User Acceptance of Information Technology: Factors, Theories and Applications

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Abstract — IT has dramatically improved the productivity and effectiveness of any organisation. For this reason, over the last few decades, both developed and developing nations have invested heavily in IT. However, a significant amount of these investments failed to achieve the expected results, causing growing concern about the feasibility of those investments. There is much literature dedicated to discovering the factors for success or failure of IT projects. Among the identified factors is the human factor, which was found to be one of the most important determinants for the success or failure of any IT project. Research has shown beyond fear of contradiction that the many advantages offered by IT cannot be realized until IT tools are commonly used. This paper examines this pivotal issue concerning the concept of user acceptance of technology, the concept of user acceptance, IT adoption theories, and the applications of these theories. The study systematically reviews the technology acceptance model and its basic constructs, namely perceived usefulness and perceived ease of use.

Keywords – User Acceptance; Technology Acceptance; TAM; Perceived Ease of Use; Perceived Usefulness

1. INTRODUCTION

In the context of IT, the term user acceptance is defined as "the verifiable willingness within a group of users to employ IT tools to support the tasks that it is designed to support" [17]. This study presents a systematic review of the most important theories concerning user acceptance of technology, with a special focus on the Technology Acceptance Model (TAM) proposed by Fred D. Davis in 1989.

Much literature has discussed and/or expanded upon the TAM to suit various contexts and environments. This is important given the variation in IT needs depending on purposes and contexts. There is no single final model that is suitable to all situations. Often, more than one theory is applied and components from various theories are merged together to suit the intended purposes. This underscores the need for contextualisation. It is with this background that this study reviews the most prominent theories concerning user acceptance and its most important factors. Additionally, this paper examines the propensity for TAM (and other acceptance theories) to study user acceptance in different contexts.

2. METHODOLOGY

This section explains the procedure adopted throughout this review.

A. Procedure

A.1 Database:

This paper depended on the online database of the UTM library (PSZ), and among the numerous online databases, four databases were selected ass references, those are:

- ✓ Google scholar.
- ✓ IEEE
- ✓ Springer.
- ✓ Science Direct.

A.2 Type of Papers

The most important criteria for paper selection were the relevancy of the topic to the intended purpose of this study. This included journal articles, conference proceedings, doctoral dissertations, and text books.

A.3 Search Strings

The following word combinations were used while searching the databases:

TABLE 1: Search Strings

Concept	Alternatives Used	
Perceived usefulness	Perceived usefulness AND user acceptance.	OR
Perceived ease of use	Perceived ease of use AND user acceptance	OR
User acceptance for technology	User acceptance AND technology	OR
Technology Acceptance Model	Technology AND Acceptance AND Model OR TAM	

A.4 Inclusion and Exclusion Criteria

Inclusion criteria:

- English papers that provide answers to the research questions.
- Studies that focus on user acceptance
- Studies that focus on technology acceptance.

Exclusion criteria:

- Studies are not in English.
- Studies that are not related to the research questions.
- Studies with unproven statements and generalizations.
- Duplicated studies.

A.5 Publishing Date

This study focuses on recent papers. However, given the dates for which certain theories were introduced, there was a need to focus more on relevance rather than date of publication. This was necessary to ensure that the topic is represented in its correct historical development. The number of published papers selected in this research published in the last five years (starting from 2008) is 32 out of 71 (around 45%). The following table summarizes the publication dates for the selected papers.

TABLE 2: Papers Publishing Dates

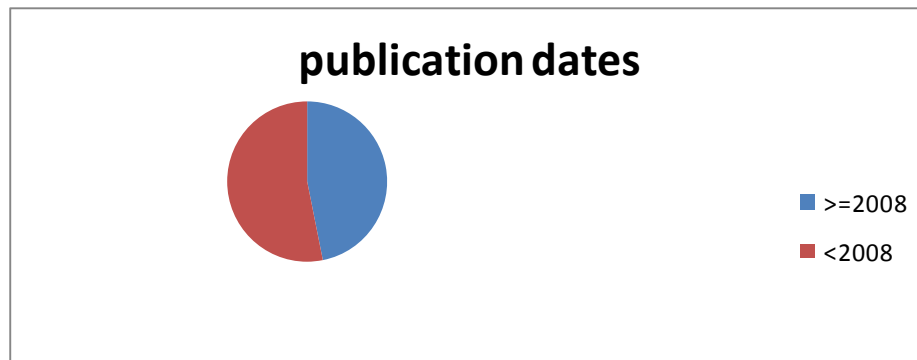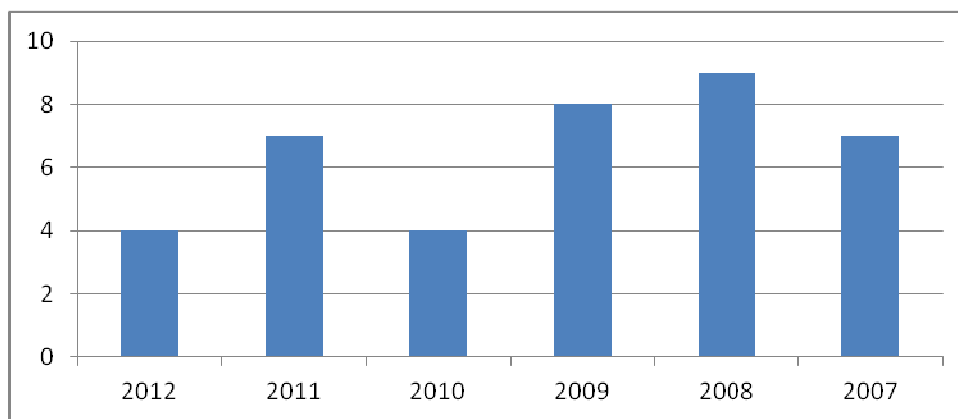| Year	Number of papers selected	Year	Number of papers selected
1989	1	2003	4
1992	1	2004	6
1995	1	2005	3
1996	1	2006	4
1997	1	2007	7
1998	2	2008	9
1999	3	2009	8
2000	2	2010	4
2001	2	2011	7
2002	1	2012	4

FIGURE 1: Publishing dates

FIGURE 2: Reviewed Papers since 2007

3. TECHNOLOGY ACCEPTANCE THEORIES

This section reviews the most prominent technology acceptance theories and models. Due to the importance of user attitude, acceptance, and behaviour toward increasingly adopted IT tools, there are plenty of theories that attempt to understand, explain, and anticipate the new technologies' acceptance among users. Among these theories, the following theories were found to be most popular, influential, and important theories and models:

The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) suggests that an individual's behavioural intention depends on the individual's attitude toward the behaviour and the subjective norms, formulated as (BI = A + SN), with the assumption that if an individual intends to perform a behaviour then it is most likely that this person will perform that behaviour.

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) complemented TRA by adding the construct of "perceived behavioural control" because as Ajzen argued, in some cases and under some circumstances, strong intentions do not always lead to actual behaviour, which means that in the cases whereby the person has an incomplete control over the behaviour the behavioural intention is not the exclusive determinant of behaviour.

The Diffusion of Innovations Theory (DOI) (Rogers, 1962) which aims to elucidate how, why, and in what rate new ideas or technologies are being disseminated through cultures. In this professor Everett Rogers stated that the diffusion is done through five stages: awareness building, attitude formation, adoption, adaptation, and appropriation. He also divided the adopters of any new technology to five categories: "innovators, early adopters, early majority, late majority, and laggards"

The Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh and others in 2003 is an attempt to provide a unified view of user acceptance of technology by integrating components from eight models which were considered as the most prominent models in user acceptance. The authors theorized that there are four key constructs that will play a considerable role as major determinants of usage intention and the subsequent behaviour, those key constructs are: performance expectancy, effort expectancy, social influence, and facilitating conditions [73].

The Technology Acceptance Model (TAM) (Davis, 1989) is one of most influential information systems' theories. It was theorized for the aim of modelling the information systems' acceptance by potential users, that is to predict IS/IT acceptance and diagnose any design problems before the systems are actually used [7]. TAM suggests that when a new technology is presented to the users, the users decide when and how they will use the technology based on a number of factors:

- Perceived Usefulness (PU): which is defined as "the degree to which an individual believes that using a specific system would improve his job performance"
- Perceived ease-of-use (PEOU): which is defined as "the degree to which an individual believes that using a specific system would be free from effort"[15].

Within the basic constructs of TAM, Perceived Usefulness and Perceived Ease of Use constructs are the factors most commonly referred to. This reflects their influence in determining user acceptance of technology, and shows the importance of TAM as a simple, predictive, and robust tool to assess the acceptance of IT by users [72].

4. TECHNOLOGY ACCEPTANCE FACTORS

Concerning the findings of this research, i.e. the factors that influence user acceptance in different contexts, the following table identifies the many factors adopted by previous studies, most of which differ in nature, and frequency of occurrence. However, among the 76 factors extracted, the TAM factors of perceived ease of use and perceived usefulness were the most frequent factors, as both adopted by 55 paper.

TABLE 3: All Extracted Technology Acceptance Factors

No.	Construct	No. Of studies	No.	Construct	No. Of studies
1	Perceived ease of use(PEOU)	(55)	39	Objective usability	(1)
2	Perceived usefulness (PU)	(55)	40	Voluntariness	(1)
3	Behavioral intention (BI)	(45)	41	Training	(1)
4	*Attitud (A)*	(26)	*42*	*External influence*	(1)
5	Subjective norm (SN)	(8)	43	Interpersonal influence	(1)
6	Performance expectancy	(8)	44	Peer influence	(1)
7	Effort expectancy	(8)	45	Teacher influence	(1)
8	Social influence	(8)	46	Information Quality	(1)
9	Perceive enjoyment (PE)	(7)	47	Socio-cultural factors	(1)
10	Experience(E)	(7)	48	Perceived Usefulness towards Professional Status	(1)
11	Compatibility	(6)	49	Contextual offering	(1)
12	Perceived external control (PEC)	(5)	50	Security	(1)
13	Computer anxiety (CA)	(5)	51	Academic Discipline	(1)
14	Facilitating conditions	(5)	52	Individualism (IDV)	(1)
15	Demographic(Age, Gender)	(5)	53	Uncertainty Avoidance (UAI):	(1)
16	Support/Organisational Support	(4)	54	Social presence	(1)
17	Results Demonstrability(RD)	(3)	55	Involvement	(1)
18	Image(I)	(3)	56	Learnability	(1)
19	Output/system Quality (OQ)	(3)	57	User guidance	(1)
20	Trust	(3)	58	System capability	(1)
21	Perceived risk(PR)	(3)	59	Library assistance	(1)
22	Technological factors/complexity	(3)	60	Accessibility	(1)
23	Facilitating Condition	(2)	61	Interest in publishing	(1)
24	Job Relevance(JR)	(2)	62	English literacy	(1)
25	Knowledge (info. + Awareness+ experience)	(2)	63	Influence of strong and weak ties	(1)
26	Triability	(2)	64	Application Specific Self-Efficacy	(1)
27	Awareness	(2)	65	Learning Goal Orientation	(1)

| No.	Construct	No. Of studies	No.	Construct	No. Of studies
28	Visibility	(2)	66	Customer Satisfaction (CS)	(1)
29	Cognitive Absorption	(2)	67	Post-Customer Satisfaction (P-CS)	(1)
30	End user satisfaction	(2)	68	Info. Search	(1)
31	User characteristics	(2)	69	Usage support	(1)
32	Perceived playfulness	(2)	70	Customization	(1)
33	Task technology Fit	(2)	71	Purchase & security	(1)
34	Tool functionality	(2)	72	Government Support	(1)
35	Task characteristic	(2)	73	Perceived processing speed	(1)
36	User motivation	(2)	74	Perceived adaptivity	(1)
37	Privacy (P)	(1)	75	Orientation	(1)
38	Computer playfulness(CP)	(1)	76	Perceived credibility	(1)
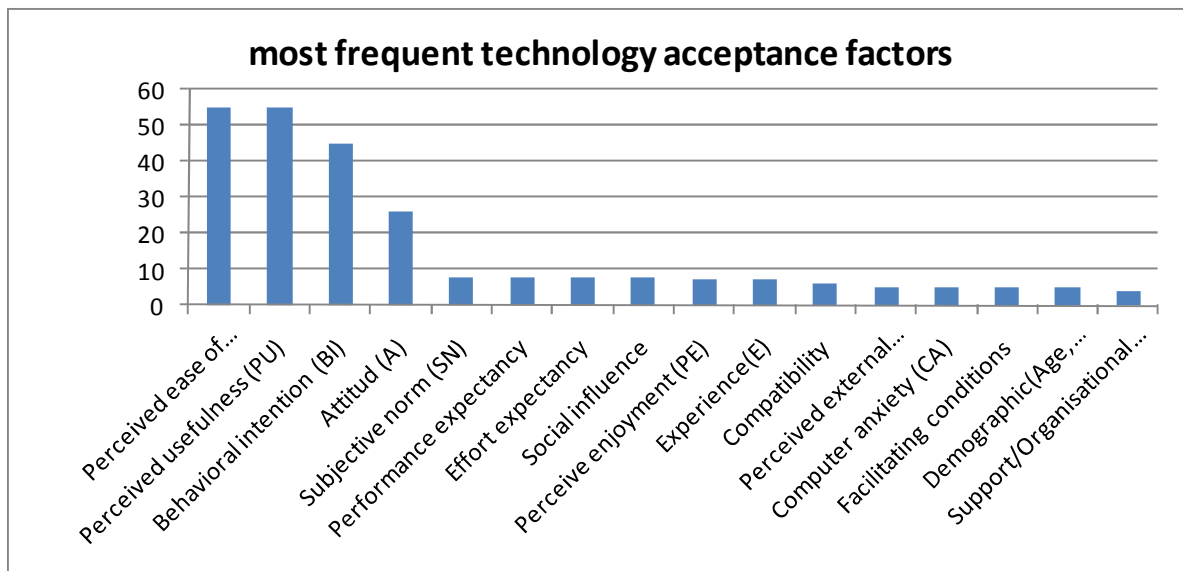
FIGURE 3: The Most Frequent Technology Acceptance Factors.

The above table and figure show that the basic four constructs of TAM; perceived ease of use (PEOU), perceived usefulness (PU), behavioural intention (BI), and attitude toward usage (AT), are the determinants most commonly used to predict user acceptance.

5. APPLICATIONS

Because of the importance of user acceptance as a success/failure determinant of any IT/IS project, numerous number of researches have investigated this issues in a wide variety of contexts and study domains. The following table and figure portrays the extent to which TAM and other acceptance theories are suitable measures for gauging IT acceptance in different contexts.

TABLE 4: Applications of TAM And Other Theories In Different Areas

	Area & Application						
	Web usage	Business (MIS & Office application	Health care	ecommerce	Education (elearning, DL)	Mobile (M-commerce, M-banking...)	Other applications
No. Of studies	5	7	9	6	17	5	15

The following figure summarizes the content of the table graphically.
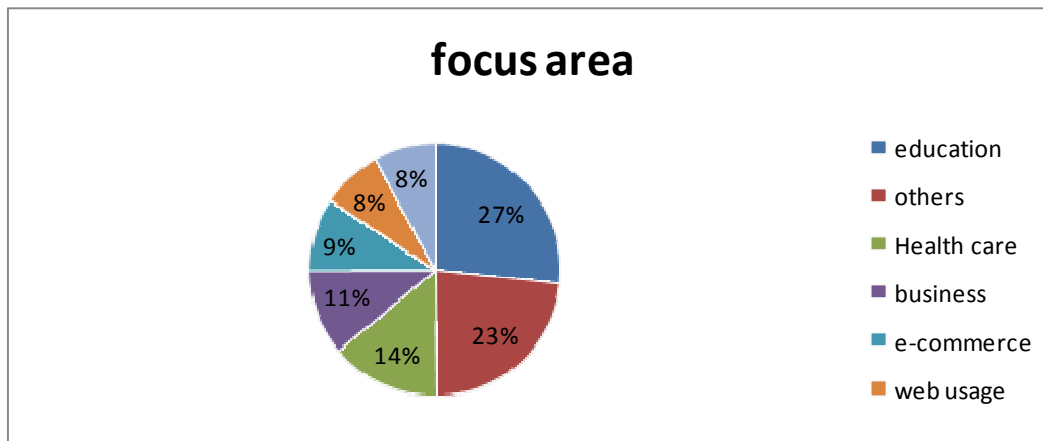

FIGURE 4: Focus Areas of Technology Acceptance Studies

6. CONCLUSION

This paper addresses key issues concerning the issue of user acceptance of technology. It provides a systematic review of relevant literature for researchers in the field of technology acceptance. Such an overview will help researchers better understand the current research trends, and in identifying new research topics to fill in the existing gaps. Of the 69 reviewed papers, 64 were empirical studies, whereas only five were theoretical. The findings show that among the prominent theories for user acceptance, the Technology Acceptance Model (TAM) is considered the most prominent, commonly used, and most empirically proven theory. Studies showed that TAM were used in many different areas, either in its original or modified format, or by integrating it with other theories and models. It was also found that the belief constructs of TAM, namely, perceived usefulness and perceived ease of use, are the factors most commonly in the reviewed sample; out of 69 reviewed papers, both constructs were used by 55 papers. Finally, the reviewed case studies include a wide range of contexts; health care, office applications, e-commerce, and most frequently education, are all examples of the areas whereby user acceptance theories are used repeatedly. The results of this study reflects the increasing interest of technology acceptance as a major determinant of any IT adoption process, and highlights the importance of TAM as the most prominent theory in the area of technology acceptance.

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