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ADAPTATION AND USAGE OF TECHNOLOGY : A REVIEW OF THEORIES AND MODELS

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ABSTRACT

The technology adoption and acceptance models direct towards the technology acceptance theories and models to have a good idea about the constructs applicable in the adoption and usage of technology over a period of time. In recent years, scholars have researched on the technology acceptance models and theories (Samaradiwakara& Gunawardena 2014, Sharma & Mishra 2014). These literatures talked about the evolution and comparison of theories and models of technology adoption and behaviour at an individual and organization level over a period of time. On the basis of that, this study attempts to understands the know-how of different theories and models which are applicable in the adoption and usage of technology with time.

KEY WORDS –Adaptation, Usage , Technology

DELINEATION OF TECHNOLOGY

In the early time, technology considered as a skillful art and required a handbook guide to operate it. In 1816, the Harvard University of USA used technology word as “application of the sciences to the useful Arts”. The journey of electronic era started before hundred years ago by using the wireless electronic communications. Advance and modern technology play a huge role in the lifestyle of people. Technology has been diffused to every aspects of life, whether it is entertainment, legal aspects, economic, health, education, etc. (Suvarnaand Godavari, 2012). In every field of work, technology persists critical role to make some positive change and increase productivity. Most of the countries make an effort to provide the best technology to get the maximum output and productivity from the citizen of their countries which ultimately affect their welfares. In the area like businesses, education and healthcare, technological progress is very high. For instance, in education, we have online classes, projectors, internet sources, sharing networks, and more. With the help of technology, one can publicized his/her knowledge to the world (Oye, IahadandAb .Rahim, 2012)

TECHNOLOGY ADOPTION AND ACCEPTANCE

Adoption of technology is an advanced area of IS (information system) research. Over a period of time, research has been evolved by conceptualizing new constructs resulting in development of various theories and models. According to Carr (1999), technology is, "stage of selecting a technology for use by an individual or an organization". Adding to this, Davis, Bagozzi and Warshaw (1989) defined technology acceptance as, "the implementation of the software and hardware technology in an organization to increase productivity, competitive advantage, improving processing speed and make information readily available".

Louho, Kallioj and Oittinen (2006) shared that the way people embrace and adopt technology for use is called as technology acceptance. Furthermore, it has been explained as the obvious readiness within the group of users gathering to utilize information technology for the assignment it is intended to help (Dillon, 2001). Hence, acceptance can be seen as a component of users' contribution in innovation utilize. Acceptance can be additionally depicted as the basic factor in deciding the achievement or disappointment of any innovation and acceptance has been conceptualized as a result variable in a mental procedure that users experience in setting on choices about (Dillon and Morris, 1996). If the technology has not been accepted and used, then it has minimal value of its inception (Oye, Iahad and Ab-Rahim, 2012). As a result, it becomes necessary to study technology acceptance to access the increased resources of information (Suvama and Godavari 2012). It has been always interesting to know the reasons or factors affecting the acceptance and continuance usage of technology for researchers so that it would be supportive in crafting, assessing and forecasting reactions of consumers in adopting new technology. This may be the reason scholars have studied concerns related to technology acceptance from cognitive behaviour to believes to perceptions and their impact on usage behaviour (Dillon, 2001).

Government and organizations introduce advances technology with high investments to make the people's life-style easy and comfortable. For instance, technologies like Electronic Health Record (EHR) in US (Simon et al., 2007), enterprise resource planning (ERP), cloud computing (Low et al. 2011), and e-government (Venkatesh et al. 2014) were promising enough in regard of the significance they offered to the users. However, the results were not turned up as expected. Thus, it becomes necessary to study the independent and dependent variables which directly or indirectly, mediated or moderated the final outcome.

Theories and models of technology acceptance and usage reflect the way user comprehend, receive, adopt and practice a particular technology. It is also depending on when and how the technology is being used. Moreover, the objective of these theories and models is to examine user acceptance and

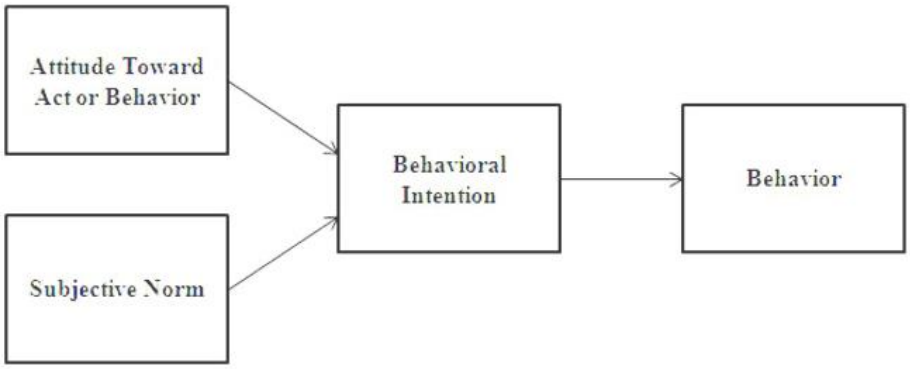
usage of technology in rapidly changing environment along with promoting usage of it (Kripanont, 2007; Oye, Iahad and Ab-Rahim 2012). As a result, it is essential to know the development of these theories and models revealing likeliness and differences between them.

This study focuses on the widely used theories and model by the scholars, who have studied behaviour and usage of technology. According to Samaradiwakara& Gunawardena (2014), and Sharma & Mishra (2014), following theories and models are used repeatedly so far, but not restricted to,with regard to innovation acceptance, utilization, and behaviour.

- ✓ Theory of Reasoned Action (TRA)
- ✓ Social Cognitive Theory (SCT)
- ✓ Theory of Planned Behaviour (TPB)
- ✓ Innovation Diffusion Theory (IDT)
- ✓ Theory of diffusion of Innovations (DoI)
- ✓ Technology Acceptance Model (TAM)
- ✓ Technology Acceptance Model 2 (TAM2)
- ✓ Technology Acceptance Model 3 (TAM 3)
- ✓ Unified Theory of Acceptance and Use of Technology (UTAUT)

Theory of Reasoned Action (TRA)

Martin Fishbein and Ajzen developed this theory in 1975 suggesting that person's behaviour depends on the attitude and subjective norms. There are three main constructs, namely, attitude (A), subjective norms (SN), and behavioural intentions (BI) lead to actual behaviour of user. This theory does not limit to any specific technology or behaviour per se. It is the most central theories of human behaviour.



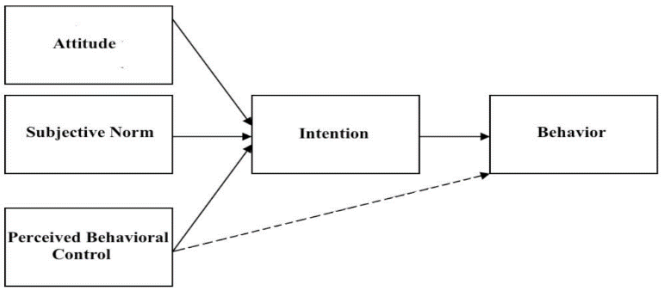
Theory of Reasoned Action (Fishbein and Ajzen, 1975)

Attitude is a set of beliefs and feelings about the object of behaviour. For instance, mobile apps are convenient. Subjective norms are based upon the peers' community attitude and how an individual

perceive that to convinced behaviour. For example, the way peers use social media and how they expect one should be.

Theory of planned behaviour (TPB)

As an extension of TRA theory, theory of planned behaviour was developed by Ajen (1991), adding one new construct, perceived behavioural control lead to intention and finally to behaviour. Perceived behavioural control (PBC) refers to, "people's perception of the ease or difficulties by performing the behaviour of interest".

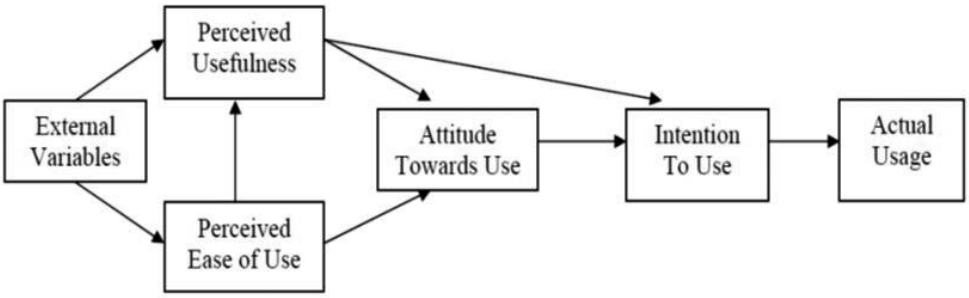


Theory of Planned Behaviour (Ajzen, 1991)

The perceived behaviour control was derived from the Self-Efficacy Theory (SET), developed by Bandura (1977) which in turn came from the Social Cognitive Theory. Self-efficacy defined by Bandura is, "the judgments of how well one can execute courses of action required to deal with prospective situations". For the continuance behaviour, self-efficacy is an essential element which lead by behavioural change.

Technology Acceptance Model

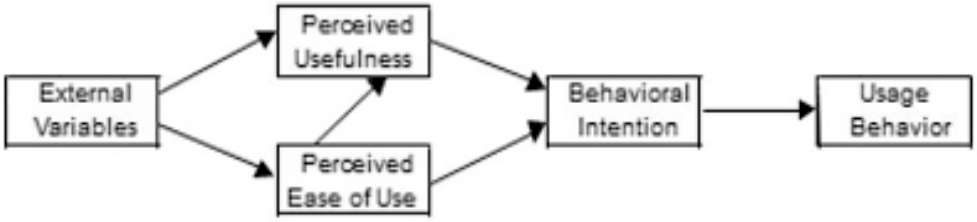
Why people use technology? This is answerable by the theory developed by Fred Davis in 1989 from TRA. This was the initial model developed and validate by Davis (1989), represented the psychological factors affecting technology acceptance. This model is very well known as Technology Acceptance Model. It talks about how consumer embrace and use technology.



Technology Acceptance Model (Davis, 1989)

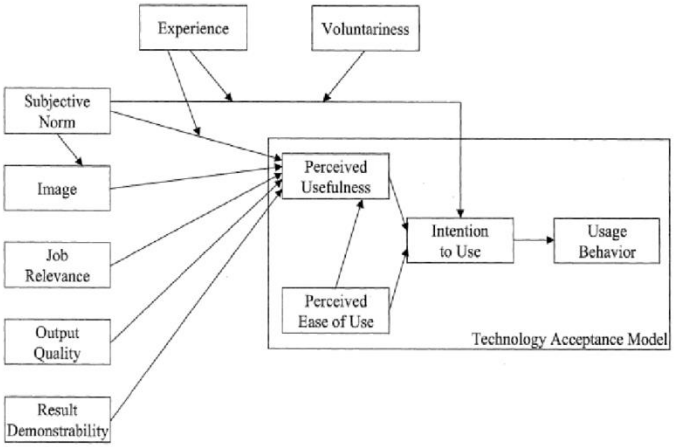
This concept comprises of two major variables, namely, Perceived Usefulness (PU), and Perceives Ease of Use (PEOU) by individual user in computer use behaviour. Perceived usefulness defines as

how a particular technology is going to be useful which ultimately improve his or her job or life performance. On the other hand, perceived ease of use defines as how easily or effortless one can use a particular technology. These two constructs are influences by external factors such as political (i.e. use of technology in politics or political crisis), social (such as language, skills, training and facilitating conditions)and cultural. In the year 1996, Venkatesh and Davis found that perceived usefulness and perceived ease of use have direct impact on behaviour, so they eliminated the construct – attitude in their revised model of TAM.



Final version of TAM (Venkatesh and Davis, 1996)

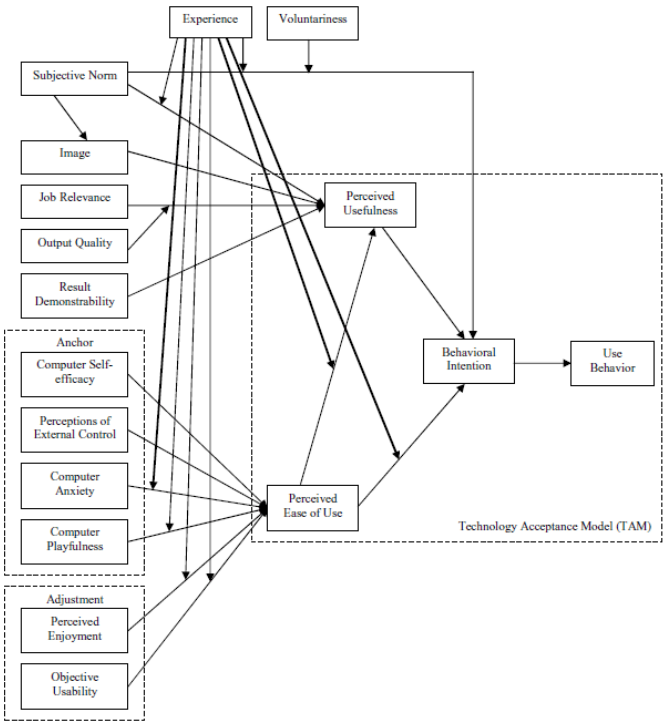
Further, these two authors developed a model by adding variables which affect the perceived usefulness in the year 2000, known as TAM2. This model represents PU and PEOU from the social influence (subjective norm and image), adopting from TRA and TPB and cognitive instrumental (job relevance, output quality and result demonstrability) processes' viewpoints. Subjective norm has direct relations with perceived usefulness and intention of use. Its relation with perceived usefulness is moderated by the user experience, while its relation with intention of use is moderated by the user experience and voluntariness of use.



TAM2 (Venkatesh and Davis, 2000)

Over a period of time, in the year 2008, Venkatesh and Bala combined TAM2 and the model of the determinants of perceived ease of use (Venkatesh, 2000) to develop an integrated model of

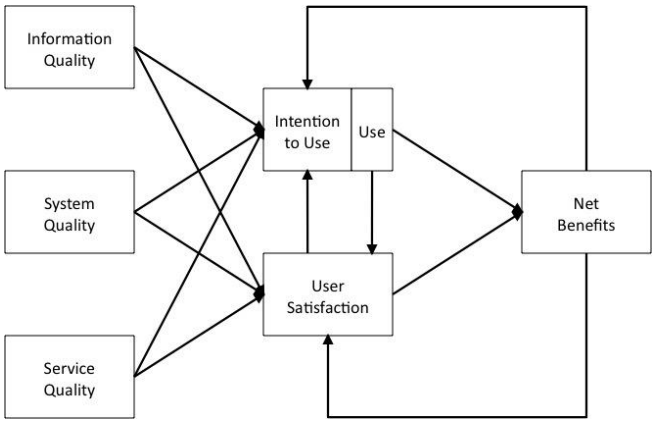
technology acceptance known as TAM3 shown in Figure 9. The authors developed the TAM3 using the four different types including the individual differences, system characteristics, social influence, and facilitating conditions which are determinants of perceived usefulness and perceived ease of use. In TAM3 research model, the perceived ease of use to perceived usefulness, computer anxiety to perceived ease of use and perceived ease of use to behavioural intention were moderated by experiences.



TAM3 (Venkatesh and Bala, 2008)

Information System (IS) Success Model

From the technical perspective, Delone and Mclean validate which factors are affecting the intention of using technology and satisfaction of user which derive to the net benefit. They have developed a model, called Information System (IS) Success Model, comprises of six constructs. It represents that information quality; system quality and service quality affect the intention to use and satisfaction of users. Initially, this model consists of six major interrelated categories, i.e. system quality, information quality, use, user satisfaction, individual impacts and organizational impacts. This model makes a significant contribution to many studies of IS success by demonstrating the time-related and causal relationships among success categories (Elliot et al. 2013, Wang 2008). Over a period of time, evolution of new technology, demands for updating the model. So, Delone and McLean proposed an updated IS success model in 2003, by adding service quality as a new construct. They have combined the individual and organizational impact of use as a 'net benefit'.



IS Success Model, Delone and McLean, 2003

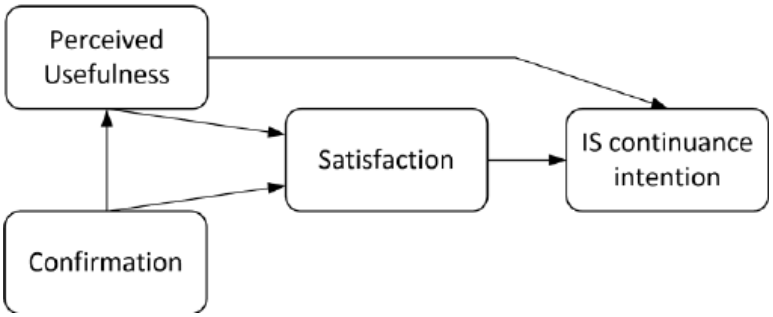
With the changing environment in information technology and growing e-commerce environment enhances the usefulness of this model (Chen and Cheng, 2009). DeLeon and Mclean (2003) proposed that intention to use is a stronger variable in the context of usage. According to Lin and Lee (2006), this new model has substantial contributions to e-commerce, because it exhibits the causal relationship among the variables and the success of an e-commerce measures by the multidimensional constructs.

Expectation Confirmation Model (ECM)

Richard Oliver developed the expectation Conformation Theory through his sequential papers in 1977 and 1980. He measured the satisfaction as a function of expectations, perceived performance and disconfirmation of beliefs. This theory was used initially in the context of marketing and psychology. However, in time, scholars from consumer research and information system sector also included in their study as the element 'satisfaction' perform vital role in measuring post purchase effect. Here, expectation refers to the characteristics associated with the service, product or technology, expected by the users. Perceived performance is the perception about the actual performance of product, service or technology in the mind of user. Disconfirmation of beliefs states evaluation or decision that person makes in comparison of original expectations with respect to product, service or technology. The satisfaction leads to the repurchase of product exhibited in the model.

Later on, in 2001, Bhattacherjee A., proposed a model, named, Expectation Confirmation Model, combining the ECT and TAM. He examined cognitive believes and experiences that influence continuance intention of information system. Here, there are two main components, perceived usefulness and satisfaction which directly affect the intention for continuance usage.

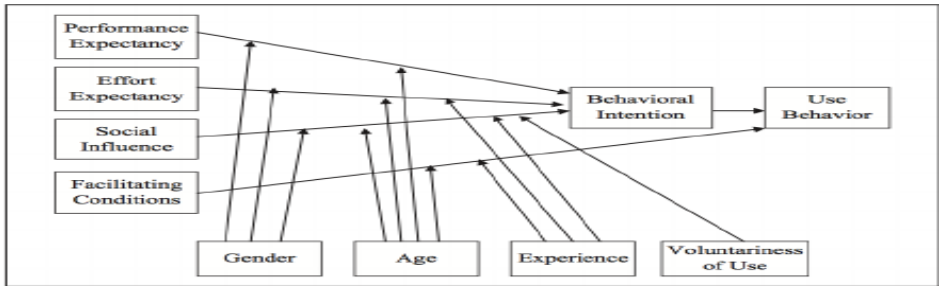
This model focuses on post acceptance factors of IS usage.



Expectation Confirmation Model (ECM), Bhattacherjee, 2001

Here, perceived usefulness is defined as expected benefits of technology, while confirmation refers as conformity between expectations and actual performance of user's perceptions. Satisfaction defined as users affect with prior usage continuance intention as users' intention to continue using.

Unified Theory of Acceptance and Use of Technology (UTAUT) - Venkatesh et al. (2003) has developed this model by conglomerating eight different theories and models namely, TRA, TAM, MM (Motivation model), TPB, TAM2, DOI (diffusion of Innovation Theory), SCT (Social Cognitive Theory) and model of personal computer use. This model is comprised of four independent elements – performance expectancy, effort expectancy, facilitating conditions and social influence.



TAUT Model (Venkatesh et. al., 2003)

Four moderating variables – gender, age, experience and voluntariness play significant role in measuring effect on behavioural intention and usage.

The four key variables can be defined as under-

- **Performance Expectancy (PE):** PE can be defined as degree of individual belief that the given technology and system will be helpful in attaining benefits in job performance. It is considered that PE can moderate the effect on behavioural intentions (Venkatesh, Morris, Davis, & Davis, 2003).
- **Effort Expectancy (EE):** EE is defined as the degree of ease related with the use of the system. **Effort Expectancy can also have an influence on behavioural intention that is hypothesized by age, gender and experience**(Venkatesh, Morris, Davis, & Davis, 2003)**.**

- **Social influence (SI):** SI can be defined as attitude, belief and perception of others toward the usage of that technology by an individual(Venkatesh, Morris, Davis, & Davis, 2003)**.** It means it depends upon what others think of that system, how important it is to use the new system? It is considered that social influence also affects the behavioural intention by age, gender, experience and volunteers of system
- **Facilitating conditions (FC):** FC can be defined as the degree availability of organizational and technical facilities and infrastructure to use the system. It also affects behavioural intention by age and experience(Venkatesh, Morris, Davis, & Davis, 2003).

Initial Trust Model

Trust plays an important role in mobile banking. Luo, Li, Zhang, & Shim, (2010) analyzed three dimensions of trust as suggested by McKnight & Chervany, (2001), these are disposition of trust, structural assurance and trust belief. Disposition of trust can be explained as a general tentency of humans to trust others and showing faith in humanity (McKnight, Chervany, & Kacmar, 2002). It can be considered as a personal trait. Structural assurance can be termed as system quality in which technical and legal structures like insurances, encryptions, regulations, promises and guarantee of completion of task. Trust belief mainly consists of the integrity, competence and benevolence of the vendor (Gefen, 2000) (McKnight, Chervany, & Kacmar, 2002). Many researchers showed that there exists direct relationship between disposition of trust and initial trust (Gefen, Karahanna, & Straub, Trust and TAM in online shopping: an integrated model, 2003), but this association mainly depends upon either individual's personal faith in humanity or on the individual strategy to deal others (McKnight & Chervany, 2001). Higher the general tendency to trust others higher will be the initial trust in M-banking**,** but disposition of trust is having significance on initial trust in case of new customers (Gefen, Karahanna, & Straub, Trust and TAM in online shopping: an integrated model, 2003) but for the existing customers who are having trust belief in banks, in their competency and benevolence they will feel more secure and they will trust the structural assurance. Perceived competency, integrity and benevolence are the components of trust and these components positively affect the adoption behaviour toward mobile banking (Lin, 2011). In short both the disposition of trust and trust belief leads to structural assurance and system quality will help in establishing the trust (Gefen, Karahanna, & Straub, Trust and TAM in online shopping: an integrated model, 2003).

Innovation Diffusion Theory

This theory was mainly popularized by the work of Everett Rogers in his book *Diffusion of Innovations* firstly published in 1962(Rogers E. M., 1962). This theory try to answer the question of

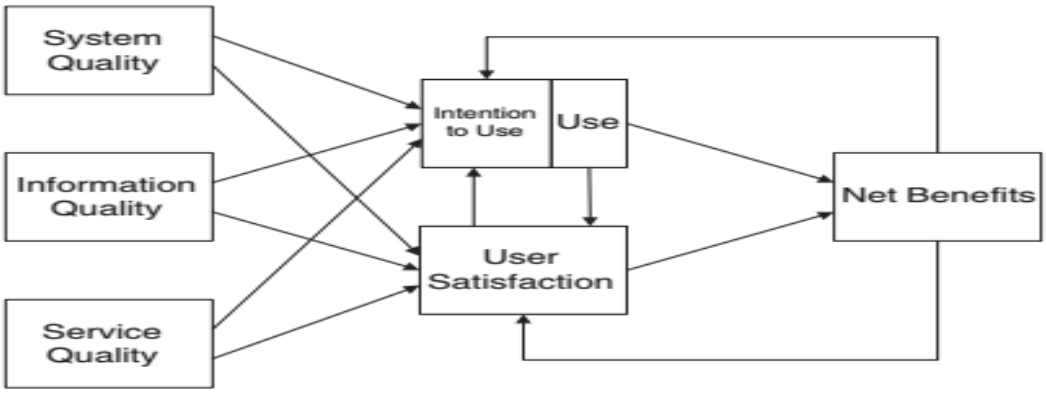
why, how and at what rate technology, innovation and new ideas spread. According to Rogers there are mainly four elements that influence the spread of innovations, these are-innovation itself, time, social system and communication channels(Rogers E. , 1995).

There are rapid developments and usage of new technology in mobile banking segment, so to measure the adoption behaviour and pattern of mobile banking innovation Diffusion theory and Knowledge based attributes play a major role(Lin, 2011). Lin 2011 in his study examined perceived relative advantage, compatibility and ease of use as major factors in innovation to affect the adoption behaviour. Researchers of Information System (IS) considered mobile banking as a major technological innovation that will help to penetrate banking transactions (Laukkanen T. , 2007)(Herzberg, 2003)as these transactions are independent of time and place constraints, so it facilitates creation of customer values(Mallat, Rossi, & Tuunainen, 2004).

This theory(Rogers E. M., 1962) posits perceived innovation attributes (Perceived relative advantages, perceived ease of use and perceived compatibility) and knowledge-based attributes like (competence, and integrity) are very important determinants to influence attitude that leads to behavioural intention to adopt mobile banking.

DE-*LONE and* MCLEAN IS Success Model

Further there were many researches using this model and those proposed various another variables that should be there to measure complete success of Information System of an organization. (Pitt, Watson, & Kavan, 1995) was of the view that service quality is also very important aspect to measure the success so a model from marketing literature names as SERVQUAL was proposed to be added in DeLone and McLean model; it was supported and endorsed by (Seddon, 1997), (Jiang, Klein, & Carr, 2002). Moreover; (Seddon PB, 1999) were of the view that this model not only affects individual and organization level only; but all the levels like industry, workgroup and society are also affected by the adoption of new Information System, so instead of individual and organization impact, Net benefits should be there in the model. Next amendment in this model was regarding “Use” variable, it was felt that use should be replaced by User Satisfaction and Intention to use as increment in user satisfaction will lead to a higher intention to use, and that will affect use. The updated version of DeLone and McLean model embedded all those new variables and came up with a new model in 2003. The construct of new model is shown in figure given below.



DeLone and McLean Model (2003)

The various variables of this model are explained as-

- **System quality** – This construct includes mainly all the desirable characteristics of an Information System like- ease of use, system reliability, system flexibility, ease of learning, and all the system features like- sophistication, intuitiveness, flexibility, and response times.
- **Information quality** – This includes desirable qualities of the output generated by the system like- conciseness, relevance, accuracy, understandability, usability, timeliness, and currency.
- **Service quality** – This shows the quality of the help and support that system users receive from IT support personnel and the IS department, like- accuracy, responsiveness, technical competence, reliability, and empathy of the staff. It is one of the important instruments to measure service quality under SERVQUAL model (Pitt, Watson, & Kavan, 1995).
- **System use** – It is concerned with the way of utilization of the system by staff and customers. This includes nature of use, amount of use, appropriateness of use, frequency of use, purpose of use and extent of use.
- **User satisfaction** – This construct mainly defines user's satisfaction with output generated by Information System like- reports, and other support services.

Net benefits – This construct includes contribution made to workgroups, individuals, companies, industries, society and nation by Information System, like- improved productivity, increased sales, improved decision, market efficiency, creation of jobs, reduction in cost, opportunities of profit making, consumer welfare and economic growth and development.

CONCLUSION

Different models and theories used in the technological adaptation and usage significantly work as a backbone for the further development of new models. This paper gives a base to researchers to identify right theories and models for further research and on the basis of which more models can be developed, Thus, this study would work as a benchmark for the future researchers.

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