

Selection of appropriate electronic banking channel alternative

Critical analysis using analytical hierarchy process

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Abstract

Purpose – The purpose of this paper is to examine the important criteria responsible for the adoption of different electronic banking channel (EBC) alternatives in Indian perspective. It also evaluates the intensity of the various criteria, namely demographics, technological factors, service components and intention to use in determining the overall priorities of EBC.

Design/methodology/approach – Data were collected from 110 respondents using pairwise comparison-based survey instrument. The collective data was analyzed using analytical hierarchy process and priorities of different EBC were computed.

Findings – ATM was found out to be the most preferred EBC alternative, followed by internet banking (IB) and mobile banking. Awareness, self-efficacy, ease of use, usefulness and security were the criteria responsible for making ATM, the most preferred channel.

Practical implications – This paper imparts a better understanding of customers' preferences among different EBC alternatives. It also explores the relationship between different criteria and sub-criteria based on the data collected from both the parties involved in electronic banking, i.e. customers and bankers. This research would be helpful to guide the strategy maker of electronic banking, so that penetration rate may improve in India. This would also give an idea which factor should be given more emphases, while offering new electronic banking services. Considering same method, further detailed research on specific EBC is required. Similarly, studies of different demographic area may consider for robustness of concept.

Originality/value – In the past research work, many researchers talked about the specific EBC and now it is needed to find the gap between all channels selection attitude, considering same parameters. Through pairwise comparison, priorities of different criteria and sub-criteria have been evaluated. This also leads to the selection of most preferred EBC. The results would also be useful in enhancing the customer base, thus reducing the barriers in the adoption of IB and mobile banking.

Keywords Analytical hierarchy process, Services, Internet banking, Adoption, Electronic banking channel

Paper type Research paper

I. Introduction

It has been witnessed in the last few decades; rapid development of technology played an important role in the growth of business as compared to previous time. The service industry is not untouched with the technological revolution that also helped in giving new directions of delivering services. Technological developments have witnessed enormous changes in the banking sector, through which customer can avail and perform financial transactions without visiting the bank. The evolution of information and communication technology (ICT) facilitated for companies in the global ever changing market where customers are more demanding. It has been found out by many



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researchers, experts and pioneers in this field that the service quality can be improved through advancements in ICT. In order to increase customer satisfaction, many banks have implemented ICTs, as internet banking (IB) facilitates customers with quick fund transfer and 24×7 services.

Several electronic banking customized services are being offered by different banks as per their business strategy and cost allocated to the particular service. But all these services are not being utilized by the bank's customers. Utilization of these services depends on various criteria like perception, attitude, behavior, awareness, security, risk accessibility, availability and many more. The exact evaluation of multiple criteria that may affect the adoption of electronic banking channel (EBC) involves various qualitative and quantitative criteria. So, this is a multi-criteria decision-making (MCDM) problem which has a high level of uncertainty. The aim of this research paper is to prioritize different factors that may affect adoption of various EBCs in Indian scenario, which is a very difficult task to compare all factors and finding their importance which may be considered by banks before developing electronic banking-related strategies.

This paper would present the application of analytic hierarchy process (AHP) for solving the factors selection problem related to adoption of EBCs. The paper would help the scholars who are working in this area to get the different facts of AHP. We propose a ranking method based on AHP that may account all useful aspects of adoption of EBCs. Next section, literature background would cover the problems and suggestion of past researchers, considering only those factors which are important to our research. The third section will illustrate the concept of AHP and related equations. In Section IV, we will discuss the application of AHP in the adoption of different EBCs for financial transactions in India with calculations for all criteria, sub-criteria and alternative which is responsible in selection of channels. Finally, our analysis and discussion of the findings are provided in Section V and some concluding remarks are given at the end.

II. Conceptual background and literature gap

The emergence of technology in the banking sector has given birth to various distribution channels like IB, mobile banking and ATM; thus helping the banking customers to avail services at any time and at any place. Banking customers use these channels to gain in terms of time and cost. Even though the types of service one can avail from these channels are comparable, still the benefaction among them is different.

As Curran and Meuter (2005) verified that while applying new technologies to offer banking services, multiple criteria need to be considered. These criteria may have varying degrees of acceptance with different electronic banking technologies. This thought gave an idea to calculate and compare different electronic banking platform on the basis of multiple important factors discussed by researchers in this field. Apart from factor considered by Curran and Meuter (2005), we took some other factors related to service component, intention and demographics. Considering many factors for different channel is very difficult to manage, but their relevance to the topic of selecting EBC on technology and service point of view is undeniable. Wan *et al.* (2005) demonstrated strong relationship of demographics of Hong Kong customers with banking channel adoption, but this relationship was not valid for ATM. To check the validity of such relationship in Indian scenario we accounted demographics as one of the important criteria. Therefore, EBC alternative could be accredited to a variety of

factors namely, demographics, technological factor, service component, and intention to use. Lee *et al.* (2007) focussed on adoption of mobile banking as another banking channel and found its strong dependency on perceived risk and trust on South Korean banking customers. There has a common methodology and similar research has been done through various researchers on different banking channels like mobile banking, IB and ATM. But there is need to keep them all in a same comparable platform to analyze the effect of factors in the adoption of different EBCs with the gap between various channel's adoptions.

According to Cheah *et al.* (2011), personal technological innovativeness was the most influencing factor in the adoption of mobile banking in Malaysia. Considering Malaysia's IB services in the research, Sohaila and Shanmugham (2003); Gerrard and Cunningham (2003) found IB governing factors like accessibility, cost, reluctance, security, trust and convenience. Through a research, Thulani *et al.* (2011) confirmed that accessibility and affordability were the main factors in the adoption of SMS banking. In context to the IB in Indian scenario, Rao and Prathima (2003) gave a hypothetical analysis and pointed out that as compared to the banks in other countries, India still have to cover a long journey before successfully implementing IB. According to them, factors like accessibility, trust, reliability, security, flexibility, customization, navigation, site appearance, demo for new users, computer-self-efficacy, perceived risk, perceived ease of use, perceived usefulness, awareness and feedback are responsible for making customer perception positive toward EBCs. Therefore, these factors should be taken into account while building up strategies in order to make penetration rate of IB services higher in India.

Many researchers talked about specific EBC and the effect of different factors on them and there has scarcity of work, in which we may find a gap among all EBC with similar types of variable. To reduce the literature gap and to analyze the effect of factors and their relationship, we have divided them into four major criteria like demographics, technological factors, service components and intention to use. All four criteria are also useful to find the intensity of the effect of criteria in selecting any EBC.

Demographics

Filotto *et al.* (1997) found young users are more than the old users, in using an ATM. In support, Barnett proved in his paper that level of comfort is more in youth while using electronic banking. In the case of gender, Katz and Aspden (1997) explained that the adoption rate of electronic banking is higher in males than females. Considering Americans scenario, Kolodinsky *et al.* (2004) said apart from factors like simplicity, compatibility, risk tolerance some other factors also responsible in adoption of electronic banking like income, assets, education, gender and marital status and age. Li and Lai (2011) expressed demographic differences with IB acceptance, in their paper and explained how, sex, age and technology competency influences the adoption of electronic banking, in addition, they found age and occupation as important factors to analyze the trend of adoption of IB. So, we treated demographics factor as a major criteria for our research.

Technological factor

The criteria technological factors of EBC adoption covers various factors, namely technological perceived ease of use, perceived usefulness, availability, accessibility, awareness, etc. Perceived ease of use is person dependent and hence varies from one

individual to another, more an individual finds IB easier, and more are the chances of finding the services useful. After comparing the attitude of mobile banking users and non users, Jeong and Yoon (2013) found perceived usefulness as significant in both; whereas perceived ease of use is significant for mobile users only. Perceived ease of use indirectly affects a customer's desire to use IB (Alsajjan and Dennis, 2009; Eriksson *et al.*, 2005; Shen and Chiou, 2009). Eriksson *et al.* (2008) talked about innovation adoption among IB customer. Duration of usage has also a positive effect on perceived ease of use (Prompattanapakdee, 2009). However, due to implementation of a complex security verification mechanism to protect online transaction security, the electronic banking services had been perceived as more complex and difficult. Echchabi (2011) concluded that perceived ease of use and usefulness drives adoption attitude. Liao and Cheung (2002) found some more attributes like convenience, user experience, user friendliness, user involvement and transaction speed, which strongly affected the customer's perception about the usefulness of IB and services. Furthermore, intention to use IB is directly dependent on perceived usefulness. Electronic banking scores full in this aspect as it is more easily accessible than the traditional form of banking. It has already been pointed out that availability, and convenience to use a service has been regarded as important contributors in the adoption of IB (Centeno, 2004). Apart from banks' reputation, size, trust among customers, awareness about electronic banking is one of the most important factors for the adoption of IB by the customers (Jaruwachirathanakul and Fink, 2005; Al-Somali *et al.*, 2009). This point was discussed and hence proved by Sohaila and Shanmugham (2003) in Malaysian context. It had been highlighted earlier by Sathye (1999) that the main reason for non adoption of IB was the prevailing unawareness among the customer groups. In the same context, Ndubisi and Sinti (2006) scrutinized how customer perceptions and intention to use IB is affected by computer self-efficacy. Therefore, we can see various works has been done in the field of banking technologies where many factors were found responsible. In this research, we kept all technological factors in one head that may affect in selecting one EBC.

Service component

There are many factors related to service which are considered by the customer before opting for same. The factor service quality is dealing with the promptness with which the employees serve the customers (Parasuraman *et al.*, 1985). Service quality can be in the form of quick dispatch, calling the customer back and responsiveness imply the services performed to the customers timely. EBCs security is most important future challenge and it is also most challenging topic for organizations doing online business (Aladwani, 2001). To avoid security hazards in the field of EBC like ATM, IB and phone banking, precautions are necessary. The technological advancement in the field of electronic banking brings the fear of security before adopting the electronic banking system. Since security and privacy have previously been found to lead in adoption of electronic banking in India. According to Ochuko *et al.* (2009) security of internet servers in banking is the most important input, which affects most of the output as the adoption rate of IB in many countries. Elements like firewalls, call-back modems, filtering routers, smart cards, biometrics, digital certificates and authentication techniques are used by various banks in order to ensure the security of their corresponding IB systems (Mukherjee and Nath, 2003). As we have already discussed about risk that leads fear factor which again results in non adoption of EBC, but the trust reduces the negative effect of fear. Suh and Han (2002) found trust was strongly related to attitude toward acceptance of IB services. A trust may build a positive image

of technological advancement in the field of IB. Yousafzai *et al.* (2003) described trust as a function of degree of perceived risk, which is strongly related with the intention to use IB also proposed a model showed perceived security and perceived privacy as two main antecedents of customer's trust. Considering Qatar IB services, research conducted by Kassim and Abdulla (2006) on influence attributes of the IB and showed the effect of trust, attraction and commitment relationship on IB. Also found trust and attraction have strongly related to relationship commitment. Only making easy interaction system is not enough but also the development of secured and private EBC required for developing trust and attract more users in banking. According to Krauter and Faullant (2008), inclination toward trust is a key determining factor not only in personal relationships but also in technological approaches. According to Wong *et al.* (2009) banking customer would have willingness to use IB if the level of trust increases with the reduction in perceived risk. The fear factor is a factor generally derived from perceptions of the uncertainty and adverse consequences while using services and this factor leads to a negative attitude among customer as risk in adoption of EBC. In the literature review Littler and Melanthiou (2006) pointed out the different types of risk related to financial performance, time, social, psychological, security and uncertainty to find customer behavior. As a survey of the China Internet Network Information Centre (CNNIC) (2008), reported that electronic commerce functions like online shopping, online payment and fund transfer, etc. were accepted by only few Chinese internet users. There has big difference of Chinese and western cultures, which affect their perception for risk factors and for exploring risk barriers and its dependencies on EBC adoption in China, Zhao *et al.* (2008), have contributed by explaining risk dimensions like privacy, finance, security and performance, prevent Chinese banking customer more in adoption of IB services. In the context of Turkey Demirdogen *et al.* (2010) added two more risks termed as a safety risk and confidentiality risk and found financial, safety and psychological risk more among non users of IB services as compared to others. In addition, it also determined the high dependencies between the income level of customers and risk perception. Awareness of EBCs and their advantages may reduce the negative image of perceived risk of IB customers (Hanafizadeh and Khedmatgozar, 2012).

Intention to use

Shahrodi and Sayad Azari concluded in their paper that behavior control has strong impact on subjective norm and intention to use IB. Subjective norm has an unquestionable effect on attitude of using IB services. But, subjective norm has not straight effect on intention to use IB. Through an experimental research Lee (2009), analyzed that not only attitude toward the use and behavior control, but also subjective norm have straight significant relationship with intention to use IB. The findings of Shih and Fang (2004) pointed out attitude toward use as main cause in influencing the intention to use. In addition, by analyzing Spanish bank's quantitative data, Miranda *et al.* (2006) explained web site content quality, speed, accessibility and navigability as important factors. These factors would be helpful in enhancing the overall quality of the bank's web site. In the context of e-commerce, system use, playfulness and system design quality are the main factors responsible for the success of web site explained by Liu and Arnett (2000). Designing an easily navigable web site is an important requisite for the growth of IB (Hernando and Nieto, 2007). IB through a web site should not be complex and should be as simple, speedy and beneficial as its traditional counterpart (Karjaluo *et al.*, 2002; Goi, 2007). Greater customer

satisfaction would be ensured with user friendly web sites having easy navigability (Hernández-Ortega *et al.*, 2007). However, web site design along with web site download speed is highly associated and has a greater impact on customer satisfaction (Jayawardhena and Foley, 2000).

Therefore, from this section of literature, it is found that the intention to use EBCs is related to perceived behavioral control, attitude and subjective norms, apart from this some factors like image, user interface, web site design and feedback are related to intention to use. So, we have considered the past researchers' future recommendation for theme of research work. Also tried to bridge the literature gap by accounting both (managers and customers) side perception. Factors which were not given by many researchers in this field, we considered to check its effect. We also took important factors used by past researcher in their models (cited in the literature review section). With the results of this research, prediction for the future adoption process of EBC with tendency and attitude of customer can be judged with respect to different EBC.

III. AHP

In the early 1970s the AHP approach was developed for contingency planning and allocation of scarce resources in the military. AHP is a mathematical structured method introduced by Saaty (1977) and used as a solution for complex MCDM problems.

This method follows a hierarchical way for decomposition of the unstructured complex problem that involve generalization of components like, criteria, sub-criteria, sub-sub-criteria and so on. The generalized AHP hierarchical structure is shown in Figure 1.

So, in short AHP is three main steps:

- (1) Decomposition of problem into lower decision level in hierarchical form.
- (2) At each level of hierarchy structure, pairwise comparison should be done with the help of decision maker's input given in the form of numeric values on 1-3-5-7-9 scale (Saaty, 1988).
- (3) Calculation and setting up the priorities should be done through relative weights of elements of the hierarchy structure, including criteria, sub-criteria and alternatives. On the basis of Eigen vector priority weights of all elements should be calculated.

Initially, priority weights are assigned to all criteria. In order to find out the relative importance levels of each criterion, a pairwise comparison is carried out between all the

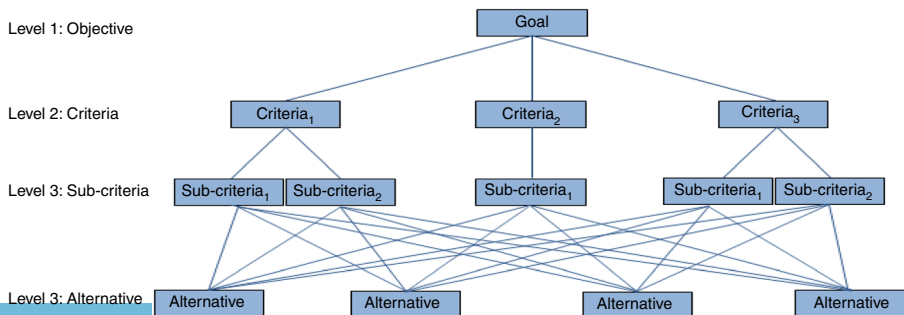


Figure 1.
General hierarchy
structure of AHP

entries at each level or sub-level of AHP model, Therefore, for n criteria at the same level, we will have $n(n-1)/2$ comparison values.

AHP can be applied to a problem by following four steps mentioned as follows:

- (1) making the problem into a hierarchical structure;
- (2) obtaining and comparing the decision matrix;
- (3) calculating local weights and checking the consistency of comparisons; and
- (4) integrate the above weights to attain the final weights of alternatives.

Suppose that there are n criteria with relative weights W_1, W_2, \dots, W_n . Let A be a $n \times n$ matrix of pairwise comparison, whose elements are assigned in 1-3-5-7-9 scale (Saaty, 1988). The comparison outcome can be composed by answering questions: "Which factor is more important and by how much?":

$$A = \begin{bmatrix} W_1/W_1 & W_1/W_2 & \dots & W_1/W_n \\ W_2/W_1 & W_2/W_2 & \dots & W_2/W_n \\ \vdots & \vdots & & \vdots \\ W_n/W_1 & W_n/W_2 & \dots & W_n/W_n \end{bmatrix}$$

Eigen value λW of matrix A can be calculated using the following equations:

$$AW = \lambda_{\max} W$$

where W is eigen vector (a non zero vector) and λ_{\max} is eigen value (a scalar).

After normalizing the eigen vector W , the vector element of W is considered as the local weight of each decision factor approximately, denoted as:

$$W_j^T = \{w_a, w_b, w_c\}$$

In order to check the consistency of users' judgments and detect the errors, if any, we calculate the ratio between Consistency Index (CI) and Random Index (RI), called the consistency ratio (CR). $CR = CI/RI$. If $CR = 0$, the matrix is said to be perfectly consistent. However, if $CR \leq 0.1$, matrix is acceptable, else the user judgment needs to be adjusted until the matrix fulfills the consistency test. CI is obtained by:

$$CI = \frac{(\lambda_{\max} - n)}{(n-1)}$$

where $\lambda_{\max} = \frac{1}{n} \sum_{i=1}^n (AW)_i / W_i$.

RI is given using Table I.

The above steps not just simply help us to acquire the weights of factors toward the ultimate goal, but we can also get the weights of each optional node toward each decision factor.

Factors (n)	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: Saaty (1980)

Table I.
Consistency index

Assuming that there are k alternative to select, all the k weight matrixes of alternatives under m factors will lead to a $k \times m$ matrix, represented by $W_{n_i/j}$, where $i = 1, 2, \dots, k$ and $j = 1, 2, \dots, m$. The global weight can be computed by obtaining the product of each alternative with the criteria and the final weight for each alternative is calculated by:

$$W_{n_i} = \sum_{j=1}^m W_{n_i/j} \cdot w_j$$

The alternative having the larger final weight has more possibility of being selected as the highest priority.

IV. Methodology and applying AHP in EBC selection

In this study, we tried to evaluate the priority of EBCs alternative, where four criteria were present that affect selection of channels. We had MCDM problem we used AHP for selection of best EBC. We could also use regression analysis with AHP, if we want to categorize criteria. Priya and Venkatesh (2012) used to regression for determining decision criteria for selecting best locations for expansion of market. With support of literature work in this field, we have criteria and sub-criteria, then we are only focussed on AHP application.

Initially, a questionnaire has been developed with four sections as four criteria. Under those heads pairs wise comparison has been done among different sub-criteria. In total, 76 comparisons questions were kept in the questionnaire. In each comparison, questions were used to analyze the priority between the two criteria.

For weight calculation of criteria, first we found out the pairwise degree of importance between and within different criteria at each level of the structural hierarchy using the Saaty's importance scale which ranges from 1 to 9. Through convenience sampling, data was collected from bank managers, IT managers and customers of different banks operating in India. Questionnaires have been floated to 110 respondents between 03 June and 19 July, 2013. In total, 100 percent response rate found, in which 60 percent respondents were male and 40 percent were female the research findings were found meaningful for selecting best EBC. For checking the consistency of data and detecting the errors, we have calculated the CR. As the value of CR were found < 0.1 fulfills the consistency test.

Figure 2 shows the AHP structural hierarchy of selection of EBC by banking customers, which includes four levels. The ultimate objective of the problem is represented in the first level of the hierarchy. The second level contains the four major criteria which effect in the selection, namely demographics, technological factor, service component and intention to use.

The third level of hierarchy further subcategorizes the above criteria into various sub-criteria and finally the last level consists of the alternative EBCs. For portraying the customers' choice of adoption of different EBCs, on the basis of different criteria and sub-criteria, a comprehensive questionnaire was prepared and answers were collected from 110 respondents comprising of customers as well as bankers in India.

Furthermore, we calculated the weights at all four levels, in order to obtain the final priorities for each of the alternative channels against all 26 sub-criteria at the third level of the hierarchy. Table I shows the internal weights of each EBC alternative with respect to main channel selection criteria and the generated priority score for each EBC.

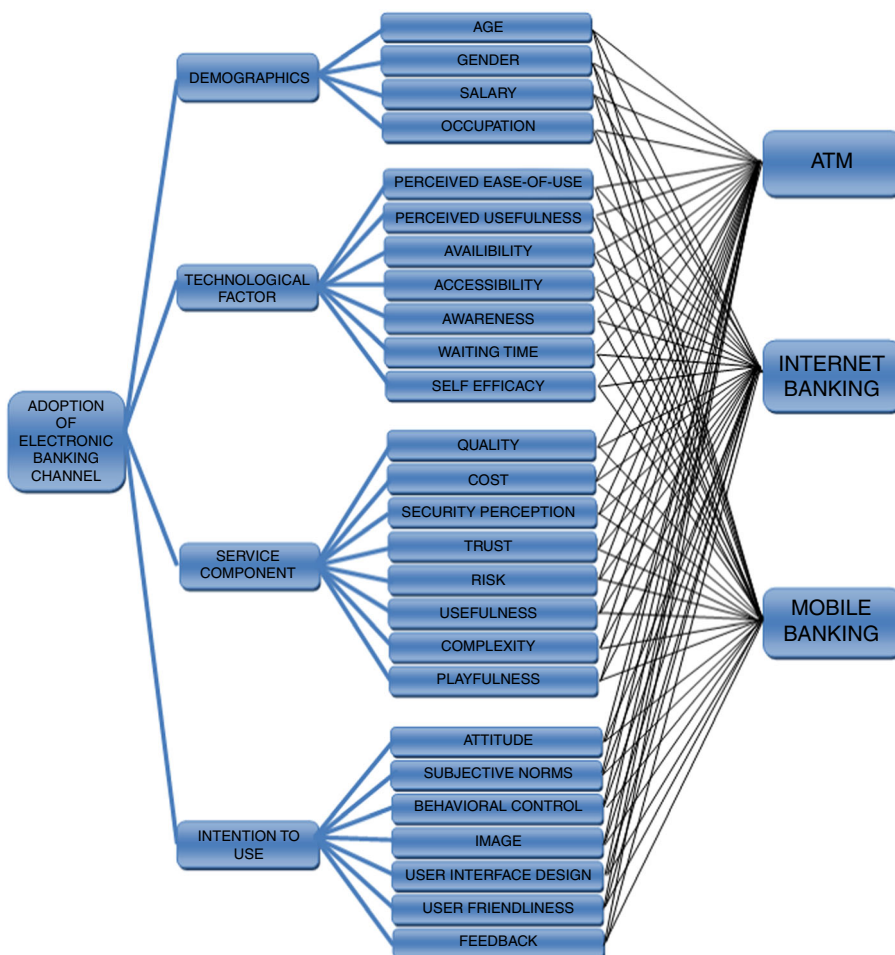


Figure 2. Hierarchy for selecting electronic banking channel alternatives

The respective values after exhaustive calculations using AHP methodology is provided in Tables II-VI.

A. Demographics

From Table II we can infer that in the case of demographics criteria out of all sub-criteria priority of age is very high (0.567) followed by occupation (0.265), gender (0.107) and salary (0.061), respectively. By comparing the EBC alternatives with respect to demographics’ sub-criteria, we can calculate final priority of channels with respect to demographics (Equations (1), (2) and (3)).

The weights calculation for ATM, IB, mobile banking under the criteria Demographics is as follows:

$$0.567 \times 0.701 + 0.107 \times 0.594 + 0.061 \times 0.637 + 0.265 \times 0.113 = 0.530 \quad (1)$$

<i>Pairwise comparison of criteria with reference to Demographics (consistency ratio = 0.032)</i>					
Criteria	Age	Gender	Salary	Occupation	Priority
Age	1	5	7	3	0.567
Gender	1/5	1	2	1/3	0.107
Salary	1/7	1/2	1	1/5	0.061
Occupation	1/3	3	5	1	0.265

<i>Comparison of EBC alternatives with reference to Age (consistency ratio = 0.075)</i>				
Alternative	ATM	Internet banking	Mobile banking	Priority
ATM	1	5	5	0.701
Internet banking	1/5	1	1/3	0.097
Mobile banking	1/5	3	1	0.202

<i>Comparison of EBC alternatives with reference to Gender (consistency ratio = 0.030)</i>				
ATM	1	3	3	0.594
Internet banking	1/3	1	2	0.249
Mobile banking	1/3	1/2	1	0.157

<i>Comparison of EBC alternatives with reference to Salary (consistency ratio = 0.021)</i>				
ATM	1	3	5	0.637
Internet banking	1/3	1	3	0.258
Mobile banking	1/5	1/3	1	0.105

<i>Comparison of EBC alternatives with reference to Occupation (consistency ratio = 0.075)</i>				
ATM	1	1/5	1/3	0.113
Internet banking	5	1	1/2	0.379
Mobile banking	3	2	1	0.508

Table II.
Comparison of
criteria for
Demographics

<i>Pairwise comparison of criteria with reference to Technological factor (consistency ratio = 0.047)</i>								
Criteria	Perceived ease of use	Perceived usefulness	Availability	Accessibility	Awareness	Waiting time	Self-efficacy	Priority
Perceived ease of use	1	1	2	3	1/2	6	3	0.191
Perceived usefulness	1	1	2	3	1/2	5	3	0.186
Availability	1/2	1/2	1	2	1/5	3	1/3	0.078
Accessibility	1/3	1/3	1/2	1	1/5	3	1/3	0.057
Awareness	2	2	5	5	1	7	5	0.347
Waiting time	1/6	1/5	1/3	1/3	1/7	1	1/7	0.028
Self-efficacy	1/3	1/3	3	3	1/5	7	1	0.113

Table III.
Comparison of
criteria for
Technological factor

$$0.567 \times 0.097 + 0.107 \times 0.249 + 0.061 \times 0.258 + 0.265 \times 0.379 = 0.198 \quad (2)$$

$$0.567 \times 0.202 + 0.107 \times 0.157 + 0.061 \times 0.105 + 0.265 \times 0.508 = 0.272 \quad (3)$$

Through calculation we came to know that criteria like age, gender and salary affect more to the selection of ATM channel, whereas occupation affect more to mobile banking channel. ATM's awareness and availability are the main reason behind selecting it, but for mobile banking use occupation is very important.

Table IV.
Comparison of
criteria for Service
component

Pairwise comparison of criteria with reference to Service component (consistency ratio = 0.07)

Criteria	Quality	Service cost	Security perception	Trust	Risk	Usefulness	Complexity	Playfulness	Priority
Quality	1	1/2	1/5	1/5	1/5	1/7	2	7	0.046
Service cost	2	1	1/5	1/3	1/3	2	5	3	0.087
Security perception	5	5	1	2	2	7	6	9	0.314
Trust	5	3	1/2	1	1	5	7	9	0.222
Risk	5	3	1/2	1	1	7	7	5	0.215
Usefulness	7	1/2	1/7	1/5	1/7	1	2	3	0.062
Complexity	1/2	1/5	1/6	1/7	1/7	1/2	1	4	0.034
Playfulness	1/7	1/3	1/9	1/9	1/5	1/3	1/4	1	0.020

Thus, for demographics, ATM is the most preferred channel followed by mobile banking and IB. Similarly, weights have been calculated for other criteria like technological factor, service component and intention to use.

B. Technological factor

Through a pairwise comparison in Table III, we analyzed the priority of criteria technological factor with its sub-criteria and found awareness is most important (0.347) followed by perceived ease of use (0.191), perceived usefulness (0.186), self-efficacy (0.113), etc. in the case of awareness ATM is well known channel and mobile banking is least known. Through this, ATM is found easy to use and IB as very useful EBC. So, while considering the technological impact, overall priority of ATM (0.535) is very high followed by IB (0.337) and mobile banking (0.128), respectively.

C. Service component

In the case of pairwise comparison of service component (Table IV), security perception (0.314), trust (0.222) and risk (0.215) were found as very high priority sub-criteria. According to respondents ATM is most preferred EBC in the case of all high priority sub-criteria of service component and IB was found least preferred in the case of trust and risk and mobile banking is least preferred in the case of security perception. Taking all factors into consideration ATM (0.596) is more important than IB (0.228) and mobile banking (0.176) is least one with respect to service component.

D. Intention to use

Out of all, attitude, subjective norms and behavioral control are the sub-criteria of intention to use with high priority as 0.389, 0.219 and 0.186, respectively. Considering these sub-criteria for criteria intention to use, ATM (0.638) has the highest priority, followed by IB (0.200) and mobile banking (0.162), respectively.

In Table V, we followed pair wise comparison between all four criteria and found corresponding weights, which are used in Table VI for calculating overall priorities of EBCs. The final weights of all selection criteria, demographics, technological factor, service component and intention to use were found 0.384, 0.094, 0.349 and 0.173, respectively.

The overall priorities are being computed by multiplying local weights of all channels with weights of selection criteria and summing up (Table VI).

Table V.
Comparison of
criteria for Intention
to use

Pairwise comparison of criteria with reference to Intention to use (consistency ratio = 0.06)

Criteria	User interface							Priority
	Attitude	Subjective norms	Behavioral control	Image	design	User friendliness	Feedback	
Attitude	1	3	3	5	7	7	9	0.389
Subjective norms	1/3	1	2	3	5	5	7	0.219
Behavioral control	1/3	1/2	1	3	5	5	9	0.186
Image	1/5	1/3	1/3	1	3	2	3	0.083
User interface design	1/7	1/5	1/5	1/3	1	1/3	5	0.042
User friendliness	1/7	1/5	1/5	1/2	3	1	5	0.060
Feedback	1/9	1/7	1/9	1/3	1/5	1/5	1	0.021

Table VI.
Pairwise comparison
criteria of all criteria

Criteria	Demographics	Technological factor	Service component	Intention to use
Demographics	1	3	2	2
Technological factor	1/3	1	1/3	1/3
Service component	1/2	3	1	5
Intention to use	1/2	3	1/5	1

V. Results and discussion

From Table II, it has been analyzed that the factors, age and occupation have more priority than other demographic factors. The reason behind it was that a specific age group has more inclination toward using electronic banking. According to respondents, occupation is the second most important factor in selecting EBC, because the different job profile gives variation in environment, time and facilities which might create need and wish to use EBC. For example IT manager and banking professional have more probability of using EBC, whereas probability is very low in case of small-level self-businessman or persons working as drivers, carpenters, etc. On the other hand salary and gender were not found to be of much importance. As ATM has more penetration in India, it has been given more priority compared to other EBC with reference to factor age, gender and salary. While considering occupation mobile banking has highest priority because its base is smartphones with supporting software.

After demographics factor, technological factor was taken as the second criteria in the selection of EBC. Out of all sub-criteria explained in Table III, under this head, awareness followed by perceived ease of use and perceived usefulness were found important. As awareness is the initial step in the adoption of any new technology, it was found that ATM has the highest awareness compared to others. The reason behind it is that all banks operating in India offered ATM services long time ago; but IB and mobile banking have started a few years back only. Due to less complexity and ease of handling, ATM is given the highest priority. In case of availability and awareness of EBCs, respondents favored ATM, whereas IB was preferred in terms of usefulness, accessibility and waiting time. So, we can say that the technology that emerged earlier has more

chances of higher penetration and vice versa. However, technology that started later came has more advancement, ease of use and usefulness, which might help it to get a reasonably good penetration. Due to these reasons, ATM has the highest priority and mobile banking has the lowest priority, while IB sways in between the two.

The service component is the next criteria in the selection of EBC. From Table IV, it has been calculated that security perception, trust and risk have higher priorities as compared to other factors. Since the chances of failed transaction are comparatively low in ATM, so it emerged as the most preferred channel with reference to security perception, trust and risk issues. ATM offers fewer operations than IB and mobile banking, so the complexity involved is less, thus leading to less risk perception, high playfulness and trust for the users. IB is a most preferred channel for service cost and usefulness as it offers low cost transaction with a wide range of services for different operations.

In Table V, comparisons of criteria for intention to use are computed, which is the last factor considered in the selection of EBC. Attitude of customer is found to be the most important, followed by subjective norms and behavioral control. In all the cases, ATM is the most preferred channel except in the sub-criteria user interface design, where IB is preferred. This is because IB has different sections for clearly visible customized functions; while ATM has fewer features and mobile banking has a small screen to see all the functions at a glance.

Through pairwise comparison, it is clearly shown in Table VI that demographics are the most important criteria for selection of best EBC followed by service component; whereas technological factors and intention are of less importance. Furthermore, Table VI also presents the comparison between all channels considered in electronic banking; in which ATM emerged the most preferred for all four criteria. While comparing mobile banking and IB, demographics play important role in selecting mobile banking and rest of three criteria support IB. So, it can be said that other EBC needs attention on factors like awareness, availability, service quality, security perception, perceived ease of use and efficacy, so as to get high usage and penetration rate. These results would be helpful in formulating banking strategies wherein banks can offer more customized services to the customers.

VI. Conclusion

The paper discusses the four major criteria involved in the selection of best EBCs namely demographics, technological factors, service components and intention to use. As far as demographics are concerned, our result explains age and occupation contributes more than gender and salary. From Table II, it can be seen that the priority of factor age is highest followed by occupation.

One more important fact that can be deduced from Table VII is that with reference to demographics, mobile banking has a higher preference than IB. As age and occupation

	Demographics (0.384)	Technological factor (0.094)	Service component (0.349)	Intention to use (0.173)	Overall priorities
ATM	0.530	0.535	0.596	0.638	0.572
Internet banking	0.198	0.337	0.228	0.200	0.222
Mobile banking	0.272	0.128	0.176	0.162	0.206

Table VII.
EBC weights related
to the individual
criterion of selection

are more important factors (refer Table II), it can be said that adoption of mobile banking is affected more by age and occupation as compared to IB. So, in order to make the high penetration rate of mobile banking, a specific age group and occupation should be targeted and corresponding marketing strategies and customizations should be designed by banking authorities. As we have analyzed the priority of factors only, the relationship and their mutual effect can also evaluate in further studies. Even though ATM emerged as the highly preferable EBC, still the main point to ponder upon is that which channel is more preferable among IB and mobile banking. From our results it can be seen that IB has more preference than mobile banking. Also detailed MCDM method can be applied for the adoption of IB and mobile banking separately, which can provide a clearer picture to future researchers about the causes of adoption or non adoption. The banking policy makers could use such results for social and economic benefits of consumers and financial system.

Further research can be done with larger sample size and in different geographical region so as to make a more rigorous study, which might be helpful to perform the comparative studies between rural and urban area. Detailed research can also be done in the future by considering IB or mobile banking channel for specific age group like young banking customers. The research theme of AHP might prove helpful by considering sub-sub-criteria for analyzing cause effect of adoption and non adoption of IB in India. Also, other MCDM techniques like graph theory, data envelopment analysis, etc. can be applied to find the effect of factors in the adoption of the specific banking channel.

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(The Appendix follows overleaf.)

Questionnaire for adoption of Electronic Banking Channels (ATM, Internet Banking and Mobile Banking) [Please tick the number: (Example: A= B (1/5) means A is 5 times more important than B, A=B (5) means B is 5 times more important than A)]

Scale for pair-wise comparison

Importance	Decision Preference
1	Equal Preference
3	Moderate Preference of one over other
5	Strong Preference of one over other
7	Very Strong Preference of one over other
9	Extreme Preference of one over other
2,4,6,8	Intermediate Values

Comparison of criteria for DEMOGRAPHICS

		9	7	5	3	1	1/3	1/5	1/7	1/9	Other Values
Age =	gender										
Age =	salary										
Age =	occupation										
Gender =	salary										
Gender =	occupation										
Salary =	occupation										

Comparison of criteria for TECHNOLOGICAL FACTOR

		9	7	5	3	1	1/3	1/5	1/7	1/9	Other Values
Perceived Ease of Use =	Perceived Usefulness										
Perceived Ease of Use =	Availability										
Perceived Ease of Use =	Accessibility										
Perceived Ease of Use =	Awareness										
Perceived Ease of Use =	Waiting Time										
Perceived Ease of Use =	Self Efficacy										
Perceived Usefulness =	Availability										
Perceived Usefulness =	Accessibility										
Perceived Usefulness =	Awareness										
Perceived Usefulness =	Waiting Time										
Perceived Usefulness =	Self Efficacy										
Availability =	Accessibility										
Availability =	Awareness										
Availability =	Waiting Time										
Availability =	Self Efficacy										
Accessibility =	Awareness										
Accessibility =	Waiting Time										
Accessibility =	Self Efficacy										
Awareness =	Waiting Time										
Awareness =	Self Efficacy										
Waiting Time =	Self Efficacy										

Comparison of criteria for SERVICE COMPONENT

		9	7	5	3	1	1/3	1/5	1/7	1/9	Other Values
Quality =	Service Cost										
Quality =	Security Perception										
Quality =	Trust										
Quality =	Risk										
Quality =	Usefulness										
Quality =	Complexity										

Quality =	Playfulness																			
Service Cost =	Security Perception																			
Service Cost =	Trust																			
Service Cost =	Risk																			
Service Cost =	Usefulness																			
Service Cost =	Complexity																			
Service Cost =	Playfulness																			
Security Perception =	Trust																			
Security Perception =	Risk																			
Security Perception =	Usefulness																			
Security Perception =	Complexity																			
Security Perception =	Playfulness																			
Trust =	Risk																			
Trust =	Usefulness																			
Trust =	Complexity																			
Trust =	Playfulness																			
Risk =	Usefulness																			
Risk =	Complexity																			
Risk =	Playfulness																			
Usefulness =	Complexity																			
Usefulness =	Playfulness																			
Complexity =	Playfulness																			

Comparison of criteria for INTENTION TO USE

		9	7	5	3	1	1/3	1/5	1/7	1/9	Other Values
Attitude =	Subjective Norms										
Attitude =	Behavioral Control										
Attitude =	Image										
Attitude =	User Interface Design										
Attitude =	User Friendliness										
Attitude =	Feedback										
Subjective Norms =	Behavioral Control										
Subjective Norms =	Image										
Subjective Norms =	User Interface Design										
Subjective Norms =	User Friendliness										
Subjective Norms =	Feedback										
Behavioral Control =	Image										
Behavioral Control =	User Interface Design										
Behavioral Control =	User Friendliness										
Behavioral Control =	Feedback										
Image =	User Interface Design										
Image =	User Friendliness										
Image =	Feedback										
User Interface Design =	User Friendliness										
User Interface Design =	Feedback										
User Friendliness =	Feedback										

Pair wise comparison criteria of all criteria

		9	7	5	3	1	1/3	1/5	1/7	1/9	Other Values
Demographics =	Technological factor										
Demographics =	Service component										
Demographics =	Intention to Use										
Technological factor =	Service component										
Technological factor =	Intention to Use										
Service component =	Intention to Use										

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