

PASSMA: Fingerprint Payment System: A New Way to E-Pay

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Abstract—Now a days when a person goes to the market to buy some products, he or she may face problem in payment either for lack of cash, loss of ATM cards and Visa or need to pay a fraction in cash. Most of current payment systems are difficult and not available for most of people around the world. In this research, we will provide a payment system that allow customers to save his money and his time by an available, secure and easy payment system based on customers' fingerprints. PASSMA is a proposed payment system based on fingerprints. Our research concluded that it is possible to make a payment system based on the use of fingerprint as a new type of fast and secure payment system , and no need to carry cash or ATM and Visa cards, so that all sectors of society of young and old, men and women are able to use the proposed system. PASSMA will provide enormous benefits to the customers as well as to sellers by providing accurate and fast processing time. This project will open a new door in e-commerce business systems.

I. INTRODUCTION

Electronic business is an application of Information and Communication Technologies (ICT) in support of all the activities of business. So it is enable the companies to link their internal and external data processing systems more efficiently and flexibly, to work closely with suppliers and customers by meet the needs and expectations of their customers [1].

Recently, the e-commerce business became one of the important issues that reflects the ability of e-competition between the different corporations and organizations such as, hotels, industry manufacturing and other governmental sectors. E-commerce is a subset of e-business models and it seeks to add revenue streams using the World Wide Web or the Internet to build and enhance relationships with clients and suppliers. Today, every organization or corporation must has a web site that views at least an information, services and other functions that encourage the customers to be an effective member in the organization by support the organization with an important feedback [1] .

One of the most effective solutions for increasing business values, attracting more customers and increasing customer satisfaction is to automate the process of payment.

Our idea is to make the automate process of payment by using the fingerprint "pay by touch".

After studying the current automate payment systems, we found lot of disadvantages that decreasing business values. For example everyone cannot use PayPal credit cards or visa cards. For that, we come up with the idea of fingerprint payment system which is easier and reachable for everyone.

Most of current payment systems are difficult and not available for most of the people around the world. When a person goes to the market to buy some products, he may face a problem in payment either for lack of cash or currency, loss of ATM cards and Visa or do not possess in the first place. Our objectives is to discuss and analysis some of the current payment systems, the advantages and disadvantages of them and how the proposed system "PASSMA" will solve this problems. To design and develop the proposed system "PASSMA" that will be More secure, available and easy payment system for all people and to evaluate the proposed system "PASSMA" .

This proposed system "PASSMA" will focus on payment and transferring money between customers and buyers by using the fingerprint as a new technology.

The outline of the project are as follows: Section1 provides the introduction and overview of the current payment systems and discuss the gaps in the current systems. Section2 describes the related study and their comparisons. Section3 gives an analysis where section4 and section5 represents design and implementation of proposed work. Finally, section6 concludes with the research advantages, limitations, recommendations and future work of the proposed work.

II. BACKGROUND STUDY

In this section we will discusses some of the current payment systems and their problems.

A. cashU :

cashU is a prepaid online and mobile payment method available in the Middle East and North Africa, a region with a large and young population with very limited access to credit

cards. Because of this, cashU has become one of the most popular alternative payment option for young Arabic online gamers and e-commerce buyers. It supports few websites and available just in the Middle East and North Africa[2].

B. WebMoney

WebMoney is an electronic money and online payment system (transactions are conducted through WebMoney Transfer) [3]. It's available in few languages.

C. Payoneer

Payoneer is an Internet-based financial services business that allows users to transfer money and receive payments through re-loadable prepaid MasterCard debit cards. The company focuses on specific payment solutions, primarily affiliate, mass payments, Local Electronic Funds Transfer (EFT), merchant accounts, and payout programs in countries with underdeveloped banking systems [4].

D. Bank transfer

Bank transfer is the process of turning money from one account to another account, through the Internet or via ATM or telephone banking and other [5]. One has to carry ATM card to complete the transactions which needs renewal time to time.

E. Credit cards

Buy or shopping sites online. Activate your account at sites such as PayPal or eBay. Receive or withdraw money from certain locations (such as AL PayPal Card Visa Card that shop online or even turn them cash in your hand) [6]. Disadvantages are intervention sites on the Internet is reliable and give them the card and the data is to withdraw them and what you are suffering from the problem of theft or monument.

F. PayPal

PayPal is the mediator between your credit card and the receiving end of money. PayPal is not only a means of payment but also a way of deposit [7]. It is considered safely for E-shopping for via Visa card. PayPal does not appear any of your personal information to the seller, it does not show your account number or your name or your credit card number which increases the security and privacy. PayPal is a secure way to online shop or E-commerce. To use the PayPal service must be have a Visa card.

G. Western Union

Western Union Money is transfer service, send money from an agent location. It is simple to send money in person. Just go to any of our convenient Agent locations worldwide - we're probably right around the corner [8]. It does not support electronic transfer money service. That person must go to an agency to transfer money.

H. SADAD payment system

SADAD Payment System (SADAD) was established by the Saudi Arabian Monetary Agency (SAMA) to be the national

Electronic Bill Presentment and Payment (EBPP) service provider for the Kingdom of Saudi Arabia (KSA). The core mandate for SADAD is to facilitate and streamline bill payment transactions of end consumers through all channels of the Kingdom's Banks [9].

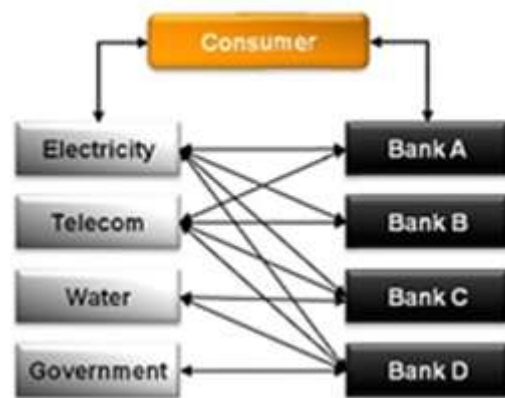


Figure 1. Pre SADAD bill payment network

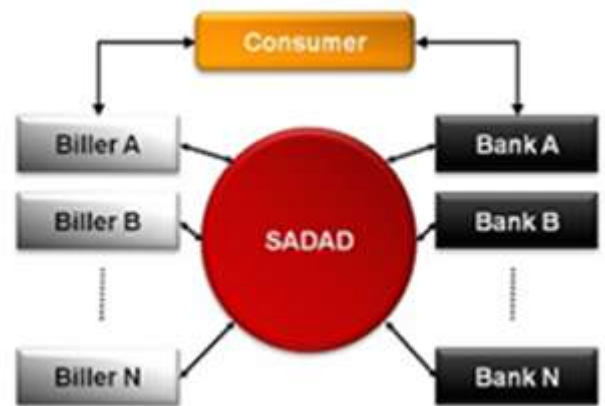


Figure 2. SADAD payment system

1) *Advantages of SADAD.* SADAD will benefit Banks and Billers in many ways, some of those benefits are listed below:

TABLE I. BENEFIT BANKS AND BILLERS

Bank	Billers
<ul style="list-style-type: none"> • Lower costs due to reduced transaction volumes at branches. • Lower costs due to reduced processing costs per transaction • Decreased reconciliation costs and exception 	<ul style="list-style-type: none"> • Lower Capital expenditure (CapEx) due to reduced investments in infrastructure and software development • Lower operational expenditure (OpEx) due to fewer resources required to build, operate and support

<p>handling.</p> <ul style="list-style-type: none"> • Fewer biller interfaces to develop and maintain. • Fewer tellers / Customer Service Relations (CSRs) required handling customer payments and bill inquiries. • New costs to be partially offset through revenue sharing schemes with SADAD. 	<p>outsourced EBPP.</p> <ul style="list-style-type: none"> • Faster collection of bills, leading to lower working capital. • Single interface point– no need to link separately with multiple banks. • Lower reconciliation processing costs. And reduced disconnections due to delay in bill processing. • Reduced Customer Service Relations (CSRs) through fewer customers paying at Biller sites.
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2) *Disadvantages of SADAD:* following are the disadvantages of SADAD.

1. It takes from 3 to 4 months to be ready.
2. The customer must have a bank account to use it.
3. Using it only by ATM and bank web services.
4. Delay in processing.

1. *Fingerprints:*

Fingerprints are the tiny ridges, whorls and valley patterns on the tip of each finger. They form pressure on a baby's tiny, developing fingers in the womb. No two people have been found to have the same fingerprints -- they are totally unique. There's a one in 64 billion chance that one's fingerprint will match up exactly with someone else's. Fingerprints are even more unique than DNA, the genetic material in each of human cells. Although identical twins can share the same DNA -- or at least most of it -- they can't have the same fingerprints. Fingerprinting is one form of biometrics, a science that uses people's physical characteristics to identify them. Fingerprints are ideal for this purpose because they're inexpensive to collect and analyze, and they never change, even as people age.[10]

All of the ridges of fingerprints form patterns called loops, whorls or arches shown in figure-3. Loops begin on one side of the finger, curve around or upward, and exit the other side. There are two types of loops: Radial loops slope toward the thumb, while ulnar loops slope toward the little finger. Whorls form a circular or spiral pattern. Arches slope upward and then down, like very narrow mountains.

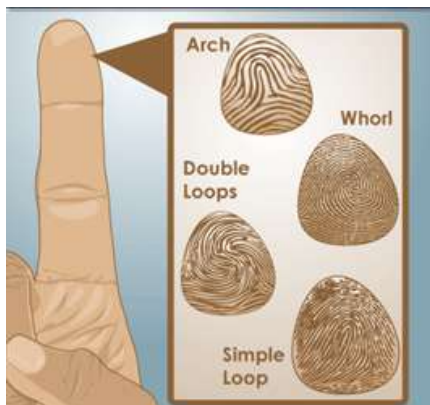


Figure 3. How fingerprint work

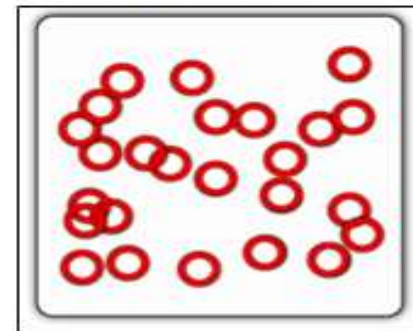
How to capture a fingerprint : Digital scanners capture an image of the fingerprint. To create a digital fingerprint, a person places his or her finger on an optical or silicon reader surface and holds it there for a few seconds. The reader converts the information from the scan into digital data patterns. The computer then maps points on the fingerprints and uses those points to search for similar patterns in the database [11] .



Finger is Scanned



Coordinates are Identified



Fingerprint is Discarded.
Coordinates are Used

Figure 4. Digital scanners capture an image of the fingerprint

IV. DESIGN

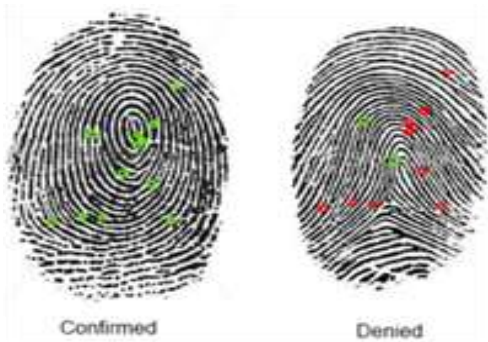


Figure 5. Example of Confirmed and Denied

Fingerprint Advantages: Fingerprint sensors are quite small, don't consume a lot of power and are becoming inexpensive to manufacture, making it possible to put fingerprint biometric systems on laptops, cell phones, PDAs and even USB thumb drives. Fingerprints are the oldest and best-developed sector in the biometrics industry, so there are many vendors and product choices available to the consumer. Fingerprint biometric systems have recently become mandated for certain classes of U.S. federal government ID cards, which should spur even more feature development and interoperability among vendors.

III. ANALYSIS

In Saudi Arabia SADAD is the only system that facilitates customers to pay between consumers and the billers. It provides a limited infrastructure and a limited number of billers to connect though it whereas our proposed system could be expanded to the retail level of payment processing for the customers. We've analyzed the existing SADAD system and our proposed system in the following table-II.

TABLE II. ANALYZING PRE-SYSTEMS VS. PROPOSED-SYSTEM

Present Systems (ex: SADAD)	Proposed system
1. Hard to join the system	1. Easy to join the system.
2. By going through the 8 stages.	2. Commercial register or shop license.
3. Require more money to make the infrastructure of SADAD system.	3. Owner details (name, ID, bank account number).
4. Suitable for Enterprises only.	4. Suitable for any types of sellers.
5. Need a bank and this bank must have website and this website have portion for SADAD	5. This system don't need bank in the first place.
	6. An independent system

A. Conceptual Model:

We defined the conceptual model for the proposed system in a form of BIRD'S EYE VIEW show in figure 6.

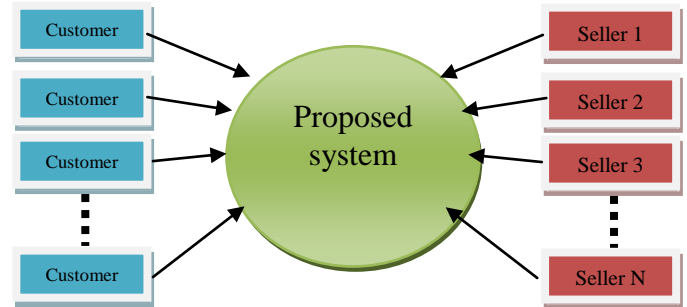


Figure 6. Bird's eye view of the proposed system

1) **Customer:** Person or organization that use a particular service or product for a certain amount of money.

Components:

- a) Fingerprint.
- b) Money.

2) **Seller:** Person or organization that provide a particular service or product for a certain amount of money.

Components:

- 1. Service or product.
- 2. Fingerprint device.

3) **Proposed system:** a computer-based system that allow customer to pay for the services or products that provide by the seller.

Components:

- 1. Service or product.
- 2. Fingerprint device.

SADAD payment system is more convenient for billers* companies, but the proposed payment system will be more convenient for sellers** companies.

* Billers: give a service for a particular duration and customer pay for it in a particular duration.

** Sellers: give a product in an instant time and customer pay for it immediately.

V. THREE-TIER ARCHITECTURE OF THE PROPOSED SYSTEM

We defined the complete three-tier architecture for the proposed system show in figure 7. The three-tiers are:

- 1. Client Layer
- 2. System Layer
- 3. Database Layer

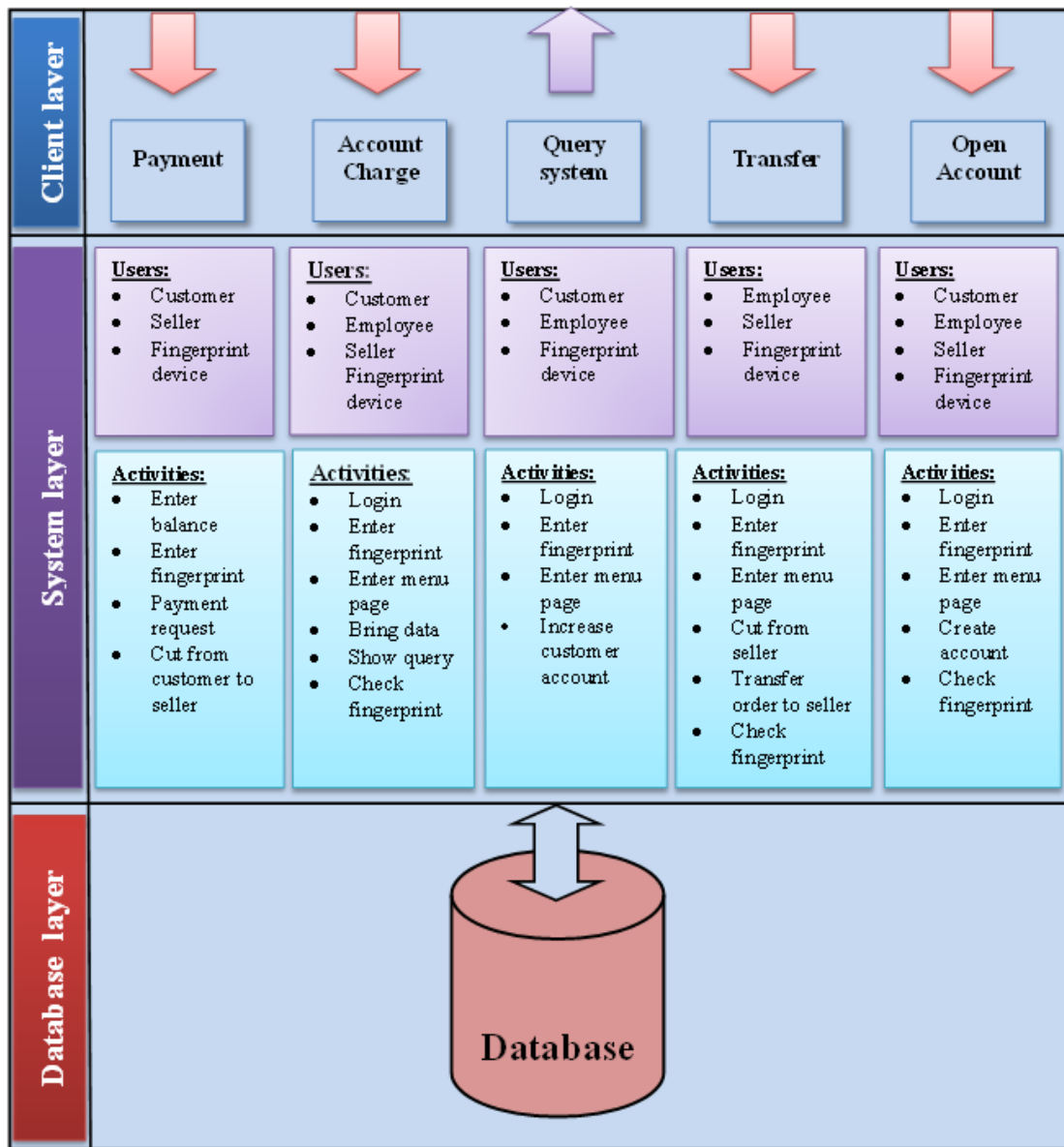


Figure 7. Three-tier Architecture of the proposed system

A. Client Layer:

The first tier of the system design is client Layer. Client layer has interfaces that help users to connect to the system through the use of those the use of those interfaces. List of interfaces in client layer are given below:

Components:

- a) Open A/C.
- b) A/C recharge.
- c) Payment
- d) Transfer

e) Query System

B. System Layer

Second Tier is the most important of layer of the system. It has user's module and activities module. Both modules comprises the complete system layer. User's module define the names of users which would be connected to the systems and activities module represents the tasks will be accomplished by those users.

C. Database Layer:

The physical data is stored in the database. The system has a number of tables namely buyer, seller, payment, query, transfer etc. in the database. Database layer stores and manages

data insertion, deletion and modification of the finger print

payment system.

VI. IMPLEMENTATION OF PASSMA

The following Figure 8 shows the implementation of PASSMA. This figure shows the complete process interfaces for a customer where it contains-

- Create new a/c for a customer
- Charge customer a/c to pay the bills
- Query customer a/c
- Transfer money from customer a/c to the billers a/c and finally,
- Closing the system



Figure 8. PASSMA customer interfaces

Via this interface the employee can create, manage and access to customer or seller information in data base of PASSMA system.

A. Create new customer account:

The employee will click on the button “Create new customer account” shown in figure 9. The employee must enter the customer’s name, fingerprint and balance. Finally, the employee will click on “Create” then the account will be created. The seller a/c is also created in the same way.

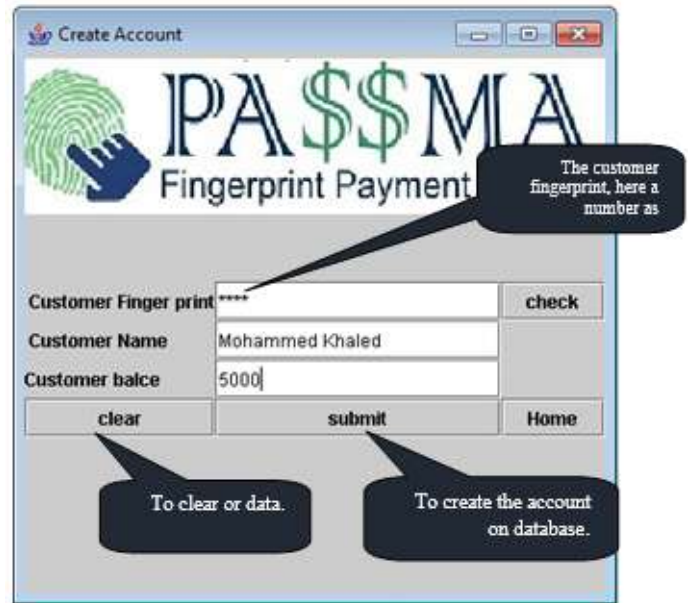


Figure 9. Create customer account

B. Charge Customer Account:

The following figure [5] shows charging customer A/C. This option is just for customer only. If the customer want to charge his account, he will go to the employee and ask for that employee will chose “Charge account” from the menu list. From the “Charge account” interface, the employee will ask for the customer’s fingerprint and amount of money he want to charge and take the money from the customer then click on charge button. The balance of customer’s account will update to the new amount.

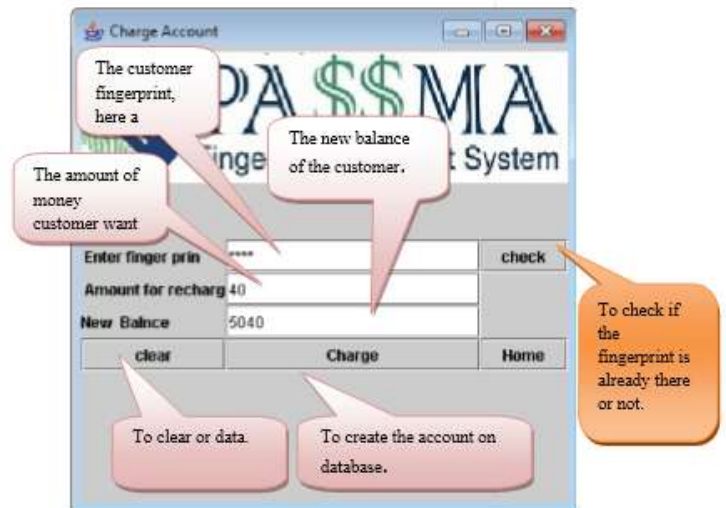


Figure 10. Charge Customer Account

C. Pay money:

After the customer chose the products he wants to buy, the seller will find out how much they cost. The seller will put the price on the machine and ask the customer to put his fingerprint to pay for the products. The following figure 11 shows the interface to pay the bill to the seller by the customer using his fingerprint. The machine will send the data to database, and if it is verified, the price will cut from the customer account and added to seller account. Finally a message will appear to show the successful of the payment step.

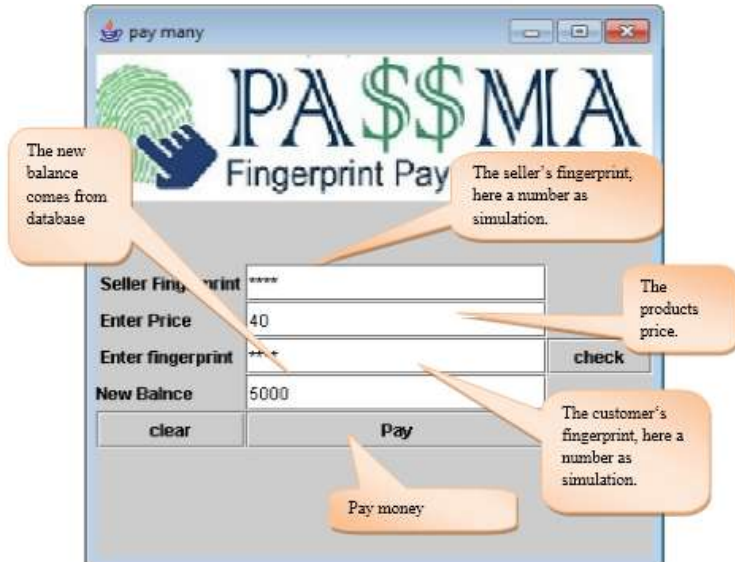


Figure 11. Fingerprint Payment System

VII. CONCLUSION

PASSMA is a proposed payment system based on fingerprints. Research concluded that it is possible to make a payment system based on the use of fingerprint as a new type of fast and secure payment system and eliminate the requirement to carry cash or ATM and Visa cards.

The main importance advantage of the proposed system is to make the process of buying and selling products or services faster, easier and more secure. PASSMA makes the payment process more easy and fast by simply using customers' fingerprints. The use of the fingerprints as a verified option makes the proposed system more secure and protected, so customers and sellers do not lose their fingerprints and no one can steal it. This system is more appropriate for daily basic needs, for example groceries, gas stations, pharmacies etc. This system is not appropriate for heavy transactions. To use this system for shopping via internet, user must have fingerprint scanner connected with his system while using it.

ACKNOWLEDGMENT

The research team would like to gratefully acknowledge the financial support of the Deanship of Scientific Research in Najran University under the grant number NU/ESCI/13/009.

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