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**AN INVESTIGATION ON BANK WEBSITE'S ROLE IN CREATING AWARENESS
AND IMPLEMENTATION OF SECURITY MEASURES**

Dr. Prasanna S

Assistant Professor, Department of Management Studies, BSA Crescent Institute of Science & Technology, Chennai, India, Prasanna.res@gmail.com

Dr. V. Mariappan

Professor, Department of Banking Technology, School of Management, Pondicherry University, Pondicherry, India. vmarisinn@gmail.com

Dr. H. Moidheen Batcha

Assistant Professor, Department of Management Studies, BSA Crescent Institute of Science & Technology, Chennai, India. hmoideenbatcha@gmail.com

Dr. S. Srimathi

Assistant Professor, Department of Commerce, Alpha Arts and Science College, Chennai, India. asokksri@gmail.com

Abstract: In a digital economy, cybercrime has become a serious threat which continues to distress businesses; it is banks and its customer who has been repeatedly targeted by the perpetrator for the financial gain. Availability of information, ease of accessibility and better website design will help an individual to gain awareness with little efforts thus preventing them from the victimization of bank related cybercrime. Hence Information published in the bank's websites in relation to bank related frauds along with anti-cybercrime measures and procedure to be adopted for safe use of e- products is analyzed for the availability and ease of accessibility. Besides the security measures implemented by the bank also plays a crucial role in providing a safe online environment. Thus this study try to examine the role of bank's websites in creating awareness through analysis of its website for information availability, design and ease of accessibility and its efforts in promoting safe online transaction through the security measures implemented by the bank for safe online banking. A collective score is calculated for each individual bank in terms of availability, accessibility, designs and security measures adopted and the independent sample t-test is applied on the collective score to find out for existence of significant difference between public and private sector bank.

Keywords: *Bank website, Security measures, anti-cybercrime measures, Cybercrime.*

摘要：在数字经济中，网络犯罪已成为持续困扰企业的严重威胁；银行及其客户多次成为犯罪者以谋取经济利益的目标。信息的可用性、可访问性和更好的网站设计将帮助个人毫不费力地提高认识，从而防止他们成为银行相关网络犯罪的受害者。因此，对银行网站上发布的有关银行相关欺诈的信息以及为安全使用电子产品而采取的反网络犯罪措施和程序进行了分析，以了解其可用性和可访问性。除了银行实施的安全措施外，在提供安全的在线环境方面也起着至关重要的作用。因此，本研究试图通过分析其网站的信息可用性、设计和可访问性，以及通过银行为安全网上银行实施的安全措施促进安全网上交易的努力，来检验银行网站在提高认识方面的作用。在可用性、可访问性、设计和采用的安全措施方面为每家银行计算集体评分，并对集体评分应用独立样本 t 检验，以找出公共部门银行和私营部门银行之间是否存在显著差异。

关键词：银行网站，安全措施，反网络犯罪措施，网络犯罪。

1. Introduction

In a digital economy, cybercrime has become a serious threat which continues to distress businesses; it is banks and its customer who has been repeatedly targeted by the perpetrator for the financial gain. Availability of information, ease of accessibility and better website design will help an individual to gain awareness with little efforts thus preventing them from the victimization of bank related cybercrime. Hence Information published in the bank's websites in relation to bank related frauds along with anti-cybercrime measures and procedure to be adopted for safe use of e- products is analyzed for the availability and ease of accessibility. Besides the security measures implemented by the bank also plays a crucial role in providing a safe online environment. Thus this study try to examine the role of bank's websites in creating awareness through analysis of its website for information availability, design and ease of accessibility and its efforts in promoting safe online transaction through the security measures implemented by

the bank for safe online banking. A collective score is calculated for each individual bank in terms of availability, accessibility, designs and security measures adopted and the independent sample t-test is applied on the collective score to find out for existence of significant difference between public and private sector bank.

2. Review of literature

This research address the bank efforts in providing safe online environment through awareness creation based on the availability of information on their official websites and safety measure implemented by the banks. Websites are the major source of communication between the organization and its customer. The success of the website in serving its purpose depends on the clarity of purpose, timeliness and approach of presenting the information on the websites [1]. Information content plays an important role in awareness creation process. For the purpose of the study information content on the bank websites is related to material available on

various cyber frauds and safe use of eservices. According to palmer amount of information, information quality and variety of information are key indicators on information content [2].Successful awareness creation depends on information

availability which in turn depends on accessibility that is easiness of obtaining required information from websites. Besides accessibility, web design plays an important role in awareness creation as better design aids the customer in getting required information with little efforts. Better website design includes better interface and designs, better navigation and communication. Interface and designs related to appearance of the WebPages, flaws in design may hinder the use of the websites [3] and create bad image on the company among its customers [4]. Locating required information and smooth browsing process is the result of better navigation features [5] which could aid in the knowledge acquisition process [6].websites are considered as the important mean in awareness creation[7].Higher the awareness better the information security behaviour[8] .Better information security behaviour and security measures will leads to the safer online environment .

3. Conceptual Framework

Though security environment for a safe online transaction is influenced by many factors, the present study is focusing on four important factors such as availability of information, ease of accessibility, better utilization of available resource (website design) and security measures. While the first

three factors are related to using of banks website in creating awareness that may lead to proper use

of E-service among the customer preventing them from cyber-related frauds, the last factor is related to the implementation of various security measures by banks that help the customers to do safe online transaction. The following conceptual framework explains the relationship.

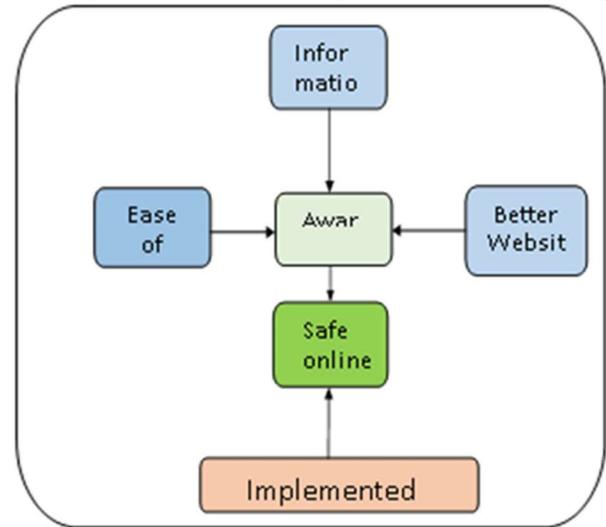


Fig 1. Conceptual Framework for awareness creation and safe online environment

Bank efforts in creating awareness and better implementation of security measures play an important role in the safe use of e-services offered by the bank to its customer. The study, look at the awareness creation by banks through their effort via designing proper websites that provide ease of access to information on cyber frauds and other safety measures on e-products. Security measures [9] include those technical features that the bank has implemented on their online services based on the guidelines provided by RBI[10] to provide a safe online environment for its customer.

This study explores the difference found among public and private sector bank's websites design, information availability related to cyber frauds and safety measures and ease of accessibility that will provide awareness to its customer's which is the need of the day. Information related to cyber

frauds were analyzed in term of the definition of the specific crime, modus of operandi and steps to overcome such frauds along with information on security measures to be adopted while using bank's online services. Assessment criteria considered for information content analysis is specified in table 1. If the particular bank websites provide the required information as per the assessment criteria a score of 1 is assigned otherwise a score of zero is assigned. Accessibility is measured on the basis of a number of clicks required for the user to reach the page containing information related to assessment criteria, higher the click more the efforts required which may hamper the accessibility process. Design of the website plays a huge role in its usability. Some of the Factors related to navigation, communication, interface and design of the usability assessment model of (Van der Merwe,2003) and (Cox and Dale,2002) was considered for the study. Those criteria that have been considering for this study is specified in table 1. A score of 1 was assigned if the criteria chosen for design in relation to information content is met else a score of zero was assigned. The sum score for each category via information content, ease of accessibility and web site design of individual banks are computed to find an individual and group difference. Besides this, the combined score of these three factors is computed to measure the difference between bank efforts in creating awareness. Proper awareness and availability of security measures will result in a safe online environment. The security measures implemented by the banks chosen for the study are displayed in table 2.

Table 1 Factors Considered for Analyzing Bank website in creating Awareness

Frauds Type	E-services Safety Measures	Website Design Features
Identity Theft	Net Banking	Changes in Link colour
Phishing	Mobile Banking	The link describes correctly or not
Vishing	ATM	Existence of Site Map
Smishing	Phone Banking	Existence of Search toolbar
Sim Swap	Credit/Debit Card	The search engine gives expected results
Skimming		Are icons easy to understand
Spoofing		Typeface Characteristics
Frauds Type	E-services Safety Measures	Website Design & Features
Money Mule		Can Important content can be seen without scrolling
		Whether webpage Is assessable in different browser
		Accessible in languages other than English
		Accommodation available for the differently abled user
		NO under construction error

Table 2 Security Measures Implemented by Banks

General	Transaction	Login Related
Virtual Keyboard	The Levels of Security Features	The levels of Security Features
SSL	Cooling Period	The last Login Displayed
Session Security	Third Party Transfer Limit	Alert Messages for Login
	Alert for Financial Transaction	
	Alert for Non-Financial Transaction	

4. Research Methodology

As part of the study, all those private sector and public sector bank that has licence to operate in India as on 2017 and offer internet banking services is identified. After identification of such banks, websites of each bank has been analyzed for information availability related to online frauds and safety measures. Those banks bank website containing minimal information on frauds affecting the customer or such information were so general rather than specific are excluded from the study. Based on the such criteria 19 public sector bank and 16 private sector bank were chosen for the study.

The chosen banks websites were analyzed for its design, availability of information, ease of accessibility, and security measures implemented. The period of the study is in between 1st July 2017 to 15th July 2018. The Researcher has considered only the security features related to personal internet banking.

There are two reasons behind this selection, one being 40 percent of banks customer prefers to use internet banking when compared to other online services as per the report of the survey conducted by the economic times [13] and other being the website's related factors are considered for the study which is base for the internet banking. Besides this independent sample t test is performed to check for any difference between public and private sector bank on the chosen criteria.

5. Hypothesis

H1a: There is a significant difference found between public and private sector bank website about information availability on cyber frauds.

H1b: There is a significant difference found between public and private sector bank websites interns of ease of accessibility of information security and safety measures content.

H1c: There is a significant difference found between Public and private sector bank websites design.

H1d: There is a significant difference found between public and private sector bank internet banking security measures.

H1e: There is a significant difference found among public and private sector bank efforts in creating awareness using their websites.

6. Analysis

The analyses of usage of banks websites in creating awareness through information availability ease of accessibility and website design and the corresponding results have been presented below.

6.1.1 Information Availability

Availability of information is measured by analyzing bank websites for the display of fraud related information via definition, modus operandi and steps to overcome such frauds. If particular bank websites contain information on all the three factors mentioned above it is assigned a score of 3. Besides if bank websites contain information on safety measures to be adopted while using e-services a score of 1 is provided for each type of E-service specified in table 6.2. On this basis, a bank can have a maximum score of 29. Analysis of Information availability reveals that Out of nineteen public sectors bank chosen for the study except for syndicate bank all the others have less than fifty per cent of information related to cyber frauds and security measures on the safe use of e-services. While In the case of private sector bank it is eight banks that have more than fifty percentages of information with one bank ICICI representing complete information on the chosen criteria. Table 3 represents the bank’s classification into two groups based on the percentile of the score obtained by the bank considering the lowest and highest score in information availability. While 26(74.30 per cent) of the total bank falls under low category 18 of them are from public sector bank and remaining 8 are from private sector bank representing a 69.2 per cent and 30.8 per cent respectively, the remaining 9(25.70 per cent) of the banks falls under high information availability category with 8(88.9 per cent) of them are from private sector and 1(5.3 per cent) from public sector.

Table 3 Bank’s Classification Based on Information Availability

Bank	Information Availability	Tot
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Type	High (No)	Within Bank (%)	Within Category (%)	Low (No)	Within Bank (%)	Within Category (%)	Total
Public Sector	1	5.3	11.1	18	94.7	69.2	19
Private Sector	8	50.00	88.9	8	50.00	30.8	16
Total	9			26			35

An independent-samples t-test was conducted to examine the difference in public and private sector bank websites information availability on cyber frauds and safety measures on the use of e-services. There is a significant difference in the scores for public sector bank (Mean=7.95) and private sector bank (Mean=13.63); $t(33) = -2.831, p = 0.01$, Cohen’s $d = .98$. These results indicate in general private sector bank websites contains more information on cyber frauds and security measures related to use of e-service than Public sector bank which means that customers of private sector banks are in a better position to do safe online banking transaction.

6.1.2 Ease of Accessibility

Accessibility of information plays a key role in creating awareness. Even though the bank has provided required information on its website, ease of accessibility plays an important role in getting the required information with lesser efforts leading to better awareness. For this study ease of accessibility is calculated by recording

the number of clicks required by the users to reach particular information in banks commercial website. Lower the click, lesser the efforts on the part of the customer to reach the required information leading to better awareness. To have a common scoring, the number of clicks recorded for each information type has been reverse coded and summed up. Now higher the score better the accessibility. Based on the recorded score each bank's are classified into two categories as shown in Table 4.

Table 4 Bank's Classification Based on Information Accessibility

Bank Type	Information Accessibility						Total
	Easy (*No)	With in Bank (%)	Within Category (%)	Difficult (No)	With in Bank (%)	Within Category (%)	
Public Sector	5	26.30	35.70	14	73.70	66.70	19
Private Sector	9	56.20	64.30	7	43.80	33.30	16
Total	14			21			35

*No-Actual Number

Out of 35 banks, 14(40 per cent) of the Bank's website containing information related to cyber frauds and safety measures are easily accessible with fewer efforts, the rest 21(60 per cent) of the bank requires more efforts to access the required

information. While 5(35.70 per cent) of public sector banks fall under the ease of accessibility category, it is 9(64.30 per cent) in case of the private sector bank. The number of private sector bank that requires the least effort on information accessibility is almost twice that of public sector bank while in terms of difficulty in accessibility the number of private sector bank is almost half in number compared to public sector bank.

A t-test was done to examine the difference in public and private sector bank websites for ease of accessibility of information related to cyber frauds and safety measures. Levene's test for equality of variances showed no violation of assumptions. $P=.797$. Results indicates that there is a significant difference in ease of accessibility between public(Mean =21.16) and private sector bank (Mean=29.06), $t(33) =-2.059$, $p=.047$, Cohen's $d=1.76$ which means that customer of the private sector bank requires fewer efforts than the customers of the public sector banks to access the required information from their bank websites.

6.1.3. Website Design Characteristics

Design of the websites plays a key role in the success of any business. Besides making a difference in how the customer views your business it acts as a better platform for information dissemination leading to better awareness among its customers. The factors specified in table1 chosen from (Indranil Bose,2008) based on (Van der Merwe,2003) and (Cox and Dale,2002) models have been accessed for better design of the bank's website. For every bank, a score of 1 is assigned for the presence of each factor else a score of 0 is assigned. A composite score of the entire factor for each bank is calculated for further analysis. Based on the

Type	No	(%)			(%)		
Public Sector	12	63.20	57.10	7	36.80	50	19
Private Sector	9	56.20	42.90	7	43.80	50	16
Total	21			14			35

*No-Actual Number

As per table 1.6, 21(60 per cent) banks have implemented additional security measures while 14 (40 per cent) of banks have implemented required security measures. Within the banks of good category 12 (57.10 per cent) banks are from the public sector and remaining 9(42.90 per cent) are from private sector banks revealing the fact that few of the public sector banks have started implementing additional security measures beyond the required standards. Similarly, In the case of banks under the average category, there were 7 public and private sectors bank each. Besides within public sector bank, 63.20 per cent of them have implemented additional security features whereas in case of the private sector it is only 56.20 per cent.

A t-test was performed to examine the mean difference in security measures implemented by public and private sector bank on internet banking channel. While the results of the Levene's test for equality of variances showed no violation of assumptions $P=.695$. Further analysis of T-test results indicates there was a no

significant difference in security measures implemented by the public ($M=11.63$) and private sector bank (Mean=11.81), $t(33)=-0.325, p=0.747$. The result reveals the fact that though there is some difference in the security measures implemented by public and private sector banks, such differences are not statistically significant. Beside test results indicates that public and private sector banks are at par in terms of implementing security measures.

6.1.5 Bank's Efforts in creating Awareness through usage of Website

Awareness is the key factors that help the users to do safe online transaction. Even if the bank has implemented best of world security measures, lack of awareness among its user on the safe use and cyber frauds may result in victims of cyber frauds.

Table 7 Classification Based on the level of bank efforts

Level Of Bank Efforts	Bank Types						Total
	Public Sector Bank			Private sector Bank			
	No	With in Bank (%)	Within Category (%)	No	With in Bank (%)	Within Category (%)	
High	1	5.30	20.00	4	25.00	80.00	5
Mode rate	5	26.30	41.70	7	43.75	58.30	12
Low	13	68.40	65.00	5	31.25	35.00	18
Total	19			16			35

Scores obtained by banks on the basis of availability of information, ease of accessibility and website design each bank's efforts are classified into high, moderate and low efforts. Higher the efforts made by the bank in making use of their websites for awareness creation better will be the awareness. Based on the banks considered for the study, only 5 (14.30 per cent) banks have made high efforts towards awareness creation while 12(34.30 per cent) banks have moderate efforts, rest 18 (51.40 per cent) banks have made less effort towards awareness creation which is of serious concern. While 13(68.40 per cent) of public sector banks are of the low efforts category, 5(26.30 per cent) of them is of moderate efforts category and the rest 1(5.30 per cent) is of high effort category. In the case of a private sector bank, it is 5(31.25 per cent), 7(43.75 per cent), and 4(25.00 per cent) respectively. Percentage based analysis reveals that private sector bank is better when compared to public sector bank in terms of efforts made towards awareness creation. An independent-samples t-test was conducted to examine the difference in efforts of public and private sector bank in awareness creation based on webpage analysis. While the results of the Levene's test for equality of variances showed no violation on assumptions $P=0.338$, further analysis of the T-test results t values $t(33)=-2.539$ and $p = 0.016$ indicates that there was a significant difference in efforts of public sector bank (Mean=30.11) and private sector bank (Mean=44.19) Besides Cohen's $d=0.68$ indicates that efforts of the private sector banks in awareness creation are more than the public sector as the value of Cohen's d of 0.68 indicate the better effort size.

7. Results of Hypothesis testing

Table 8 Results of Hypothesis Testing

Hypothesis	T-value	p-value	Supported /Not Supported
H _{1a} : There is a significant difference found between public and private sector bank website about information availability on cyber frauds.	-2.831	0.010**	Supported
H _{1b} : There is a significant difference found between public and private sector bank websites interns of ease of accessibility of information security and safety measures content.	-2.059	0.047*	Supported
H _{1c} : There is a significant difference found between Public and private sector bank websites design.	5.149	0.000**	Supported

H _{1d} : There is a significant difference found between public and private sector bank internet banking security measures.	-0.325	0.747 ^{ns}	Not supported
H _{1e} : There is a significant difference found among public and private sector bank efforts in creating awareness using their websites.	-2.539	0.016 ^{**}	Supported

***- Significance at 1% level, **-Significance at 5% level and ns-Not Significant

The results of hypothesis testing indicate that public and private sector bank websites differ in term of information availability related to various bank-related cyber frauds and associated security measures, web sites design that aids quick access of information and their efforts in making use of the website to create awareness. While in case of security measures implemented and accessibility, no difference exists between public and private sector banks

8. Summary of findings

- Most of the Private sectors bank websites contain more information on cyber frauds and safe use of e-service than public sector bank websites.
- On an average three clicks are needed to get any of the information related to cyber frauds and associated security measures from both the public and private sector bank websites.

- Public sector bank websites had more features when compared to private sector bank in terms of display of information in a language other than English and user-friendly option for differently abled people.
- Private sector banks are making better use of their website to create awareness than public sector banks.

9. Discussion

There was significant difference in terms of dissemination of information on cyber frauds and safe use of e-service in their commercial websites .The reason being some of the private sector bank has made best use of their website to display most of the information related to cyber fraud than public sector bank. Almost all public sector bank displayed information on phishing, anti phishing measures and safe use of internet banking but most of them have failed to concentrate on other important cyber frauds that may have serious impact on customer security on use of e-services. When comparing ease of accessibility for information related to cyber frauds on the websites of the public and private sector bank, there was no significant difference found between them .The reason being most of the banks websites are designed in such a way that on an average there is minimum of 3 clicks needed to access the required information. In case of website design of public sector and private sector bank in accessing the required information on cyber frauds and safe use of e-services public sector bank scored better than private sector bank. The reason for a difference being public sector bank websites had more features when compared to private sector bank in terms of display of information in language other than english, user friendly option for differently

abled person. On the basis of above three factors there was a significant difference in bank efforts in creating awareness through the use of bank commercial websites. Private sector bank had made more efforts to use its website as a medium for awareness creation than public sector bank. Besides as expected there was no significant difference in case of security features implemented by public and private sector bank as all the security features implemented by the banks are on the basis of guidelines issued by the regulator reserve bank of India .The only difference found between banks is on the implementation of number of level of credentials requires during login and transaction process.

10. Implication

The finding of the study can help the bank management to make better use of their website in awareness creation. Further, it is concluded that the public sector bank should include more information on cyber related frauds and safe use of e-services in their websites as wider coverage of information can result in more awareness leading to the safe online environment [15].A private sector bank should try to include facilities for accessing their web page in different languages other than English and make their website user friendly of differently abled person. The result of the research could help other organizations who are in the online business to access their preparedness level in combating cyber crimes through the use of their website.

11. Limitations

The study considered only bank official website in accessing information dissemination related to cyber frauds and safe use of e-services. On reality banks are using various medium to disseminate such information; efforts of the bank

via other channel in awareness creation are not considered for this study. While accessing bank websites for information availability, all cyber related frauds are given equal importance where as in reality some of frauds are of serious concern which should have received more weight age.

12. Future area of research

Bank's efforts in creating awareness through the use of various channels via bank websites, emails, social media and advertisements etc can be verified to know which medium is considered best among the bank customers so that bank can make best use of it. Further researcher can consider developing the model that shows the impact of information dissemination on awareness creation.

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