



# Enhancing Technology Acceptance through User Experience Evaluation: Comparative Analysis of Banking Website Versus Mobile Application

Dasharathraj K Shetty,<sup>1</sup> Jumleena Bhagawati,<sup>2</sup> Shreya Shetty,<sup>3</sup> Lewlyn L R Rodrigues,<sup>1,\*</sup> Arun Kumar,<sup>4</sup> Prithvi Tilwani,<sup>5</sup> Manjunath K Vanahalli,<sup>6</sup> Kishore B,<sup>4</sup> Anuradha Rao,<sup>7</sup> Namesh M,<sup>8</sup> Shreyansh Chaabra,<sup>9</sup> Krishnamoorthi Makkithaya,<sup>4</sup> Nithesh Naik<sup>5</sup> and Girish Nair<sup>10</sup>

## Abstract

Despite the high rate of technology adoption in banking services, there is still a void in the literature on technology adoption and diffusion in this area, and hence, the purpose of this paper is to analyze the comparative user behavior of two different banking platforms, namely Banking Websites and Mobile Applications in India. The theoretical underpinning for the empirical validation is the Technology Acceptance Model (TAM). The research is based on the quantitative analysis with a sample size of 304 and 411 customers in the aforementioned banking platforms respectively. Structural Equation Modelling (SEM) has been adopted as the technique of analysis. Results indicate that among the ten variables of the study *behavioral intention*, *dependability*, *efficiency*, and *perspicuity* have a similar effect on technology acceptance, and the rest of the variables differ in their impact with respect to the two platforms under comparison. The implication of the study is that both platforms need to focus on the aforementioned variables during the system design as they are crucial in connection to the actual usage of the system. The outcome of this research could be of use to academicians, system designers, and application developers.

**Keywords:** Attractiveness; Behavioral intention; Net banking; Perceived ease of use; User experience.

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## 1. Introduction

The global economy has transformed itself into an internet-based economy in the past decade, which is perceived as one of the most significant developments since the industrial revolution. The banks are one of the major beneficiaries of the

internet-based economy, as internet-based banking provides several advantages, among which, remote access and faster access to services stand out from the rest. There are advantages such as the service providing will be economical in the longer run, several features can be grouped together, and it helps escape the constraint of space and time.<sup>[1]</sup> Internet banking allows consumers to perform the most financial transaction with a mouse click. Currently, three primary types of Internet banking are used in the market: Transaction, Information, and Communication. Online banking technologies and solutions are of great significance as by focusing on this, banks can build better relationships with their clients by providing quick access to various goods and services. This development has been welcomed by the Indian banking and financial sectors. The two types of banking interface with customers that are focussed in this research are Net Banking and Mobile Banking, which have been chosen specifically for their relevance in the current banking scenario.

Internationally, Internet banking/Net banking has become widely accepted, and accordingly, things are changing quickly in India, too. With the introduction of net banking, India is on

<sup>1</sup> Department of Humanities and Management, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

<sup>2</sup> Department of Chemical Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

<sup>3</sup> Department of Biomedical Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

<sup>4</sup> Department of Computer Science and Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

<sup>5</sup> Department of Mechanical and Manufacturing Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

the cusp of a vast banking revolution. Only a dozen banks provided services at various levels in 2002. However, now all the banks have started to follow this trend, and they provide their customers with internet banking services. The Indian bank's online banking services were far behind multinational banks, without developing enough infrastructure or an extensive enough number of users, this is not achievable. ICICI Bank Ltd. and HDFC Bank Ltd., experience demonstrate a relatively limited number of net transactions. The speed with which identical activities may be accomplished over the Internet (and lower workforce) entirely shades the conventional ways. India is the world's second most significant Internet user (approximately 687,6 million users), and its population is expanding continuously.<sup>[2]</sup>

Mobile banking (m-banking) on the other hand, provides another conduit for financial services, potentially becoming the dominant channel in emerging economies. It could be used as a mode to offer banking services "anytime and anywhere," as opposed to branch offices, where banks have historically given services through face-to-face contact with customers.<sup>[3]</sup> By banking bringing convenience, affordability, and accessibility to bank clients, mobile technology revolutionizes the worldwide financial business. Indian customers at present are increasingly moving onto mobile phones to look for, acquire, and suggest products and services. Banks are undergoing the most dramatic transformation in their history as customers migrate online and become more mobile.

While the advantages that internet-based banking can offer are quite useful to bankers, equally important is the user experience of the new system of banking. So, the User experience (UX) has become a buzzword in the fields of Human-Computer Interaction (HCI) and interaction design since the previous decade, because when technology advances, interactive goods became more valuable, functional, stylish, and intriguing so there will need to capture the experiences of the users of these systems so that continual improvements can be initiated.<sup>[4]</sup> The UX design is how a team of designers develops products that give users meaningful and relevant experiences. It includes creating the whole acquisition and integration process, including branding, designing, usability,

and function. It contributes to an organization's ability to leave a lasting impression on its customers. A highly positive UX demonstrates that the product is stress-free and easy to use. It has a ripple effect on the overall consumer experience. For starters, it increases consumer happiness, which leads to increased customer loyalty and retention, promoting brand loyalty. Thus, measuring customer satisfaction can offer banks important information regarding client loyalty and retention. Also, it can assist them in developing effective strategies for using efficient customer service as a differentiating feature in this very customer-oriented service sector. User experience has become a key component in internet-based companies, as a result, new product attributes which include perceived ease of use, quality, aesthetics, attractiveness, and value for money must meet or exceed customer expectations.<sup>[5]</sup>

For more than two decades, the user acceptability of technology has been an essential topic of research. Although numerous models have been developed to study the nature of the antecedents of actual system usage on the introduction of new technology in the market, the TAM has been one of the most widely accepted by the Information Systems community. It is an experimental paradigm for predicting user adoption of new technologies. TAM expanded on the Theory of Reasoned Action (TRA) by incorporating two belief components, perceived usefulness (PU) and perceived ease of use (PEOU), which replaced several of TRAs attitude measures.<sup>[6]</sup> However, Hornbæk and Hertzum<sup>[7]</sup> pointed out that the mere information that technology needs to be useful and easy to use in order to be accepted does not provide enough guidance for practitioners for the selection or modification of competing technologies.

In this study, user experience characteristics have been used as the determinants of technology acceptance. The extension of TAM called the User Experience Technology Acceptance Model (UX-TAM) considers the role of individual characteristics and consumer perceptions on the adoption of online banking services. It will allow banks to develop solutions to entice clients to utilize their online banking service. Even though net banking and mobile banking are two different modes of banking they must provide a seamless user experience to their clients. The result of this study should be in the form of the difference in technological acceptance of banking websites and mobile applications. It will also help in realizing if the modified UX-TAM used in our research can help determine if the factors considered can refine and enhance both services to improve the user experience and help achieve maximum customer satisfaction. Also, the differences will help the designer design better and more cohesive interfaces for banking websites and banking applications. The comparison can help us understand the acceptance of technology in terms of user experience when applying the TAM individually and what can be changed in the general design of the services. This will help improve the overall banking experience that will benefit both the user customer and the bank.

<sup>6</sup> Department of Data Science and Intelligent Systems, Indian Institute of Information Technology Dharwad, Karnataka, 580009, India.

<sup>7</sup> Department of Information and Communication Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

<sup>8</sup> Scholar, Pilon School of Business, Sheridan College, Mississauga, Ontario, Canada.

<sup>9</sup> Department of Instrumentation and Control Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India.

<sup>10</sup> International Hospitality Management, Stenden University of Applied Sciences, Qatar.

\*Email: [l.rodriques@manipal.edu](mailto:l.rodriques@manipal.edu) (L. R. Rodrigues)

## 2. Method

One of the most prevalent models of technology adoption is the TAM, particularly in the consumer setting. Bagozzi recommended that TAM is more suited for assessing factors affecting the use of new technology. The TAM is fundamentally based on the TRA that found its origins in the field of social psychology. The TAM is a unification of the Fishbein Theory and TRA, based on the premise that the emotions and perceptions of customers affect their behavior and attitude. Usability, ease of use, and attitude have been grouped as a set of variables in the study of technology acceptance in several contexts.

### 2.1 The conceptual Model

The evaluation of technological features is significant in predicting technology acceptance, according to the social and technological systems approach, and this forms the basis for the development of the conceptual model in this research. The conceptual model developed in this research is an integration of TAM and UX. The establishment of the linkages between the components of the model is based on earlier research in various service-providing contexts and is as follows.

#### 2.1.1 Linkage of efficiency with perceived usefulness of Net banking

Jolly has associated the linkage between efficiency and PU in the context of internet banking. There are several other studies that have established the linkage between these two variables of interest. Perceived usefulness is the degree to which a person thinks it could increase his job effectiveness using a certain program. Rahi *et al.* suggested that the prognosis for the user's intention of adopting internet banking is one of the most crucial aspects among other variables.<sup>[8]</sup> PU is associated with functionality criteria, especially efficiency and output quality in the user experience technology accepting model. The efficiency of technology is a guarantee that the user can do the necessary task without excessive effort to do a problem. Brandon-Jones *et al.* discovered that efficiency and quality-related are associated with PU in a survey of the acceptance of e-procurement technology. Therefore, the hypothesis postulated based on these studies for the role of efficiency in the user experience of Net banking and Banking applications based on these studies is:

H1: Efficiency has a positive relationship with the perceived usefulness of internet banking.

#### 2.1.2 Linkage of attractiveness with perceived usefulness of Net banking

There are several website attributes that have an impact on the interaction experience and attractiveness is also one among them. Attractiveness is one of the aspects of quality and it is linked to the PU. It is associated with the interface: clean, aesthetic, inviting, appealing, friendly, motivating, and desirable. In the context of the website, Heijden investigated the effect of Visual Appeal (VA). Tsai *et al.* recommended that

industry experts increase mobile website development and provide high-quality websites to enhance the involvement of users. Hasan and Ahmed investigated the impact of two interface designs (menu- and command-based) on users' perceptions of ease of use, usefulness, and behavioral intention to use automated systems. Tucker used a web-based survey to test the TAMs ability to predict consumer attitudes toward e-commercial systems. The findings show that the systems interface style has a considerable significance on perceived usefulness. According to Hoffman and Novak, impacting the attractiveness of interactive systems was a significant factor.<sup>[9]</sup> Therefore, the next hypothesis postulated for the role of attractiveness on the user experience of Net banking and Banking applications based on these studies is:

H2: Attractiveness has a positive relationship with the perceived usefulness of internet banking.

#### 2.1.3 Linkage of perspicuity with perceived ease of Net banking

Perspicuity refers to the degree to which a technology can be understood. Perspicuity has been associated with PEU by several researchers. Earlier research has shown that perceived usability is one of the main variables that improve the credibility and performance of the system to make the site more reliable.<sup>[10]</sup> Also, to measure the efficiency of the banking website or application, we need to determine if the service is user-friendly and if it is easy to navigate through the website or application. Therefore, the next hypothesis postulated for the role of perspicuity on the user experience of net banking based on these studies is:

H3: Perspicuity has a positive relationship with perceived ease of use of internet banking.

#### 2.1.4 Linkage of dependability with perceived Ease of use of Net banking

When customers feel that the online banking system is reliable or safe, they accept online Banking voluntarily. Technology Dependency can be established if the user relies upon and controls the technology. Fogg observed that perceived ease of use is an important aspect of enhancing the credibility and effectiveness of the system to make the website trustworthy.<sup>[10]</sup> Dependency is one of the markers of usefulness tied to both PU and PEOU; however, the relationship with PEOU has been observed to be stronger.<sup>[11]</sup> User is more likely to find a system easy to use if they feel in control of the interaction and finds it predictable while using it. Therefore, based on these research studies, we propose the following hypotheses:

H4: Dependability has a positive relationship with perceived ease of use of internet banking.

#### 2.1.5 Linkage of perceived ease of use and perceived usefulness of Net banking

The impact of perceived ease of use on perceived utility in TAM is empirically verified in various literature.<sup>[12,13]</sup> There is abundant evidence that perceived ease of use is highly

connected to use through its impact on perceived usefulness, both directly and indirectly.<sup>[14]</sup> Moreover, if technology is seen as straightforward to use, people will be more likely to use them. Based on these earlier studies the following hypothesis is a postulate.

H5: Perceived ease of use has a positive relationship with perceived usefulness.

### 2.1.6 Linkage of perceived usefulness with the behavioral intention of the consumer in Net banking

In the context of online banking, PU defines the extent to which the consumer perceives it as more favorable, effective, and conducive to conducting online transactions than the typical format of visits to a physical bank branch.<sup>[14]</sup> PU is one of the essential factors determining whether a person would decide to deal with an online company apart from others.<sup>[15]</sup> In the broad analysis of technology adoption studies, research publications indicated that the PU construct was relevant. Earlier research in this topic area also substantiates the positive relationship between PU and consumer intentions to adopt online banking.<sup>[16,17]</sup> The PU structure is one of the most important variables influencing customer decisions toward adoption.<sup>[18]</sup> Similarly, investigations using several models of TAM have shown that customers referred to PU as one of the main reasons for accepting technology.<sup>[19]</sup> Previous research also identified that the more usable the online banking platform is, the more likely it is to be used by consumers.<sup>[20]</sup> Hence, in light of the evidence provided in the literature, the next hypothesis that can be posited is:

H6: Perceived usefulness has a positive relationship with the behavioral intention of a consumer in net banking.

### 2.1.7 Linkage of perceived ease of use and behavioral intention of the consumer in Net banking

The word ease-of-use refers to the relative complexity of use. When a new system or technology is employed, PEOU can have a substantial impact on consumer intentions for adoption.<sup>[21]</sup> In the field of online banking, PEOU is commonly identified as a crucial indicator of adoption of the newer technology.<sup>[22]</sup> The PEOU structure is an important motivator for online banking, with consumers stating that less effort in using such systems is fulfilling. Previous research indicates that PEOU is especially significant in situations of online banking because consumers have no conventional face-to-face encounter with the provider.<sup>[23]</sup> In an amended version of TAM, it was observed that PEOU was the key to consumer intentions in adopting online banking platforms. In other words, the easier the consumers navigate the online banking website and the smoother effort-free conduct of typical banking activities and services, the more likely they are to use the canal for future usage. The majority of internet banking study supports its relative strength in determining customer acceptance by the PEOU construct.<sup>[24]</sup> Hence, the next hypothesis postulated is as follows:

H7: Perceived ease of use has a positive relationship with the behavioral intention of customers in net banking.

### 2.1.8 Linkage of stimulation and behavioral intention of the consumer in Net banking

In the context of user experience, stimulation is considered to be one of the important hedonic properties.<sup>[7]</sup> Hedonic characteristics are a thrilling and stimulating technological experience. Stimulation relates to how exciting and compelling the use of the technology. Kim *et al.*<sup>[25]</sup> observed that the hedonic quality in the case of smartwatches was substantially associated with a positive approach to the technology, which in turn predicted its aim. Hence, in light of the evidence provided in the literature, the next hypothesis that can be posited is:

H8: Stimulation has a positive relationship with perceived ease of use of net banking

### 2.1.9 Linkage of novelty with the behavioral intention of Net banking

Novelty is the other hedonic quality in the paradigm of acceptance of user experience technology. Novelty is when technology is new and attracts the interest of the user. Researchers observed that hedonic qualities are associated with a positive intention to use a technology that can predict its aim to use it.<sup>[11]</sup> Research has proved that novelty of technology is positively related to the user's behavioral intention.<sup>[7]</sup> These findings formed the basis for the formulation of the following hypothesis.

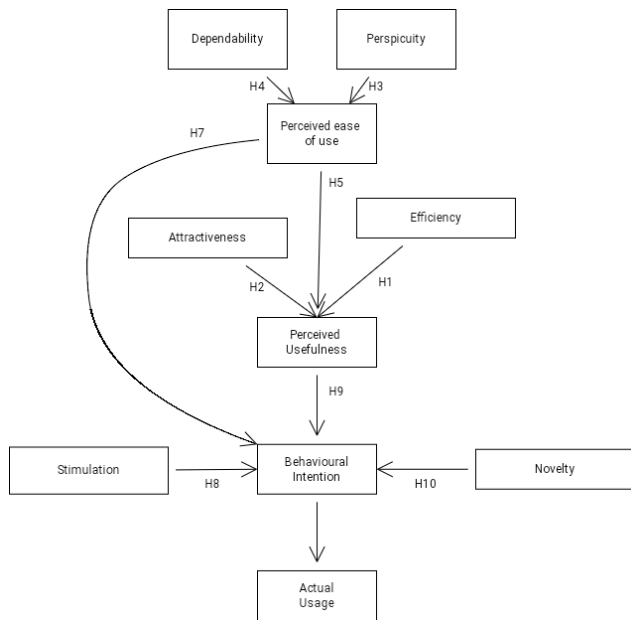
H9: Novelty has a positive relationship with the behavioral intention of using net banking.

### 2.1.10 Linkage of the behavioral intention of consumer and actual usage of Net banking

TAM extensively predicts the acceptance of new technology. This variable is considered very relevant to behavior, perceived utility, and perceived ease of use. Some researchers have lately modified the TAM further and extended its use to the internet arena. The external influences that affect the Actual usage use are evident in different contexts of system usage like banking and educational systems.<sup>[26]</sup> According to TAM, usage is determined by beliefs (subjective probability of impact on a Web site), attitude and intentions (willingness to use the website) as well as the positive and negative feelings about that technology which in turn are measured by the perceived utility and usability of the site.<sup>[27]</sup> Thus, the purpose of use and reuse of the website/application, and to what extent the user wishes to do so in the future would widely depend on the user's convictions. To test this, the following hypothesis is postulated.

H10: Behavioral intention has a positive relationship with the actual usage of net banking.

These hypotheses have been depicted in [Fig. 1](#).



**Fig. 1** The hypothetical model for system usage in banking websites and mobile applications.

## 2.2 Instrument development

The instrument used for the collection of the quantitative data required for the empirical study is a survey questionnaire which has been developed using the standard procedure of collecting the standard scales available and choosing the most appropriate items under each dimension of the study, conducting a pilot study using a sample size of about 10% of the primary data, validating the questionnaire and performing the confirmatory factor analysis for the factor reduction. The questionnaire had two parts: while the first part was to elicit the demographic information about the respondents the second part was to obtain the quantitative data through the 5-point Likert scale with 5- strongly agree and 1- strongly disagree criteria with the intermediate values measuring the variance between the two extreme conditions for each of the items in the questionnaire. The questionnaire captured both the technology acceptance and user experience criteria as required in this research.<sup>[28]</sup>

## 3. Results and discussion

A sample size of 35 has been used for the pilot study. There is no hard and fast rule for the sample size selection for the pilot run; however, the aforementioned thumb rule of 10% of the primary data was used in this research. While probability sampling would be ideal if the results have to be generalized gaining access to the entire sampling frame has practical problems, and hence, convenience sampling has been used in this research. Thus, the sample size of 200 will be adequate as per the principles of SEM; however, a larger sample size is used to maximize the reach of the respondents. The banking application survey had respondents who are users of 23 different banking applications and the banking website survey had respondents who are the users of 16 different Indian banking websites.

A total of 411 responses were collected for the Mobile app-based survey, and the website users, 304 responses were collected. This sample for both the surveys consisted of people of the age group 18 years to 60 years out of which (45.5 %) respondents were male and (53.3 %) respondents were female for the banking app and the website 53.3% respondents were male and 46.7% respondents were female. In terms of annual income, for banking applications 44% of respondents earned less than INR 5,00,000 (Approx. 6,645 US\$), 31.3% earned between INR 5,00,000-25,00,000 and (Approx. 6,645 US\$ - 33,225 US\$) 19.2% earned between INR 25,00,000-50,00,000 (33,225 US\$ - 66,450 US\$); whereas, for the website the corresponding figures were 43.4%, 43.4%, and 10.9% respectively. Based on how often the respondents used the banking application/website, for banking application 46.6% chose Occasionally, 37.8% chose Regularly and 14.1% chose Rarely. For the banking website, 53.3% of respondents chose Occasionally, 25.7% of respondents chose Regularly and 14.1% of respondents chose Rarely.

### 3.1 The measurement model

The convergent validity of the constructs was examined through the factor loadings, Composite Reliability (CR), and Average Variance Extracted (AVE). While the first values in the table refer to the Mobile App, the values in the bracket indicate the corresponding values for the Website services in the banking (Table 1). The Cronbach's Alpha for the Mobile App and Website based banking services are in the range of 0.7 to 0.9 and 0.8 to 0.9 respectively indicating adequate internal consistency.<sup>[29]</sup> The factor loadings varied from 0.8 to 0.9, which indicates a strong effect of the factor on the variable of study (cut-off 0.5) and the CR values for each dimension were above the minimum cut-off value of 0.6, ranging between 0.8 to 0.9, which indicate a moderate to the high level of internal consistency. Similarly, all the AVE values are greater than 0.5 with values ranging between 0.7 to 0.8. Further, the convergent validity was established through CR and AVE, as all the CR values were greater than the AVE.<sup>[29]</sup> Finally, the discriminant validity of the data is proved that the square root of the AVE value for dimensions is greater than the inter-item correlation of that dimension with all the rest of the dimensions (Table 2). Thus, all the recommended criteria of reliability and validity were met for the data obtained on both platforms. Further, the Coefficient of determination provides the goodness-of-fit of the model and it can be observed that the R<sup>2</sup> values in the model range from 0.3 to 0.6 (Mobile App) and 0.5 to 0.7 (Website) (Figs. 2 and 3) indicating that 30% to 60% and 50% to 70% of the dependence of the endogenous variables have been explained for the two platforms respectively by the model, and the goodness-of-fit is adequate as the values are above the cut-off point of 0.1.

### 3.2 The Structural Model

The results of hypothesis testing are in the form of Tables 3 and 4 and Figs. 4 & 5. The Original Sample is the mean value

**Table 1.** Reliability and validity of latent variables (values within brackets are for websites).

Latent Variable	Code	Factor Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Attractiveness (ATT)	ATT1	0.845(0.728)	0.887(0.833)	0.918(0.833)	0.691(0.602)
	ATT2	0.862(0.796)			
	ATT3	0.833(0.812)			
	ATT4	0.864(0.818)			
	ATT5	0.746(0.718)			
Efficiency (EFF)	EFF1	0.869(0.782)	0.709(0.819)	0.897(0.880)	0.745(0.648)
	EFF2	0.891(0.827)			
Perceived Usefulness (PU)	PU1	0.901(0.855)	0.86(0.839)	0.904(0.903)	0.701(0.736)
	PU2	0.871(0.882)			
	PU3	0.887(0.871)			
Perspicuity (PER)	PER1	0.880(0.880)	0.882(0.882)	0.873 (0.919)	0.774(0.739)
	PER2	0.852(0.848)			
	PER3	0.858(0.863)			
	PER4	0.847(0.847)			
Dependability (DEP)	DEP1	0.870(0.840)	0.85(0.796)	0.902(0.868)	0.754(0.622)
	DEP2	0.793(0.736)			
	DEP3	0.827(0.763)			
	DEP4	0.857(0.810)			
Perceived Ease of Use (PEOU)	PEOU1	0.881(0.829)	0.864(0.841)	0.917(0.904)	0.787(0.759)
	PEOU2	0.866(0.888)			
	PEOU3	0.913(0.894)			
Stimulation (SIM)	SIM1	0.905(0.906)	0.842(0.863)	0.919(0.916)	0.738(0.785)
	SIM2	0.903(0.875)			
	SIM3	0.806(0.877)			
Novelty (NO)	NO1	0.852(0.884)	0.837(0.831)	0.917(0.898)	0.785(0.746)
	NO2	0.873(0.855)			
	NO3	0.880(0.852)			
Behavioral Intention (BI)	BI1	0.865(0.907)	0.828(0.770)	0.905(0.897)	0.765(0.813)
	BI2	0.835(0.896)			
	BI3	0.888 (0.974)			
Actual Usage (UB)	UB1	0.923(0.854)	0.728(0.787)	0.787(0.876)	0.782(0.702)
	UB2	0.844(0.876)			

and the Sample Mean is the estimated mean during the bootstrapping operation, which should not differ more than 5% for the model to have the required validity.<sup>[29]</sup> It can be observed that the difference between the Original Sample and the Sample Mean is less than 5% in all the cases. The t-statistic for the hypotheses being tested is also given in the table. Hypothesis testing of the Mobile Application has revealed the following:

**Mobile App**

- 1) Behavioral intention is a significant predictor of actual usage.
- 2) Dependability is a significant predictor of perceived ease of use.
- 3) Efficiency is a significant predictor of perceived usefulness.
- 4) Perceived ease of use is a significant predictor of perceived usefulness.
- 5) Perspicuity is a significant predictor of perceived ease of

use.

- 6) Perceived usefulness as well as stimulation is a significant predictors of behavioral intention.

**Website**

- 1) Behavioral intention is a significant predictor of actual usage.
- 2) Dependability is a significant predictor of perceived ease of use.
- 3) Efficiency is a significant predictor of perceived usefulness.
- 4) Perspicuity is a significant predictor of perceived ease of use.
- 5) Perceived usefulness is a significant predictor of behavioral intention.
- 6) Stimulation is a significant predictor of behavioral intention.

Both in the case of Mobile Apps as well as Websites *behavioral intention* is a significant predictor of *actual usage*.

**Table 2.** Discriminant validity of latent variables (values within brackets are for websites).

	ATT	BI	DEP	EFF	NOV	PEOU	PU	PER	SIM	UB
ATT	0.831 (0.776)									
BI	0.450 (0.575)	0.863 (0.902)								
DEP	0.650 (0.685)	0.408 (0.743)	0.837 (0.788)							
EFF	0.659 (0.743)	0.367 (0.617)	0.713 (0.767)	0.880 (0.805)						
NOV	0.613 (0.605)	0.473 (0.535)	0.566 (0.675)	0.510 (0.567)	0.868 (0.864)					
PEOU	0.593 (0.675)	0.428 (0.675)	0.750 (0.775)	0.661 (0.723)	0.528 (0.706)	0.887 (0.871)				
PU	0.568 (0.765)	0.464 (0.618)	0.674 (0.736)	0.644 (0.754)	0.365 (0.5)	0.656 (0.680)	0.886 (0.870)			
PER	0.701 (0.694)	0.405 (0.651)	0.783 (0.727)	0.799 (0.820)	0.516 (0.629)	0.730 (0.755)	0.679 (0.735)	0.859 (0.859)		
ST	0.677 (0.644)	0.541 (0.591)	0.685 (0.763)	0.598 (0.653)	0.745 (0.788)	0.601 (0.729)	0.553 (0.515)	0.622 (0.736)	0.872 (0.886)	
UB	0.512 (0.623)	0.725 (0.769)	0.503 (0.760)	0.499 (0.643)	0.474 (0.625)	0.536 (0.732)	0.614 (0.666)	0.558 (0.698)	0.567 (0.692)	0.884 (0.838)

Note: Values are - Mobile App (Websites)

**Table 3.** t-statistic of mobile applications.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics ((O/STERR)	Hypothesis
ATT -> PU	0.151	0.161	0.102	0.102	1.482	Not supported
BI -> UB	0.725	0.733	0.055	0.055	13.201	Supported
DEP -> PEOU	0.461	0.456	0.118	0.118	3.914	Supported
EFF -> PU	0.300	0.308	0.120	0.120	2.487	Supported
NV -> BI	0.181	0.201	0.128	0.128	1.416	Not supported
PEOU -> BI	0.103	0.106	0.123	0.123	0.841	Not supported
PEOU -> PU	0.371	0.359	0.109	0.109	3.416	Supported
PER -> PEOU	0.369	0.378	0.130	0.130	2.842	Supported
PU -> BI	0.244	0.255	0.137	0.137	1.781	Supported
SIM -> BI	0.264	0.242	0.160	0.160	1.647	Supported

These results are aligned with the outcomes of similar studies in other contexts of technology use e.g., Agarwal.<sup>[30]</sup> So, to stimulate user behavior toward technology acceptance, the behavioral intentions of the consumers have to be positively changed in both cases. Also, *dependability* is a significant predictor of *perceived ease of use*, and *efficiency* is a significant predictor of *perceived usefulness* in both cases. This finding agrees with earlier research e.g., Khalid.<sup>[31]</sup> Thus, to make Mobile Apps as well as Websites to be perceived as easy to use and useful, the dependability, as well as efficiency of the Mobile Apps and websites, have to be enhanced.

*Perspicuity* is found to be a significant predictor of *perceived ease of use* in the case of both Mobile Apps and Websites, which indicates that enhancing this feature can be beneficial in increasing the *perceived ease of use* as well as *perceived usefulness* in both Mobile Apps as well as the Websites. This revelation is in agreement with several earlier studies, e.g., Agarwal *et al.*<sup>[30]</sup> In the case of Mobile Apps, *perceived usefulness*, as well as stimulation, is a significant predictor of *behavioral intention* as well as *actual usage*, and hence, for developing a positive *behavioral intention* towards the banking App or website, either *perceived usefulness* has to

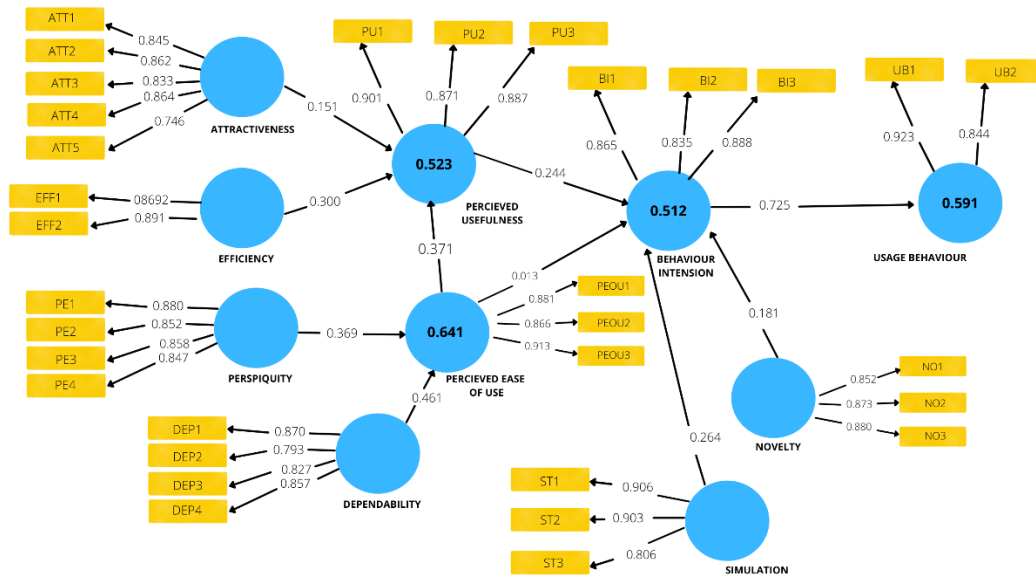


Fig. 2 Path model of mobile applications in banking.

Table 4. t-statistic of websites.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics ( O/STERR )	Hypothesis
ATT -> PU	0.151	0.164	0.1	0.1	1.507	Not supported
BI -> UB	0.755	0.735	0.054	0.054	13.559	Supported
DEP -> PEOU	0.461	0.444	0.113	0.113	4.088	Supported
EFF -> PU	0.299	0.28	0.114	0.114	2.617	Supported
NV -> BI	0.181	0.185	0.121	0.121	1.493	Not supported
PEOU -> BI	0.113	0.114	0.119	1.099	0.103	Not supported
PEOU -> PU	0.371	0.379	0.107	0.107	3.468	Not supported
PER -> PEOU	0.369	0.395	0.127	0.127	2.899	Supported
PU -> BI	0.244	0.252	0.128	0.128	1.914	Supported
SIM -> BI	0.264	0.259	0.143	0.143	1.841	Supported

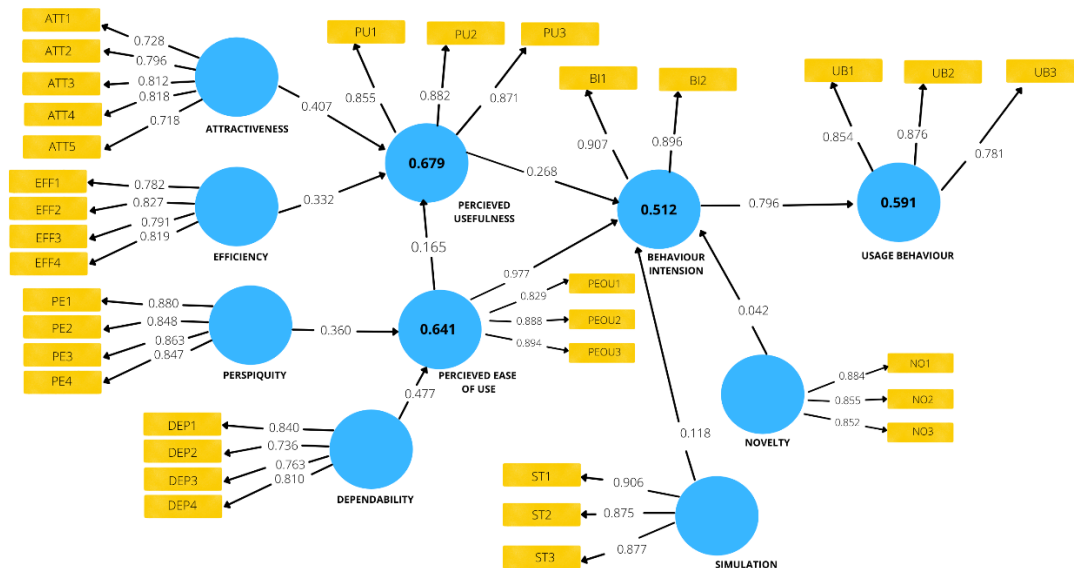


Fig. 3 Path model of banking websites.

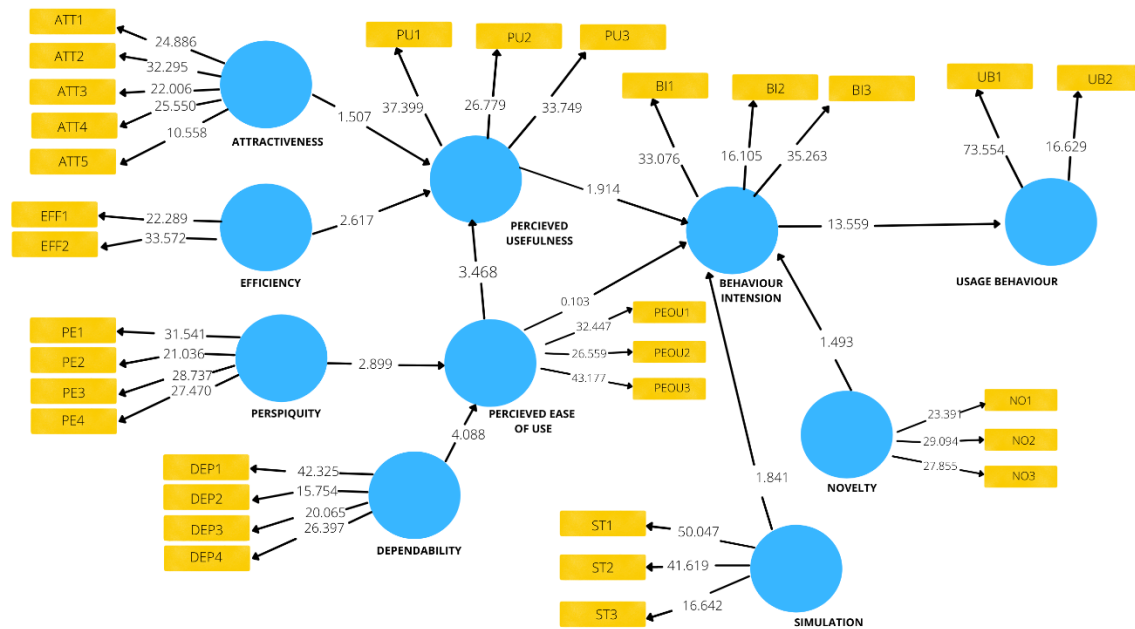


Fig. 4 Structural model of mobile applications in banking.

be enhanced or *stimulation* feature has to be enhanced; whereas, in the case of Banking websites, *perceived ease of use* has to be improved to enhance *perceived usefulness*. Thus, to make the users perceive that the App is *useful* its *ease of use* has to be enhanced specifically in the Banking Websites. *Perceived usefulness* is a significant predictor of *behavioral intention* only in the case of Banking websites, which indicates that both *behavioral intentions* can be improved if the application is made to be *perceived as useful* to the customers. *Stimulation* is a significant predictor of behavioral intention in the case of Banking Websites, and hence, to make the customer develop an *intention to use* the applications the stimulation feature of the websites plays an important role.

### 3.3 Theoretical Implications

The theory of TAM is evolving as the technology is also growing at an unprecedented rate in the past decade. There have been several extensions to the TAM and at the same time, there have been integrated approaches where TAM has been integrated with other well-known models such as the Theory of Reasoned Action, Theory of Planned Behavior, Diffusion of Innovation Theory, and so on. The value addition of this research is in the form of the extension of the model in terms of external stimulus as a research construct comprising functionality and usability, which are the quintessential aspects if the TAM has to be applied to the IT related applications. Theoretically speaking, all the variables shown

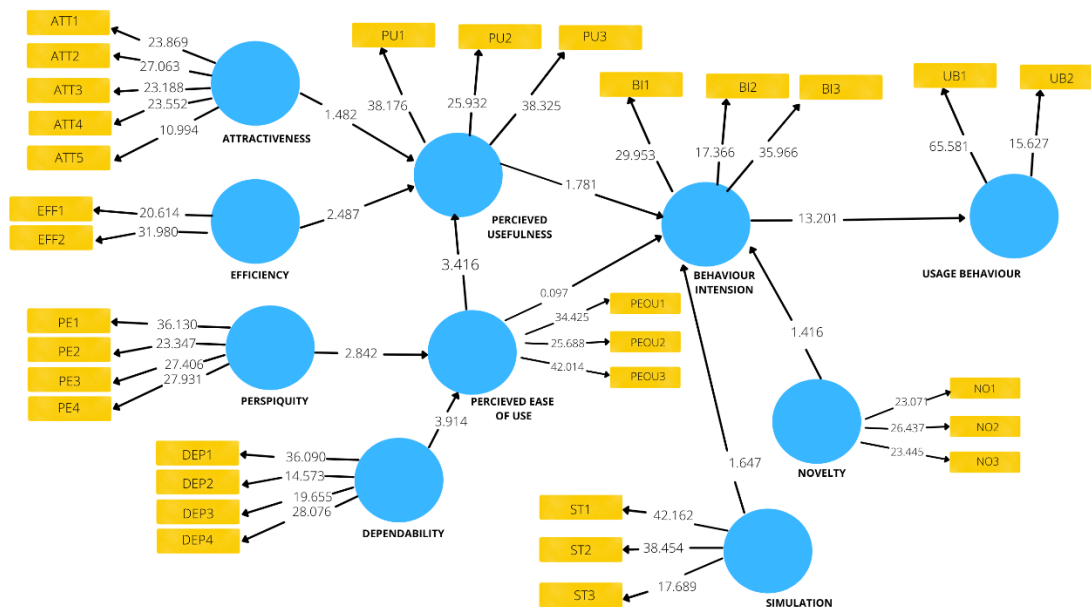


Fig. 5 Structural model of banking websites

in the model have been associated with the basic variables of TAM; however, on the empirical validation it was found that *dependability* and *perspicuity* factors of usability were a significant predictor of *perceived ease of use* as well as *perceived usefulness*, and *efficiency* factor of functionality was a significant predictor of *perceived usefulness*, in banking Mobile Apps as well as Websites. *Behavioral intention* is a significant predictor of usage behavior in both the cases of banking applications and *perceived ease of use* is the predictor of *perceived usefulness* only in the case of Banking Websites. *Stimulation* is a predictor of *behavioral intention* in the case of banking websites. These additional factors could be added to the TAM as an extension theoretically as it has been empirically validated in this study. It has to be mentioned that in the banking sector, the UX-TAM model is not completely a new concept. There have been several models which have extended TAM in the context of technology adoption in banks. In comparison to the previous extension of the UX-TAM, our model has further improved the variance extraction in all the technology acceptance-related characteristics. The previous model by Mlekus *et al.*,<sup>[32]</sup> for example, was able to explain only 38% variance in PU (compared to 50-70% in our study), 61% in PEOU (60-65% in our study), 26% in behavioral intention (30-50% in our study), and 2% in use (50-60% in our study). We have shown that technological platform affects the social system and users' attitudes and behavior may differ significantly based on the platforms used in banking. Secondly, having successfully applied the UX characteristics for acceptance of banking services this research bridges the gap between UX and TAM opened by Hornbæk and Hertzum in the year 2017.<sup>[7]</sup> They suggested that TAM and UX are coupled since they focus on separate areas of use of technology that complement one another since they are both parts of research into human-computer interaction. TAM primarily focuses more on utilities; whereas, UX research examines the experiential part. A mixture of the two domains of inquiry can contribute to further research in each of the fields.

### 3.4 Practical implications

This research has several practical implications in the form of suggestions to the website managers in the Banking Mobile Applications and Banking Website developers based on the empirical findings of the research.

Both the Banking Mobile Applications developers and Banking Website developers need to consider the *dependability* of the application/website to be a critical factor to popularize the usage. There are earlier studies have indicated that the *dependability* of the applications can be enhanced through several measures which include: Co-creation of the data-driven personalization approach which has been very successfully tried and tested on tourism websites. The concept here is to combat the personalization-privacy paradox according to which the higher the personalization more the risk to the privacy of the customer thus co-creating the personal information capture is the most effective way out

in such a situation. A repository of the digital behavior of customers may have to be developed by the App/Website experts so that during the personalization of the customer data a tailor-made solution would be available well in advance based on the liking, tastes, choices, and preferences of the customer. Data-driven personalization is still in its nascent stage.<sup>[33]</sup> It is advisable to try this approach as data-driven models not only provide the behavioral patterns of the customers but also are useful in predicting the changing patterns. Dependability is perceived by the customers and hence their perception plays an important role here.

*Efficiency* is also a common factor of significance in terms of its relationship with perceived usefulness in both the banking applications under consideration. Customization and the dynamic interaction medium impose severe problems on the websites in terms of their efficiency. It has been observed that it is important to provide a culturally sensitive form of information presentation, and also the styles of communication would be important as the efficiency of the application during the interaction will also be measured in these terms. The other measures of efficiency include the time required to elicit the required information, information density, task accomplishment speed, and error-free content. To sum up, as efficiency is a measure of total time spent by the user from start to end for the accomplishment of the task, innovative ways may have to be tried by the content developers to avoid circuitous paths, redundant information, overcrowding of the sites with information, and focus on providing minimum clicks to perform an operation or elicit and information.

*Perspicuity* is the third factor that has been the key predictor of *perceived ease of use*. As both of these factors have bearing on behavioral intention to use as per the basics of TAM, it is important to provide due attention to this factor. As perspicuity is basically the use of words, phrases, and sentences used to convey ideas to others clearly and emphatically, enhancing it would be more of an art than science. Both in Banking Apps on mobile as well as Websites, there is ample scope to highlight prominent features of the services offered by the bank and a professional team has to be activated to look only into this factor thoroughly, as empirical evidence has been obtained in this research for its importance.

*Stimulation* has been identified to be a significant predictor of *behavioral intention* in this research specifically in Banking Websites. This component of technology deals with the excitement and the motivation that technology can provide through the content displayed in the portal. Benchmarking the stimulation design of the websites with the best in the trade would be worthwhile as it will provide the most modern techniques that have been used by the website developers. The more the customers feel excited about the technology used the more they will be motivated to explore and the effectiveness of the website will improve substantially. Research has shown that stimulation has an impact on cognitive, emotional, and experiential evaluations of website users and has the potential to increase usage and patronage. Some of the techniques

successfully improve stimulation include: providing the desirable ambient stimulus cues, using design stimulus which is mysterious and triggers the curiosity of the users, providing coherent content, and providing aiding functions wherever desirable.

In both cases, it is found that *behavioral intention* is a significant predictor of *actual usage*. This finding is in alignment with that of several research studies.<sup>[26,30]</sup> The message is very clear that to enhance the actual usage of Banking Mobile Applications or Websites there is a need to create a behavioral intention among the users. In the earlier points, it has been mentioned that *perceived usefulness* is the significant predictor of *behavioral intention*, and hence, it indicates that if the website users find the applications/website useful they will obviously develop an intention to use it, and the suggestions made before having a potential to enhance the actual usage of the Banking Mobile Applications and Banking Websites.

#### 4. Conclusion

The theoretical implication of this research is in the form of an extension of the TAM model with the identification of critical factors to be added to the TAM in the context of Banking services through the website and mobile application platforms. The practical implications provide clear-cut instructions to the system designers of banking websites and mobile applications on the incorporation of the features that would enhance the efficiency and effectiveness of the service platforms and increase the system usage by the customers. As revealed in this research, the website and application developers may focus specifically on dependability, perspicuity factors, efficiency, behavioral intention, ease of use, and stimulation and make attempts to add features and functions which meet the specific needs of the banking customers in relation to these factors, as they have a direct impact on the actual usage of the system.

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#### Conflict of Interest

The authors declare no conflict of interest.

#### Supporting information

Not applicable.

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### Author Information



**Dasharathraj K Shetty** is a faculty member of Department of Humanities and Management, Manipal Institute of Technology (MIT), Manipal Academy of Higher Education (MAHE), Manipal. He is an Author, Columnist, Engineer and Social Entrepreneur. He is also the Secretary General of Indian Bureau of Administrators and Technocrats and the Director of Micro Souharda Credit Cooperative Ltd. He has recently authored the book *Learning like a Lion*. Dasharathraj is a B.E. (Computer Science and Engineering) and has three Post-graduation Degrees - MBA (Finance) MPhil (Management) and M.Tech (Computer Science and Engineering). He was awarded a PhD by MAHE, Manipal. He is also a Certified Microsoft Certified Technology Specialist, Dale Carnegie High Impact Teaching Skills, AIMA Certified Management Trainer and RBNQA Examiner.



**Jumleena Bhagawati** is a graduate from the department of Chemical Engineering, Manipal Institute of Technology, which is a constituent college of Manipal Academy of Higher Education, Manipal, India. She started out in 2017 and received her B-Tech degree in 2021 (Chemical Engineering). Her areas of interests include, but are not limited to, interventions to improve accessibility, customer experience and aesthetic usability effect of a product or technology.



**Shreya Shetty** is a recent graduate who studied Biomedical Engineering from Manipal Institute Technology which is a constituent college of Manipal Academy of Higher Education Manipal. She received her degree in 2021. Her interests lie in the amalgamation of technology and psychology which further leads her to be interested in fields like user experience and product management.



**Lewlyn L R Rodrigues** was born in India in 1961. He received the B.E. (Mechanical Engineering), MBA (HR & Quality), and M.Tech. (Production Engineering System Technology) and PhD in System Dynamics. Dr Rodrigues is Professor in Humanities & Management Department at Manipal Institute of Technology, which is a constituent college of Manipal Academy of Higher Education, Manipal, India. He has over 200 papers in Journals and Conferences with over 1200 citations for his papers and is an active researcher in the field of Modelling and Simulation, Human Resource Management, Technology Management and Innovation Management. He has supervised 11 PhDs.



**Arun Kumar** is an Assistant Professor at Manipal Institute of Technology, Karnataka, India and completed his Ph.D in Opportunistic networks from CAITFS lab in NSIT, Delhi University in the year 2018. He received his M.Tech degree in Computer Science from School of Computer and System Sciences (SC&SS), Jawaharlal Nehru University Delhi in year 2012. He has also worked as Research Officer at Auckland University of Technology, New Zealand on health science project. His research interest includes Opportunistic Networks, IOT and Vehicular area Networks, Virtual reality and Machine Learning.



**Prithvi Tilwani** a 3<sup>rd</sup> year MIT Manipal pursuing Mechanical engineering. He has a keen sight for analysing and drawing inferences. His research interests include Mechanical Modelling and Operations Management.



**Manjunath K Vanahalli** is currently working as an Assistant Professor in the Department of Data Science and Intelligent Systems at the Indian Institute of Information Technology Dharwad, Karnataka, India. He has received his M.Tech. degree in computer science and engineering from Manipal Institute of Technology, Manipal, and a Ph.D. degree from National Institute of Technology

Karnataka, Surathkal Mangalore, India. His research interest includes Data Mining and Bioinformatics.



**Kishore B.** submitted Ph.D. thesis at Sri Chandrasekharendra Saraswati Viswa Maha Vidyalyaya University, Tamilnadu. He has received his Master of Technology degree in Software Engineering from Jawaharlal Nehru Technological University, Kakinada in 2010. His Ph.D. area is Computer Vision and Image Processing. His research interest is in Information Security, Steganography and Computer Vision topics. He is a life member of ISTE, IACSIT and a member of IE, India. He has published around 30 research publications in various National/ International Conferences and Journals.



**Anuradha Rao** is Assistant Professor - Senior Scale in the Department of Information and Communication Technology, Manipal Institute of Information Technology, Manipal. She has 15 years of experience in teaching.



**Namesh M** completed his bachelors in Print and Media Technology with a minor in Digital Marketing from Manipal Institute of Technology, MAHE, in the year 2019. He finished his master's in engineering management from Manipal Institute of Technology, MAHE, in the year 2021. His research primarily focuses in the areas of Management studies, Leadership studies and Computer Applications.



**Shriansh Chaabra** - 2nd year Student in the Department of Electronics and Instrumentation Engineering in Manipal Institute of Technology, Manipal.



**Dr. Krishnamoorthi Makkithaya** is a Professor in the Department of Computer Science and Engineering, MIT, Manipal. His Areas of Interest are Data Mining, Network Security, Knowledge Engineering.



**Nithesh Naik** is faculty of engineering at Department of Mechanical and Manufacturing Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education (Institute of Eminence) with 8+ years of academic experience. He has two years of industry experience in the field of planning and design of HVAC systems with ETA Engineering Private Limited, India. His research interest includes the development

of polymers, green composites, Finite element analysis, Artificial Intelligence, and design and product development techniques. Mr. Nithesh has published 60+ research publications in International Journals of repute and has keen interests in medical innovations. He received award of South Indias most exciting young teacher.



**Dr. Girish Nair** received his Ph.D. in Management in the areas of Financial Accounting and Industrial Economics and Master's Degree in Commerce, International Business and Business Administration. More than 18 years of teaching, research, and administrative experience with several international publications to his credit in the areas of Corporate Finance and Financial Economics and Hospitality Management. Presented his research and acted as a chair for technical sessions at various conferences. He is also International Examiner for Ph.D. research at various universities in India. He is one of the Principal Investigators on NPRP research projects funded by Qatar National Research Fund.

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