VALIDATION OF A SCALE FOR MEASURING PRECAUTIONS FOR SAFE USE OF ATM

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Abstract

ATM fraud is a big threat and it requires a coordinated and cooperative action on the part of the bank, customers and the law enforcement machinery. It not only causes financial loss to banks but also undermine customers' confidence in the use of ATMs. The specific objectives of the study are (a) to develop and validate a scale for measuring the precautions taken by ATM users for the safe use of ATM and (b) to examine the adequacy or otherwise of the precautions taken by ATM users. The study is empirical in nature and survey method has been employed for collecting data from 342 respondents. The response was collected using a structured questionnaire which was pilot tested with 25 respondents who are using ATM. Non-Probability convenience sampling technique was used to identify the respondents. Seventeen statements were used to elicit precautions taken by ATM users for the safe use of ATM. These are the statements that describe the practices ATM users should follow while using ATM's. The reliability of the measures is assessed by examining the Cronbach's Alpha Coefficient. Exploratory Factor Analysis is used in the current study to explore six underlying dimensions of the measured items and each dimension were suitably labeled based on the characteristics of the items converged in each dimension. These six dimensions are precautions related to PIN, precautions related to Machine, Precautions related to Card, Precautions related to Cash, Precautions related to bank accounts and precautions related to transactions. These dimensions were further validated through confirmatory factor analysis. The findings have managerial implications for banks, as they will help them to take necessary steps to safeguard their customers against the risks associated with the use of ATM. The mean of percentage score of all the constructs were found to be above 80 percent except precautions related to Machine which is 72.4 per cent. This indicates that ATM users take fairly enough precautions while using ATM and found that comparatively highest precautions are taken on transactions dimension and lowest precautions related to machine. If banks can take initiative in creating awareness among their users to take more required precautions, it will instill more confidence among ATM users so that they can do banking transactions without the fear of risk and fraud. The most important contribution of this study to the existing literature is the development and validation of a scale for measuring the precautions for safe use of ATM.

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I. Introduction

The advent of Information Technology (IT) has enabled banks to shift from the traditional way of delivering banking services to new and modern techniques of banking with technological support (George, 2018). Therefore, the contemporary era has replaced the traditional monetary instruments from a paper and metal based currency to "plastic money" in the form of credit cards, debit cards, etc. This has resulted in the increasing use of Automated Teller Machine (ATM) all over the world (Adepoju and Alhassan 2010). With the introduction of Automatic Teller Machines (ATMs), customers can even go to any networked branch or networked ATMs, and carry out any banking transaction. With e-banking, many banking activities are carried out from within the customer's home such as payment of shopping bills, electricity bills, school fees, phone bills, insurance premium, traveling bills and even petrol bills. The convenience and safety that both debit and credit cards carry with their use has been instrumental in increasing both debit/credit card volumes and usage.

When ATMs were first installed in the 1970's, few financial institutions or their customers were concerned about security. But over the years, there has been a dramatic increase in ATM crime (Seibert, 1994). However increased use of ATMs resulted in various threats and frauds in the system. This evil side is reflected in the form of "ATM frauds" that is a global problem (Adepoju and Alhassan, 2010). Brunner et al. (2004) states that the ATM fraud is not the sole problem of banks alone. It is a big threat and it requires a coordinated and cooperative action on the part of the bank, customers and the law enforcement machinery. ATM frauds not only cause financial loss to banks but they also undermine customers' confidence in the use of ATMs.

II. Observations from the Literature

Raghavan (2006) opined that at present, over 85% of the finished payment transactions are electronic and traditional way of doing banking at the branch level has relatively little importance to electronic banking users. Many banks, including PSU banks, would have online ATMs, phone banking, virtual banking, e-banking, Internet banking, etc. by 2020. Mohan (2006) remarked that Indian banking is at the threshold of a paradigm shift and a significant development has been achieved by banks in offering a variety of new and innovative e-banking services to customers today, which was not thought of before. However, public sector banks have not been able to harness the benefits of computerization. Kamadkodi and Ahmed Khan (2008) found that a wide gap exists in human service in Indian banking while technology based services are exceeding expectations. Uppal and Chawla (2009) found that the customers of public sector, private sector and foreign banks in Ludhiana district of Punjab are interested in e-banking services, but at the same time are facing problems like inadequate knowledge, poor network, lack of infrastructure, unsuitable location, misuse of ATM cards and difficulty to open an

account. Indian customers' perception in the context of e-banking has been examined by Agarwal et al (2009) and found that people in the age group of 31-45 years using e-banking most frequently. Respondents opined that using e-banking for balance inquiry to be the most useful, closely followed by inter-account transfer of funds and they found e-banking least useful for lodging complaints. Slow transaction speed was found to be the most frequent problem faced, closely followed by non-availability of the server while using e-banking. Sharma (2009) opined that the trend towards electronic delivery of banking products and services is occurring partly as a result of consumer demand, and partly because of the increasing competitive environment in the global context. Kumar and Sinha (2009) cited various instances of hacking and phishing attacks reported throughout India. They remarked that cyber crimes prove that e-banking has several loopholes that can be easily exploited and users need to be extra cautious while making online transactions. Srinivas (2009) discussed various e-banking channels and suggested security tips for customers which include changing password frequently, abstaining from revealing PIN either via mails or phone, avoiding cyber cafes for net banking etc. In a study conducted by Mohammed and Shariq (2011) in the city of Lucknow, U.P to examine the adoption of e-banking channels, particularly ATM, it was found that ATM was the most adopted technology by banks. Shukla and Shukla (2011) stated that E-banking offers a higher level of convenience for managing one's finances even from one's bedroom. However, it continues to present challenges to the financial security and personal privacy. Customers are advised not to share personal information like PIN numbers, passwords etc with anyone, including employees of the bank; change ATM PIN and online login and transaction passwords on a regular basis; ensure that the logged in session is properly signed out. Paur (1991) found that for those who deploy an ATM, it is imperative to monitor the environment around the ATM to ensure there is adequate lighting and an absence of shrubbery or blind corners where attackers might lay in wait. Malviya (2015) suggested the concept of chip/ micro chip that will be embedded into the hand of the possessor at the same time when ATM card is issued by the bank to overcome the risk involved due to lost pins and pin hackers of ATM cards. Jain (2017) explored the types of ATM frauds and securities, modus operandi with general precautions to protect the ATM frauds. George (2017) explored the precautions for safe use of IB and opined that it may not be correct to generalize his findings among banking customers who use ATM. Therefore, it is felt that a separate study is required to examine the precautions taken by ATM users for its' safe use

III.   Research Gap and Objectives

The review of literature revealed that the studies which examined the safe use of ATM's are scant in literature. The purpose of the study is to fill this void. The study raises the following research questions for enquiry.

(a) What are the dimensions on which ATM users are supposed to take precautions?

(b) Do they take the required precautions?

Based on the above research questions, the specific objectives of the study are

(a) To develop and validate a scale for measuring the precautions taken by ATM users for the safe use of ATM

(b) To examine the adequacy or otherwise of the precautions taken by ATM users.

IV.   Materials and Methods

An exploratory study was conducted by reviewing the existing literature to have a clear understanding of the constructs. A focus group discussion was conducted with 5 senior managers of banks to get an idea about which items are to be included in the instrument. The study is empirical in nature and survey method has been employed for collecting data from 342 respondents consisting of students, businessmen, service people, retired employees and professionals in Kottayam and Ernakulam districts of Kerala. The response was collected using a structured questionnaire which was pilot tested with 25 respondents who are using ATM. Non-Probability convenience sampling technique was used to identify the respondents. Seventeen statements were used to elicit precautions taken by ATM users for the safe use of ATM. These are the statements that describe the practices ATM users should follow while using ATM's. The statements consist of positive statements only and if the response to a positive type statement is in the affirmative it is construed as having taken a precaution and vice versa. Responses on each of the statements were obtained using five point Likert-scale (Strongly agree = 5, Agree = 4, neither agree nor disagree = 3, Disagree = 2 and Strongly disagree = 1). The reliability of the measures is assessed by examining the Cronbach's Alpha Coefficient. Cronbah's Co-efficient Alpha of all the 17 measures taken together is 0.831, which surpassed the threshold of 0.70 suggested by Nunnally (1978). The collected data was analyzed using mathematical and statistical tools like factor analysis, Arithmetic Mean and Standard Deviation.

V.   Sample Profile

Out of 342 respondents, 66 percent are females and 34 percent are males. About 76 percent of the respondents are below 30 years of age and 24 percent are above 30 years of age. Nearly one third of the total respondents are students who are postgraduates and graduates; about 20 percent are business people, 16 percent are professionals and 14 percent are working in service sector, rest 20 percent of the respondents are retired employees. Of the 342 respondents, 30 per cent has no income as they are students. But they operate ATMs using the money deposited into their accounts by their parents. Ten per cent has annual income up to Rs. 1,00,000; 22 per cent has annual income between 1,00,000 and 2,00,000; 20 per cent has annual income between 2,00,000 and 3,00,000 and 18 per cent has annual income above 3,00,000. Seventy four per cent of the respondents have average level of computer knowledge while 26 per cent have advanced level of computer knowledge.

VI.   Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) is conducted on 17 measures to explore the factor structure. The correlation matrices are computed and found that there is enough correlation between measures to perform factor analysis. A sample size of 150 observations is sufficient to obtain an accurate factor solution as long as item inter correlations are strong (Hinkins, 1995). The Kaiser-Meyer-Oklin Measure of Sampling Adequacy is 0.628.

According to Kaiser, a measure greater than 0.6 is mediocre, (Darren and Paul, 2011 p.256) which means that the sample is big enough to do factor analysis. The significance value of Bartlett's test of Sphercity is less than 0.05 which indicates that the data do not produce an identity matrix and the distributions are thus approximately multivariate normal and acceptable for factor analysis.

Principal Component Analysis with Varimax roation is employed for extracting the factors, their Eigen values. Six factors with Eigen values greater than one are extracted which together account for 72.034 per cent of the total variance. The communalities of the 17 original measures range from 0.607 to 0.876, which indicates that the variance of the original values is captured fairly well by these six factors. The summarized results of exploratory factor analysis along with the mean and standard deviations of the items are given in Table 1.

Table 1

Summarised Results of Exploratory Factor Analysis

Factors	Item Acronym	ean	D	L	V	E	A
F1	P1	4.66	0.69	0.709	4.846	28.509	0.698
	P2	4.82	0.34	0.914			
	P3	2.72	1.29	0.580			
	P4	3.62	0.98	0.649			
	P5	4.40	0.88	0.461			
F2	P6	3.76	1.45	0.548	1.792	10.539	0.712
	P7	3.38	1.17	0.677			
	P8	3.72	1.32	0.610			
F3	P9	4.64	0.87	0.820	1.749	10.289	0.734
	P10	3.64	1.17	0.773			

	P11	3.96	1.02	0.576			
F4	P12	4.44	1.03	0.811			
	P13	4.24	0.84	0.837	1.432	8.424	0.765
F5	P14	4.02	1.05	0.763			
	P15	4.06	0.99	0.717	1.261	7.417	0.687
F6	P16	4.62	0.67	0.752			
	P17	4.10	1.16	0.819	1.166	6.857	0.780

Extraction Method : Principal Component Analysis   SD = Standard Deviation,

FL – Factor loading, EV – Eigen Value, VE – Variance Explained, CA - Cronbach's Alpha.

Rotation Method : Varimax with Kaiser Normalisation

Rotation converged in 10 iterations

Source: Authors' own

Each of the six factors is suitably labeled based on the characteristics of its composing measures. Factor 1 – precautions related to PIN, Factor 2 – precautions related to Machine, Factor 3 – Precautions related to Card, Factor 4 – Precautions related to Cash, Factor 5 – Precautions related to bank accounts and Factor 6 – precautions related to transactions.

The mean of percentage score (construct score / maximum score x 100) for each construct is calculated and it is shown in graph 1 along with their standard deviations.

Graph 1

Mean of Percentage Score (MPS) of Precautions Constructs
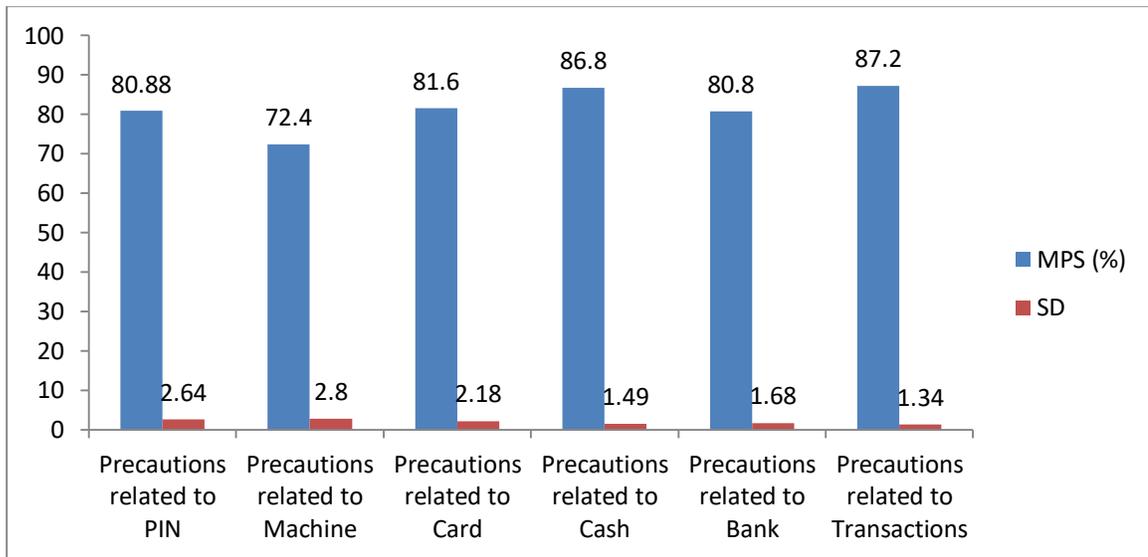
The MPS (Mean of Percentage Score) of precautions related to transactions is highest (87.02) with the lowest standard deviation which means that users take comparatively maximum precautions in respect of this construct. The MPS of precautions relating to machine is lowest (72.40) with comparatively high standard deviation which means that users take comparatively minimum precautions in respect of this construct.

VII.   Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was performed to test how well measured items represent a latent construct (Demirbag et al, 2006). The results showed an acceptable overall model fit (Table 2) with all fit indices within the acceptable levels suggested by previous research.

Table 2: Fit Indices of the Measurement Model

Fit Indices	Measurement model	Recommended value	References
$\chi 2 /df$	3.921	< 5	Bentler, 1989
GFI	0.931	> 0.90	Hair et al. 2010
AGFI	0.804	> 0.80	Gefen et al. 2003

NFI	0.902	> 0.90	Bentler, 1992
CFI	0.918	> 0.90	Bentler, 1992
RMSEA	0.073	<0.08	Hu and Bentler, 1999

Source: Authors' own

The measurement model exhibited a fairly good fit and therefore the reliability, convergent validity and discriminant validity of the model were assessed. As per the methodologies suggested by Hair et al. (1998), the composite reliability and Average Variance Extracted (AVE) were calculated. The composite reliability co-efficient exceeds the cut off value of 0.70 (Straub, 1989) except for CARD (Table 4). However, composite reliability values greater than 0.60 are also acceptable (Bagozzi & Yi 1988). All the indicators loaded significantly on the constructs they were designed to measure. As shown in Table 3, the standardized regression weights of all the indicators in the measurement model are above 0.50 (Hair et al. 1992), Critical ratios or t-values are higher than 1.96. All these suggest good convergent validity.

Table 3: Convergent Validity of the Measurement Model

Constructs	Indicators	SRW	t-value	(Sig. level)
PIN	P1	0.578	*	
	P2	0.537	3.462	***
	P3	0.567	3.327	***
	P4	0.817	3.700	***
	P5	0.540	3.967	***
MACHINE	P6	0.759	*	
	P7	0.765	4.830	***
	P8	0.802	10.815	***
BANK	P14	0.605	4.502	***
	P15	0.902	*	
	P7	0.685	*	

CASH	P12	0.958	3.672	***
TRANSACTIONS	P16	0.655	*	
	P17	0.731	3.540	***
CARD	P9	0.704	7.317	***
	P10	0.764	4.209	***
	P11	0.789	*	

SRW – Standardized Regression Weight

* Unstandardised regression weights assumed as 1, ***Significant at p < 0.01 level

Source: Authors' own

The assessment of discriminant validity of each of the 6 constructs was done as per the criteria of Fornell & Larcker (1981). It is evident from Table 4 that the AVE for each construct is greater than the squared correlation between constructs, thus satisfying the criteria. To put it succinctly, the six dimension model of precautions for safe use of ATM demonstrated good model fit, adequate reliability, convergent validity and discriminant validity.

Table: 4 Reliability, Average Variance Extracted and Discriminant Validity

	CRC	PIN	MACHINE	BANK	CASH	TRAN	CARD
PIN	0.724	0.567					
MACHINE	0.736	0.370	0.605				
BANK	0.728	0.183	0.194	0.697			
CASH	0.779	0.280	0.336	0.129	0.708		
TRN	0.794	0.174	0.360	0.463	0.432	0.692	
CARD	0.684	0.342	0.239	0.392	0.459	0.375	0.629

Notes: CRC – Composite Reliability Co-efficient; Diagonal values are Average Variance Extracted and off diagonal values are the shared variance

Source: Authors' own

VIII.   Managerial Implications and Suggestion

ATM centers across India have been on the rise and therefore safety must be the prime concern not only for banks but also for the users. Banks should ensure that there should be a system of mail notifications or an alert system to the user insisting ATM pin change in order to confirm the security of account login. Another measure to ensure the change of ATM pin is the adoption of automatic PIN lock system wherein the ATM pin is to be mandatorily changed once in a specified period of time; else the system locks the account denying further transactions without resetting ATM pin. Conducting public awareness campaigns through online and offline media can educate the users on issues and measures for the safe use of ATM transactions. Banks should also ensure that the door lock system based on card swipes is properly working at ATM counters so that it will act as an added security and privacy measure. The finding that out of the six constructs, precautions related to ATM Machine is the lowest and hence banks should educate customers about the need to take precautions in this regard.

IX.   Limitations and Scope for Future Research

The study has limitations as most field surveys suffer from. The findings are based on a small sample of 342 respondents and therefore future studies could consider a large sample of ATM users from a large sample area to generalize the results. The measures used in this study may not cover all the precautions for the safe use of ATM's. Therefore in future, replication studies should also be conducted with additional measures to refine the scale developed in this study.

X.   Concluding Remarks

Modern banking is high-tech, electronic and tech-savvy (Kumar et al, 2012). There are diverse hidden risks inherent in the use of ATM and the present study explored various dimensions on precautions for the safe use of ATM. Exploratory Factor Analysis segmented six constructs of precautions for the safe use of ATM and was labeled as Precautions related to PIN, Machine, ATM Card, Cash, Bank accounts and Transactions. The mean of percentage score of all the constructs were found to be above 80 percent except precautions related to Machine which is 72.4 per cent. This indicates that ATM users take fairly enough precautions while using ATM and found that comparatively highest precautions are taken on transactions dimension and lowest precautions related to machine. If banks can take initiative in creating awareness among their users to take more required precautions, it will instill more confidence among ATM users so that they can do banking transactions without the fear of risk and fraud. The most important contribution of this study to the existing literature is the development and validation of a scale for measuring the precautions for safe use of ATM.

Appendix: Measurement scales and items

Precautions Related to Pin

- Do not disclose my ATM pin to others. (P1)

- I do not keep the PIN number and card together or write PIN on the ATM card. (P2)
- I change the PIN number at least once every three months. (P3)
- I use to cover the key pad while entering the PIN number for cash withdrawals. (P4)
- I do not disclose my PIN number to others while swiping ATM card at point of sales. (P5)

Precautions Related to Machine

- Whenever I face trouble with a particular ATM machine, I stop my transactions immediately. (P6)
- Whenever a machine produces weird sounds while dispensing, which end up in failure, I use to retry by drawing smaller denominations like 100. (P7)
- I do not use ATM machines which are poorly lit and those placed in unsecured places. (P8)

Precautions Related to Card

- I do not keep any remarks on the card which might help others to find my PIN. (P9)
- I don't use card at special festival and stall terminals point of sales for making transactions. (P10)
- I use extreme precautions while using cards for making transactions involving offers. (P11)

Precautions Related to Cash

- I do not seek help from others while withdrawing cash. (P12)
- I use to report within 7 days whenever I lose cash. (P13)

Precautions Related to Bank Accounts

- I inspect the account statements regularly. (P14)
- Whenever I get calls or messages requesting information regarding ATM based details, I ensure that they are authorized enquiries by contacting the branch. (P15)

Precautions Related to Transactions

- I ensure that I cancel the transactions by pressing cancel button whenever the transactions are incomplete. (P16)
- I ensure that I receive mobile alerts for each transaction I make. (P17)

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