

An Improved Automatic Teller Machine (ATM) framework for People with Disabilities (PWD)

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ABSTRACT

Since the introduction of Automated Teller Machines (ATMs) in Nigeria, ATM operation has seen to be beneficial to some people but People with disabilities (PWD) has greatly suffer a setback in the use of ATM especially the illiterate also the design of ATM machines operation contributed to the fact that made many people to forget their ATM cards after transaction. ATM operation could be seen not to completely meet the needs of everyone. This research investigate the framework of the existing ATM machine and provide modification by proposing a new framework that cater for the identified challenges by designing a new design modification of mode operation, transition diagram and algorithm that will allow ATM to accommodate PWD and to reduce the number of ATM card forgot at the machine.

Keywords: Automatic Teller Machine (ATM), Framework, People, Disabilities and Security

1. INTRODUCTION

Automated Teller Machine (ATM) is a product of technological development developed to enhance quick service delivery as well as diversified financial services such as cash deposits, withdrawals, funds transfer, transactions such as payment for utilities credit card bills, cheque book requests and other financial enquiries [1], and it has become a major indicator of ICT investment by banks [2]. Globally, Automatic Teller Machines (ATMs) have been adopted and are still being adopted by banks. They offer considerable benefits to both banks and their depositors. The machines can enable depositors to withdraw cash at more convenient times and places than during banking hours at branches [3].

Nigeria started the long and tortuous journey of e-banking in November, 1990 when Societe Generate bank launched their first Automated Teller Machine blazing the trail in November 1990 with ATM popularly referred to as "cash point 24" at their Broad Street and Apapa Branches [2]. Idowu [4] stated that the introduction of this machine serves as genesis and bedrock of electronic banking and concluded that ATM is basically a cash dispenser with a 24/7 service facility, that is, the machine unattended to i.e. "stand alone" or "wall mounted" (outside or inside the banking hall) allows you to transact limited business without referring to any bank staff except in case of problem and difficulty round the clock. An ATM allows a customer to withdraw cash from his or her bank account by entering a Personal Identification Number (PIN) after the insertion of a card into the machine and having the amount of the withdrawal immediately debited to the account of the customer.

ATM deployments and its use by customers is just gaining ground, When it was first introduced, the ATM was meant to reduce the unnecessary traffic in the banking hall, make customers have a quick access to their money and make life convenient to a certain level. However, the situation today has changed drastically; it has become a source of worry to users and providers (banks) [5], because of some disadvantages such as fraud perpetration, network failure in time of dire need of money,

ignorance in terms of services provided by ATM and large queue on ATM in the designated places [6]. With all the problems and incompetence of this money dispensing machine in Nigeria, it could be said that level of satisfaction derived from it has reduced. Some other problems associated with the use of the machine which has drawn little attention are the illiteracy, Blindness, Ability to forget ATM card after withdrawal and ability to forget pin which affect People with Disabilities.

People with Disability (PWD) are people with special need and can be found everywhere in the societies. They are found in families, in rural and in urban areas. PWD are classified into three categories according to the Federal Government of Nigeria [7] in the national policy on education, which include the disabled, the disadvantaged and the gifted and talented. The first category is the disabled which is known as impaired people, who due to this impairment or disability cannot cope with regular school organization and methods without formal special educational training. In this category, we have people who are: visually impaired (blind, partially sighted) hearing impaired (deaf and the partially hearing) and physically impaired (deformed limbs).

The second category is the disadvantaged. These are the children of nomadic pastorals, migrant fishers, folks, migrant farmers, hunters, and others who due to their lifestyles and means of livelihood are unable to have access to the conventional education provision therefore require special education to cater for their peculiar needs and circumstances. While the third category is the gifted and talented, these are people (children and adults) who are highly endowed with special traits (in arts, creativity, music, leadership, intellectual precocity) and therefore find themselves insufficiently to cope with the regular school activities. This study seeks to provide a framework for the transaction process done by ATMs that will cater or PWD (illiterate and Blind) through the introduction of use of biometrics that will checkmate the problem of forgetting pin, use of localized speech to text system to checkmate the problem of illiteracy and rearrangement of transaction order that will checkmate the risk of forgetting ATM cards after transactions.

2. LITERATURE REVIEW

The history of ATMs could be traced to the 1960's, in 1970, Hanson disclosed in his book 'Service Banking' that Automated Teller Machine was just introduced in the United Kingdom in 1967 and ever since, Japan and France have used the machine for a multiplicity of purpose [8]. Others authors like Moutinho and Brownlie [9] recommended that some consumers have positive attitudes towards ATMs based on dominant perceptions of convenience, accessibility and ease of use in the late 80's. Reichheld and Sasser (1990) recognized the benefits the customer satisfaction delivers to a bank [8]. For instance, the longer a customer stays with a bank the more utility the customer generates. This is a result of a number of factors relating to the time the customer spends with a bank. Without usage of technology the banking sector cannot provide customers with a satisfactory service. Effective service delivery is a new or significantly improved service concept that is taken into practice [10].

It is believed by some people that Luther George Simjian was the inventor of ATM because his idea came first [11]. Some also believed it was Dan Wetzel because he's got patents on display in the Museum of American History to prove it. Still others, including the Queen of England believe the inventor of ATM is John Shepherd-Barron. John D. White contacted ATMmachine.com and sent copies of patents and gave convincing evidence that he is the ATM inventor. James Goodfellow of Scotland also contacted ATMmachine.com and gave his account, including copies of patents. Jairus Larson contacted ATMmachine.com and, although he did not invent the ATM, he did develop the first 'online' ATM. Since the patent on an ATM was never applied for until years Mr. Simjian, confusion on the inventor still exists [1].

In Nigeria, the first bank to introduce ATM was the Moribund Societe Generale (SGBN) in 1990. The trade name for SGBN's ATM was "Cash Point 24". One of the first generation banks then, First Bank Plc came on stream with their own ATM in December 1991, a year behind SGBN. They also gave a trade name "FIRST CASH" to their ATM. While that of SGBN was the drive-in-system that of the First Bank ATM was through-the-wall. Access to ATM is through the use of Personal Identification Number (PIN) and a plastic card that contains magnetic strips with which the customer is identified. Banks usually hand over the PIN to the customer personally and the customer is usually instructed not to disclose the number to a third party. ATM card is about the size of a normal credit card and apart from the need to ensure its safety, its surface strips could be mutilated which may make the machine to reject it even though the PIN number is entered correctly.

Since its introduction numerous researches has been carried out in Nigeria on the use of ATMs covering diverse dimensions. A Report on Global ATM Frauds identified the following types of ATM Frauds: Shoulder Surfing, Lebanese Loop, Use of Stolen Cards, Card Jamming, Use of Fake Cards, Duplicate ATMs, and Card Swapping [12]. Adeloye [13] identified security as well as power outage as major challenges facing the ATM users in Nigeria. Obiano [14] blamed the menace of ATM frauds on indiscriminate issue of ATM card without regard to the customer's literacy level.

According to him one of the frequent causes of fraud is when customers are careless with their cards and pin numbers as well as their response to unsolicited e-mail and text messages to provide their card details.

Adeoti [8] worked on the dimensions of ATM frauds in Nigeria and proffer solutions that will mitigate the ATM frauds in the Nigerian banking system. His study employed both primary and secondary data to investigate the ATM frauds in Nigerian banks. The chi-square statistical technique was used to analyze the data and test the hypothesis raised, while it was concluded that both bank customers and bankers have a joint role to play in stopping the perpetrators of ATM frauds in the banks, the work further revealed that Card jamming, shoulder surfing and Stolen ATM cards constitute 65.2% of ATM frauds in Nigeria. Strong evidence exists in the literature about customers' satisfaction from ATM services [15]. A large number of studies are found in the literatures that highlight the satisfaction of customers with ATMs [9, 16, 17, 18]. Some studies have also identified customers' dissatisfaction with ATM service quality dimensions. Large numbers of customers are resistant to this new mode of service delivery and prefer more personalized service [19]. The researchers note that customers do not like ATMs because of it impersonality, vision problem, fear of technology and reluctance to change and adoption of new mode of service delivery [20].

Chinedu *et al.* [21] however observes that, despite the deployment of over 900 ATMs by Nigerian banks, there are still a large number of customers who are reluctant to patronize the ATM service. He further asserts that even in Lagos area that has the most ancient of banking customers, less than 10% of customers (in number, not in value) currently patronize this product/service. Findings by Ovia [22] and Nwaze [23] show that despite the ascending usage of ATMs in Nigeria, it is still negligible compared to ATM statistics from other countries and emerging economies of the world. Adeniran and Junaidu [24] work on an empirical study of automated teller machine (ATM) and user satisfaction in Nigeria, the study measured the satisfaction of customers as regards to ATM services and revealed that customers are satisfied with the ATM perceive ease of use, transaction cost and service security but not satisfied with ATM dispense of cash.

The foregoing analysis shows that several research have been conducted on ATM in Nigeria. It is quite obvious that despite the perceived advantages that have been ascribed with ATMs there are still elements of dissatisfaction among Nigeria. This study therefore seeks to contribute to knowledge by providing a framework for ATM operations that will be used by the PWD (illiterate and Blind) in Nigeria.

3. THE CARD READER

The card reader of the ATM system is the interface device, which accepts an inserted bank card, scans predesigned identification information on the card, and returns the card to users.

The Keypad

The keypad of the ATM system is an interface device for users to enter required information such as the personal identification number (PIN) and withdraw amount of money.

The Monitor

The monitor of the ATM system is the output device that displays system operational and status information to users.

The Bills Storage

The bills storage of the ATM system is the internal device that stores bills in different notes, which can be sent to the bills disburser in various combinations.

The Bills Disburser

The bills disburser of the ATM system the output device that delivers bills of requested amount from the bills storage to the customer

The System Clock

The system clock of the ATM system is used for event timing, process duration manipulation, and system synchronization.

The System Database

The system database of the ATM system is the internal centralized database located in the bank's server where the ATM connects to. The ATM uses the card number scanned from a bank card and the PIN entered from the keypad to access the system database in order to verify the validity of the card and information recorded in the corresponding account in SysDatabaseST, such as the card holder, current balance, and withdraw constraints.

Biometric Scanner

Fingerprinting or finger-scanning technology is the oldest of the biometric sciences and utilizes distinctive features of the fingerprint to identify or verify the identity of individuals. Finger-scan technology is the most commonly deployed biometric technology, used in a broad range of physical access and logical access applications [25]. All fingerprints have unique characteristics and patterns. A normal fingerprint pattern is made up of lines and spaces. These lines are called ridges while the spaces between the ridges are called valleys. It is through the pattern of these ridges and valleys that a unique fingerprint is matched for verification and authorization [26].

Text to Voice Converter

The W3C speech interface framework is presented in [3]. Automatic speech recognizer (ASR), which is a component part of the VoiceXML Gateway, accepts speech from the user and produces text. It uses statistical grammars generated from large corpora of speech data based on the speech grammar makeup language (SGML). A Text-to-speech synthesizer is an application that converts text into spoken word, by analyzing and processing the text using Natural Language Processing (NLP) and then using Digital Signal Processing (DSP) technology to convert this processed text into synthesized speech representation of the text. Here, we developed a useful text-to-speech synthesizer in the form of a simple application that..

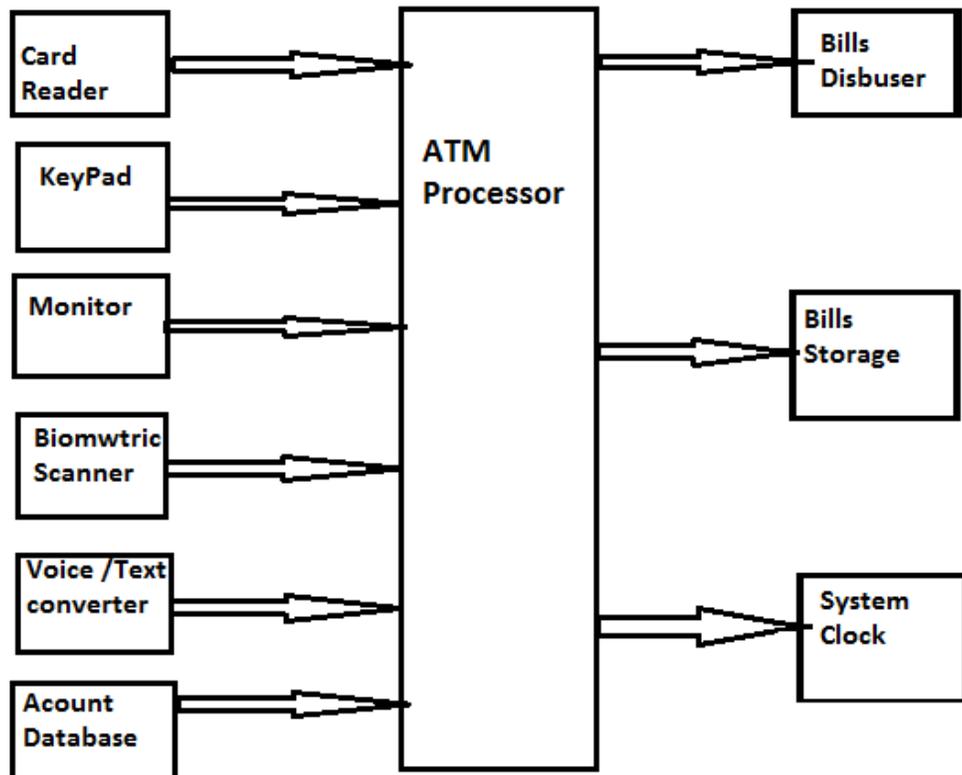


Fig. 1: Conceptual Model of the ATM for PWD

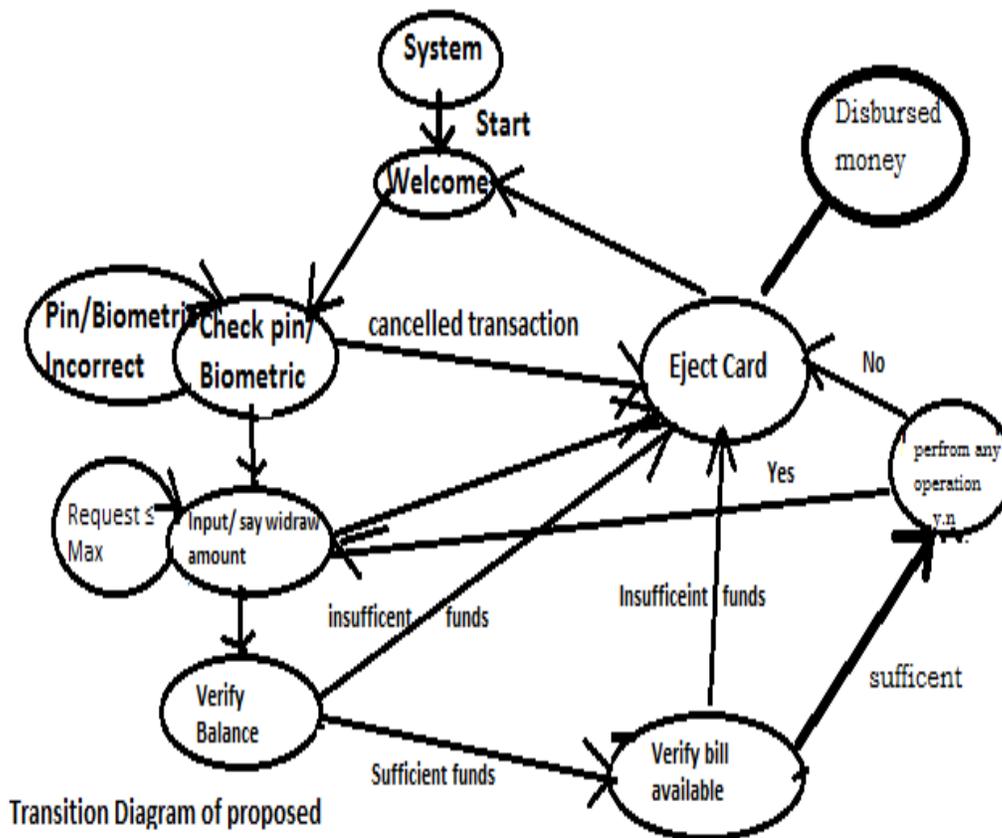


Fig. 2: Transition Diagram of Proposed System

4. CONCLUSION

The proposed framework for the transaction process done by ATMs will cater for PWD (illiterate and Blind) through the introduction of use of biometrics that checkmate the problem of forgetting pin, use of localized speech to text system that solve the problem of illiteracy and rearrangement of transaction order which checkmate the risk of forgetting ATM cards after transactions.

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