing the solutions proposed by different researchers. We conclude of a design with NFC tags and reader against existing printed barcode and barcode scanner for reducing long stalls of billing counter and making purchase experience satisfactory. Moreover trolley equipped with NFC reader display is suggested to maintain running total. In addition to this, use of IoT to connect all trolleys with the central server and providing provision of online payment would add more positivity to shopping experience suggested.

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BIOGRAPHIES

Sagar Sojitra1 M.E. research scholar Department of ECE, Sankalchand Patel College of Engineering, Visnagar, Gujarat, India. 2 years of working experience in Embedded Systems

Rahul G. Patel2 is working as an Asst. Prof in P G Department of ECE, Sankalchand Patel College of Engineering, Visnagar, Gujarat, India. He has 9 years of teaching experience and he has published many research papers in international and national journals.