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**| RESEARCH ARTICLE**

## **Design of Error Code Guide System on Wincor Nixdorf ATM Machine for CMD Controller Part Based on Mobile Application**

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**| ABSTRACT**

The machines must have an identity to categorize these machines that are starting to circulate in the Indonesian market. The identity of these machines is determined by the Serial Number (SN) on the machine. For machines manufactured in 2015, the machine has the identity of "Mesin dengan SN 56DW5." Moving on to 2016, the machine's identity changed to "SN 56HG6," while the machine type remained the same, which is Procash 280. Given the various types of Procash 280 machines, engineers sometimes struggle to decipher the codes on Wincor Nixdorf ATM machines. The method employed by the author in analyzing the SSI Net system involves data collection through literature review and field studies, alongside Software System Development using the Waterfall Method. The author conducted a feasibility test, which included a Technology Feasibility Test for the error code application. The necessary facilities for creating the Error Code Application were available, such as a Toshiba Satellite C-40 Laptop with Windows 10 Pro, Intel Core™ i3-3110 M CPU @ 2.40 GHz Processor, 4.00 GB RAM, and a 64-bit Operating System. The Operational Feasibility is evident in engineers being able to install the application whenever and wherever using the provided APK. Additionally, the application's instructions are in Indonesian to accommodate new engineers joining the company. The designed system consists of two components: the Master Data Error Code and the output produced. The Master Data Error Code employs a two-digit number to provide results within this application, both for CMD Error Codes and Screen Error Codes. The application's output features two displays: one in English and the other in Indonesian. The author suggests adding additional menu options to the application to further assist users in finding solutions.

**| KEYWORDS**

ATM, Wincor Nixdorf, Machines, Android-Based

**| ARTICLE INFORMATION**

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### **1. Introduction**

Maintenance of ATMs involves regular maintenance activities conducted in accordance with guidelines outlined in the manual instructions or based on the experience of ATM personnel. This encompasses all efforts made to uphold and restore the machine to a usable condition for users. On the other hand, service refers to the repair process conducted when customers encounter issues while using the ATM that disrupt or even halt their transactions. Once a problem is identified, customers need to report it to the NCR call center via email. However, if the response to the email report is delayed by the call center, the accumulation of other emails poses the risk of neglecting the reported issue. Subsequently, the responsibility of the call center is to inform field technicians for prompt resolution (Gustian & Nardiono, 2020)

The Wincor Nixdorf Procash 280 machine is a product manufactured by PT. Wincor Nixdorf P280. The machine was introduced to Indonesia in 2011 with machine Serial Numbers (SN) starting from 56DU10. Over time, its presence in the Indonesian market increased. To categorize these machines that started circulating in the Indonesian market, the machines needed to have an identity. This identity is determined by the SN on the machine. If the SN starts with 56DU1, the machine was released in 2011. If it starts

with 56DU3, the machine was released in 2013. However, in 2015, the machine underwent an upgrade, resulting in a change in its identity. For machines released in 2015, the machine's identity is indicated by the SN 56DW5. In 2016, the SN became 56HG6, while the machine type remained Procash 280.

With various types of Procash 280 machines, engineers sometimes struggle to comprehend the codes on Wincor Nixdorf ATM machines. The handling of ATM error codes can vary. There are yearly additions of error codes that the engineering team hasn't fully understood. Each engineer indeed has a manual to understand error codes on the machines. However, in this advanced technological era, not all engineers carry a manual when facing ATM errors in the field. As a result, engineers require an application to simplify their tasks in today's digital era. The Error Code Guide Application is expected to be an alternative to support field engineers, especially when dealing with new engineers unfamiliar with all the Procash 280 ATM machines from Wincor Nixdorf. The term "application" refers to problem-solving that utilizes data processing techniques typically driven by desired computations and data processing (Juansyah, 2015).

The Android-Based ATM Error Code Dictionary, the application used in the research, employs Intel XDK to create native mobile applications using web technology (Ahmed et al., 2017). This application is compiled using the Cordova platform online to create cross-platform hybrid applications. The Intel XDK application itself is cross-platform, available for Windows, Linux, and OSX. With such technology, developers can create a single application that runs on multiple mobile platforms using a single codebase. Improving Error Code Interpretation for ATM Machines in the Event of a Cash Handler Fatal Error. The method used in this study focused on Anjungan Tunai Mandiri (ATM) machines at PT. Bank Negara Indonesia (BNI) in the Prabumulih City region, using a Visual Basic application. The application successfully interpreted the entered error codes (Yansuri, 2017)

## **2. Theoretical Basis**

### **2.1 Aplikasi Mobile**

A Mobile Application, also referred to as a Mobile App, is a term used to describe internet applications that operate on smartphones or other mobile devices (Alda, 2020). Mobile applications typically help users connect to internet services commonly accessed on PCs or facilitate the use of internet applications on devices designed for specific mobile computing functions. There are three approaches used to develop Mobile Applications: Native Applications, Web Applications, and Hybrid Applications (Suryantoro et al., 2022), as follows: (1). Native Applications: These applications are specifically designed for a particular mobile platform and use programming languages and development software tailored to that platform. (2). Web Applications: These are websites optimized for use on smartphones. They are built using web technology standards such as HTML, CSS3, and JavaScript. The write-once-run-anywhere approach in web applications produces cross-platform mobile applications capable of functioning on different mobile platforms. (3). Hybrid Applications: The core of hybrid applications involves embedding HTML5 mobile applications into a native container. These applications aim to combine the advantages of HTML5 mobile web application approaches with native smartphone applications for the target platform.

### **2.2 Kode Error**

Error codes consist of numerical combinations (combinations of letters and numbers) associated with error messages used to identify issues in Windows and other programs (Rafiuddin, 2013). Data or messages can be transmitted through wireless or wired channels. When using wireless or wired channels, the information may not always be transmitted correctly; errors can occur, causing sent messages to differ from received messages (Muhajir et al., 2018).

Errors that occur are categorized as hard failures and soft errors. Hard failures entail permanent physical damage, causing memory cells to become stuck at 0 or 1 or to switch unpredictably between the two (Handayani & Suryana, 2018). Hard errors can result from misuse, manufacturing processes, and usage. Soft errors involve events that alter the content of one or multiple memory cells without damaging the memory. These errors can be caused by resource issues or alpha particles, which are products of radioactive decay. Most memory systems have logic to detect and correct such errors. The Service Team at PT Wincor Nixdorf provides operational tips or troubleshooting guidance displayed on the Controller's interface. In the normal operating state, the display shows "0-0." During initial transportation or dispensing, the system must be reset.

Table 1. Display during Start-Up:

No.	Meaning	Reaction
OFF	No power supply	Switch on the device.
	Controller faulty	Replace the controller.
	Controller test after Power On (displays are flashing and keep changing)	None
	Warning: Battery too weak	Replace battery (controller)
	Controller faulty	Replace the controller.
	Startup of firmware (reset) Validation of firmware Check of CMOS parameters Test of mechanical components Clearing run	None : Error 11 Initialization of photosensors CMOS error PS xx, 22 Error 23 ... 28\ Error 18,19, 71..9A
XX	Error during photosensor initialization after change of configuration or replacement of controller (the display alternates between 'PS' and the photosensor number 'XX').	Check and clear photosensor xx, try RESET again. Replace module or controller if necessary.
	Power-up completed without errors.	

Source : PT Wincor Nixdorf

### 2.3 ATM

ATM (Automated Teller Machine) or Anjungan Tunai Mandiri has the literal meaning of an automated cashier machine (Sugiharto, 2010). Its operational principle is similar to that of a cashier, particularly in managing customer account balances and financial transactions according to programmed systems. In Indonesia, the term ATM is translated as Anjungan Tunai Mandiri. It takes the form of an electronic device that replaces human cashiers, allowing bank customers to withdraw money and check their savings accounts. Thus, electronic machines facilitate transactions effectively without the need for additional human labor. Many ATMs also provide services for depositing money, writing checks, transferring funds, or even buying stamps.

ATM is an electronic terminal provided by banks that enables customers to conduct various transactions, including withdrawing cash from their savings accounts, making deposits, checking balances, or transferring funds. The use of ATMs depends on an individual's confidence in technology's ability to enhance work performance, leading them to choose ATMs due to perceived efficiency and effectiveness (Lubis, 2017).

ATM (Anjungan Tunai Mandiri/ Automatic Teller Machine) is a technology that applies digital data processing concepts. This device has two essential components: hardware, which includes the processing unit (in this case, a PC), and the system device interface that connects users through a magnetic card. The software acts as an interface connecting users with the data (information) system. The money machine used to read magnetic stripe cards became known as the Automated Teller Machine (ATM). The operational process of an ATM generally resembles that of a computer, involving data processing (Astuti, 2011). There are several types of Wincor Nixdorf ATMs (Suryantoro et al., 2022), as follows

Table 2. Various Types of Wincor Machines

Type Machine	Capabilities
Slim Cash 200	Cash Dispenser
ProCash 3000	MonoFunctional Deposit
ProCash 2250Xe	MultiFunction ATM For Outdoor drive up model
ProInfo 1000	Non Cash function
ProCash 4000Xs	Cash Deposit & Recycling ATM
ProCash 1500Xs	Cash Dispenser
Procash 280	Cash Dispenser

Sumber: Mayu, (2017)

**3. Research Methods**

The Research Methodology employed by the Author involves the Field Study Method, Literature Study Method, and Waterfall method. The sequence of activities using the Waterfall Method is as follows: 1) System Requirements Analysis, conducted in the month of October 2021; 2) Design, conducted in November 2021; 3) Code Generation, carried out in December 2021 and the first two weeks of January. 4) Testing performed in the third and fourth weeks of January 2022. The tools required for the research include Hardware: 1 laptop unit 1 mobile phone unit. Software: Windows X, Google Chrome, Microsoft Word 2013, Kodular. The Waterfall Method used by the researcher aims to facilitate the organization and design of the application in use. Utilizing this software and hardware streamlines and expedites the report creation process. By conducting trials on the SAMSUNG J-5 Pro and SAMSUNG A30S mobile phones, the application's usability is significantly enhanced. The Operational Feasibility Test indicates that ATM engineers can install the application whenever and wherever using the provided APK. This application system is easily comprehensible for the ATM engineer team in the field.

**4. Results and Discussion**

The system issues discovered are elaborated using the PIECES Method (Performance, Information, Economics, Control, Efficiency, and Services) as follows:

1. Performance (Work Analysis): The work analysis required to address Controller problems can be time-consuming, given the extensive range of issues with the Cash Handler and the various error codes generated. Hence, engineers need to memorize all the error codes displayed on the Controller screen.
2. Information (Information Analysis): Information is crucial for engineers to understand the malfunctions in ATM machines. Currently, only a few ATM engineers possess accurate information regarding the error code guidelines on ATM machines, leading to inaccurate and sometimes mistaken information. Only specific engineers have access to the guideline book, as it's exclusively available to Technical Support.
3. Economics (Economic Analysis): The cost utilization of copying the guideline book is usually borne by the engineers themselves to avoid waiting list delays in obtaining the book. Alternatively, engineers might print copies at the office, but paperless practices like these are considered less economical.
4. Control (Control Analysis): In terms of Control Analysis, using the guideline book is convenient and can be possessed by any user. However, the book's security is compromised in actual usage due to factors such as exposure to rain, dirt, and wear and tear, which are unpredictable in the field.
5. Efficiency (Efficiency Analysis): From an efficiency perspective, excessive paper usage is discouraged from aligning with the Go-Green movement in Indonesia. In terms of durability, the paper format doesn't last long, given its susceptibility to wear and tear.
6. Service (Service Analysis): Improving services is essential for companies, particularly in the service sector. To enhance the quality of service offered, ATM engineers are required to provide excellent, accurate, and swift assistance in ATM performance services.

Based on the PIECES analysis, the weaknesses of the error code guideline book lie in its inefficiency due to paper usage in today's digitalized era. Hence, ATM engineers require innovative solutions to facilitate their work when encountering Controller problems in the field. Consequently, the author designs a Mobile application system that's expected to assist ATM engineers in addressing ATM Controller problems. The necessary information for creating the Mobile application for error codes on the ATM Controller part includes the following:

**1) Error Code Data:**

This data is used to assist in identifying the possible codes related to spare part Controller problems. Error codes consist of 2 digits, which can be either numbers or letters, depending on the issue occurring in the Controller. The number 1 is located above the screen, and the second number/letter is positioned below it, as depicted in the image below.



Figure 1. Error Code Screen

**2) Problem Analysis Data**

With the presence of problem analysis for a given code, ATM engineers are expected to analyze what needs to be done next on the ATM machine to ensure smooth operation.

Output Design:

- [1] Access Code Result: The resulting Access Code can be analyzed using the Mobile Application. The language displayed is English, as the original data generated has not been translated yet.
- [2] Translation: To facilitate ATM engineers in their work, English can be translated into Indonesian.  
(Note: There seems to be a typo in the original text where "Bahasa Inggirs" appears. It's likely intended to be "Bahasa Inggris," which means "English" in Indonesian.)

The research approach employed in this study involves utilizing the waterfall methodology. The waterfall methodology is a structured and step-by-step model for the development of information systems. The Waterfall method encompasses the subsequent phases (Lucitasari & Khannan, 2019).

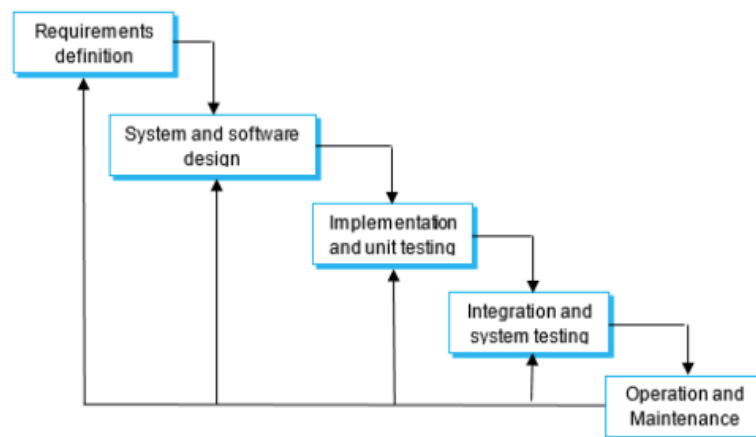


Figure 2. Waterfall Method

The Mobile Application Design is carried out using the Waterfall Method, with the following details:

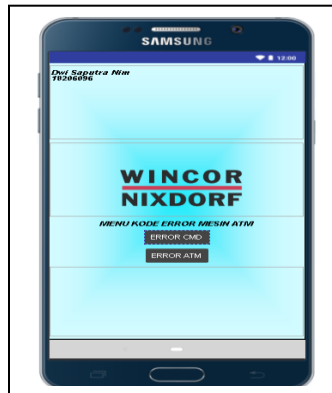
- 1) Requirement Analysis: Due to
- 2) Complaints from engineers and customers about the time-consuming nature of solving CMD (Cash Media Dispenser) Error Code issues, engineers require significant time for resolution. This issue can arise due to the engineers' lack of knowledge in resolving Error Code problems in the Sparepart Controller.
- 3) Design: The design used by the researcher is as follows :

2.1 Main Application Interface. Testing for the main page was successful, as the main page serves only as an opening display.



*Figure 3. Main Application Interface*

2.2 Display of Error Code Menu Page. The display of the ATM Error Code Menu page is a menu page that can be selected by users to display CMD Error Codes or ATM screen codes.



*Figure 4. Error Code Menu Page*

2.3 Display of CMD Error Code Menu Page. In this display, there are 2 columns that can be input or filled by engineers. In the Input Error Code 1 field, the code number above the CMD Controller Error can be written, while in the Input Error Code 2 field, the code number below it in the CMD Error code can be filled. The Description display shows the malfunction that occurs for the 2 inputted error codes



*Figure 5. CMD Error Code Menu Page*

2.4 Display of ATM Error Code Menu Page. In this display, there are 2 columns that can be input or filled by engineers. In the Input Error Code 1 field, the code number at the 2nd digit on the ATM Screen Error can be written, while in the Input Error Code 2 field, the code number at the 3rd digit on the ATM Screen can be filled. The Description display shows the malfunction that occurs for the 2 inputted error codes.



Figure 6. ATM Error Code Menu Page

2.5 Design of ATM Screen Error Code Display. The result of the ATM Screen Error Code display design is as follows:

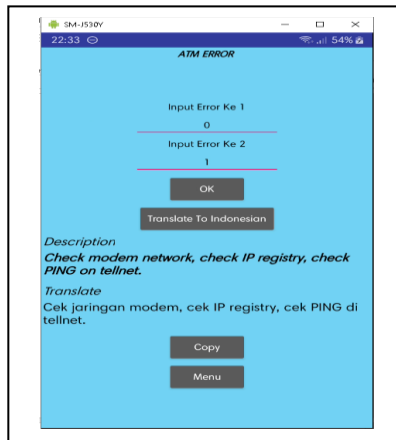


Figure 7. Result of ATM Screen Error Code Display

2.6 Design of ATM Screen Error Code Display Result

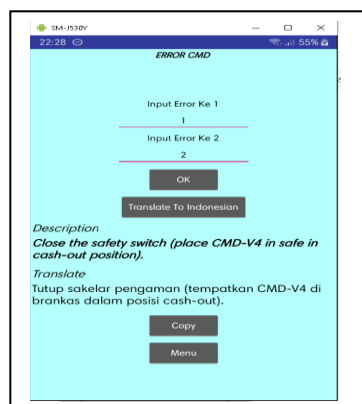
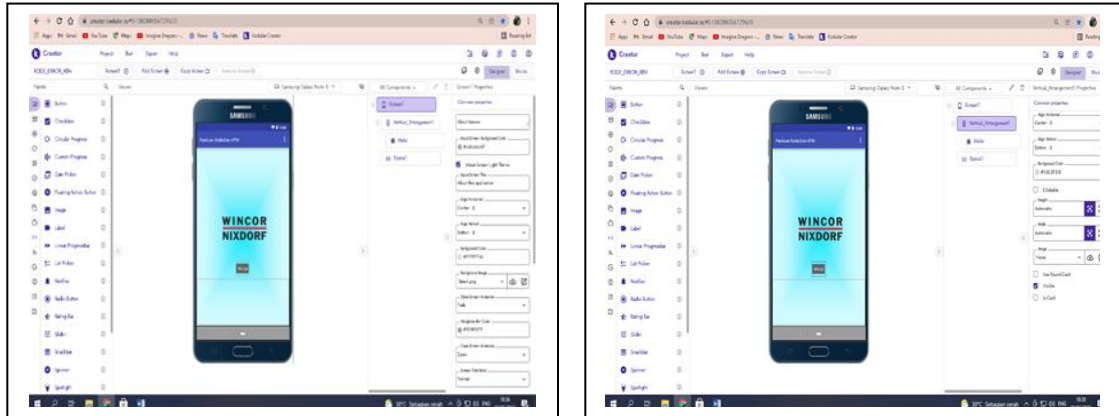


Figure 8. Result of ATM Screen Error Code Display

**3) Coding**

The coding carried out by the researcher is using Blocks Code coding. The Kodular application has a coding system that is very user-friendly for beginners. The coding system involves assembling predefined block codes provided by the kodular system.

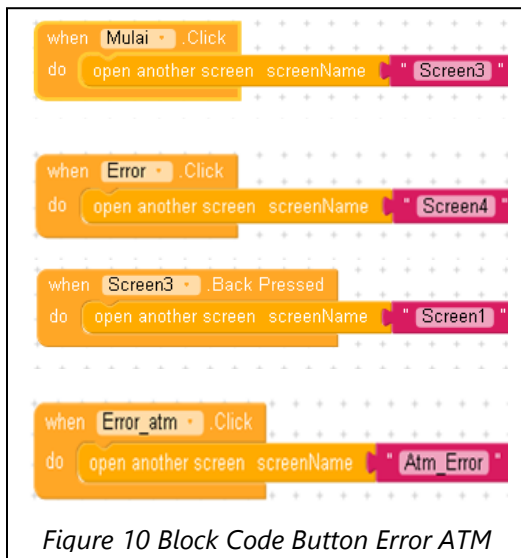
3.1 A layout is needed to create the initial appearance of the application. The author used the Vertical\_Arrangement layout because the required display is purely vertical.



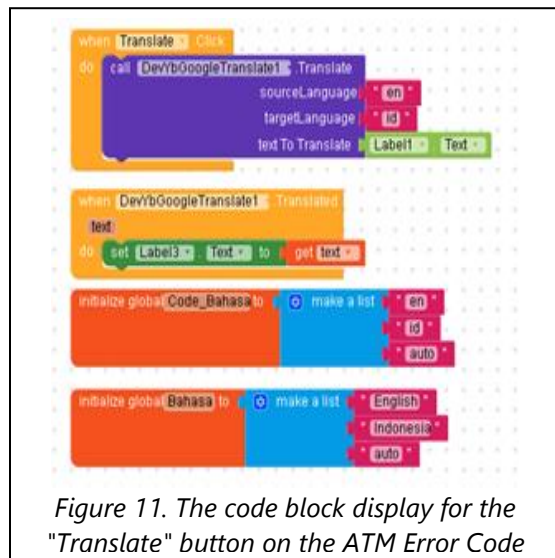
*Figure 9. Screen 1 Layout Display and Vertical\_Arrangement Layout Display*

3.2 Button. The button is used to initiate the Error Code Application with the Blocks code display. In the Display of the ATM Error Code Menu Page, there's a command to return to the previous page. This command can be executed with block code. The coding Blocks perform the command to return to Screen 1, which is the Main Screen (First Page) of the ATM Error Code. Several required codes and designs are needed. The online translator referred to here is an automated translator that can automatically translate sentences from one natural language to another (for example, from English to spoken Indonesian). The online translator consists of three parts: speech recognition, text translator, and text output (Utami et al., 2016).

The online translator referred to here is an automated translator that can automatically translate sentences from one natural language to another (for example, from English to spoken Indonesian). The Sentence Splitting Method uses Split for the purpose of breaking or separating sentences into words in a simple way. The entered sentence will be checked for the number of words; then, the split process will be carried out (Afifah et al., 2010). The online translator consists of three parts: speech recognition, text translator, and text output. The "Button Translate to Indonesian" functions as an English to Indonesian language translator. As for the required coding block, it is as follows:



*Figure 10 Block Code Button Error ATM*



*Figure 11. The code block display for the "Translate" button on the ATM Error Code*



**4) Testing**

An organization that already has a well-defined testing process or one that is disjointed with almost no process, Systematic Software Testing provides unique insights into better ways to test software (Wolman et al., 1994) dalam (Yansuri, 2017). The testing conducted by the researcher is as follows:

*Table 3. Application Testing Results*

Submodule	Test Scenario	Test Result	Result
Main Menu Page Display	Display error code page	Display error code page	Success
CMD Error Code Menu Page Display	Displaying Description and Translate on CMD Error Code	Displaying Description and Translate on CMD Error Code	Success
ATM Error Code Menu Page Display	Displaying Description and Translate on ATM Error Code	Displaying Description and Translate on ATM Error Code	Success

Display of ATM Error Code Menu Page

The display of the ATM error code menu page is also a crucial page in this application. Here are the testing results for the ATM error code menu page

*Table 4. Results of ATM Error Code Menu Testing*

Submodule	Test Scenario	Test Result	Result
Input Error 1	Input error code 1	Input error code 1 Successful	Success
Input Error 1	Input error code 2	Input error code 2 Successful	Success
Description	Displaying results of Error Code 1 and 2	Displaying results of Error Code 1 and 2	Success
Translate to Indonesian	Translating Description Display	translating Description Display	Success
Copy	Duplicating the results from Description to another Application	Duplicating the results from Description to another Application	Success
Menu	Return to Error Code Menu Page	Return to Error Code Menu Page	Success

**5) Maintenance**

The support (maintenance) carried out on the application usually involves upgrading for the latest information related to an application. Changes or upgrades to error codes on machines that haven't been input by the application developer or other changes that can enhance the stability of this application. The scope of maintenance activities includes:

- a. Addition or improvement of software products
- b. Adaptation to new operational environments
- c. Correction of issues arising in the application

**5. Conclusion**

The main objective of this research is to design and implement an error code guide system based on a mobile application for the CMD Controller section of Wincor Nixdorf ATM machines. The results of this study have significant implications for the efficiency, performance, and maintenance of ATM machines, as well as contributing to the enhancement of user experience. The error code guide system has been designed and implemented, enabling technicians and ATM operators to quickly identify, comprehend, and resolve various error codes occurring in the CMD Controller section. The mobile application serves as an effective and easily accessible medium, reducing reliance on physical manuals or online searches, thereby expediting the ATM machine recovery

process. This guide system provides structured and clear steps, aiding in minimizing technician errors and optimizing machine downtime.

This research contributes to the field of ATM machine maintenance by integrating mobile application technology into error code troubleshooting. This concept introduces a novel, more efficient, and effective approach to addressing operational issues in ATM machines. With a focus on the CMD Controller section, this study complements existing literature with practical solutions applicable to real-world scenarios. It should be noted that this study is limited to Wincor Nixdorf ATM machines and specifically targets the CMD Controller section. As a result, generalizing findings to other ATM brands or sections should be done cautiously. The availability of access and network quality on the mobile application can impact the effectiveness of the error code guide system. Resource and time limitations during the study might have influenced the depth of analysis and testing.

For future research, expanding the scope to encompass various brands and types of ATM machines can make the solution more universal. Integrating remote monitoring systems to allow proactive monitoring and prevention of further issues is recommended. Developing additional interactive features within the mobile application, such as step-by-step guides in the form of videos or animations, could enhance user experience. Conducting in-depth studies on user perceptions and experiences with the error code guide system is suggested. This study opens up the potential for further development by integrating the latest technology advancements to enhance services in the banking and financial services industry.

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