CUSTOMERS PERCEPTION TOWARDS E-BANKING SERVICES WITH SVM-ABC APPROACH OF SELECTED BANKS

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ABSTRACT

The development of internet and Information Technology (IT) the handling of E-commerce applications has been also enlarged in now days. Since numerous association and commerce have been also using the internet toward distribute their products and services toward their customers. While the usage of E-banking have been become an enhanced effectiveness and expediency in recent years, it have also posed numerous challenges toward the supervisors to act their services. In addition, customer viewpoint second-hand for quality, service, and significance are rising commonly. The major objective of this work is paying more attention on customers' attitudes forecast on the way to E-Banking services. To achieve this objective Support Vector Machine (SVM) -Artificial Bee Colony (ABC) called SVM-ABC schema is presented to classify and highlight the customer perceptions concerning e - banking services. The major findings of this paper is to study the customer perceptions in e- banking services like insufficient information, underprivileged network, lack of infrastructure, inappropriate location, mishandling of ATM cards and complexity in opening an account etc. The findings showed with the purpose of the majority of respondents are satisfied by means of their E-banking services.

Keywords: Electronic banking, Customer satisfaction, Competitive advantages, classification, Support Vector Machine (SVM) and Artificial Bee Colony (ABC).

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1. INTRODUCTION

Today's banking takes place more and more online, financial institutions transport their Services by the use of various electronic channels and the significance of a conventional branch network have declined. The great progress in Information Technology (IT) and the forceful combination of information technology have brought in an example shift in banking operations. Technology has developed into a gradually very important aspect in the aggressive background of the financial services [1] to E-commerce. The recent developments have created a totally new service concept and service environment. One of the mainly essential alterations in the banking industry has been the consumer association beginning conventional branch banking to additional stand-alone banking. In addition today banking industry [2] has been also changed in now days because of the e-banking services. Currently the banking industry approximately the world has second-hand interactive advertising as a major division channel in order to wholesale their products, afford services, make contact with customers and generate a customer association.

As per prediction [3] the e- banking is important toward a standard shift in marketing observe in the banking industry. The development of e-banking services started from the utilization of several number of services such Automatic Teller Machines (ATM), straight bill compensation, Electronic Fund Transfer (EFT) and the revolutionary online banking. There determination is enormous recognition of E-banking [4-5] by means of the passage of time through growing responsiveness and education. The E-banking services permit customers toward handle their accounts beginning any place on any time designed for smallest amount of cost.

E-banking obtains benefits on the behalf of together banks and its customers. From the bank's viewpoint E-banking facilitate banks toward lower operational costs all the way through the decrease of physical services and staffing resources essential, concentrated waiting times in branches consequential in possible in sales performance and a better global reach. From the customer's point of view, e-banking offers customers toward carry out an extensive range of banking transactions automatically by the use of the bank's website and everywhere. During this E-banking services process extremely assure the customers of the respective banks. As time factor, is extremely much significant in favor of each and every one of the people in this simplified world, therefore are waiting in queue expenditure the valuable time which

determination go ahead us to go backward. Consequently the customers don't want interest to spend more time anywhere, since the time becomes more important for individual customer. Since the expectation of the customer towards their services, and importance are rising frequently. The major objective of this work is paying more attention on customers' attitudes forecast on the way to E-Banking services. To achieve this objective Support Vector Machine (SVM) -Artificial Bee Colony (ABC) called SVM-ABC schema is presented to classify and highlight the customer perceptions concerning e - banking services.

2. RELATED WORK

In the literature [6-7] proposed the new method to measure the relationship among perceived helpfulness and behavioural purpose is based on the hypothetical case. In [6] exposed with the purpose of perceived usefulness influence Taiwan people's purpose of toward implement e-banking systems considerably. In other words, perceived value has an important relation by means of behavioural objective. Consequently, the larger the perceived effectiveness of using e-banking services, the more probable with the intention of e-banking determination be established through users [8] .Moreover, TAM moreover supports a prior learning on the consumer recognition of technologies with the purpose of showed dependable helpful relationship among helpfulness and the acceptance of a variety of category of interactive technologies, series from central processing unit software toward email.

In [9] second-hand the chi-square to decide the force of e-banking in Iran. In additional, Iran banks afford services with the intention of the customers are developing satisfaction through particular position to the make use of e-banking. In [10] conducted an experimental study on implementation of ebanking in Nigeria. This literature survey acknowledged the major reduced factors to Internet banking implementation in Nigeria such as, lack of self-confidence, insufficient equipped services together with telecommunications services and electricity supply on how Nigeria banks are able to narrow the digital segregate. In addition, the description exposed with the purpose of Internet banking is being obtainable on the fundamental level of interactivity by means of the majority of the banks having mostly information sites and providing small Internet transactional services.

Correspondingly, in [11] examine electronic payment scheme and telebanking services in Nigeria. The examination revealed with the purpose of there has been an extremely reserved move away beginning cash. The result of the study exposed with the intention of tele-banking is proficient of enlargement the customer relationship, and allow banks toward increase powerful height of promote share if their assistant problems such as, epileptic deliver of power, high cost, apprehension of fake observe and be able to argue with the intention of the literature on the impact of e-banking is uncertain particularly in increasing economy and serve as an open position designed for additional study in the part of e-banking.

In [12], Predicting customers' purpose regarding Internet banking. It is new categories of information system with the purpose of make use of the original resources of the Internet toward facilitate customers to achieve financial activities in virtual space. The implementation rate of Internet Banking was expected through analogy toward adoption pattern. This study is conducted by consideration of the Internet banking in Malaysia. Proposed IT model was second-hand to learn thoughts and purpose towards Internet banking. Perceived effortlessness of use, Perceived value and perceived satisfaction are the three major important factors which control the attitude and purpose regarding the use of Internet banking. Proposed IT model is applied to online banking acceptance be able to be modeled by means of the variables derived from the TAM and Perceived Enjoyment (PE) for customer attitudes prediction and goal.

In [13] opines with the intention of the challenge to enlarge and conserve banking market allocate has predisposed numerous banks toward provide more in creation better make use of the Internet in competitive markets. This work recommend with the purpose of the banks that be unsuccessful toward answer to the appearance of e-banking in the market are probable toward lose customers and with the purpose of the cost of contribution of e-banking services. In [14-15] has recognized with the purpose of internet banking is no longer an aggressive improvement however an aggressive prerequisite for banks. Related to IAMAI report still in the work 43% of customers not interest to work of e –banking on financial transaction since of security reasons, 39% of customers not interest to work since of direct face to face transaction, and 22% of customers might not work since they didn't know how to access services, 10% of customers sites are not customer responsive and 10% of banks not offer internet banking services.

3. PROPOSED SVM-ABC METHOD FOR E-BANKING SERVICES

E-banking obtains benefits on the behalf of together banks and its customers. From the bank's viewpoint E-banking facilitate banks toward lower operational costs all the way through the decrease of physical services and staffing resources essential, concentrated waiting times in branches consequential in possible in sales performance and a better global reach. The awareness of the customers is the created as an outcome of understand the knowledge. There is an increasing attention in perceptive the users' knowledge as it is experimental as a larger perception than user approval. From this viewpoint, evaluate the user experience is necessary designed for numerous technology products and services. The current work aspire to discover the most important factors accountable for E-banking based on customer awareness on a variety of internet applications. The current work also aspires to observe whether there is any relation through the demographic variable, find the relationship between user and non-user perception. In addition, customer viewpoint used for quality, service, and significance are rising commonly. The major objective of this work is paying more attention on customers' attitudes forecast on the way to E-Banking services. To achieve this objective Support Vector Machine (SVM) -Artificial Bee Colony (ABC) called SVM-ABC schema is presented to classify and highlight the customer perceptions concerning e - banking services. The major findings of this paper is to study the customer perceptions in e- banking services like insufficient information, underprivileged network, lack of infrastructure, inappropriate location, mishandling of ATM cards and complexity in opening an account etc. SVM aspire to make best use of a margin in a hyper plane by separation of the E-banking services into various classes depending on the customer attitudes and it is formulated as follows:

$$\min \frac{1}{2}||w||^2 + C_+ \sum_{i,y_j=+1} \xi_i + C_- \sum_{i,y_j=-1} \xi_i \qquad (1)$$

Satisfies that $y_i[(w^T x_i) + b] \geq 1 - \xi_i \; \forall i = 1,.,l,\ldots n, \xi_i \geq 0$

where the C_+ is the higher positive class for each E-banking services , where $C_-$is the negative class for each E-banking services depending on each user. In this thesis , fix $C_- = C$and $C_+ =$

$C \times C_{rf}$, where C and C_{rf} are respectively the regularization parameter as the ratio of misclassification value for each E-banking services. On the construction of SVM for attitudes prediction, Radial Basis Function (RBF) is a used in this work with fewer parameters (γ). The equation of RBF function for the analysis of customer Perception is defined as,

$$k(x_i, x_j) = e^{-\gamma(x_i, x_j)^2} \quad (2)$$

Algorithm 1. SVM classification

Input: Number of the customer with E-banking service dataset samples with dataset x for SVM classification

Output: Classification result and customer Perception prediction for E banking services

1. Procedure SVM (x) // input training E-banking service dataset samples from the SVM
2. Begin
3. Begin
4. Initialize C=0 //initially the class labels should be zero
5. Get input E-banking service dataset samples bsd for training //the E-banking service dataset samples result as the example for training the user E-banking service data and customer Perception prediction results
6. Read the number of input E-banking service dataset bsd from original dataset
7. $bsd_i . w + b = 0$ // Input E-banking service dataset bsd is represented as matrix and denoted by bsd_i and w is the weight value matrix whose product is summed with bias value to give the class value.
8. $bsd_i . w + b = 1$ // This above equation marks a central classifier margin. This can be bounded by soft margin at one side using the following equation.
9. Decision function $f(W) = bsd_i . w - b$ //decision function f(w) decides the class labels for the SVM-ABC classification training examples ,
10. If $f(W) \geq 1$ for x_i is the E-banking service yes class // if the F(w) is greater than or equal to the 1 is labeled as yes class
11. Else

12. $f(W) \leq -1$ for x_i is the E-banking service no class // if the f(w) is less than or equal to the value of -1 is labeled as no class

13. The customer Perception prediction result for (i=1,…n) number of E-banking service dataset samples bsd //

14. $y_i(bsd_i.w - b) \geq 1$ //if the function is greater than one the results as customer Perception result

15. Display the result

The fitness value of customer perception prediction results to each E-banking service is obtained based on the number of occurrence of the services. For little and average E-banking services, the prediction assessment of every E-banking service designed for customer capacity be predicted through by means of the 10-fold cross-validation. The 10-fold cross-validation determination randomly divide E-banking services into 10 subsets; from ten samples anyone of the banking service samples is considered as the testing perspective and while the remaining banking services is second-hand for training samples. This schema is continuously repeated until the reach of the threshold value ten. But in the SVM classification methods the tuning of parameters will be very difficult; to overcome this problem, ABC algorithm is introduced. Each food source is modified depending on the E banking services and specified as employed bees to eq. (3) where ϕ is a random number in the range between [-1,1].

$$v_{ij} = x_{ij} + \phi_{ij}(x_{ij} - x_{kj}) \quad (3)$$

where $k \in \{1, 2, \ldots, SN\}$ and $j \in \{1, 2, \ldots, D\}$ are randomly selected SVM parameters . Although $\phi_{ij} \in$ [-1, 1]. The equation (3) returns a new SVM parameter optimization results v_{ij} and compare to earlier parameter optimization results. Thus, above found SVM parameter optimization results must be converted into either 0 or 1 by using equation (4) and (5) as follows:

$$S(v_{ij}) = \frac{1}{1+e^{-v_{ij}}} \quad (4)$$

If (rand< $S(v_{ij})$) then $v_{ij} = 1$ else $v_{ij} = 0$ (5)

This new optimized SVM parameter values should be evaluated by means of SVM classifier. If the fitness value of new optimized SVM parameters is better than the current optimized parameter value, the employed bees replace new optimized SVM parameters to classifier;

otherwise, the new optimized SVM parameters will be ignored. Onlooker bee's determination chooses new optimized SVM parameters relying on the probability value in equation (6).

$$p_i = \frac{fit_i}{\sum_{n=1}^{SN} fit_n} \quad (6)$$

where p_i is the probability value and fit_i is the fitness value. After the onlooker bees select new optimized SVM parameters will perform the process of updating new optimized SVM parameters solution until the Maximum Cycle Number (MCN) termination criterion is reached. If it reaches to higher MCN then current SVM parameters is discarded and replaced as new SVM parameter in the scout bee phase in the following equation,

$$x_i^j = x_{min}^j + rand(0,1)(x_{max}^j - x_{min}^j) \quad (7)$$

Algorithm 2 . Pseudo-code of the ABC algorithm

Initialize the population of solutions $X_{ij}\,(i = 1, \ldots SN, j = 1, , . . D)$

Evaluate the population

cycle=1

repeat

Produce new solutions υ_{ij} for the employed bees

Apply the greedy selection process

Calculate the probability values P_{ij} for the solutions x_{ij}

Produce the new solutions υ_{ij} for the onlookers from the solutions x_{ij} selected depending on P_{ij} and evaluate them

Apply the greedy selection process

Determine the abandoned solution for the scout, if exists, and replace it with a new randomly produced solution x_{ij}

Memorize the best solution achieved so far

cycle=cycle+1

until cycle=MCN

4. EXPERIMENTATION RESULTS

The major objective of this section is to examine the results of the various classifiers (SVM, SVM-ABC, and NN) of electronic banking in CAL Bank. The section discusses the details of the various classifiers of the bank's electronic product and their fulfillment. Table 1 denotes the

social demographic information of the respondents. The Table 1 shows with the intention of 58.5% on behalf of majority of the respondents are males and the remaining 41.5% are female. On Agewise calculation, 68.1% of the customers were ages among of 21-30 to 31-40 of 22.7% and 41-50 of 9.2%. On the behalf of education, 58.9% of the customers hold first degree followed through HND of 28.7%, master's degree of 3.2% and secondary certificate of 9.2%. In conclusion on how long the customers have been responsibility business through the bank, 33.0% on behalf of popular of the respondents supposed they have been customers of the bank designed for the past 4-5 years go behind 29.4% (2-3 years), 28.4% (0-1 year) and 9.2% supposed they have been by means of the bank designed for 6 years and above. The suggestion is with the intention of the banks customers are comparatively reliable to the bank.

Table 1. Bio-Data of Respondents

S.No	Frequency	Percentage	Valid percent	Cumulative percent
Gender Respondents				
Valid Male	165	58.5	58.5	58.5
Female	117	41.5	41.5	100
Total	282	100	100	
Age Distribution of Respondents				
21-30	192	68.1	68.1	68.1
31-40	64	22.7	22.7	90.8
41-50	26	9.2	9.2	90.8
Total	282	100.0	100.0	
Highest level education				
Secondary education	26	9.2	9.2	9.2
HND	81	28.7	28.7	37.9
First degree	166	58.9	58.9	96.8
Masters Degree	9	3.2	3.2	100
Total	282	100	100	
How long have you been a customer of CAL bank				

0-1 year	80	28.4	28.4	28.4
2-3 year	83	29.4	29.4	57.8
4-5 year	93	33.0	33.0	90.8
6 years and above	26	9.2	9.2	100.0
Total	282	100	100	

Table 2. E-banking services used by the customer

Services	**Frequency**			**Percent**	**Valid percent**	**Cumulative percent**
	SVM-ABC	**SVM**	**NN**			
CAL alert	81	76.1	73.13	28.7	28.7	28.7
CAL net	29	26.18	25.52	10.3	10.3	39
CAL SMS	28	25.81	24.16	9.9	9.9	48.9
ATM	64	62.41	61.18	22.7	22.7	71.6
Visa Electron Card	54	52.16	50.32	19.1	19.1	90.8
Banking Ezwich	26	23.23	21.81	9.2	9.2	100
Total	282	242.66	234.31	100	100	100

Table 2 here presents the E-banking services used by the customer. As of the table 2, totally 28.7 % of the customers use a CAL Alert service, 19.1% of customer use a Visa electron, 10.3 % of customers use a Cal Net, 9.9 % of customers use a CAL SMS and 9.2% of customers use a Banking Ezwich. From this table 2 the results demonstrated that the most of the services which is used by the customers are CAL Alert and ATMs.

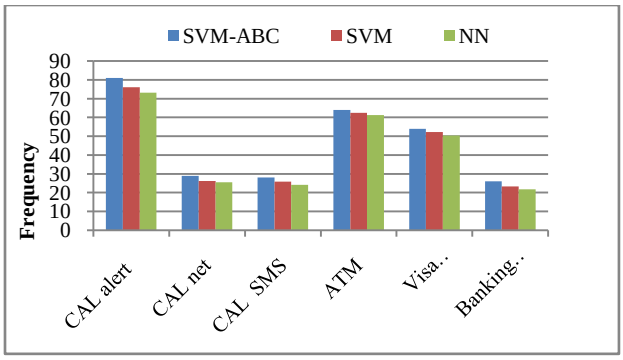

Figure 1. E-banking services used by the customer

5. CONCLUSION AND FUTURE WORK

Through the fast enlarge in the growth and accessibility of information technologies, EB has developed into a reality. People are starting toward sell and purchase their products via the use of the Internet. Through observe to customers' fulfillment in terms of e-service quality, the widespread of E-Banking customers demonstrate fulfillment by means of each factor of e-service quality. The current work also aspires to observe whether there is any relation through the demographic variable, find the relationship between user and non-user perception. In addition, customer viewpoint used for quality, service, and significance are rising commonly. This work introduces a Support Vector Machine (SVM) -Artificial Bee Colony (ABC) called SVM-ABC approach to classify and highlight the customer perceptions depending on e - banking services. To highlight and discover the user experience of the E-banking services it is categorized into various classes depending on the customers attitudes. In conclusion it was finished with the purpose of customers are very much fulfilled by means of e-banking services provided by the banks.

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