

ATM Availability Management System

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Abstract: ATM monitoring process is a part of ATM Availability Management solutions. It's a process of monitoring Automated Teller Machines on a regular basis. It enables the financial institutes to maximize the availability of their ATM fleet for the customers and reduce the downtime caused by various issues. Handling the incidents related to ATMs and monitoring the devices level health of entire ATM fleet is the prime study of this paper. The Master View that helps a financial institute to improve the overall availability of their self-service terminals and minimizing the downtime. Various reports and statistics about the transactions across various demographics is provided with useful information like, a) the cities using ATM heavily, b) most popular transaction, c) ATMs having heavy transaction volumes, etc. Monitoring ATMs helps greatly to identify the various causes behind slow or failed customer transactions so as to reduce the service incidents and maximize the ATM uptime.

Keywords: ATM Monitoring, ATM Availability Management, ATM Fleet Optimization

I. Introduction

1.1 An Automated Teller Machine(ATM), is an electronic telecommunication device which enables the customers of a financial institutions like banks, to carry out financial transactions, such as cash withdrawal, Balance Enquiry without any need of a human cashier, clerk or bank teller.

For an ATM, the customer is a person who inserts or swipes a plastic card with a magnetic stripe or a plastic smart card with a chip into an ATM containing a unique card number and some security information such as CVVC (CVV), an expiry date or the 16 digit card number. Post inserting the card the customer is also asked to provide his authentication by entering a personal identification number (PIN) which must match with the PIN stored in the chip on the card (if the card has it equipped) or in the financial institution's database who has issued the card.

Using an ATM, customers can access their bank deposit or credit accounts in order to make a variety of transactions such as cash withdrawals, check balances, or, cash deposits, cheque deposits, statement printing, credit mobile phones and so on.

1.2 ATM Architecture

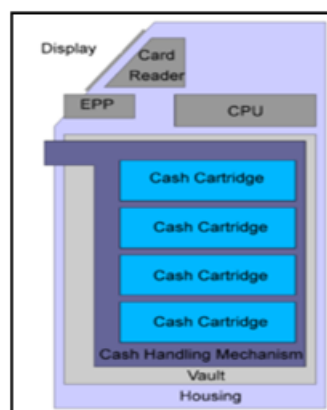


Fig. 1.1 ATM Architecture

1.3 ATM Working

A generic ATM machines is a combination of multiple devices and a software application which work in a synchronized manner which has an ATM Terminal with

- Card Reader
- Encrypted Pin Pad with functional display keys

- c. Cash Dispenser
- d. Receipt Printer

A customer visiting an ATM for a Cash Withdrawal, swipes the ATM card. The card reader reads the data such as 16 digit card number, card holder's name and expiry date from the magnetic strip or EMV chip on the card. Then the customer is prompted to enter the PIN using the Encrypted Pin Pad. The entered PIN is encrypted by the Pin Pad. The customer then selects the transaction options such as type of transaction, type of account, receipt consent using the Functional Display Keys. The customer again uses the Pin Pad for entering the amount to be withdrawn. With all this data, the ATM terminal application fires the request for withdrawal. With the response, the ATM dispense the cash with help of the dispenser and receipt printer prints the data received in the response such as amount withdrawn, remaining balance etc.

1.4 ATM Eco-system

Usually ATM ecosystem is based on *Client Server Architecture*. It three major entities are –

- a. ATM terminal
- b. Switch
- c. Host

ATM terminal is the client application which runs on terminal with help of various devices. Host is the Central Banking System (CBS). It is a server in the bank premises which holds the data of all the account holders of the banks. Switch is another server application which acts as a middleware between ATM terminal and switch.

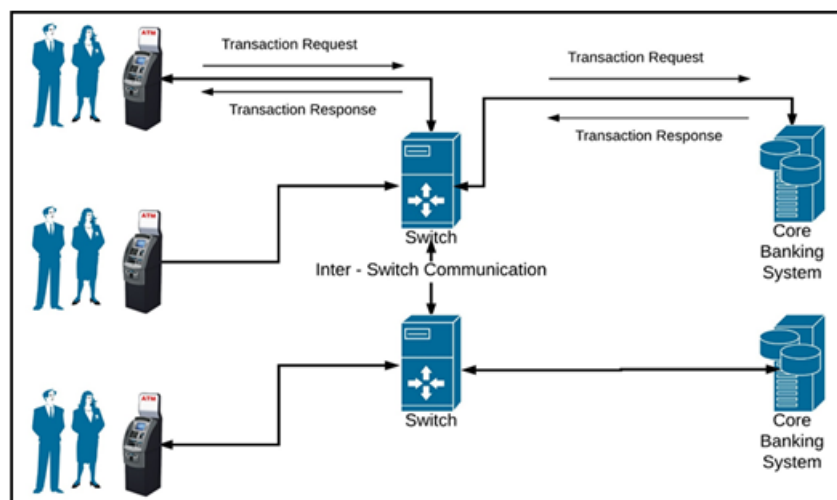


Fig. 1.2 ATM Eco – System

When a transaction request is initiated from the ATM terminal, it comes to the switch and PIN authentication is done by the Switch. If PIN authentication is successful, then the request is sent to Core Banking System. The Core Banking System (CBS) is responsible for executing the requested transaction such as Cash Withdrawal, Balance Enquiry and so on. The CBS then sends the response to the Switch and Switch forwards it to the ATM. As per the requested transaction, ATM performs the actions such as dispensing the cash, printing the balance etc.

An unsuccessful PIN is not forwarded to the CBS and response is sent to ATM as '*PIN Authentication Failed*'. This response sent to ATM terminal customer asks for re-entering the PIN or the transaction is cancelled depending on the business logic set by the financial institute in the Switch.

There are multiple Switch vendors in the market and the ATM machines of all financial institutes are connected to these various Switch vendors. Suppose there are two banks – Bank A & Bank B which are connected to two different Switch vendors X & Y respectively. When a customer of Bank A goes to the ATM of Bank B, the transaction request is made to Switch Y. Switch Y forwards this request to the Switch X and then Switch X forwards this request to the CBS of Bank Y. Such kind of transactions are known as Off-us transactions. When a customer goes to ATM of its own bank, the transaction is known as On-us transaction.

1.5 ATM Monitoring

ATM manufacturers faces a wide range of problems while deploying and providing maintenance services to the financial institutions. Among these problems, maximizing the ATM terminal uptime is the major goal in front of ATM vendors. Given the sensitive nature of cash dispensing ATM terminals, the service providers need to provide a proven and secure solution for the service delivery. Moreover, financial institutions being always under constant scrutiny to reduce their operational cost, the service providers need to provide a solution which gives an optimal customer experience and fulfill the need to generate the meaningful data about their ATM in order to make the wise management decision.

ATM monitoring is the process of monitoring the health of the ATM terminal and the various hardware devices installed to it. ATM Monitoring also includes keeping a track of transactions taking place on ATM terminal. The main need of ATM monitoring is maximizing the availability of ATM terminals to the end users i.e. the customers of financial institutions and reducing the downtime of the terminals. The reason behind this is downtime of the ATM terminals makes the customers of financial institutions visit the ATM of other financial institutions for doing transactions such as Cash Withdrawals. In such kind of off-us transactions, the financial institution has to pay certain amount as a transaction fees to the other one. Another major concern of having a down time is that if the ATM terminal is having a down time frequently, it hampers the reputation of the financial institution causing the loss of its existing customers and making it next to impossible for acquiring new customers.

Financial institutions heavily depend on the data generated thousands of transaction performed on the ATM Terminals for making wise business decisions. Various reports and statistics about the transactions across various demographics is provided with useful information like, a) the cities using ATM heavily, b) most popular transaction, c) ATMs having heavy transaction volumes, etc. Monitoring ATMs helps greatly to identify the various causes behind slow or failed customer transactions so as to reduce the service incidents and maximize the ATM uptime.

Most of the ATM managers still calculate the availability of an ATM based on the percentage of time the ATM was able to dispense the cash [3]. However, for a better consumer experience, need to consider all the factors while measuring the availability of an ATM. Many financial institutions assume that ATM availability should be equally important all the time and at all the locations. However it is not true. As The availability of an ATM on a busy street or a railway station at 5:00 p.m. is much more important than the availability of the same ATM at 2:00 a.m. In addition to the availability, ATM monitoring solutions should also analyze the incidents, severity of the incidents, actions taken and time required to resolve the incident. Based on all this data, the financial institutions can design their business strategies and other future expansion plans. According to a survey[1],50% of the survey respondent have said that their monitoring solution have made noticeable improvements to their ATM availability levels of their financial institutions compared to before they deployed the solution. However, majority of the financial institutions are still unaware about the benefits as they don't know what are the features provided by their existing monitoring solutions.

In ATM, there are multiple devices and the health of a single depends on these devices. If any of the critical device stops working, the ATM becomes non-functional and downtime starts. Continuous monitoring of ATM and these devices, helps to analyze the patterns of the device status and predict if any of the device is reaching end of its life. This helps the financial institutions to proactively avoid downtimes of ATM. The continuous monitoring facilitates the predictive maintenance and thus get rid of sudden downtimes which causes the loss of productivity of ATM terminals.

1.5 Customer

This study providing services like Monitoring, Cash, FLM, SLM and Total implementations (TIS) to various Banks , Federal, UBI and many more. The total number of ATMs currently the IMS having is around 15000+. Below are the various services offered by DBD India Managed Services Centre.

1.6 Objective

Below are the objectives of this survey

- To understand the concept of automated ATM Monitoring Solution
- To study the various features of Master View Resolve(MVR) Application Suite.

This study involves the evaluation of the efficiency of MVR in terms of Availability, Usability, Performance, Portability, Scalability & Robustness of an ATM which are very vital.

II. Master View Resolve (MVR)– an automated ATM monitoring solution

Master View Resolve(MVR) is an automated ATM monitoring tool which is process oriented, multivendor and multiprotocol supported system which ensures consistent and end to end availability of ATM network. In addition to the availability management of the Self-Service Terminals it also provides below services.

- Content Distribution

Content distribution is one of the services provided by the MVR suite. MVR suite allows a seamless and hassle-free distribution of software patches, security updates, software updates and hotfixes on the ATM network. It also enables the users to install these patches and updates remotely on the entire ATM fleet of the banks.

- EJ Pick-up

Electronic Journal(EJ) in transactional banking industry contains the details about the transactions performed by the customers on that specific ATM terminal. This EJ file is very useful for banks for performing Reconciliation process. The MVR suite provides the capability to pull the EJ from each terminal. It also provides the facility to schedule the EJ Pulling job at a particular interval.

- Consumable Management

ATM terminal consist of many various hardware components and other consumable items such as receipt printer papers. The MVR suite has the ability to track the usage of such hardware items in order to replenish them at the correct point before they reach their end of life with help of preventive maintenance so that failure of any device or hardware component doesn't causes a downtime for the terminal.

The three main parts of MVR are

- YMS
- IC-YMS
- Master-View

2.1.1 YMS

The YMS application is a management system that ensures consistent and effective availability of services, as agreed with the customer. It provides an environment where business processes that manage the end-to-end availability of self-service networks can be managed and executed.

The YMS application is built on a state-of-the-art ATM Channel Management Systems architecture. It utilizes databases and up-to-date software to improve and sustain high network availability for financial institutions and their customers. It helps to monitor the hardware, software and operations related to an ATM from a simple user interface. It supports any equipment that sends alerts in a documented message format.

The YMS system components are organized into a common kernel that supports the following four main parts:

- **Configuration Tools.** Help to customize the system.
- **User Interface.** Provides a user-friendly interface.
- **Connectors.** Provide integration with the external systems.
- **Processes and Activities.** Customize the Managed Services operation

2.1.2 IC-YMS

The IC-YMS application is based on the concept of utilization, depending on the consumer transaction demand and the installed and working resource capacity of the available equipment. The IC-YMS application enables users to view the operational statistics and the historical data for managing sites in a simple graphical interface. In addition, it is structured to use a forecast engine which uses forecast components (e.g. neural network components) to estimate transaction demands at the terminals and provide users a different monitoring point of view.

- IC-YMS for Managed Services Users allows the MS users to manage different customers in a single instance of the application. Also, allows to perform the administrative and monitoring activities.
- IC-YMS for Customer Users. Allows the users to perform the administrative and monitoring activities.

The IC-YMS application provides the following features:

- Occupational status of the customer's sites
- Availability status of the online terminals.
- Information about the terminal transactions grouped through hierarchical views.
- Information about the call dispatches related to the terminal Hierarchical views for the terminals.
- Detection of problems in terminals that cannot be detected through the monitoring alerts sent by the terminal (such as video monitor broken in old terminals, terminal room door locked and so on).

In addition to the above, the IC-YMS-MS application provides following features:

- Manage customer activation.
- Manage customer access permissions.
- Configure password rules and mandates.

2.1.3 Master View

Master view is a remote monitoring tool which is based on client server architecture. The client resides on the self-service terminal whereas the server is installed in the managed services provider's or financial institution's environment. MVR has the capability to provide 'Content Distribution' functionality in which it can be used to distribute software patches, security updates, campaign files remotely on the self-service terminals. It also facilitates the remote installation of the software patches and security updates on self-service terminals.

In addition to this, Master View also provides the feature of EJ upload and download. The EJ file contains the details about the transactions performed by the customers on that specific ATM terminal. This EJ file is very useful for banks for performing Re-conciliation process. It also provides the facility to schedule the EJ Pulling job at a particular interval.

2.2 Status Monitoring

ATM status monitoring is a base of all the ATM monitoring software solution. A standard ATM monitoring software solution must be able to monitor, filter and analyze all the status being received from ATM terminals. According to a survey [2], status indicators and fault information are essential KPIs which are supposed to be provided by an ATM monitoring solutions. The MVR system is capable of monitoring all the statuses including minute statuses such as heartbeats of ATM with help of its state-of-the-art ATM Channel Management Systems architecture. It can monitor any Self Service Terminal(SST) device regardless of its manufacturer. The other software solutions in these segments which are the competitors of MVR suite also provide this functionality. However, MVR doesn't provide the functionality to monitor 'Point of Sales' terminals. Major competitors do provide a feature of monitoring 'Point of Sales' terminals along with regular Self Service Terminals.

The ATM terminals communicate with monitoring systems with help of protocols. The status being sent by the ATM terminals must be in some or the other standard format which is understood by the monitoring systems. These formats are known as protocols and the monitoring systems supporting the multiple protocols are always in demand. Here, the MVR suite comes in advantage as it supports multiple protocols such as 91X, MDS, SNMP, TAA, EMS and NDX. Its other competitors such as ABC, PQR and MNO supports limited protocols which puts the MVR at first place.

MVR has the ability to communicate with ATM terminal directly without help of any other middleware. The remote monitoring agent which is a part of MVR suite can be installed and configured on the ATM terminal to send the status messages to MVR monitoring application. The other competitors need to take help of switch vendor here as they do not support direct communication with ATM terminal with help of a remote monitoring agent. In case of other monitoring suites, the ATM terminal sends the status messages to switch and from there the messages are forwarded to the monitoring applications for further filtering and analysis. The later approach might also cause a delay in reflecting the messages on monitoring application dashboard as instead of directly receiving the message from ATM terminal, it is getting received via Switch.

The capability of MVR, when demonstrated automatically interpret the status received from ATMs or from the hosts. MVR also updates the status of tickets automatically whenever the service team is notified or device is accessed. i.e. If the Cash Dispenser of a terminal is out of cash, it will be shown in 'Red' icon, but when the services engineer will reach the site and accesses the Cash dispenser it will change its color to indicate the 'Work in Progress'. The users of the MVR can amend or modify the ticket information manually whenever the additional information is available. Like other monitoring system solutions, MVR enables the users to query and retrieve the status of each and every device installed in the ATM.

2.3 Automated Service Team Notifications

Automated Service team notifications refers to mechanism of notifying the service team and other stakeholders about the events occurred on ATMs in an automated way. Like all other monitoring solutions, MVR also provides the 'Auto-dispatch' feature i.e. whenever the ticket is created or any other information is updated about the ticket, the related stakeholders are automatically notified.

The service team notification provided by the MVR supports multi-channel notification processing. The automated notifications generated by the systems can be communicated to the concerned stakeholders via phone, fax, pager, SMS and e-mail.

The MVR provides a feature called as 'Bidirectional Communication'. Along with PQR, it is the only monitoring solutions providing this feature among its competitors. In addition to the above features, MVR also facilitates the trouble call /ticket escalation.

2.4 Remote Service

The remote service is one of the best and popular feature provided by MVR suite. It enables the user to remotely access the ATM and perform the operations. With help of Remote Service feature, a user of MVR can

- Conduct a remote diagnostic session on ATM
- Check system processes for normal operation
- Test individual devices on the ATM
- Recommend recovery solutions and parts needed for the customer service engineer (CSE)
- Analyze root causes by viewing log files
- Validate the hardware and software configuration for latest performance enhancements and fixes, such as the introduction of new self-service features including bulk-note acceptors and deposit automation
- Install software fixes and updates to enhance performance

2.5 Reports

The Reports functionality of the YMS application allows the users to view reports, subscribe to reports and manage the user's subscriptions according to the user's access rights. These reports help to analyze data for a) managing SLAs, b) improve processes and c) examine equipment faults. This data can be used to decide the course of action for ensuring terminal's network availability for the customers. The YMS Reports functionality is also designed for customizing the reports. The users can use the standard templates and specify the parameters for generating reports. In addition, the users can specify either a *.pdf* or *.xls* output format for viewing the reports.

The YMS Reports function enables the user to generate reports based on the following aspects of the YMS workflow:

- Equipment and site availability
- Diagnostic information of the activities
- Activities executed on the equipment to resolve a detected problem
- Processes employed for resolving problems on equipment
- Time taken to resolve the problems occurring on the equipment

The YMS reports can be broadly categorized into two major types

1. Historical Reports - Report based on the historical data available in the Historical database such as

- Diagnosis Analysis – Summary Report
- Equipment Status Analysis Report
- Gross Availability Daily Histogram

2. Online Report - Report based on the online data available in the Online database such as

- Current Effects Analysis – Online Report

To ensure the security of the data being accessed using the reports, user roles with specific access privileges to the YMS Reports functionality are defined in the YMS application as follows .

a) Report User

A Report User has read-only access to reports, and can view, print, subscribe to and download the reports using the YMS application. In addition, the Report User can create and organize folders in the Report User's directory, and manage subscriptions made to the reports. Viewing, printing and saving the published reports to which the Report User subscribes. Report user is mainly responsible for organizing reports and folders in the Report User's directory, creating and managing subscriptions to reports and viewing, printing and downloading shared reports using the Adobe Reader interface.

b) Report Designer

A Report Designer designs the reports according to the requirements of the customer. The Report Designer is not a part of the YMS workflow and does not work with the YMS application. The Reports Designer analyzes the information requirements of the customer, and plans the report layout. The layout is created , queries tested and applies changes to achieve the desired outcome.

2.6 Transaction Monitoring

Transaction monitoring is another feature provided by MVR suite. It enables the users of financial institutes to monitor the transactions taking place at ATMs. IC-YMS a part of MVR suite is responsible for monitoring the transactions. The transaction monitoring is used to determine the transaction success rates, popular transactions, and other parameters. MVR suite provides detailed reports such as maximum total transactions, maximum denials, maximum reversals etc. MVR suites also allows to monitor the host link monitoring.

2.7 Cash Monitoring

Cash monitoring enables a financial institute to proactively monitor the cash levels in ATM network by enabling them to specify additional threshold for each ATM. It allows them to determine the required level of cash more accurately for each ATMs.

Unfortunately, the MVR suite doesn't provide this feature on its own. It needs to be integrated with Cash Management Applet. Other competitors except XYZ and PQR of MVR suite also needs an integration with some or the other third party application in order to provide this feature.

III. Survey, Data & Methodology

A survey was done amongst the users of MVR to figure out efficiency of MVR in following parameters:

- a. Availability
- b. Usability
- c. Performance
- d. Portability
- e. Scalability
- f. Robustness

An exploratory study conducted adopted two types of methodology. A) first type of study was mainly carried on Secondary Data Survey, consisting of the data collected from of the previous research studies and reports and B) the second type of study was on the Primary Field Survey- data collected from users of the MVR tools.

Effort was made by the researcher, as far as feasible, to take all related aspects in understanding the efficiency of MVR as an automated ATM monitoring solution. The secondary data was collected from various published and unpublished sources like electronic resources, documents, reports, magazines, journals, websites etc.

On the basis of primary field survey the researcher picked up the data from the dynamic real-world field conditions. The advantage of this was that live information which they experience in the daily activities which has helped to find to the actual situation how MVR was useful to Financial Institutions to provide continuous availability of their Self Service Terminal network.

IV. Analysis

The MVR survey was conducted amongst the MVR users within the organizations. The main motive of this survey was to find out the efficiency of MVR in context of availability, usability, performance, portability, scalability and robustness. The sample size was 10. In the sample, there were 70% of male users and rest were females. Almost 50% of the users belonged to the age group of 25 to 30 years.

4.1 Availability

Availability of the MVR software suite is majorly based on the unexpected downtimes. Since, the MVR application is used for monitoring the self-service terminals and if unexpected downtimes of MVR occurs in the midway, it is considered as a financial loss. The obvious reason behind this is during the downtime of MVR, the ATMs cannot be monitored and which results into breaking of SLAs.

There are basically two types of downtimes

1. Planned downtime – This is a downtime asked from financial institutions by MVR team for any software upgradation or routine maintenance task.

2. Unplanned downtime – This is an unexpected downtime which occurred due to any issue in MVR suite.

From the survey, it was observed that MVR has a success rate of 100% for carrying out any maintenance tasks during the planned downtime without exceeding the downtime. It was also seen that from last two years MVR has experienced downtime only twice – a) once due to a minor issue and b) another due a major issue. It was found that the major issue occurred unexpectedly due to congestion in a network component of MVR. As the situation was never experienced earlier, it had taken almost 3 days to rectify and resolve the issue and till then

MVR was completely down. Another downtime which occurred due to a minor issue lasted only for 20 minutes and was resolved with some configurational changes to MVR.

The effectiveness of a cash dispensing ATM[3] is measured by measuring the ATM availability and strictly measuring the number of minutes an ATM is down irrespective of high or low usage of the ATM window.

4.2 Usability

Usability refers to the user-friendliness of the MVR suite for its users. It basically shows that how the icons and other elements are placed on the screen. The consistency in visual elements such as font, layouts & buttons across the MVR user screens etc. It also focuses on how the common functionalities such as working on tickets, extracting the reports, how to design a process, etc. are designed, are those functionalities easy to be understood by users or not.

From the survey data it was observed that almost 90% of the users are satisfied with the button icons and other elements used in MVR user interface and they feel that the icons are intuitive enough to communicate the functionality of that particular button. The survey data shows almost 56% of users belong to the age group of 25 to 30 years of age who agreed that MVR has 100% consistency in visual elements across the user interface as they agreed that all the visual elements are font, buttons, layouts are consistent across all the MVR user screens.

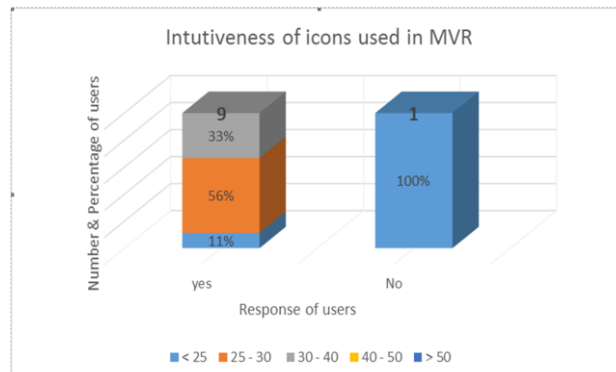


Chart. 4.1 Intutiveness of icons used in MVR

From the survey, it was identified that 80% of MVR users think that it is easy for users to work on tickets such as allocating, monitoring tickets, etc immediately after finishing the classroom training. This means that ticketing functionality of MVR is very much straight forward and can be understood by anyone with help of basic classroom training. However, there is some scope of improving the training program as 20% of users who do not agree with the statement has only 1 to 2 years of experience. It needs to be highlighted that from rest of the 80%, 10% people strongly agree with the statement. From remaining 70%, 57% of users have 2 to 4 years of experience which indicates that hand on working experience of minimum 2 years is required along with classroom training to develop confidence in users for use of ticketing functionality of MVR.

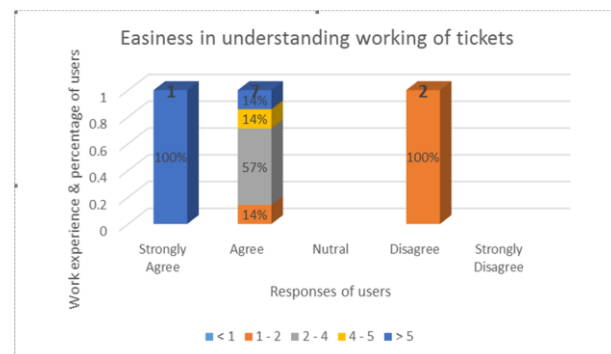


Chart. 4.2 Easiness in understanding working of tickets

Similarly for the ‘Process Design functionality’, 70% of users said that this functionality is 80% to 99% easy and simple to be understood by the new user. Seeing the complexity of this functionality, the survey indicates that the training program is decently designed for ‘Process designing’ in order to grasp the fundamental concepts of the functionality.

MVR application suite scores 100% when it comes to the simplicity and understandability of 'Report Extraction' process. Out of 10 users who were surveyed, all the 10 have agreed to the statement that it is very much easy for MVR users to extract reports from the MVR suite immediately after finishing the classroom training. This indicates that report extracting functionality is quite simple compared to the others and training program is very well designed to be understood by new users.

The MVR application suite has scored decently in the area of functionalities and use of visual elements. However, the product owners need to seriously think about the color combinations and other factors which contribute to the overall look and feel of the software as 80% of users have reported that the look and feel and color combination of MVR users screen do not have any positive impact on its users.

4.3 Performance

From the survey it was identified that the communication between MVR monitoring application and MVR agent residing on ATM happens in near real time. All the users have confirmed that it takes less than 0.5 seconds to reflect the status of devices on MVR monitoring application. The survey also indicates that MVR suite provides 100% accurate status information about all the devices installed in an ATM. From this we can conclude that MVR is performing absolutely well in its core competencies of monitoring the ATMs and updating the status in near real time.

However, one major drawback of MVR software suite is that it does not provide counter information about the cash handling devices installed in ATMs. Counter information refers to the counts of currency notes and coins available in the cash handling devices in the ATMs. This is a one of the important feature of any ATM monitoring application. With help of this, a financial institution can monitor the cash levels of various ATMs located at different locations and branches. It enables the financial institution to identify which are the locations where there is high requirement of cash and which are the locations where supply can be decreased in order to manage the cash level amongst the fleet of ATM. It enables a monitoring application vendor to provide Cash management feature as a part of Monitoring application suite. Currently MVR does not provide this feature because of which MVR cannot compete its other competitors in market for Cash Management feature.

One more feature is that the measure of the number of down time [5] does not accurately indicate the loss of opportunities in terms of revenue lost nor the problem faced by the consumer when the ATM failed.

5.4 Portability

Portability refers to the ability of MVR Software Suite to work on any ATM irrespective of its vendor or make. As per the survey results, 100% users have confirmed that the MVR can be used to monitor all the ATMs. This points add another feature to the MVR's list. In ATMs domain, portability is utmost important factor as it enables the Monitoring Application vendors to sell the applications to financial institutions having heterogeneous ATM fleet. The vendor gets free from the dependency of a particular model or its own ATM applications to deploy the monitoring applications.

Moreover, all the users have also confirmed that MVR suite provides the feature to modify the existing processes in MVR suite as per customer requirements. The Process Design feature of MVR allows the financial institutions to automate the process of incident handling or monitoring the ATMs. The MVR comes with its own default processes for the same requirements which can be directly used as plug and play. However, most of the financial institutions do have their own customized manual process designed for the same. The MVR allows these financial institution to use the existing processes available in MVR as well as make use of these processes to design their own customized process.

5.5 Scalability

Scalability refers to the ability of MVR software suite to handle increasing count of ATMs to be monitored or the number of users that can be added to MVR application. From the survey it was known that out of 10, 70% users agreed on a statement that the performance of MVR doesn't degrade if the number of terminals to be monitored are increased. The rest 30% says that the performance somewhat decreases if the number of ATM to be monitored are increased with very high number.

From the below given graph 5.3, if we look at the number of years of experience of people disagreeing to the statement, we will notice that all of them are having much higher experience than those who agreed to the statement. This means that these people might have experienced such kind of issue in early days of their entire journey till today with MVR or they were involved in such projects where the number of ATMs to be monitored might be too high. From this, we can conclude that MVR works absolutely fine with increased number of ATMs to be monitored unless and until the numbers are exceptionally high.

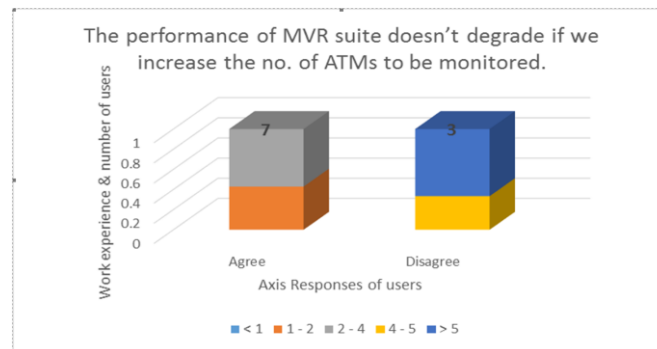


Chart 5.3 Performance of MVR suite doesn't degrade if we increase the no. of ATMs to be monitored.

Similarly, almost 90% of users have said that there is no limitation on numbers of users that can be added to the MVR application. These two findings indicate that MVR scores fairly above average in the parameter of scalability.

5.6 Robustness

Robustness is the ability of the MVR application to run smoothly even in case of application of network failure. It is a degree of MVR software suite to which it can deal with the errors. From the survey it was identified that out of 10, 90% of the users have agreed that MVR can handle network failure with more than 90% of success rate. This means in more than 90% of cases of network failure, MVR has worked properly without giving any error or breaking down in between.

Similarly, from the survey, it was also known that in case of any abrupt shut down of the system due to any technical or power issue, 80% of the users have agreed that there is no possibility of data loss. Remaining users have said there is a very rare possibility of data loss. The Disaster Recovery (DR) server is always present to for back up. So whatever data which is processed within the system like tickets, reports, etc. is always backed up in the DR server. In case if the system is abruptly shut down while receiving the data from MVR agents residing on MVR, there is a very rare chance that data might get lost as once the data is received at MVR monitoring application's end it sends an acknowledgement saying that the data has been received. If the MVR agent doesn't receive this acknowledgement, it keeps on trying to send the data to MVR monitoring application.

Moreover, all the 10 users have confirmed that in case of abrupt shutdown the MVR monitoring application takes less than 5 minutes to restart the application. This shown that MVR software suite has an ability to recover quickly from abrupt shut downs and start working in a normal condition. From the survey taken, we can say that MVR application has a fairly above average robustness which can be a key point in cracking the sales opportunities of the software.

V. Conclusion

In today's competitive world, automated ATM monitoring solutions have become an integral part of any financial institution's day to day operations. These tools help the banks by providing near real time status, data and analytical reports about their ATM fleet and gain competitive advantage over others.

Talking about monitoring solutions, MVR has proved itself to be one of the market leaders by providing a range of various features for monitoring ATMs. To find out the efficiency of the 'MVR (MVR) – an automated ATM monitoring solution system', we conducted a survey amongst its users. The survey had around twenty five questions which were objective and one open ended question about suggestions. The survey included questions related to the availability and usability of the system, how the system performs, what is the level of robustness etc.

After analyzing the survey data, we could conclude that in terms of availability, MVR has faced only 2 downtime issues out of which only one is major and another is minor. MVR has a 100% success rate for carrying out any maintenance tasks during the planned downtime without exceeding the downtime.

Similarly, in context of usability, users are happy with the functionalities and the use of visual elements. However, if the product owner work more on color combinations and other factors which contribute to the overall look and feel of the software it will have a much positive impact on the users.

In terms of Portability, Scalability and Robustness of the system almost 90% MVR users are happy. From the survey, we could conclude that MVR has scored fairly above average in above mentioned parameters. The product owners of MVR should maintain this consistency as these parameter are base of any monitoring solutions. They can leverage this plus point of the system in order to attract more financial institutions as their customers in the market.

When it comes to the performance of the system, MVR facilitates reports and other analytical graphs which contains 100% accurate information that too with real time data. From the survey it is easy to conclude that MVR is performing absolutely well in its core competencies of monitoring the ATMs and updating the status in near real time. However, the only major drawback is it does not provide counter information, ie counts of currency notes and coins available in the cash handling devices installed in ATMs. This is a one of the important feature of any ATM monitoring application. It enables the financial institution to identify which are the locations where there is high requirement of cash and which are the locations where supply can be decreased in order to manage the cash level amongst the fleet of ATM. It enables a monitoring application vendor to provide Cash management feature as a part of Monitoring application suite. The future of MVR product is to provide this feature too to become true market leader with the other state of art features and functionalities already available.

In addition to the above parameters, we also got few suggestions and recommendations during the survey as given below

- MVR is not yet capable of monitoring the external devices or utilities like AC, lights. The agents have to create incidents manually in XMS for these peripheral devices like AC, lights etc. The system should be able to detect and map such statuses and should be able to create tickets in MVR automatically.
- The customers in different geographies are using different versions of MVR. It increases the overhead of management and maintenance. For this there should be globally uniform release process.

If above suggestions are implemented by MVR product owner, this study will surely help MVR will be a state of art monitoring solution.

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