

# Integrated Paperless Receipts for Shoppers

*Fatma Jaffer Mwendu, Bernard Shibwabo Kasamani*  
Strathmore University, Nairobi, Kenya  
[fatma.z.jaffer@gmail.com](mailto:fatma.z.jaffer@gmail.com) [bshibwabo@strathmore.edu](mailto:bshibwabo@strathmore.edu)

DOI: 10.20470/jsi.v9i3.337

**Abstract:** *There are millions of purchases made by shoppers all over the world today and the only way to prove that they indeed bought the goods has over the years often been through a receipt that they are given upon payment. A large fraction of these receipts are printed on paper for customers/shoppers. Generating all these bulky sets of receipts is an expensive process to businesses, individual customers and the environment which therefore results in the need for a way of storing these receipts in an integrated fashion. Paper-based receipts are also easily lost, damaged and are cumbersome. Having the process of issuing the receipts in a paperless form can address this problem. This has been achieved in this paper by developing an integrated system that provides a means for the customer to get the receipt and storing it straight away through a customer account; which businesses can use to send a receipt instead of printing it. The methodology that was used is Prototyping.*

**Keywords:** Paperless receipts, integrated receipts, Payment confirmation, shopping experience, budgeting, shopping history

## 1. Introduction

A receipt is a written acknowledgment that a specified article or payment has been received. It records the sale of goods or provision of a service. If the recipient of the payment is required to collect a tax from the customer, the amount collected would also be included on the receipt and the amount would be deemed to have been collected on behalf of the relevant government tax authority. In many countries a retailer is required to include the tax and similar amounts in the price of goods sold. Similarly, amounts may be deducted from amounts payable (Webstar, 2011).

On the other hand, tips or other gratuities given by a customer, for example in a restaurant, would not form part of the payment amount. In some countries, it is obligatory for a business to provide a receipt to a customer confirming the details of a transaction. In most cases the recipient of money provides the receipt, but in some cases the receipt is generated by the payer, as in the case of goods returned to a store for a refund (Slohan, 2005). A receipt is not the same as an invoice, which is a commercial document issued by a seller to a buyer, relating to a sale transaction and indicating the products, quantities, and agreed prices for products or services the seller had provided the buyer (Webstar, 2011).

There is usually no set form for a receipt, such as a requirement that it be machine generated. Many point-of-sale terminals or cash registers automatically produce receipts. Receipts may also be generated by accounting systems, be stamped by cashiers or generated electronically, for example if there is not a face-to-face transaction. To reduce the cost of postage and processing, many businesses do not mail receipts to customers, unless specifically requested or required by law.

The custom in most stores at the point of sale is for a salesperson to scan or in some way record the price of a customer's proposed purchases, including tax, discounts and other adjustments. In traditional situations and still in some family businesses today, the salesperson would then show the customer the summary, the invoice, for their agreement; but most stores today bypass this stage. The practice of presenting an invoice is most common in restaurants where a "bill" is presented after a meal. The salesperson would indicate to the customer the total amount payable, and the customer would indicate the proposed method of payment of the amount. After processing the payment, the salesperson would then generate in the one document an invoice and receipt (Godelnik, 2012).

If payment was made by a payment card, a payment record would also be generated. These are the printed records of the transaction, and are legal documents. A copy of these records would be handed

to the customer. The document may also include messages from the retailer, warranty or return details, special offers, advertisements or coupons, but these are merely promotional and not part of the formal receipt. Receipts may also be provided for non-retail operations such as banking transactions (Godelnik, 2012).

Hand-written or hand-completed receipts are more often used for infrequent or irregular transactions, or for transactions conducted in the absence of a terminal, cash register or point of sale: for example, as provided by a landlord to a tenant to record the receipt of rent (Bergstrom, 2011).

It is natural for many shoppers to be fond of keeping or hoarding their receipts from the many transactions that they make daily. Some people keep them to use while accounting for money spent, others in case they will need to reverse a transaction but most receipts are kept out of habit. Receipt tracking can be time consuming and very tedious especially since most receipts are small and can easily get lost.

People keep these receipts because of the important information that they contain, like proof of purchase for warranties receipts, proof of major expenses, merchandise returns or exchanges, expense reimbursements budgeting and reconciling, tax deductions. Other than these reasons, one does not generally need to keep receipts, so they should liberate themselves from letting them pile up (Bergstrom, 2011).

Developing digital receipts systems has been tried in some parts of the world to simplify the storing and managing of receipts for later use. The system enables more than just receipt storage for people, it enables other financial uses that are of importance to both the business and the customer. Paper receipts are also terrible for the environment, with research showing over 1.2 billion gallons of water being used to produce paper receipts (Bergstrom, 2011).

The problem that this paper addresses is that there is no proper storage of receipts to ensure that they can be retrieved, analysed or viewed by businesses and shoppers. Producing the receipt printout for each transaction is costly for a business while keeping them only to find them faded, damaged or lost and therefore of no help is unfortunate to customers. Many people have the problem of looking for warranties months after they purchased their products and now have a problem with it, but cannot trace the receipt to use it to complain. Retailers also encounter the same problem especially if the customer did not pay with via any electronic means as it becomes a problem to replace the product if the transaction was not recorded or if the receipt cannot be produced. Additionally, paper-based receipts affect our environment during manufacture with over 1.2 billion gallons of water being used and also during disposal, most are thrown carelessly on sidewalks or are thrown in bulk later, piling up on trash bins (Godelnik, 2012).

## **2. Literature Review**

### **2.1 Various Modern Ways of Issuing Receipts around the World**

#### **2.1.1 Cash memo**

The most common way of receipt is a cash memo, made in hand and authorized by the owner. The items purchased are written down in different name, price and date columns by a sales person and handed to the customer as proof of purchase. It is very common in small business or businesses that payments can be made in a bit of a hurry, like taxi drivers, food trucks, and magazine or newspaper vendors. In Kenya, they are still in use commonly in small businesses like canteens, public transport for long distances and exhibitions. Through the advancements in technology and its inefficiency in large businesses, the new way followed is Printed receipt (Goel, 2013).

#### **2.1.2 Printed Receipt**

Printed receipts are mainly generated by a receipt- generating cash register and are printed on thermal rolls. These are special fine paper that is coated with a chemical that changes colour when exposed to heat. They are used in thermal printers, cash registers, credit card printers, adding machines, ATM machines etc. For cash registers that use thermal Paper (some use normal paper rolls), the total paper usage for the receipt purpose is at high cost to the environment (Goel, 2013). Many businesses are starting to move away from Cash memos and using printed receipts because they are easy to use and understand by customers.

### **2.1.3 Bluetooth**

The bluetooth is found in any smartphone or any normal mobile phone. The goods or service bill generated are generated in the form of mobile phone compatible image. The cash registers in the new modern world with increasing number of functionalities can easily be provided with bluetooth on it. The customer giving the order is normally carrying a mobile phone that includes the bluetooth functionality available in it. Upon billing the customer shall just provide his bluetooth device's mobile name so that the bill's image could be sent to the customer's device. This method is very easy and convenient, it provides the customer with the lasting format of receipt and doesn't involve much of cost as it would only require a bluetooth functionality to be added to the cash registers and a program to make image of any receipt that's all. The limitation is that the picture of the receipt is stored in the mobile phone's memory so any damage to the phone means loss of the receipt as well. Moreover not many stores in Kenya have cash registers with the Bluetooth enabled technology (Goel, 2013).

### **2.1.4 SMS**

Another method that is being used around the world to send receipts to customers is through SMS/MMS (Short Message Service, Multi-media Service). Almost all mobile models support the images which are usually in the form of jpg, gif, png etc. If the customer agrees to use the SMS/MMS option, he/she shall provide the mobile phone number on which he is to get the receipt, the image is then sent to the customer as a message. This method reduces costs on printing paper however in most mobile phones MMS service is blocked by default. There will be need to either ask the customer to start his MMS service on the phone which can turn out to be a time consuming process or choose other options of getting the receipt (Goel, 2013).

### **2.1.5 Email**

The customer can also be provided with the option of receiving the receipt on his/her E-mail. The option of E-mail is very much viable and is used by the online payment systems and online service providers. In today's world full of internet six people out of ten people in cities have at least an e-mail account. So if the customer feels comfortable with the option he/she shall receive their receipt through e-mail. This option only needs an E-mail server to be set up for the store/business so as to send auto generated e-mails. This option could be set a compulsory option and will benefit both business and customer as email is safely kept on the internet as long as the account's owner wishes to keep it. So the receipt will be very safely kept and at very minimum cost. The issue with this method is that, such emails that will be very frequent containing receipt information can be classified as spam in some email providers and therefore the customer will never get to see them even if the email was actually received (Goel, 2013).

### **2.1.6 Cloud**

The fast growing use of the cloud in the world has led to shift to various services to be on cloud, and also smartphone users, more advanced computer users have also started using the cloud services to a great extent. Due to advancement in cloud technology, the cloud would be the next level of development and most of the services shall be provided and used on cloud. Taking into consideration this widespread use of the cloud and ever increasing need and use of it, some stores, especially equipment and machinery stores in the USA found an easy way to provide the customers with the digital receipt of their products/services bought. The customer upon billing out of many options can choose the receipt via cloud option where he just needs to provide his username if the vendor and the customer share the same cloud provider, else the e-mail account through which the digital copy of the receipt shall be shared with that email-account provided. The cost involved in making this option working is that of the space on the cloud that could be feasible in the business as many business firms in the USA have already started use of the cloud on large scale. In Kenya, the usage of cloud is not that widespread and many businesses would not find it easy to use this method of issuing receipts because it would require training on how to use it for both their staff and the customers (Goel, 2013).

## **2.2 Alternative Points of View on Digital Receipts**

The last five years or so have seen an explosion of ideas surrounding the capture, management and storage of digital receipts. There has been a mad rush by start-ups trying to capitalise on the enthusiasm typically generated by the new and innovative concept (Johnson, 2009). Arguably, the

most common strategy for digital receipts at the moment is the email, and retailers have wasted no time taking advantage of consumers wanting to reduce their carbon footprints.

Obtaining a consumer's email address provides retailers with a channel to send additional marketing and promotional material. They need to tread carefully as they may foster a feeling of resentment from the consumer, the opposite of what they would like to achieve. In a financial technology event in San Francisco USA, in September 2014 that was meant to get audience for technology start-ups; investors were of the view that, for companies willing to invest in digital receipts, their strategy must add value while offering greater simplicity. It should be a frictionless experience for the consumer. If it is not more convenient than throwing a receipt in a drawer for storage then it will not be successful. Taking pictures of receipts, perhaps managing folders and backups of receipts on a smartphone or PC sounded like too much work for the average shopper (Johnson, 2014).

Currently, the start-ups that have invested in providing digital receipts platforms have developed mobile applications that enable customers to either take pictures of the receipts and upload them or have scanning technology (Johnson, 2014). A number of the mobile applications are however either proprietary, inappropriate or out of reach by the world at large. Examples include Receipts by Wave, which uses scanning of the receipts and uploads them to a cloud server that users can access them later from. Shoeboxed, which is a receipt mobile application that requires users to take pictures of the receipts using the camera in their smart phones (Nassir, 2015). The receipts are later sent to the users email address.

Having a platform where shoppers can simply login to view different receipts at the same place which are long lasting can solve the problems that come with the above means of issuing receipts. The key components that were needed to develop the system are a login form to enable users to sign into their account, a database to hold the users information and receipt information and a user interface for interaction with the system. The design is aimed at making the users experience as friendly as possible.

### **3. An Integrated Paperless Receipt**

In developing this information system, the methodology that was used is Prototyping. Prototyping reduces risk failure by integrating testing during the entire life cycle, as potential risks can be identified early and mitigation steps can be taken, also the time required to complete the project after getting the final model reduces since the developer has a better idea on how to approach the project. Prototyping helps to demonstrate the concept of the system to prospective investors because users can get proper clarity and feel of the functionality of the software and also suggest changes and modifications. It lets one take account of any changing requirements which despite the best efforts can be necessary in many projects. This iterative and incremental development ensures convergence on an accurate business solution (Goel, 2013).

#### **3.1 Functional Requirements**

Functional requirements may be calculations, technical details, data manipulation and processing and other specific functionality that define what a system is supposed to accomplish (Patterson, 2011). Behavioural requirements describing all the cases where the system uses the functional requirements are captured in use cases. Functional requirements drive the application architecture of a system. Functional requirements of this system include:

- a) Users shall login in first in order to access the system
- b) Businesses will be able to see customer information concerning their purchases
- c) Each user shall be uniquely identified by his or her user name.
- d) The system shall store receipts for both shoppers and business and present the information on the receipts when needed
- e) Users shall be able to view receipts according to date and where they made the transaction
- f) Users shall be able to see their total spending at one shop
- g) Users shall be able to access the system through-out.
- h) Users shall be able to log out after they finish using the system.

### 3.2 Use case Diagram

This system has two major types of users: a shopper and a cashier. The actions performed by regular users can also be performed by a staff member. The analysis tool used was the use case diagram to analyse how different actors interact with each other and with the system. Figure 1 presents the use case diagram that describes the use cases.

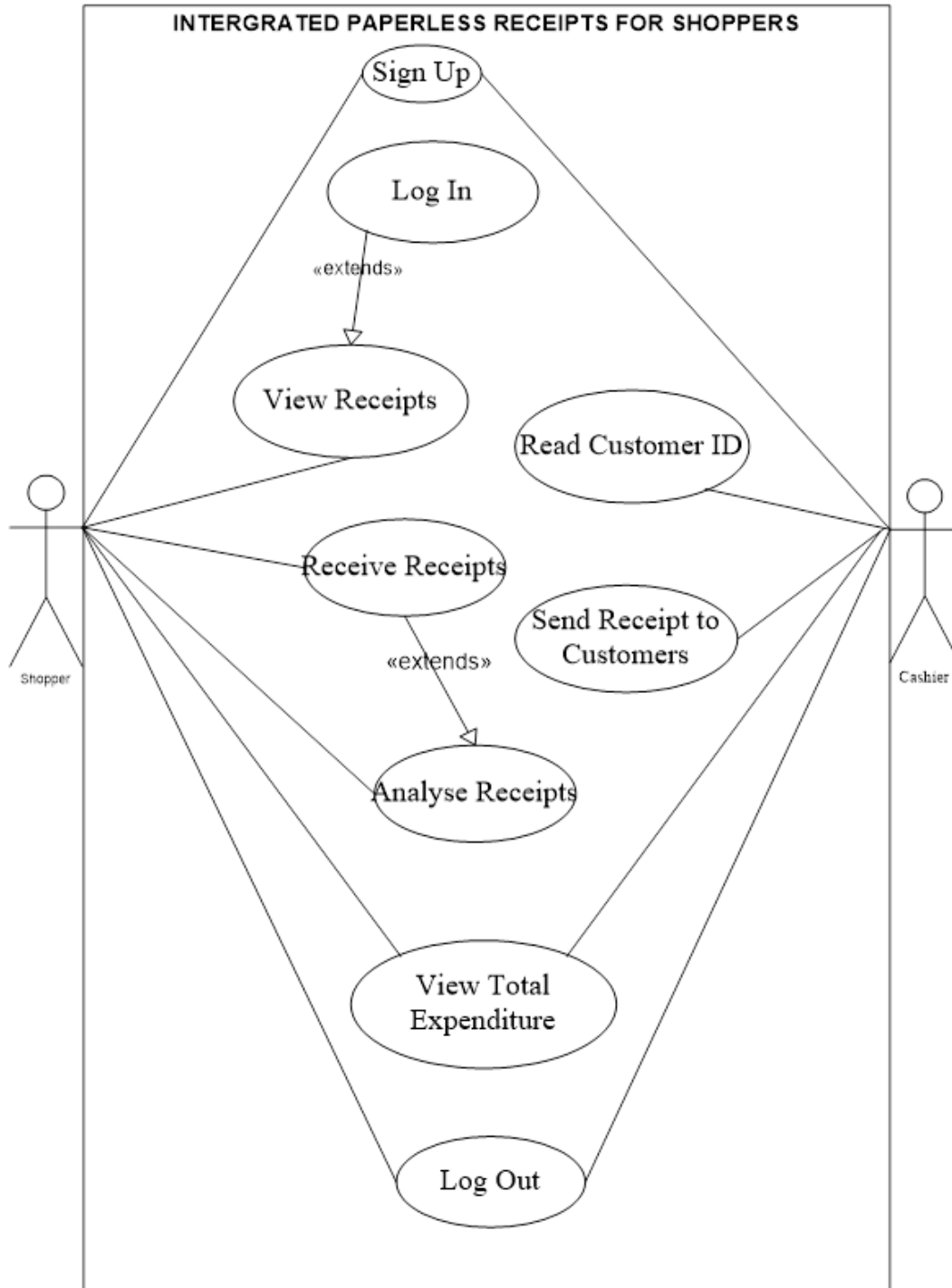


Figure 1: Use case diagram for the Integrated Paperless Receipt system

### 3.3 Class Diagram

Figure 2 shows the class diagram of the proposed solution.

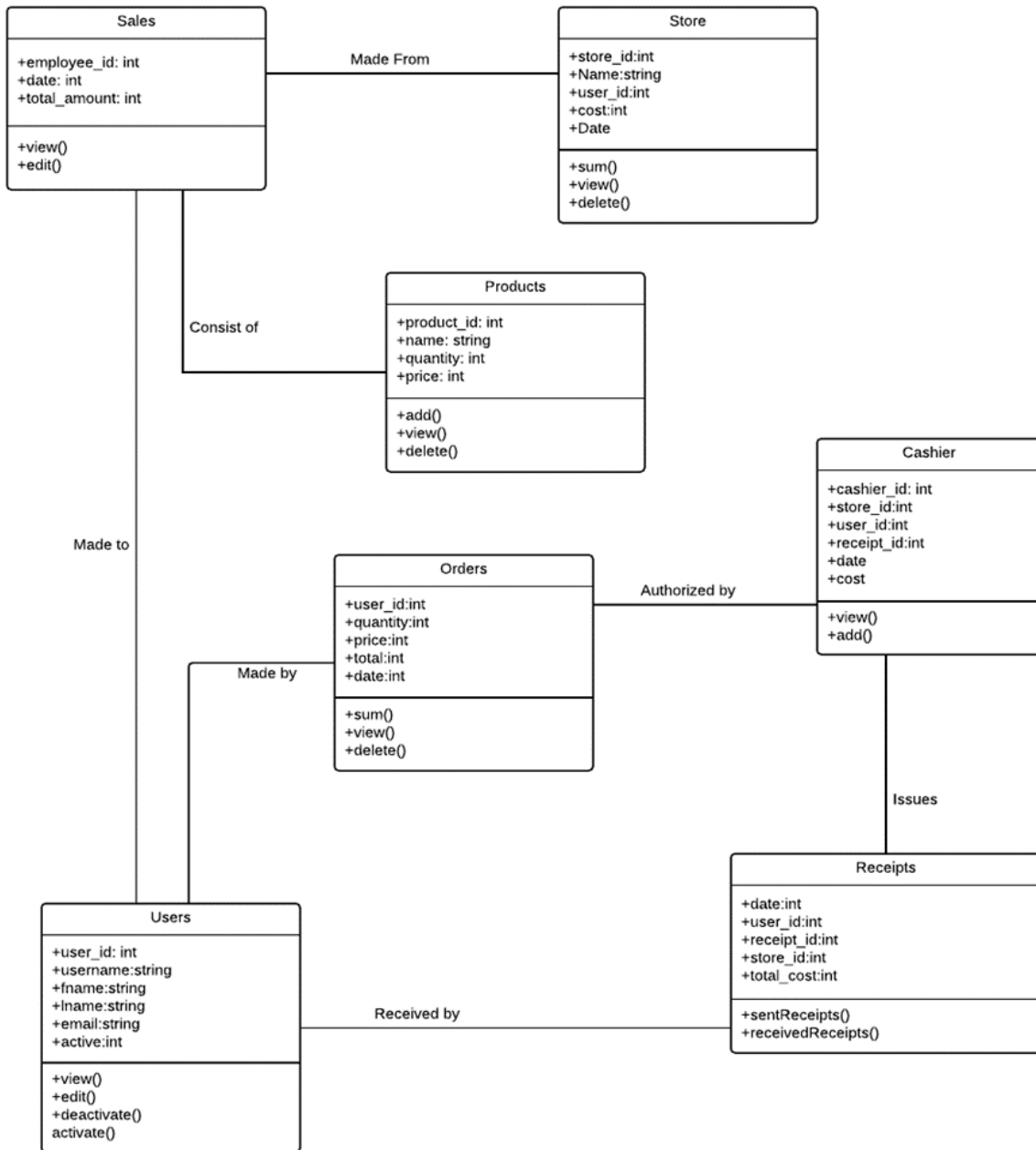


Figure 2: Class Diagram for the Integrated Paperless Receipt system

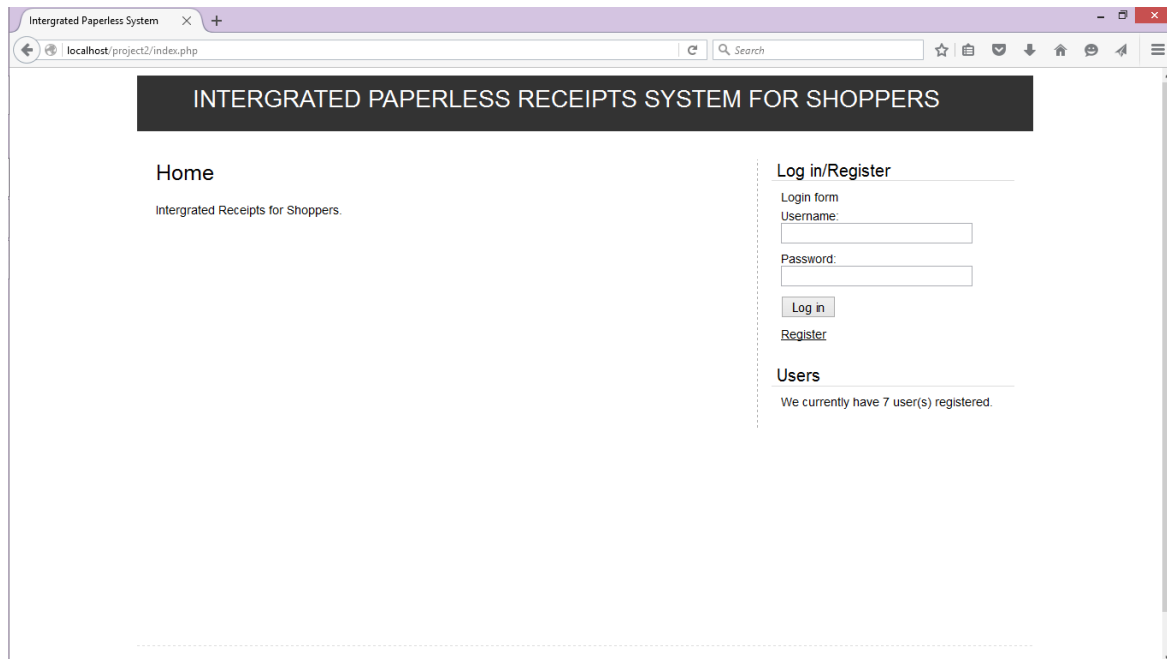
### 3.4 Implementation and Testing

After the system design discussed earlier, the designs were converted into the actual system. The text editor used to develop the proposed web based application is was Notepad++, this is a free source code editor that runs on the Microsoft Windows environment and was designed as a very lightweight application that loads quickly (Thatcher, 2012). It was used because the detection of modified files, syntax highlighting, search and replace features were enough to use during development. The back-end tools consisted of Apache, MySQL, PHP and JavaScript. MySQL as used since it is free, open source, light, easy to use and to customize (Shibwabo & Gikundi, 2017). The front-end section of the system, consist of the various profiles of individual customers and was developed using PHP and HTML languages.

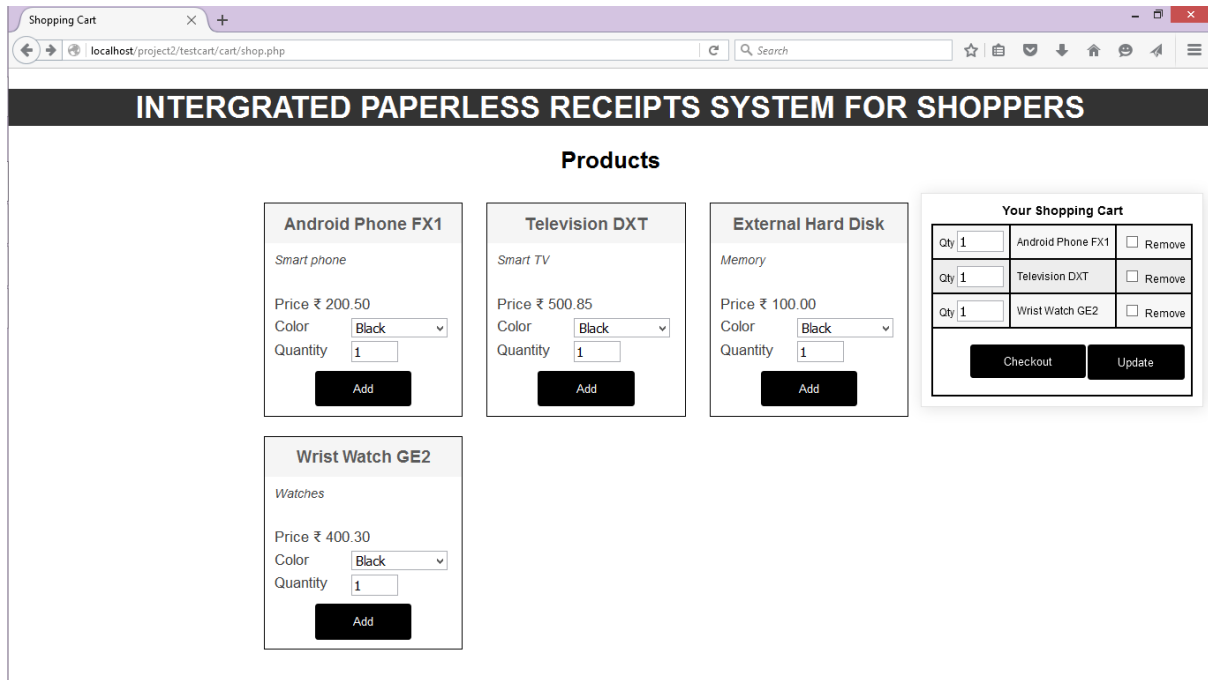
The following is the description of how the process works:

- a) A Shopper registers (in case they are not yet registered).
- b) When a shopper visits a store, the system at the store is expected to be preconfigured to send the customer data to a common cloud database that the proposed system provides. This is achieved through some level and way of integration that can be through an Application Programming Interface that has been developed as part of this solution.
- c) After the shopper is done shopping, the entries relating to the receipt of a shopper are posted to the cloud database. As expected, a local copy is retained at the store. Alternatively, a customer could scan the receipt and upload it on the cloud database. The option of scanning the receipt however is less of value to the environment due to the fact that the receipt has already been printed but may be desirable at some circumstances.
- d) The cloud database retains records of all posted transactions from various stores for the registered customers.
- e) The shopper may also purchase items from the integrated market store provided by the system. This is a value additional service to attract more businesses to the platform.
- f) A Shopper can Log in on the system and obtain the receipts on their profile.

Figure 3 presents the screenshot for the login page. Users have to register in order to log in to the system on this page. After the users have successfully registered and their accounts activated, the system updates the active user count to display the number of all active users.

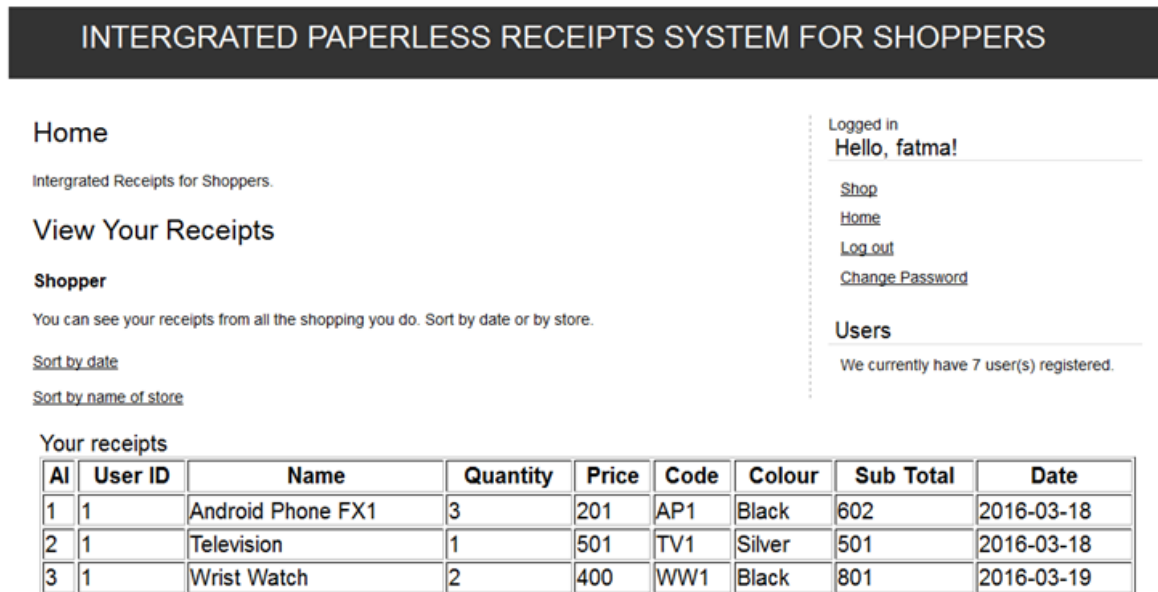


**Figure 3: Login Window**



**Figure 4: A Shopping Page as a Value Additional Service on the Proposed Solution**

The receipts of the items checked-out from various stores and saved are saved in the database and can be retrieved and displayed as shown in the screenshot on Figure 5. The table storing the receipts can be sorted according to the user or date of the purchases.



**Figure 5: A sample results page for Historical Records of Customer’s Receipts**

The web application was tested for compatibility with different browsers. Since the latest versions of php was used, the current Apache web servers could run the application. Shoppers often need to be certain that their shopping history remains confidential in order to use the system comfortably. This has been guaranteed through encryption of data prior to transmission to the cloud server and during storage. Additionally, hashing has been used for simple sensitive data in the database. The report generation feature of the system had to be tested on the authenticity of the receipt. The only receipt generated is the one sent directly by the cashier to avoid any interference from third parties.



## 4. Conclusion

The integrated paperless receipt system is a solution to many people who prefer to hold on to their receipts for the desired reason(s). It provides a convenient, reliable and effective way of storage and retrieval of receipts. This idea is being adapted in various forms around the world each with its own set of challenges. One of the main challenges to digital receipts is how retailers under no circumstances, wish to part with their data to a third party. While this is understandable for a number of reasons, many companies that have embraced digital receipts are offering to scan and organize the clutter of receipts for consumers and other companies offering to extract the data off paper receipts or photos of paper receipts. This is very cumbersome process. With the solution provided in this paper, there is no need for any other party to be involved other than the two entities already part of the process. The consumer and the retailer.

As part of the future work, users can be provided with more benefits especially relating to budgeting, for example, generating a graph to show their spending. A graphical illustration can be understood faster than displaying numbers. This will help them track their spending better. A price comparison feature can also be included, this may involve the use of artificial intelligence so as to match the products purchased from various stores and determine the cheapest or alternatively by incorporating recommendations for search by Shibwabo and Nahimana (2017).

## References

- Bergstrom, K., 2011: *Solving Lost Warranties*. [Online], Available at [www.ted.com/solving-lost-warranties](http://www.ted.com/solving-lost-warranties)
- Godelnik, R., 2012: *Can eReceipts Convince Shoppers Electronic Receipts Are a Better, Not Just Greener Option?* [Online], Available at [www.triplepundit.com/ereceipts](http://www.triplepundit.com/ereceipts) , [Accessed 2 January 2018]
- Goel, K., Patel, G.K., 2013: Digital Receipts: a Viable Replacement For the Printed Receipts on Thermal Papers. *International Journal of Innovative Research and Development*, Vol 2 Issue 12, 38-41
- Johnson, M., 2014: *Big picture on digital receipts*. [Online], Available at [www.techcrunch.com/nig-picture-on-digital-receipts](http://www.techcrunch.com/nig-picture-on-digital-receipts) , [Accessed at 19 September 2017].
- Johnson, M., 2014: *The Big Picture On Digital Receipts*. [Online], Available at [www.techcrunch.com/2014/09/19/the-big-picture-on-digital-receipts/](http://www.techcrunch.com/2014/09/19/the-big-picture-on-digital-receipts/) [Accessed at 2 January 2018]
- Nassir, A., 2015: *Top Android Applications*. [Online], Available at [www.quora.com/best-receipts-applications](http://www.quora.com/best-receipts-applications) [Accessed at 19 September 2017].
- Patterson, E., 2011: *Software Engineering*. Retrieved March 16, 2016, from ITlabs: [www.it-labs.com](http://www.it-labs.com) [Accessed at 19 September 2017]
- Shibwabo, B. & Gikundi D., 2017: A Location-Based Service for Handyman Order Placement. *Journal of Systems Integration*. 8 (4), pp. 29-41. [Online] Available at: <http://www.si-journal.org>. ISSN: 1804-2724
- Shibwabo, B. & Nahimana G., 2017: A System for Recommending Rental Properties. *Journal of Systems Integration*, 8 (3), pp. 10-18. [Online] Available at: <http://www.si-journal.org>. ISSN: 1804-2724
- Slohan, M., 2005: Causes of the Digital Divide. *European Economic View on the inequalities in the 21st Century*, 42-44
- Thatcher, J., 2012: *Source code Editors*. [Online], Available at [www.sitepoint.com/advantages-of-notepad++/](http://www.sitepoint.com/advantages-of-notepad++/) [Accessed at 12 October 2017]
- Webstar, M., 2011: Receipts Definition [Online], Available at [www.meriam.com](http://www.meriam.com): [www.meriam.com/receipts](http://www.meriam.com/receipts) definition [Accessed at 13 March 2017]

**JEL Classification: L86, M15**