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An examination of consumers' adoption of internet of things (IoT) in Indian banks

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Abstract: The purpose of this study is to find out the impact of awareness, privacy & safety, cost, convenience, social influence, and habits on the adoption of IoT in Indian banks. The sample size of 467 Indian customers has been taken for the study. The Confirmatory Factor Analysis (CFA) is applied for testing the reliability and validity as well as the suitability of the questionnaire for the research. Moreover, the Structural Equation Modeling (SEM) model is used for testing the hypotheses of the study, both CFA model fit and SEM model indices are found satisfactory in comparison with recommended values. The results reveal that convenience, social influence, privacy & safety, and awareness have a significant impact on the adoption of the internet of things in Indian banks. On the other hand, the results show that cost & habits do not have an influencing impact on the adoption of IoT. The current study is an attempt to examine the adoption of the internet of things in Indian banks. In India, there is a huge scope of application of IoT in different sectors as India is aiming at being a developed country and no doubt, such kind of

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PUBLIC INTEREST STATEMENT

The study examines the impact of awareness, privacy & safety, cost, convenience, social influence and habits on the adoption of IoT in Indian banks. The Confirmatory Factor Analysis (CFA) is used for testing the reliability and validity as well as the suitability of the questionnaire for the study. The results reveal that convenience, social influence, privacy & safety, and awareness have a significant impact on the adoption of the internet of things in banks in India. On the other hand, the results show that cost & habits do not have an influencing impact on the adoption of IoT. The current paper is an attempt to help the policy-makers as well as the producers of IoT objects to create that kind of services in the banks that can be easily adoptable and beneficial to general public.

technology in the banking services can be a basis for it. The current paper is an attempt to help the policymakers as well as the producers of IoT objects to create that kind of service in the banks that can be easily adoptable and beneficial to the public.

Subjects: Economics; Business, Management and Accounting; Information Technology

Keywords: IoT; internet of things; banks; banking sector; cost; convenience; awareness; social influence; privacy; safety; adoption

1. Introduction

In developing countries, like India, Internet of Things based applications for banks is in the evolutionary stage. Adoption of Internet of Things is still limited to a few application areas (Mital et al., 2018). As per a joint report by IAMAI (The Internet and Mobile Association of India) and Deloitte, Industrial IoT is expected to surpass the consumer IoT space in India by 2020. It also predicts a 12 USD billion IoT opportunity. Ashton introduced the term internet of things (IoT) in 1999 (Gubbi et al., 2013). The IoT aims at extending benefits of the internet, data sharing, remote control ability, constant connectivity and so on, to goods and services in the physical world (Peoples et al., 2013).

In today's increasingly connected ecosystem, Indian banks can rely on IoT-driven data to increase revenue streams and improve customer experiences. the commencement of branchless banking, phone banking, mobile banking, SMS banking, provide value-added services to the customers as per their needs and requirements with the help of IoT technology, so it's an opportunity to retain and grab customers by providing them quality services. According to Del Giudice et al. (2016), the banking sector affected highly by the phenomenon of IoT for two reasons that are; the first customer can save time through using new technology (like internet banking, smartphones, tablets). The second reason is that investors and customers need real-time information about investment, expected consumption, cash flow, etc. In addition, banks need to use IoT technology to reduce both operational costs and fixed costs. Therefore, banks need to do more investment in new technology to enhance customer value and strengthen market position (Mital et al., 2018). Due to increasing use of smartphones and connected objects, IoT has become a new tool for a better customer relationship too (Rathod et al., 2020). IoT describes a world where just about anything can be connected to communicate in an intelligent fashion", a report of RBI states. The use of IoT in banks will provide the banks an unprecedented level of real time data of customers. These data enable the banks to provide the world-class insightful services to their customers.

The IoT phenomenon has been approached technically as well as conceptually. Many researchers like Khan et al. (2012), Gubbi et al. (2013), Sundmaeker et al. (2010), and Uckelmann et al. (2011) investigated the technical aspect of IoT, like implementation, architecture, and design. In the same line, Tan and Wang (2010) addressed many IoT technical aspects like interoperability, architecture, etc. Also, Haller et al. (2009) discussed many technical issues of IoT like identification, heterogeneity, addressing, and interoperability. In contrast, many other researchers investigated the IoT theoretically from the perspective of users, governments, and firms (Haller et al., 2009; Peoples et al., 2013; Weber, 2010; Zhao et al., 2013). According to Gao and Bai (2014) "The research into the IoT acceptance from the consumer perspective is still in its infancy". In addition, Bandyopadhyay and Bandyopadhyay (2010), Luarn and Lin (2005), and Venkatesh et al. (2012) investigated the factors influencing user's adoption of IoT products and services, they found that the acceptance of IoT applications determines the usage behavior. The factors affecting consumer adoption of IoT are still limited and need more investigation (Gao & Bai, 2014).

There are still very few studies that explore the adoption of Internet of Things from a customer perspective in general and specifically in Indian banks. Although we found a lot of literature about

IoT but mostly are in developed countries' context that too mostly presents privacy and security issues. The authors of the present study are failed to find a study on overall adoption effecting factors in Indian context. Accordingly, previous studies discussed the technical issues of IoT. While, this paper aims at investigating the factors that may influence consumers to adopt IoT in banking sector from the theoretical aspect, i.e. consumer perspective. We investigated many factors that may affect Indian customers' adoption of IoT services in banks, like privacy and safety, cost, convenience, social influence, habits, and awareness. The study provides researchers, marketers, and bank managers with an important glance about factors affecting consumers' adoption of IoT in Indian banks. The research into the IoT acceptance from the consumer perspective is still in its infancy stage. Therefore, this paper completely based on consumer behavior aspects.

2. Literature of review

2.1. Adoption

Davis (1989) proposed the TAM (Technology Acceptance Model). According to TAM concept, there are two conditions that determine the adoption and acceptance of technology; that are perceived usefulness and perceived ease of use (Al-Momani et al., 2019; De Boer et al., 2019; Chau & Hu, 2001; Svendsen et al., 2013). TAM had applied to many research fields related with technology like online purchasing/shopping, financial services via mobile (Lee et al., 2012), mobile advertising (Zhang & Mao, 2008), using of e-health and e-learning (Lee et al., 2012). According to Gao and Bai (2014) "TAM can serve as a useful foundation for investigating consumer acceptance of IoT technology, as IoT system is a type of new IT". Marketing literature confirmed that there are many factors affecting the adoption of IoT like enjoyment (Van der Heijden & Verhagen, 2004). Also, social influence has a significant influence on adopting new technology (Hsu & Lu, 2004). Other factors influencing the adoption of IoT are perceived usefulness, perceived ease of use, attitude toward using, social influence, trust and safety (Al-Momani et al., 2019; Shih, 2004).

Also, Hsu and Lin (2018) mentioned that users perceived the cost of using new technology as a function of free. Furthermore, the cost of using IoT banking services is an important factor that determines the adoption of this new technology (Hsu & Lin, 2018). In addition, Zeithaml (1988) considered IoT adoption as "a trade-off between perceived benefits and perceived sacrifices. In other words, the adoption of new technology, like IoT, is directly influenced by comparing the perceived benefits with cost (perceived sacrifices).

Today, IoT in banks is going to create a new wave in India, and it has its use in every sector ranging from, banking, agriculture, manufacturing, electronics of daily use to home appliances, etc. (Upadhyay et al., 2019). The above arguments led us to investigate factors that may influence Indians' customers to adopt IoT in banking services.

2.2. Convenience

The term of convenience is introduced in marketing by Copeland's (1923) (as cited from Cho & Sagynov, 2015). The meaning of this term is changed over time from a descriptor of products to its unique term with emphasizing on time-saving and time buying (Cho & Sagynov, 2015). The convenience concept is related to saving time, avoiding crowded markets, solving parking problems, and 24 accessing to online services (Tatnall & Davey, 2017). Previous studies confirmed that ease of use is significantly determining the behavior intention toward adoption of new technology like IoT in banks (Del Giudice et al., 2016; Gao & Bai, 2014; Lee et al., 2012). This view is also supported by TAM and UTAUT model of using new technology (Kuo & Yen, 2009; Lee et al., 2012; Venkatesh et al., 2012). Also, Jannatul confirmed the importance of convenience concept in the online environment, especially emphasizing on the terms of accessibility 24 hours a day and seven days a week. Today, the only problem than Indian customers face is to deal with internet. Indian customers, especially in rural areas, still find it hard to deal and work with the new technology like smartphones, laptops, etc.; which are essential to adopt the IoT services of banks (Upadhyay et al., 2019). The Indian government aims at making the country digitalized, through the Digital India

Program, which will help in ensuring convenience (ease of using) and ease of access to digital resources (DeitY). The above arguments and findings led us to hypothesize that:

H1:There is a significant impact of convenience on consumer adoption of the internet of things in Indian banks.

2.3. Social influence

When evaluating the adopting of new technology like IoT adoption, the social context shouldn't be ignored (Gao & Bai, 2014). According to Hsu and Lu (2004), the social context is an essential factor in the decision process. This is the case for any services and products in the stage of diffusion or development. Venkatesh et al. (2003) defined social influence as "a person's perception that is important for others to believe that he should use new technology". Therefore, influence from family, friends, peers, and media may influence the consumers' intention to adopt IoT products and services of banks. Social influence is an essential factor in accepting and using new technology like IoT banking services. In addition, Chong et al. (2012) found that the social context significantly affects the consumer intention to accept new technology. In Al-Momani et al. (2016, 2019)) found that social influence has a significant impact on the consumers' intention to adopt IoT products and services. In the same quest, Alolayan (2014) found that social influence is an essential factor for the adoption of smart fridges in the UK.

The Indian government had already published a draft policy on IoT in 2015. Indian customers can realize the pros and cons of IoT services in banks before they intend to adopt it by the help of social influence (Chatterjee, 2020). The above findings confirmed the crucial impact of social influence on adopting new technology like IoT services in Indian banks. Therefore, we hypothesize that:

H2:There is a significant impact of social influence on consumer adoption of the internet of things in Indian banks.

2.4. Habits

Limayem and Hirt (2003) mentioned that habits are developed in the history of the human being. Therefore, habits are what customers always do. Limayem et al. (2001) confirmed that habit is an essential factor that influences adopting and using new technology IoT banking services. In the field of new technology, like IoT banking services, the habits became a critical factor that influences people's adoption (Limayem et al., 2001). Only a few studies on the habits of automatic nature had been done. Abushakra and Nikbin (2019) found a strong relationship between habits and IoT adoption. The study shows that customers are more likely to adopt the technology, if using the IoT services becomes a habit, this compound with the result of Venkatesh et al. (2012). In addition, Alalwan et al. (2015) confirmed the significant relationship between habits and adoption of new technology like internet banking. Therefore, this study tries to add to the previous literature new findings from the perspective of Indian consumers toward adoption of IoT banking services. To what extent the habits may influence Indian customers to adopt new technology like IoT banking services. Consequently, it is hypothesizing that:

H3:There is a significant impact of habits on consumer adoption of the internet of things in Indian banks.

2.5. Privacy and safety

Medaglia and Serbanati (2010) identified the privacy and safety issues "as the major challenges for user-oriented IoT applications". In the same quest, Kim and Lennon (2013) and Luo et al. (2010) mentioned, "The perceived risk associated with a product or service has gained significance in consumer research on innovations". In the era of IoT, the inexperience with new technology led

consumers to concern in the security especially the security of financial data (Weber, 2010). In the same quest, Hsu and Lin (2018) mentioned that the payment via IoT is related to many risks like losing personal data and losing the transaction. Therefore, the use of IoT banking services is always associated with high-risk; especially the consumers cannot see or even touch the products. Similarly, Lin (2011) confirmed "Enhancing the consumer's trust is an effective tool for reducing risk and uncertainty and increasing the sense of safety". Therefore, the trust of consumers in IoT banking services plays an essential role in IoT adoption.

Weber (2010) defined the privacy risk as an "individual's belief regarding potential losses of confidential, personally identifying information through the use of IoT services". Consumers may concern that the providers of IoT banking services may use personal data for profit, or may collect personal data without permission. Such concerns will impact negatively on the adoption of IoT banking services (Hsu & Lin, 2018). Many researchers like Weber (2010) and Sun et al. (2015) supported this argument. Similarly, Wu et al. (2012) confirmed that privacy risk had a negative influence on willingness to transact, intention and trust to reveal location information, and continuous usage of IoT products and services. Therefore, IoT adoption in banking services not only is related to some costs, but it also entails to high risk of personal privacy (Miorandi et al., 2012).

In the near future, Indian customers will have many safety and privacy issues where the IoT banking services will be interconnection of billions of devices (Al-Momani et al., 2019). Indian customers will adopt the IoT in banking services only in case of good protection of their privacy and safety. Therefore, we hypothesize:

H4:There is a significant impact of Privacy and Safety on consumer adoption of the internet of things in Indian banks.

2.6. Awareness

Gupta and Srivastava (2013) defined awareness of IoT as "Understanding how to use the new technology". In this regard, mentioned that increasing the awareness of innovation of new technology, like IoT, is an essential catalyst to enhance the consumers' adoption of IoT banking services. In addition, Kaled recommended that banks leaders, while providing internet solutions, should improve the awareness of customers about the provided services, which result in building a good relationship between the customers and the bank. To adopt IoT banking services, consumers should be aware of the used technology and how it can be utilized effectively (Al-Momani et al., 2016; Dimitrova & Chen, 2006). Furthermore, Han et al. found that technology awareness is an essential factor for accepting and adopting new technology like IoT.

Internet of Things is a new phenomenon for Indian customers (Upadhyay et al., 2019). Therefore, it is interested to throw lights on the awareness of banks' customers toward this new technology. The Digital India Program, introduced by the government, aims at ensuring digital literacy and availability of digital services in Indian language. The Indian government efforts, in the field of IoT, focus on the Citizens, the Government, and the Industry. In other words, the awareness of Indian customers, toward IoT adoption of banking services, has a priority in the Indian government policy. Accordingly, we hypothesize that:

H5:There is a significant impact of awareness on consumer adoption of the internet of things in Indian banks.

2.7. Cost

Kim et al. (2007) defined perceived fee as "the amount of economic outlay that must be sacrificed to obtain the IoT service". Also, Cheong and Park (2005) described the IoT cost as the comparison between sacrifice (cost) and the benefits of using IoT services. Therefore, if the cost exceeds the benefits, service is considered as expensive and users may be less interest to adopt it. Also, the

cost could be seen as a monetary value that consumers may pay for the product or service providers. Many studies about the adoption of IoT services confirmed that cost is a crucial factor. For instance, Kim and Shin (2015) confirmed that there is a significant relationship between cost and adoption of IoT products and services. In the same quest, Acquity Group (2014) (as cited from Al-Momani et al., 2016) revealed that the cost is an effective factor that influences on consumers behavior toward the adoption of IoT banking services.

Lastly, since the IoT in banks is new, cost could be a key determinant of the acceptance of this new technology by the Indian customers. Based on the mentioned findings, the cost is a major obstacle that may lack the adoption of IoT in banking services mainly in India where 40% of the total population lives below the poverty line (Al-Momani et al., 2019). Therefore, we hypothesize:

H6:There is a significant impact of cost on consumer adoption of the internet of things in Indian banks.

3. Conceptual framework

Based on the review of existing literature, this study developed a conceptual framework designed to help understand the study as shown in Figure 1. This study focuses on the extent to which convenience, social influence, habits, awareness, cost, privacy and safety affect the Indian customer to adopt the IoT banking services.

4. Methodology

This study aimed at exploring the different factors that are influencing consumer behavior to use the internet of things in Indian banks. We performed CFA to determine validity and reliability of the measurement model (Figure 2). Finally, we performed SEM analysis to test the study's structural model and hypotheses (Figure 3). The following methodology has been used for the study.

4.1. Tools for data collection

The study tool based on literature review as well as self-structured questionnaire. There were two sections in the questionnaire consisting of demographic information and the second one included 29 statements relating to the factors influencing the adoption of the internet of things in Indian banks. The questions had been developed to fit within the seven dimensions, dependent and independent; those determine the consumer adoption of IoT in banking services in the issue of cost, convenience, privacy and safety, social influence, awareness and habits. The responses were measured on a 7-point Likert scale by indicating 1 for "Strongly disagree" 7 for "Strongly agree".

4.2. Sample design

For the data collection, the convenience sampling technique had been adopted (Paul et al., 2016) to fetch information regarding the factors that affect the adoption of the internet of things in Indian banks. The universe of this study is all the customers of the Indian banks in Aligarh, UP India. A total of 580 structured questionnaires were distributed among Indian bank customers in which 95 questionnaires were responded, and 18 questionnaires were discarded as these were partially filled. Total of 467 questionnaires was finally analyzed. Many research papers on consumer behavior and technology adoption also followed the sample size between 200 and 500 (Kumar & Khiala, 2013; Karaduman & Sehrawala, 2015; Aqsa & Kartini, 2015) that support the sample size, used for the present study.

5. Results and discussions

The data have been collected from primary as well as secondary sources and findings have been drawn based on data analysis and its interpretation. To analyze the quantitative data, SPSS (20.0 version) and AMOS software have been used (Amin et al., 2015). With the help of these statistical

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Figure 1. Conceptual framework.

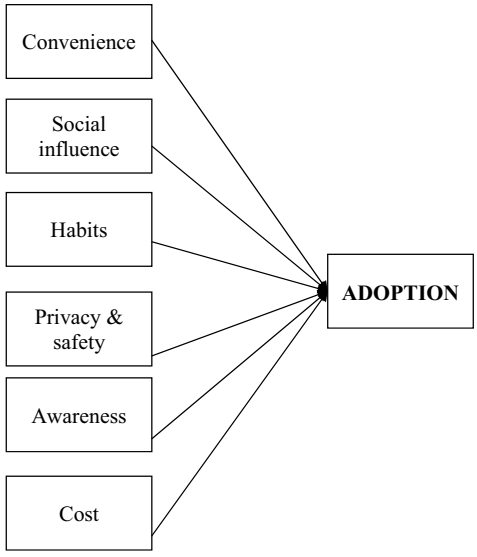
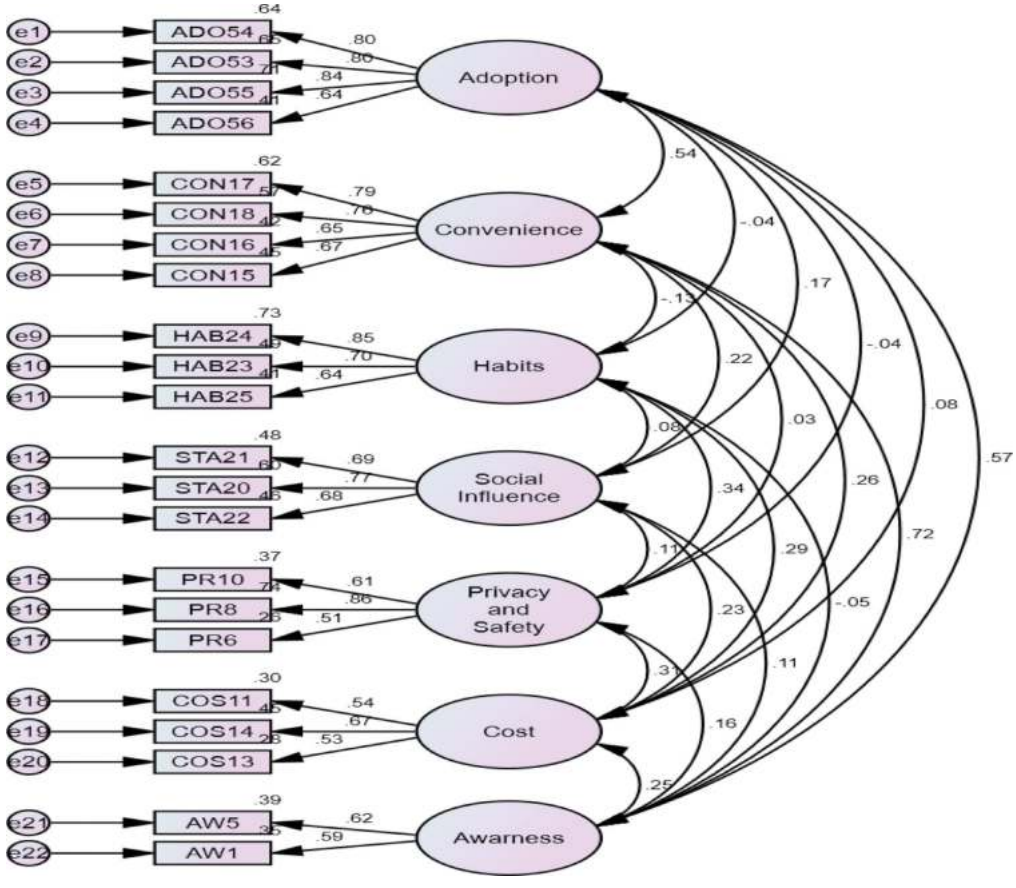
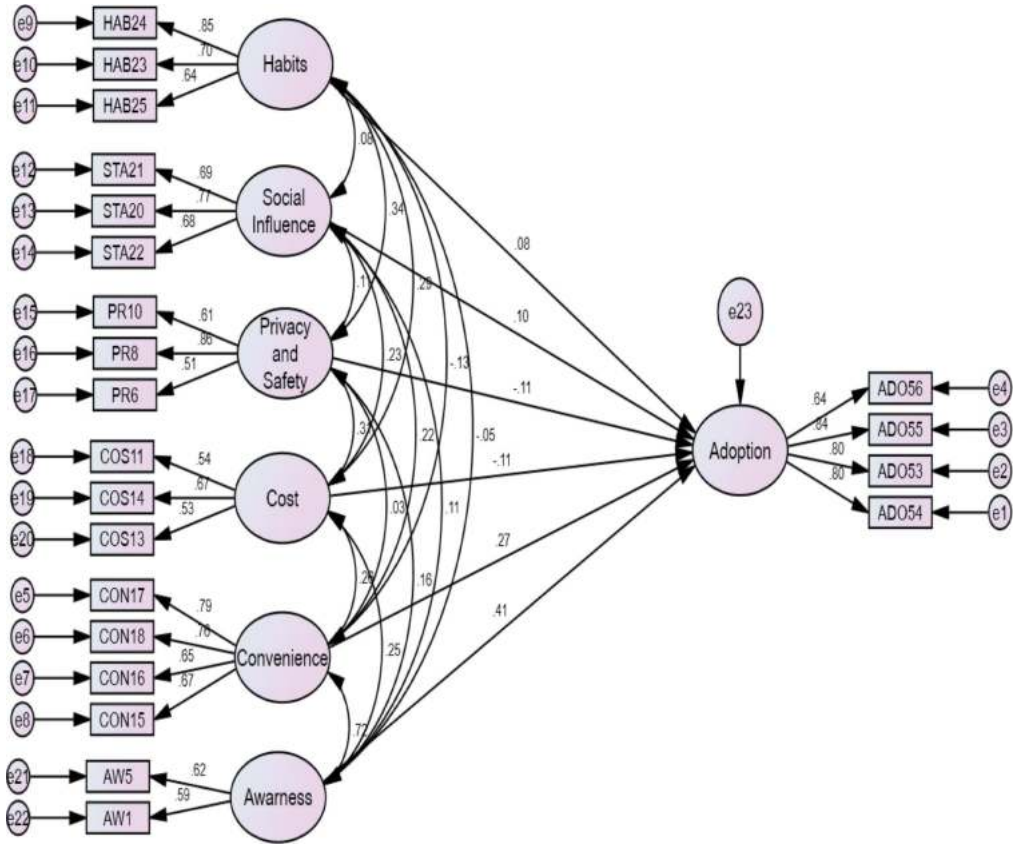


Figure 2. CFA Model.



tools: Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) tests were applied in the present study (Bharu et al., 2015; Al-Majali & Mat, 2011; Kim et al., 2014).

Figure 3. SEM model.



5.1. Descriptive analysis

5.1.1. Demographic characteristics

For demographic analysis, look at Appendix 1, consists of four demographical scales that are gender, age, education and income. First scale gender that is subdivided into two categories; male and female, in which the data collection frequencies are 256 and 211 respectively. While age is divided into six categories where the frequency of data collected is 140 respondents for 20–25 years, 81 respondents for 26–31 years, 83 respondents for 32–37 years, 128 respondents for 38–43 years, 16 respondents for 44–49 years, and 19 respondents for above 50 years above old. Furthermore, 83 respondents have done intermediate, 132 bachelor degrees, 142 are from master's level, and 110 are from doctoral. Also, 204 respondents belong to the family having annual incomes of Rs. 100,000 to 300,000, 127 are from Rs. 300,000 to 600,000, 75 belong to the family earned annual income 6,000,000 to 1,000,000, and 61 respondents belong to a family having an annual income of more than Rs. 1,000,000.

5.1.2. Mean values

The higher mean value indicates the top positive attitude of consumers regarding the adoption of the Internet of Things (IoT) in Indian banks. Appendix 2 shows the mean values of seven variables that have been used for the data analysis for the purpose. The highest mean score is 5.7446, for convenience variable and the lowest one is for the social influence variable that is 4.5450.

5.2. CFA test

The data collected were tested for reliability and validity using confirmatory factor analysis (CFA) using AMOS 22. Segars and Grover (1998) suggested that the assessment of the structural model should be done after evaluating and fixing the problems of the measurement

model. Some items whose factor loading is less than 0.5 have been removed at the time of assessment of the initial model (Hair et al., 1992). However, it was carefully ensured the meaning of each item that it was reasonable theoretically before removing the items. Twenty-two items were kept after re-specifying the instruments. The results of CFA show that the factors loading for the observed items are appropriate for the study. The items are ranging from 0.854 to 0.649 (Fuchs, 2008). The highest loading value in the test is 0.854, whereas the lowest value is 0.649. As well as the loadings between variables are very low, that is also a good sign that there are no multiple correlations. Based on previous literature and empirical study, the CFA model is built.

The following figure shows the CFA model to check the overall validity of the data collected.

There is a satisfactory remark of the Model Fit Indices (Appendix 3) and the output values satisfy the criteria of recommended values. The CMIN/DF (Marsh & Hocevar, 1985) value is 2.923, and the recommended value is 2–5. GFI value (Jöreskog & Sörbom, 1984) is 0.892, where the recommended value is 0 ≤ 1. AGFI value is.862 where the recommended value is 0 ≤ 1. The CFI value (Bentler, 1990) is.864 where the recommended value is ≤0.95 and RMSEA value (Steiger, 1980) is .064. Since we found all the output values are in the range of recommended values. Therefore, the CFA model is fit (Amin et al., 2015; Al-Majali & Mat, 2011; Schivinski & Dąbrowski, 2013; Bharu et al. 2015).

5.3. Reliability and validity

We tested the reliability and validity using the AMOS output (Fornell & Larcker, 1981). The correlation estimates and standardized regression weights had been used. Reliability is tested using the composite reliability (CR) as shown in Table 1. According to Bagozzi and Yi (1988), the value of 0.6 is the minimum level of composite reliability.

The convergent validity is tested using the average variance extract (AVE) as shown in Table 1 (Fornell & Larcker, 1981). The convergent validity is satisfied in case the AVE value is higher than 0.5 (Hair et al., 2010). The discriminant validity is tested by comparing the AVE with Maximum Share Variance (MSV) as shown in Table 1 (Lucas et al., 1996). The MSV values should be less than AVE values for satisfied discriminant validity.

Table 1 and Table 2 show good reliability where the CR values are higher than 0.6, as recommended by (Bagozzi & Yi, 1988). Furthermore, the convergent validity is satisfied where the AVE values are higher than 0.5, as recommended by (Hair et al., 2010). Besides, the discriminant validity is satisfied where all the MSV values are less than AVE values as recommended by Lucas et al. (1996). Furthermore, the square root of EVA is larger than the inter-correlation of each dimension as shown in Table 2.

Table 1. Reliability and convergent validity

Dimensions	CR	AVE	MSV	MaxR(H)
Cost	0.706	0.525	0.145	0.660
Adoption	0.857	0.602	0.296	0.871
Convenience	0.809	0.516	0.296	0.819
Social influence	0.763	0.550	0.071	0.784
Habits	0.777	0.542	0.102	0.819
Privacy and Safety	0.700	0.573	0.102	0.754
Awareness	0.784	0.734	0.117	1.438

Table 2. Factor correlation matrix with the square root of the EVA

Cost	Adoption	Convenience	Social influence	Habits	Privacy and Safety	Awareness
0.570						
0.188	0.776					
0.381	0.544	0.719				
0.267	0.160	0.232	0.671			
0.267	−0.033	−0.129	0.096	0.737		
0.263	0.018	0.062	0.126	0.319	0.611	
0.162	0.298	0.342	0.017	0.021	0.125	0.857

5.4. Testing of hypotheses

Hypothesis testing is a crucial phase of the research process that is necessary to determine the results of the analysis (Fuchs, 2008; Nour & Almahirah, 2014). The primary data, which is collected, have been tabulated in Microsoft Excel File and transferred to SPSS (Statistical Package for Social Science). Then AMOS software has been used to test the hypotheses of the study. For testing of hypotheses of the study, Structural Equation Modeling (SEM): has been used for the analysis of data (Yoo et al., 2000; Schivinski & Dąbrowski, 2013; Hsu & Lin, 2018; Bharu et al., 2015).

5.5. Structural equation modeling (SEM)

The hypothesized model is tested employing structural equation modeling (SEM) using AMOS 19. The process of applying the SEM technique involves two steps. First, confirmatory factor analysis (CFA) tests a measurement theory based on overall model fit and other evidence of construct reliability and validity. Second, the structural model takes information about measures into account and examines the structural relationships among the seven constructs that are cost, convenience, privacy & safety, social influence, awareness, habits and IoT adoption (Hair et al., 2010). We Followed Anderson and Gerbing's guidelines, data analysis was carried out with a two-stage methodology. First, we performed confirmatory factor analysis (CFA) to evaluate the convergent and discriminant validity of the constructs. Next, the causal structure of the proposed research model was tested.

The Structural Equation Modeling (SEM) test was applied for the purpose of evaluating the direct and indirect impact of independent variables on the dependent variables (Roy & Shekhar, 2010; Yoo et al., 2000; Schivinski & Dąbrowski, 2013; Hsu & Lin, 2018; Bharu et al., 2015). Furthermore, the SEM can test the study model consistency of the data and estimate the relation between the variables. The SEM of adoption internet of things among the customers of Indian banks was conducted. The SEM measures the effect of cost, convenience, privacy & safety, social influence, awareness and habits on the adoption of the internet of things among Indian customers in Indian banks. Each variable is measured based on different items related to the variable. The following figure shows the impact of independent variables on the dependent variables using the SEM test.

The above figure shows the relation among the independent variables and the dependent variable, where the recorded values indicate a proper fit of the CFA model with the data. The results of the Model Fit Indices (SEM) are shown in Appendix 4.

There is a satisfactory remark of the Model Fit Indices where the output values satisfy the criteria of observed values (Appendix 4). The CMIN/DF value (Marsh & Hocevar, 1985) is 2.923, GFI value (Jöreskog & Sörbom, 1984) is .892, AGFI value is .892, CFI value (Bentler, 1990) is 864 and RMSEA value (Steiger (1980) is .064. It is observed that all the output values are in the range of observed values. Therefore, the results of SEM are satisfactory (Hartmann et al., 2005; Amin et al., 2015; Al-Majali & Mat, 2011; Schivinski & Dąbrowski, 2013; Bharu et al., 2015).

The results of the hypotheses testing, using SEM, are presented in Table 3.

Table 3 shows that the estimates for the relationship between convenience and adoption is 0.287 and the p-value is **0.022**. Accordingly, there is a significant impact of convenience on consumer adoption of the internet of things in Indian banks ($p < 0.05$). Hence, H1 is accepted. Also, the above table shows that there is a significant impact of social influence on consumer adoption of the internet of things in Indian banks. Where the estimated relationship between social influence and adoption is 0.101 and p-value is **0.085**. So, the H2 is accepted too. On the other hand, the H3 is rejected where the estimated relationship between habits and adoption is 0.061, and the p-value is **0.168**. Therefore, there is no significant impact of habits on the adoption of the internet of things in Indian banks. The H4 is accepted where the estimated relationship between privacy & safety and adoption is −0.152 and p-value is **0.064**. Therefore, there is a significant impact of privacy & safety on the adoption of the internet of things in Indian banks. In addition, the H5 is accepted, as the estimated value is 0.776 and p-value is **0.003**. Therefore, there is a significant impact of awareness on consumer adoption of the internet of things in Indian banks. The estimated value for the H6 is −0.178 and p-value is 0.119. So, there is no significant impact of cost on consumer adoption of the internet of things in Indian banks. Cost, convenience, privacy & safety, Social influence, awareness, privacy and safety in the model, together explained the variance of 38.80% ($R^2 = .388$).

The above results of the study concluded that there is a significant impact of convenience on the adoption of Internet of Things in Indian banks, many researchers also considered the convenience factor as an essential factor for motivating customers to adopt IoT services of banks (Barbara and Johnson, 2001, as cited in Cho & Sagynov, 2015; Tatnall & Davey, 2017). In the same quest, Upadhyay et al. (2019) found that convenience of using internet is an essential factor for Indian customers to adopt the IoT services of banks.

In addition, the results show that there is a significant impact of social influence on the adoption of the internet of things in Indian banks. Most of the respondents are influenced with social context to use IoT banking services as new technology and innovation. Similarly, Venkatesh et al. (2012) mentioned that the social influence factor affect the individual's perception and belief towards the adoption of the internet of things in banks. In the same quest, Chatterjee (2020) found that the adoption of IoT services among Indian customers is affected by the social influence.

The third hypothesis result says that there is no influence of habits on the adoption of the internet of things in Indian banks. This finding goes in contrast with Limayem et al. (2001) who mentioned that habits became an important factor that influences the people's adoption of new technology like IoT banking services. In addition, Alalwan et al. (2015) and Abushakra and Nikbin

Table 3. Regression weights: (Group number 1—Default model

			Estimate	S.E.	C.R.	P	Decision
Adoption	<—	Convenience	0.287	0.125	2.289	**0.022****	**Accept**
Adoption	<—	Social Influence	0.101	0.059	1.721	**0.085***	**Accept**
Adoption	<—	Habits	0.061	0.044	1.379	**0.168**	**Reject**
Adoption	<—	Privacy and Safety	−0.152	0.082	−1.852	**0.064***	**Accept**
Adoption	<—	Awareness	0.776	0.258	3.005	**0.003*****	**Accept**
Adoption	<—	Cost	−0.178	0.114	−1.561	**0.119**	**Reject**
R2	**0.388**						

***, **, ***, indicate significance level at 10%, 5%, 1% respectively**

(2019) found a strong relationship between habits and IoT adoption. Therefore, this finding is going with contrast with the previous literature.

The fourth hypothesis concludes that there is a significant impact of privacy & safety on the adoption of the Internet of Things in banks. Also, Weber (2010) discussed that for increasing the consumer adoption of IoT, users must be educated on privacy and safety-related issues. Also, they confirmed that customers are very careful about their financial data while using IoT services in Banks. In the same quest, Al-Momani et al. (2019) confirmed that customers will adopt the IoT banking services only in case of good protection of their privacy and safety.

The fifth hypothesis result shows that there is a significant impact of awareness on the adoption of IoT. This result is also supported Sathye (1999) who defined the awareness of new technology as the understanding of customers of services and its benefits. Kaled also recommended the bank managers to provide some awareness about new technology like IoT banking services. In the same quest, Dawid discussed that for increasing the awareness of users regarding the applications of IoT, users must be educated on the benefits and advantages and disadvantage of IoT banking services. In the same quest, Al-Momani et al. (2016) mentioned that new technology awareness is an essential factor for accepting and adopting new technology like IoT banking services.

The sixth hypothesis concludes no impact of cost on the adoption of IoT in Indian banks. These findings are inconsistent with Kin and Shin and Acquity Group (2014) who confirmed that there is a significant relationship between cost and adoption of IoT products and services.

6. Conclusion

The present study is an attempt to peters out the influencing factors that affect the adoption of the internet of things (IoT) in Indian banks. The population of the study is the total number of the customers of different Indian banks out of which the sample size of 467 customers has been taken for the study. According to the results, the convenience aspect makes some impact on the adoption of the Internet of Thing (IoT) in Indian banks. Customer prefers to use IoT banking services because it saves time and effort and easy to use as well. The result shows that adoption of IoT banking services is also influenced by the social influence of the respondents because IoT has become the need of today to make the task as per requirements but adoption is negatively impacted with social influence. In addition, the results conclude that habits are not a bar for adopting the Internet of Things (IoT); now the older customers are also taking the initiatives from IoT as others. Moreover, there is a significant impact of privacy & safety on the adoption of IoT; there is no risk associated with adoption of such technology that is why privacy & safety is considered as an influential factor. They are affected by the information being shared by the Indian banks through IoT. That means the safety consideration is in depth in case of the bank's customers because financial data is quite personal. Furthermore, the results indicate that awareness is an influencing factor for the adoption of the Internet of Things in Indian banks. People are intended to use IoT banking services if they are informed time to time and served with real-time information. While the cost resulted no influence on the adoption as nowadays so many sources of technology are available, in fact these are not too much costly in comparison of its benefits. Therefore, customers are intended to use IoT banking services, as they are ready to pay for the quality services.

7. Research implications and limitations

The results of the study can be applied in making new policies or plans regarding internet of things services as well as new technological innovation not only in the banking sector but also in other services like insurance, online services etc. The results of the study could help other developing or under developed countries like Pakistan, Bangladesh, Indonesia and so on to make policies related to internet of things. The researchers found very few studies that follow theoretical aspects of the internet of things in banks. Therefore, the current study can be helpful for future research in the case of IoT in Indian banks. This study has contributed to the existing literature of IoT adoption. This study is limited in terms of sample size, only 467 respondents; more sample size is recommended for future studies. Also, the convenience sampling method was used which has many

limitations. Furthermore, the study is exploratory. Finally, the adjusted R^2 of the SEM model interprets only 38.8% of the total variance of dependent variable IoT adoption. Therefore, about 61.2% of the total variance is attributed to other factors not mentioned in this study. Therefore, more variables are recommended in future studies.

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APPENDICES

Table 1. Demographic Analysis

Profile	Category	Frequency	Frequency (%)
Gender	Male	256	54.8
	Female	211	45.2
Age	20–25 yrs	140	30
	26–31 yrs	81	17.3
	32–37 yrs	83	17.8
	38–43 yrs	128	27.4
	44–49 yrs	16	3.4
	50 yrs and older	19	4.1
Education	Intermediate	83	17.8
	Bachelor Degree	132	28.3
	Master Degree	140	30.4
	Doctorate Degree	110	23.6
Income (annually)	Rs. 100,000 to 300,000	204	43.7
	Rs. 300,000 to 600,000	127	27.2
	Rs. 600,000 to 1,000,000	75	16.1
	More than Rs.1000000	61	13

Table 2. Mean Values

S. No.	Variable	Mean
1	Awareness	5.6099
2	Privacy	5.2318
3	Cost	5.1451
4	Convenience	5.7446
5	Social Influence	4.545
6	Habit	5.0064
7	Adoption	5.6536

Table 3. CFA Model Fit

Fit index	Recommended Values	Observed Values	Remark	References
CMIN/DF	2–5	2.923	Satisfactory	Marsh & Hocevar, 1985
GFI	0 ≤ 1	0.892	Satisfactory	Jöreskog and Sörbom (1984)
AGFI	0 ≤ 1	0.862	Satisfactory	
CFI	≤ 0.95	0.864	Satisfactory	Bentler, 1990
RMSEA	≥ 0.09	0.064	Satisfactory	Steiger (1980)

Table 4. Model Fit indices (SEM)

Fit index	Output Values	Observed Value	Remark	References
CMIN/DF	2.923	2.923	Satisfactory	Marsh & Hocevar, 1985
GFI	.892	.892	Satisfactory	Jöreskog and Sörbom (1984)
AGFI	.862	.862	Satisfactory	Bentler, 1990
CFI	.864	864	Satisfactory	Bentler, 1990
RMSEA	.064	.064	Satisfactory	Steiger (1980)

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