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Credit Card Frauds: An Indian Perspective

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Abstract—*In today's era, online payment system and net banking are widely accepted all over the world as they make the transactions much easier and faster. Credit card transactions are rapidly increasing over the years that lead to a higher rate of online identity theft and subsequent losses by banks as well as consumers. Followed by the western economies, these online frauds are also making their presence in the developing economies like India. In this context, a comprehensive study is performed to examine the trends of credit card frauds in the Indian banking industry. This study analyzes the secondary data across ten years from 2005 to 2014. Further, a few statistics have been adopted to identify the bank wise, within groups and year wise fraud. Our findings reveal that there has been a decreasing trend in the online frauds in last few years, which shows banks concern about security measures & detecting the new techniques of frauds & developing the measure to fight with them. This study has suggested some guidelines and measures to fight against these kinds of situations. This study reveals new insights of security measures adopted by different banks that can be adopted by other banks on protect their online customers. Thus, this study helps to mitigate the risk occurred during online transactions.*

Keywords: *Credit card, Frauds, Banking Industry, Trends*

1. INTRODUCTION

In the today's era e-payments system and the online banking system are widely accepted all over the world as they make the payment system and the banking transaction easier and faster. Credit cards are one of the instruments of the payment which allows the user to make payment for purchases of goods and services. Credit card is different from the debit card as the Credit card issuing bank or institution creates the revolving account and offers the facility of credit to the customer or the user of the card. He can access this facility for borrowing the money for making the payment of the trader or as cash advances to the user. VISA is the first credit card that is recognized globally. The few major innovations and the development in the field of the credit card are listed below:-

Innovation & Development in the field of credit card

Year	Innovation
1946	First Bank card, Named Charge It, was introduced by John Biggins, a banker in Brookly.
1950	Dinners Club Card is the next development in the field of credit card.
1951	Frankin National Bank in New York's Starts a credit card plan.
1959	American Express Introduce the Plastic Card.
1966	Barclays Bank was the first British bank to introduce credit card known as "Barclays card"
1966	National credit card system was formed by the Inter Bank card Association. This Card known as the Master card. Formerly the credit cards are issued only to the local customers of the bank.
1977	Lloyds Bank introduces "Access Card."

Credit Cards in India

Credit cards in India have recent history. In the staring the few Banks takes the initiatives to introduce the credit card. The few Historical steps in the development of the credit cards in India are discussed below:

Year	Innovation
1981	Andhra Bank and Central Bank of India has introduced the credit cards.
1989	ANZ Grindlays Bank came with classic card.
1990	Citi Bank's Master card became popular.

Now days, most of the banks and other non banking institutions are competing in the industry of the credit card.

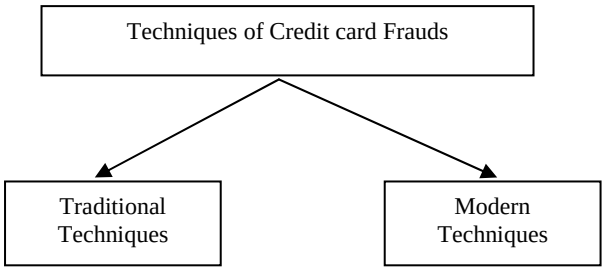
With the innovative developments in the field of banking the eyes of the offenders stick on profit-making and growing Banking industry. As the developed countries showed the large number of credit card frauds incidences like US, Malaysia, Japan, Taiwan, Australia, UK and Hongkong, Similar to this the developed countries are following this path (Kathirvel [4]).

2. CREDIT CARD FRAUDS

Technological advancement has created the avenues for credit card frauds. Credit card fraud is one of the major type of bank fraud that is found in the today Banking System. Credit card frauds includes the taking undue advantage of the other person identity for the purpose of making payments of the purchases or removing funds from the card; so it is also considered as the form of Identity theft.

Now a day, the fraudsters become more innovative and fast moving. They find the new ways of committing the frauds. On the basis of the previously committed frauds, there are the few kinds of the credit card frauds committed in the banks.

These techniques are classified under the two major categories.



2.1 Traditional Techniques

Traditional Techniques Consists of the following:

Application Fraud

Application Frauds are the serious kind of the credit card frauds because the victim came to know about the fraud too late, if ever. In this type of fraud the fraudster acquires the information regarding the victim that must be enough to completely fill up the application form. Application frauds can further be classified into two categories: Assumed Identity & financial Fraud

Account Takeover

Account takeover is that scheme of the credit card fraud in which the wrongdoer has the enough technical knowledge and skills to hijack the account of the victims and acquires the entire information of the victim including the address and capable of changing the address. The wrongdoer then request the bank or the non banking institution (issuer of the credit card) that his card has been stolen or lost, kindly issue him the new card on the new address or changed address and start fraudulent transaction like purchase of the goods, making payments for travelling etc.

Intercept Fraud

In this kind of fraud the penetrator stole the credit card from the postal service before reaching the real owner. This kind of fraud is quite easier. The penetrator tracks the postal service i.e. where the card has reached and stole the card from the mid way.

Lost or Stolen Card

This is the scheme of the fraud in which either the penetrator stole the credit card from the legitimate person (Real owner) or found the lost card and takes the undue advantage of Lost or Stolen credit cards.

2.2 Modern Techniques

Now days the fraud technology becomes more sophisticated. The following technologies are adopted by the fraudster.

Fake Cards

The Fraudster creates the fake card and presents the same card (Fake) for making the payments of the goods. In the kind of fraud the fraudster requires lots of efforts and the technical skills to produce the fake credit cards.

Doctored Cards

Doctored cards are the technique of the fraud under which the wrongdoer tempers the existing credit card frauds. He erases the metallic strip of the acquired card with the help of the powerful electro- Magnet and alters the details of the cards to match with the valid card.

Skimming

Skimming is very popular form of the credit card fraud under which the information stored on the magnetic strip of the credit card is copied to the another strip for making the fraudulent transactions. Firstly skimming took place in restaurants and retail outlets.

Site Cloning

Site cloning is the technique in which the fraudster clones the entire business site or the few pages of the site. When the customer places the order by entering the entire details of the card, the complete information is stolen by the fraudster.

False Merchant Site

In this scheme of the fraud the fraudster makes the false site and requests the customer to enter the personal information and the credit card details just for the verification of the age of customer. They claim that these sites are free of cost and did not chare a cent from the customer. These sites are created for the purpose of collecting more and more credit card numbers and details.

Triangulation

Triangulation is that method of the fraud in which the fraudster acts as the intermediator between the customer and merchant. The fraudster advertises the products with the heavy discounts, take the order from the customer that are shipped before the payment and ask the customer to provide the valid credit card details to the site. Then he fulfills the order using another stolen credit card.

Card Not Present (CNP) Fraud

This type of fraud is committed via emails, telephone or over the internet. The account number and expiry date of the credit card are known to the penetrator. Under this type of fraud physical existence of the card is not require until the merchant request the card for verification code.

3. RELATED WORK

Panigrahi, S., Kundu, A., and Sural, S.,[1], has proposed the innovative model for the credit card fraud detection which is based on the combination of the three approaches i.e rule based filtering, Dempster- Shafer theory and the Bayesian Learning. For the computation of the initial belief regarding the incoming transactions the author has used the Dempster's rule, a rule-based component on the combined multiple evidence. The Beyesian Learning is used for updating the suspicious score by using the history database of the genuine cardholder and the fraudster cardholder.

Falaki S. O., Alses B. K., Adewale O. S., Ayeni ,J.O.,Aderounmu, G. A. [2] has suggested the probabilistic model for the detection of the frauds. In these methods the author makes the best use of the algorithms of the Baum Welsh and hybrid posterior-Viterbi. In this research paper the author concluded that after the efficient and better utilization of the parameters, posterior-Viterbi cum new detection model performance is better than the Viterbi cum old fraud detection model.

There are number of Fraud detection techniques for the developed countries so Anwer, R., baig, S., Khiyal M. S. H., Khan, A.,Khanum, M. [3] has studied those techniques and evolved the online fraud prevention system specially for developing countries. The system proposed by the author consists of the multiple checks namely, Lost/ Stolen Check (LS), Credit card Validation Check (Val), Security Code Check (SC), Expiry (Exp), Multiple IP (MIP), and Repeated IP (RIP). This Method is basically the advancement of the Address Verification System (AVS).

Ghosh S., Reilly D. L.[7] has proposed a Credit card fraud detection technique with the neural network. This study on Mellon Bank showed that due to the use of neural network based technology for detecting the credit card fraud it possible to reduce the total credit card frauds by 20 -40 %.

Shrivastava A., Kundu, A., Sural S.[8] they had proposed a model of fraud detection with application of HMM. They completely defined the stochastic process followed by the HMM. This study explained how HMM is efficient in detecting whether the transaction is fraudulent or genuine. Along this the author conducted the comparative study between the existing models of fraud detection and Hmm and established the accuracy of the system using HMM is 80 %.

Delamaire, l., Abdou, H., Pointon, J., [9] has explained the types of the credit card frauds and explained the various detection techniques of credit card on the basis of the review of existing literature.

Kadam, N., Soni, S., Puntambekar, D., Kaul, R[10] has done the study with the objective of prevent the customer from credit card fraud. The authors use the Concept of Data Mining and the Hidden Markov model for the detection of the credit card frauds.

Prakash, A., Chandrasekar, C.,[11] has explained the concept of Advanced Hidden Markov Model and showed the entire process of fraud detection .

4. OBJECTIVE OF THE STUDY

This research paper aims at the following objectives:

1. To Study the credit card and credit card Frauds
2. To identify the trend of credit card frauds in India from 2005 -2014.
3. To suggest the measures for preventing the credit card frauds.

5. RESEARCH METHODOLOGY

In this research paper the Descriptive statistics is used to represents the trends of the credit card frauds. This study analyzes the secondary data. The India Stat Software, RBI reports, Indian Banking Association Reports, New papers are used as the sources of the data.

6. DISCUSSION OF RESULTS

As Discussed above India Stats Database, RBI reports, Indian Banking association Reports are used to extract the data. The Data is further classified, filtered as per the requirement.

The Trends of the credit card frauds are represented as below:

Year wise trend of Frauds in Credit Card

Table 6.1, Table 6.2, Fig. 6.1 & Fig. 6.2 explains the trends of credit card frauds from year 2005-2004.

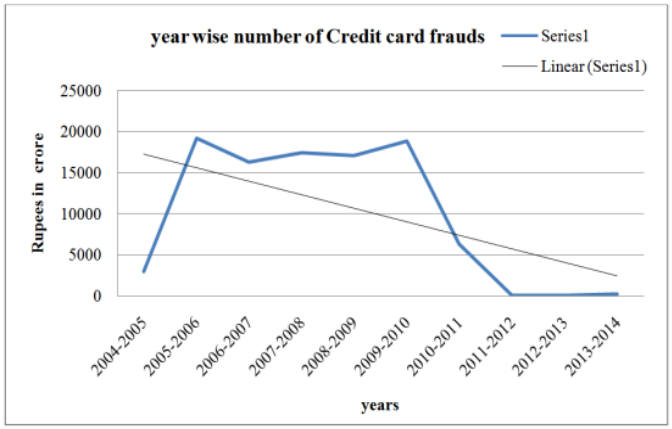
Table 6.1 Shows the trend of the credit card frauds from year 2005-2004 (in numbers).

Years	Number of frauds
2004-2005	2994
2005-2006	19252
2006-2007	16308
2007-2008	17447
2008-2009	17114
2009-2010	18925
2010-2011	6388
2011-2012	71
2012-2013	115
2013-2014	227

Fig. 6.1

Fig. 1 show that the numbers of frauds are rising up to year 2010beacuse that time the banks and non banking institutions entered in the market of credit card. At that time banks and institutions are not capable of detecting & combating with the different types of techniques opted by the fraudster. Then the numbers are frauds start decline in year 2010-2014. Because the banks became aware of the fraud detection techniques followed by the developed countries. From year there is again

slight increase in the number of frauds, this is due to the reason that the fraudsters are more innovative and fast track. If we draw a trend line it shows decreasing trend. It happens just because of the increasing awareness level of the customers and the banks.



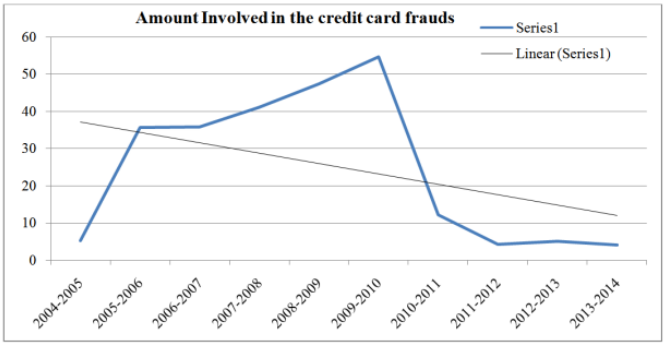
Source: Lok Sabha Unstarred Question No. 1640, dated on 19.11.2010 & Lok Sabha Unstarred Question No. 1261, dated on 18.07.2014.

Figure 6.1

Table 6.2: Shows the amount wise trend of credit card frauds from year 2005-2014.

Years	Amount of frauds (Rs in Crore)
2004-2005	5.32
2005-2006	35.69
2006-2007	35.82
2007-2008	41.1
2008-2009	47.43
2009-2010	54.67
2010-2011	12.28
2011-2012	4.39
2012-2013	5.19
2013-2014	4.16

Fig. 6.2 shows the amount wise trend of the credit card frauds from the years 2005-2014. It reveals that the trend of amount of credit card frauds is decreasing.



Source: Lok Sabha Unstarred Question No. 1640, dated on 19.11.2010 & Lok Sabha Unstarred Question No. 1261, dated on 18.07.2014.

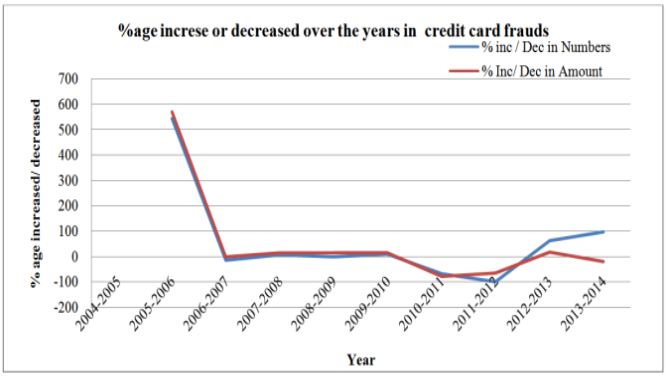
Fig. 6.2

Table 6.3 gives the comprehensive picture of the frauds increased or decreased from the year 2005-2014.

Table 6.3

Year	% Inc/Dec in Number	% Inc/Dec in Amount
2005-2006	543.0194	570.8647
2006-2007	-15.2919	0.364248
2007-2008	6.984302	14.74037
2008-2009	-1.90864	15.40146
2009-2010	10.58198	15.2646
2010-2011	-66.2457	-77.53796
2011-2012	-98.8885	-64.25081
2012-2013	61.97183	18.22323
2013-2014	97.3913	-19.84586

Fig. 6.3 explains the trend of credit card frauds amount wise and number wise in the form of % increased or decreased over the years. this Fig. reveals that the both the amount wise and number wise the practices of credit card frauds reveals the same trend but in the year 2013-2014 both the amount and number of credit card shows the opposite trend. The amount wise chart shows that the amount involved in the credit card frauds are decreasing while on the same time numbers of fraud are rising which is due to the reason that banks are now a day more concerned about fraud risk management and restricted the credit limits. Because of this the credit card frauds in numbers are raising but the amount involved in the frauds is lesser in comparison to the past.



Source: Lok Sabha Unstarred Question No. 1640, dated on 19.11.2010 & Lok Sabha Unstarred Question No. 1261, dated on 18.07.2014.

Fig. 6.3

Comparison between the Credit card frauds and Technological frauds

Table 6.4 compares the trends of technological frauds with the trends of credit card frauds.

Table 6.4

Years	Credit card Fraud (In Numbers)	Technological Frauds (In Numbers)
2009-2010	18925	19787
2010-2011	6388	14271

2011-2012	71	10048
2012-2013	115	8765

Fig. 6.4 makes the comparison between the credit card frauds and technological frauds. Technological Frauds consists of the frauds committed via the use of technology or taking the undue advantage of technology. It consists of debit card frauds, credit card frauds, phishing, fraudulent emails etc. This Fig. represents that both the credit card and technological frauds follows the same trend.

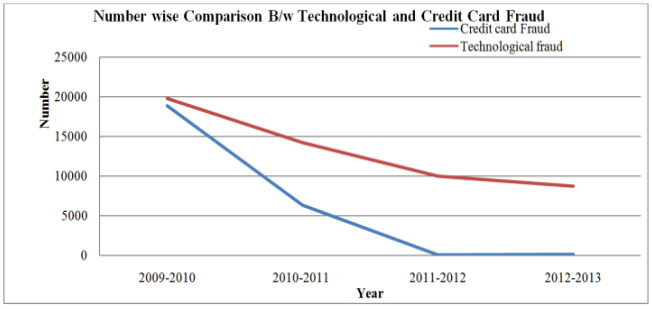


Fig. 6.4

Table 6.5 helps to make comparison between the amount involved in credit card frauds and technological frauds.

Table 6.5

Years	Credit card Fraud (In Crore)	Technological Frauds (In Crore)
2009-2010	54.67	63.38
2010-2011	12.28	40.03
2011-2012	4.39	38.46
2012-2013	5.19	67.36

Fig. 6.5 facilitates the comparison between the amount involved in the credit card frauds and the Technological frauds.

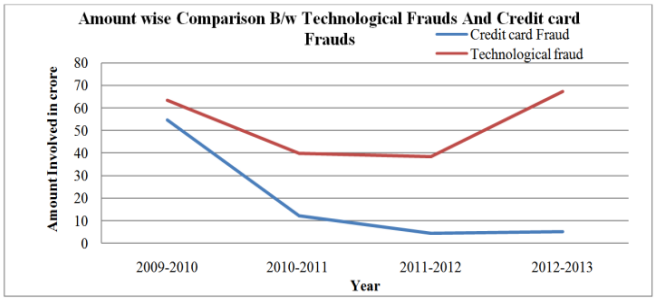


Fig. 6.5

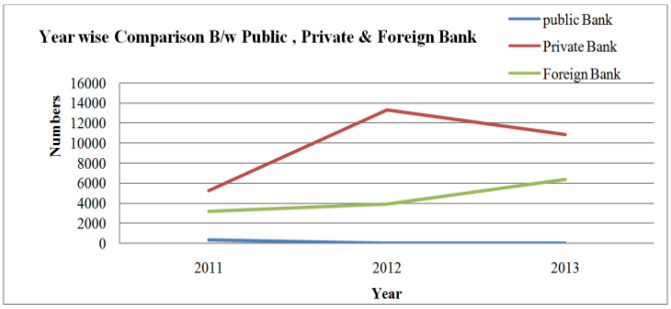
Segment wise comparison

Table 6.6 reveals the comparison between the public bank private bank and foreign bank.

Table 6.6

Segment	2011	2012	2013
public Bank	327	10	9
Private Bank	5274	13350	10895
Foreign Bank	3188	3908	6390

Fig. 6.6 facilitates the comparison between the three segments of the banking sector i.e. Public Banks, Private Banks and Foreign Banks. This Fig. shows that the foreign bank and the public bank follow the same pattern while the private banks show the opposite pattern. This is due to the reason that the private Banks are more technological advanced. As per the second report of DNA, ICICI bank held accountable for nearly 62% of the reported fraud cases (3304 out of 5319 cases in FY 2010-11) which were related to Phishing & KYC.



Source: Rajya Sabha starred Question No.97, dated on 04.03. 2008.

Fig. 6.6

Table 6.7 reveals the comparison of amount involved in the credit card frauds between the public bank private bank and foreign Bank.

Table 6.7

Segment	2011	2012	2013
public Bank	2.77	0.21	.02
Private Bank	6.62	17.71	18.02
Foreign Bank	8.97	12.08	20.22

Fig. 6.7 makes the comparison between the amount involved in the credit card frauds among the public bank, private and Foreign Bank.

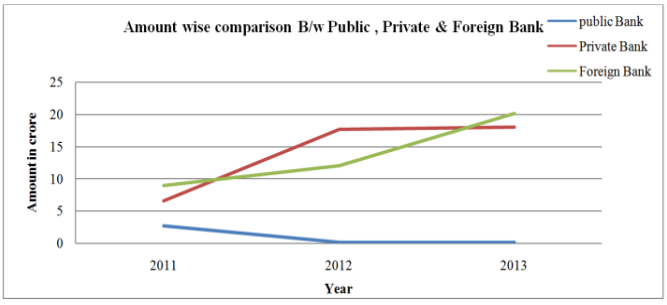


Fig. 6.7

7. METHODS FOR PREVENTING THE CREDIT CARD FRAUDS

On the bases of review of literature the following methods are useful for the prevention of credit card frauds.

7.1 A fusion of Dempster- shafer theory and Bayesian Learning

In this method a combination of the three integrated approaches are used that are namely rule based filtering, dempster – shafer theory and the Bayesian learning. Under this method the behavior of the transactions are fraudulent or genuine. Dempster- shafer rule is applied on the set of multiple evidences for making the initial belief regarding the incoming transactions and the Bayesian learning use the databases of the genuine cardholder and the fraudulent cardholder for updating the suspicious score. The architecture if this Fraud Detection system is kept flexible for the purpose of the further addition of the any other new rule or effective technology at the later stage. In addition to this Bayesian learning makes this FDS dynamic to adopt the changing behaviour of the genuine as well as fraudster's customer.

7.2 Probabilistic credit card fraud Detection system

In online Transaction: In this method a stepwise architecture is designed to develop the new model for the credit card fraud detection. This method simulates the credit card transaction data. Around 3200 transactions are simulated for the purpose of training and 800 transactions are predicted for checking the effectiveness, efficiency and accuracy of the data. This method was evaluated with the help of different performance matrices namely, true positive matrix and false positive matrix, accuracy and the ROC Curve. With the optimized use of the performance parameter & improved algorithms it can be said that this probabilistic Posterior-vertbi cum new fraud detection model is better than the vertbi cum old fraud detection model.

7.3 Advance Address Verification System

This method is the advancement of the address verification system. Under this method a system of multiple checks are developed namely, Lost/ Stolen Check (LS), Credit card Validation Check (Val), Security Code Check (SC), Expiry (Exp), Multiple IP (MIP), and Repeated IP (RIP).

7.4 Decision Tree

The decision tree technique for detecting and preventing frauds is very much easier and simpler. In this method the attribute names are placed on the nodes and values of attribute are placed on the edge. Then the Leaves Consists of the intensity factor. This method is easy to implement and understand.

7.5 Clustering techniques

Cluster techniques are used to detect and prevent the behavioral credit card frauds. Clustering techniques use the peer group analysis in which the system at any point of time detects the accounts which are behaving differently from others, especially when they are repeating the previous behavior. Those accounts are flag suspicious and then further investigation is carried out.

7.6 Neural Network

Neural network method is considered as the effective method for the detection & prevention of credit card frauds. Neural network usually involves a large number of processor operating in parallel that helps in detecting the fraudulent transaction.

7.7 Credit Verification Values

This method protects from the offline credit card fraud as the physical possession of the card is necessary. It checks the 3-4 digit number embossed on the credit card. But this technology is not useful in combating with online credit card frauds such as phishing, or fraudulent emails etc.

7.8 Chip & PIN

Under this technology new smart cards are issued by the banks. These cards are consists of the EMV Chips and the PIN instead of the signature which proves that the customer is genuine.

8. LIMITATION OF STUDY

The unavailability of the data of frauds becomes the limitation of the study and the available data contain lots of missing values.

9. CONCLUSION

The banking sector is the core of the any economy so its growth will lead to the growth of the economy. For the development of the banking sector lots of up gradations are made which may also attracts the wrong business and wrongdoer. This study shows that when the banks entered in the business of credit card, the number of frauds specially credit card (Technological frauds) climbs very high i.e. 545% and amount of frauds rises' by 570 % which create huge lose to the banks. As per the RBI report and reports of Indian Banking Association private banks leads the other banks. This huge lose shift the bank concern towards the adoption of the preventive measures for safeguarding customer and their interest. Due to this at the present time where the other kinds of frauds like the loan or advance related frauds are rising, there is decreasing trend seen in the credit card frauds.

10. ACKNOWLEDGEMENTS

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