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Full Length Research Paper

Perception of information technology use in organization: Models and theories used in current landscape

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In the world where information technology (IT) evolves at a rapid pace, the slightest lapses of acceptance of the latest development could mean a drawback for an organization. Information technology plays a vital role in various organizational activities. How well the information system (IS) perceived and integrated into organizational processes, hence, is the primary factor that influenced the level of effectiveness exists in IT use especially at different organizations. Subsequently, it is essential to review the models and theories to further understand the outcomes on perception of IT use in the organization. To optimize use of IT, the appropriate information system level must match the type of technology use on what users perceived. The purpose of this study is to review models and theories used in current research on perceptions of IT use and to understand the determinants on 6 key sectors in organization mainly business, government, education, manufacturing, healthcare and financial institution. The analysis consideration of these models and theories focuses on conceptual and empirical review with significant external variables. Findings indicated that technology acceptance model (TAM) theory, unified theory of acceptance and use of technology (UTAUT) theory and seven principles of good practice in undergraduate education theory are mostly used to examine the perception of IT use in the respective sectors in organization. Furthermore, the significant results shown these models are still relevant to current research. This literature study suggests constructive recommendation for future research work.

Key words: Information technology, perception, technology acceptance model, unified theory of acceptance and use of technology, information system.

INTRODUCTION

While a growing number of organizations deploy information technology (IT) to gain operational effectiveness and enhance productivity within their technology systems, the perception of IT use continue to rise gradually. The information and communications technology (ICT) world has been stressing the need to acquaint organization structures in a different way.

Driving this matter further is the perception that organizations do have finite amount of magnitude resources and commitments in enabling IT use. With the unification of video, voice and data technology, it became necessity to gain efficiency through merging of information system (IS) resources especially in designing and operating these networks which potentially increase usefulness of the system. Advancement of IT architecture is a paradigm shift that revolutionizes the transformation of an organizations IT system by extending technology use beyond anxiety.

Noted that every single function in the organization is affected with utilization of technology such as computer

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and various type of application ranging from network based standalone system to online web based system, there are not many literature reviews on models comparative analysis of perception on IT use especially on individual level. With the limited scope and purpose of this study to review the perception of IT use with applicable models and theories to assist organization instilling workable deployment plan and efficiently manage the IT system, investigating the dependent variables associated with perception of IT use in systems have been viewed as the pivotal factor.

Conceptual framework and dependent factors are the focus on how the perception has been affected. Organization and individual perceives and interpret differently in various environments. In this review, several prominent models and theories related to IS and education at organization level is selected for discussion. With the contribution of this paper, it serves as basis for further research opportunities in perception of IT use in respective sectors to integrate technology use by enhancing decision making when selecting or changing new IS technology. The definition of perception as explained in this paper encapsulates on the depth investigation and validation theory of perception by information system in totality.

LITERATURE REVIEW

Over the last decade, the world has witnessed a paradigm change across most if not all sectors in the organization and this is expected to continue for the foreseeable future. Many organizations perceived technology use requirement in change to stay relevant in market. Global economic, social and environmental landscapes are changing also. It may be confusing to others as the change of technology landscape is too fast. One which touches the lives of most if not all people is perception of IT use. There is a wave of improvement in overall underlying IS technological demand. Global and local businesses climates are moving forward and it is expected a powerful information system refresh cycle soon.

In sociology research context, the concept of perception is important as a universal view. The interpretation and recognition of sensory stimuli is known as perception which is defined as the ability to remember the perceived subjects. Definitive perception is a neurological process that encapsulates the impact of interpretation, recognition and observation which made feasible extent into actual state. Essentially, the perception of IT use is the process of acceptance by the user on any technology forms for specific purposes which can be predicted. Perceptions in technologies have developed in quantum leaps and bounds over the past decades. On the contrary, with developed theoretical models to understand and investigate the significant variables impacting perceived of technology use in organizations.

As technologies use spawn across organizations, and society becomes more reliant on IT, the issue with usefulness of IS model and theories is proposed to rise. IT acceptance has been rigorously researched in tremens-dous detail for the past few years in different scope of studies. To date, there are many models and theories widely used in IS research (Wade, 2010).

Models and theories used

Referring to theory of reasoned action (TRA) by Fishbein and Ajzen (1975), a person's action of a specified behavior is driven by their behavioral intention to perform a specified behavior which is jointly induced by the person's attitude and subjective norm as determining factors in behavioral intention to use a specified system. The theory of planned behaviour (TPB) by Ajzen (1985) is based upon the TRA with one additional construct that is perceived behavioral control. Hence, TPB is consisting of three constructs as perceived behavioral control, attitude, and subjective norms. Therefore, behavioral intention determines the actual behavior of a person.

Davis (1986, 1989) and Davis et al. (1989) used technology acceptance model (TAM) based on adaptation from TRA by Fishbein and Ajzen (1975). TAM consists of two strong constructs, that is, perceived ease of use and perceived usefulness. In short, the main objective of TAM is to explain the computer usage behaviour. The model is also used for tracing the effect of external variables on attitudes, beliefs and intentions depicted in Figure 1. Numerous researchers have expanded TAM elements to investigate empirical result on significant relationship between technology use, usefulness and ease of use.

Later on, Venkatesh and Davis (2000) introduced extended theory of TAM which is TAM2, which include the determinant subjective norm for investigating intention of use effect on perceived usefulness and ease of use of the system. To further develop and consolidate the TAM related studies, Venkatesh et al. (2003) have created a predictive model known as unified theory of acceptance and use of technology (UTAUT) which include four key constructs; effort expectancy, performance expectancy, social influence and facilitating conditions used to determine user acceptance of technology and intention to use.

There is a wider perspective of comprehensive research on system success and user satisfaction, DeLone and McLean (1992) have revised and classified the various dimensions of IS success into six major categories, that is, information quality, system quality, use, user satisfaction, individual impact, and organizational impact. Further improving the IS success model, DeLone and McLean (2003) validated their model by updating the model with six correlated constructs, that is, system,

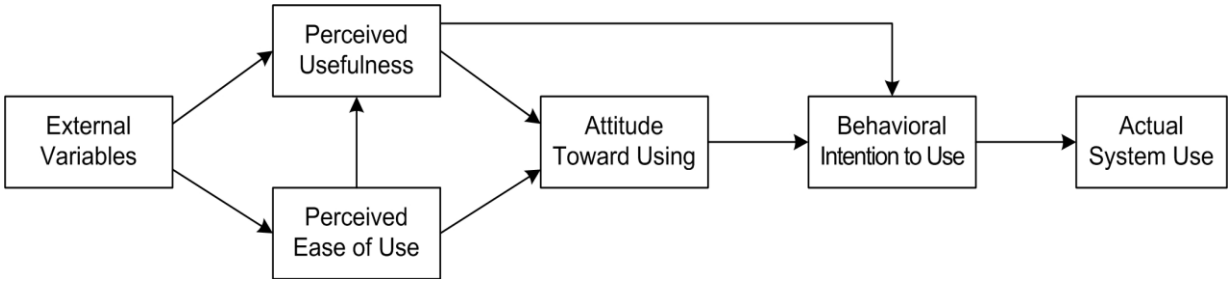

Figure 1. Technology acceptance model (Davis, 1989).

information and service quality, intention to use, user satisfaction and net benefits which found to be significant in interpreting the success model. It is notable that intention to use constructs is influenced by the widely used TAM model.

In this updated IS success model, it is not specified how the significant relationship between information and system quality is associated to system use. After investigation and studies done by Wixom and Todd (2005), they suggested that there should be a connector between quality elements and technology acceptance elements. Therefore, Wixom and Todd (2005) have developed an integrated model based on technology acceptance and user satisfaction literature. The important mechanics in the model is the link between object-based attitudes and behavioral beliefs which are perceived ease of use and perceived usefulness in the TAM.

Goodhue and Thompson (1995) studies introduced task-technology fit (TTF) model that includes 8 constructs, that is, quality, locatability, authorization, systems reliability, ease of use/training, production timeliness, compatibility and relationship with users to determine the positive effect of individual performance through capability of system use by matching the task that the individual performed. Similar to TAM, the key contribution of TTF is focusing on the ability of the system to assist the users as they perform their tasks; TAM focuses more on the technology itself.

Technology use in education emerges as part of instruction learning and perceived as viable tools that affect student's perception, satisfaction, participation and performance. Chickering and Gamson (1987) have developed the seven principles for good practice in higher education theory which consists of student-faculty contact, active learning, time on task, cooperation among students, high expectation, prompt feedback and diverse talents and ways of learning to support the learning environment. Subsequently, with growing of distributed technology use across institution of higher learning, Chickering and Erhmann (1996) have introduced a framework that integrates the use of technology in course with the seven principles for good practice.

To summarize, the review of models and theories used in this paper include technology acceptance model (TAM), extension of the technology acceptance model (TAM2), unified theory of acceptance and use of technology (UTAUT), IS success model, theory of reasoned action (TRA), theory of planned behaviour (TPB), theory of task technology fit (TTF), integrated model of user satisfaction and technology acceptance, and seven principles of good practice in undergraduate education theory which is found to be relevant to study acceptance, engagement, interaction and technology use behaviour.

The preliminary review identified 32 journals and conference papers with proposed conceptual framework and empirical descriptive analysis focus on perception of IT use, IS models, information system in education, technology use behaviour and user engagement to system. Table 1 is organized according to six categories of sectors in organization.

The selection of the category is grouped into six major key sectors for the ease of discussion and comparative analysis. Business sector, financial institutions and government sector dominates the technological acceptance in their system implementation.

Application of theories

In recent years, several latest studies have used users' perception as the factor by which to determine the technology use of discussion. In business sector, Cascio et al. (2010) also argues that system adoption is influenced to a greater extent by the salespeople's perception on top management commitment to technology deployment. In Ghobakhloo et al. (2010), a study to examine technology acceptance and satisfaction in small and medium sized enterprises (SMEs) reviewed, there was a significant relationship of system use behaviour to address specific characteristics such as resource limitations, management methodology and direct interaction with external environments.

Heikkila and Smale's (2010) findings indicated a perception that effects of language standardization e-HRM system on users perceptions of effort expectancy were mostly positive, it was due to high linguistic ability

Table 1. Studies based on perception of IT use in organization sector.

Business	Government	Education	Manufacturing	Healthcare	Financial Institution
Cascio et al. (2010), Ghobakhloo et al. (2010), Heikkila and Smale (2010), Kang and Lee (2010), Tan (2010)	Chan et al. (2010), Diez and McIntosh (2009), Lu et al. (2010), Medeni et al. (2010), Sipior et al. (2010)	Babb et al. (2010), Grandzol et al. (2010), Lymn and Mostyn (2010), Sandler (2010), Urwin (2011), Ward et al. (2010)	Al-Jabri and Roztocki. (2010), Autry et al. (2010), Chen and Li (2010), Heyder et al. (2010),Toto et al. (2010)	BenMessaoud (2011), Breen et al. (2010), Marriott et al. (2008), Or et al. (2010), Rahimpour et al. (2008), Soroush et al. (2010)	Adesina and Charles (2010), Agarwal et al. (2009), Andoh-Baidoo et al. (2010), Hasri et al. (2010), Safeena et al. (2010)

which allowed them to use the system's capability efficiently. Kang and Lee (2010) highlight the use of website; system and information satisfaction is found to play major role in the formation of continuance intention through perceived usefulness and perceived enjoyment. The findings also highlight that 90% of the respondents visited the website more than few times a week and approximately 80% used it more than 10 min per day which implies level of respondents habitual use of website is high. Based on Tan (2010) research studies, it is noted that effective use of technology would add business value and assist organization to achieve business objectives.

Moving on to education sector, the study of Babb et al. (2010) shows that there is a significant relationship on the hybrid learning environment where student have positive perceptions on their performance and satisfaction in the system. With technology use in course design and delivery, the findings proved there are effects on students' satisfaction and performance. In Grandzol et al. (2010) studies, there are increased levels of online interaction measured by time spent in the use of technology. The findings also depicted students have successfully completing a course and earning credit in the course management system. Lymn and Mostyn (2010) found that 100% of students enjoyed using the audience response technology system which ultimately increased their conceptual understanding of concepts.

Sandler (2010) studies stressed that effective assessment of learning with technology use required reliable measure to map learning outcomes. The study also suggested that all national levels, across institutions, employ reliable measures and stronger empirical practices in determining the effect of learning with technology, specifically in online learning. Urwin (2011) depicted that there has been a significant increase in the volume of data transferred between users' computers and the online learning system during analysis of observation. It suggested that online learning system usage is occurring from a wider range of computers at different locations due to online activity happens within the system. In Ward et al.'s (2010) research, the study found that instructor and student have significant positive relationship on synchronous interactive online instruction system. Main findings of this research were the ease of access to the course and effectiveness in an online instructional delivery.

Financial sector depicted Adesina and Charles (2010) studies noted that users perceived using e-banking system is a useful, convenient and easy to use tool. Hypothesis testing in this study have proved significant positive relationship of perceived usefulness and perceived ease of use toward perception on intention to use e-banking system. Agarwal et al. (2009) studies also support the findings on there is a highest level of perceived usefulness in e-banking services. The surveyed studies also depicted that younger age group is more tech savvy, accepting new ideas and perceived to use technology in any new way.

Andoh-Baidoo et al. (2010) results found that users of national and international bank have high perception of IS implementation. Therefore, perception of technology use is significantly relevant to users' perception in system and information quality. It is noted as well, the user involvement in technology implementation has been proved to influence users' intention to use the system. From the research findings of Hasri et al. (2010), it shown users understanding received high level on systems needs and system performance when using the user information system which perceived as important factors on technology use. In Safeena et al.'s (2010) observation of studies, perceived usefulness, ease of use and consumer awareness have significant positive implication on intention to use internet banking.

As for the government sector, Chan et al. (2010) findings depicted there is a strong technology adoption and perception on citizen satisfaction with e-government technology. Diez and McIntosh (2009) studies showed that the key predicting factors for IS usefulness are user participation, user perceptions and intentions, user computer experience and availability of external information sources. In Lu et al.'s (2010)

empirical studies, perceived ease of use and perceived usefulness are key factors in attitude that affect online tax filing. Descriptive analysis show that perceived ease of use has significant impact on taxpayers perceived usefulness, perceive behavioral control and attitude when using the online system. Medini et al. (2010) also pointed out that ease of use, service, and information quality, is the determinants that significant to citizen perception on use of e-government technology. Questionnaire findings from Sipior et al.'s (2010) research stated that perceived access barriers and perceived ease of use is significantly related to technology use with characteristics of demographic, education level, employment status and household income evaluated. On manufacturing sector, Al-Jabri and Roztocki (2010) studies noted that users who benefited from organizational transparency are likely to use the technology with mandatory IT implementation. In Autry et al.'s (2010) research findings, the empirical result showed that in technologically turbulent environment, the relationship between perceived usefulness, ease of use and the intention to use a technology are significantly stronger. Chen and Li (2010) outlined the results which support the fact that perceived use of IT and design customization has positive effect on new product development success. The technology use is also seen to contribute to enhancing quality controls which enables enterprises user to customize and manage production targets to measure their performance against set criteria.

Heyder et al. (2010) surveyed findings highlighted that there are significant factors influencing investment behavior through use of tracking and tracing system in agribusiness firm. With the tracking and tracing system use, it can track and leveraging the technologies and incorporating them into their organizations to track and simulate the entire production process before the actual production even starts. From the study of Toto et al. (2010), the survey results proved that technology use such as internet was significantly impacted by perceived usefulness, perceived ease of use, internet self efficacy and internet anxiety.

In healthcare sector, BenMessaoud et al. (2011) findings depicted that perceive use of technology such as robotic assisted surgery system can guide and assist surgeons, hospital and medical school administrators and policy maker for their future medical research development. Breen et al. (2010) studies perceived that three IT tools such as ehealth services, electronic medical records and electronic prescription ordering systems are increasingly in use among all medical providers. It noted as well that technology use have resolved many organizational malfunctions or deficiency that resulted from unskilled and lack of knowledge personnel's. In clinical environment, a number of clinician's perceptions on the system was found to be significantly correlated with the actual usage of the system.

Marriott et al. (2008) findings have shown that majority of clinicians using the antibiotic approval system found it to be easy to use and useful to them. Or et al. (2011) studies demonstrated that perceived usefulness, perceived ease of use, subjective norm and healthcare knowledge are the major factors that can predict the variance in patients acceptance and perceived self-reported use of the technology. Majority of the participants perceived system as a useful tool and convenient mode of health care delivery. The participants also perceived positive attitudes and intent to use the tele-care management system reported in Rahimpour et al. (2008) findings. In Soroush et al. (2010) observation studies, besides sound quality and digital stethoscope physical features, perceived usefulness was found to be the determinant that influenced clinicians use of digital stethoscopes in telehealth system.

Most of the financial institutions have listed the national entities with aggressively customizing and upgrading their core banking system and have been channeling their focal point on spanning their online banking features to attract more businesses. Business entities and government ministries are not far behind with their respective sectors, in that they are busy working on business intelligence, enterprise resource planning (ERP), messaging collaboration and IT system consolidation; whereas, the manufacturing sector is nearly on par with the government sector on emphasis in server virtualization, ERP and business continuity. Education and healthcare sector are picking up pace with manufacturing sector on implementing online web based portal integration with real time simulation interaction.

METHODOLOGY

The selected journals published by the researchers involves the latest studies in IT perception on various industries. Published journals validated the quantitative and qualitative methodology which the authors conducted in form of online survey and follow up questionnaires to verify and expand their responses. Different literature databases for the journals selection which is deemed to be significant to this study was selected. Selected journals are restricted to those published in well established research journals specializing in information system, IT management, medical information management system, business information system, education technology, financial and economic information system. 29 periodicals were selected; they are: Elsevier Industrial Marketing Management, European Journal of Economics, Elsevier Journal of World Business, Elsevier Computers in Human Behaviour, 18th European Conference on Information Systems, Journal of Online Learning and Teaching, Journal of Distance Learning Administration, BMC Medical Education, American Educational Research Association, Blended Learning in Practice, International Review of Research in Open and Distance Learning, Journal of Internet Banking and Commerce, Elsevier Journal of Retailing and Consumer Services, Americas Conference on Information Systems, International Research Journal of Finance and Economics, Journal of the Association for Information Systems, Elsevier Environmental Modeling and Software, African Journal of Business Management, European, Mediterranean and Middle Eastern Conference on Information Systems, European Journal of Information Systems, Elsevier Journal of Operation Management, International Journal Electronic Business, International Journal on Food System

Dynamics, Journal of Global Business Administration, Plos One, Journal of Information Technology Impact, Elsevier International Journal of Medical Informatics, Journal of the American Medical Informatics Association and 21st Australasian Conference on Information Systems.

The basis for the classification and discussion is determined by four components which are from the abstracts, literature review, methodology and conclusion. Evaluation of dependencies between variables outcome and implication factors are key determinants for the analysis. Selected journals were indexed according to organization sectors and subsequently, according to models and theories used in the specific research area with analysis of dependent variable used. While it explored the enterprises of IT users across the organizations, it endeavors to ensure the six sectors are as evenly represented as possible.

Time restriction have been a factor in careful analysis of the journal papers and references obtained; so, only the top 20% cited sources was selected and reviewed. Area of improvement is that the journals should have more application of empirical evidence. Rich analysis of the studies in the literature review should be made available in the part of analysis to support the argument. Some of the empirical basis are narrow and consist of small sample size.

RESULTS AND DISCUSSION

The review identified 32 journals with a conceptual framework, qualitative or empirical aims on information system, IT management, medical information management system, business information system, education technology, financial and economic information system. Ironically, the following discussion is organized and presented according to the six categories of sectors with respective models and theories used in Table 2.

Some authors used the TAM model with other theories such as TPB, Integrated Model of User Satisfaction and Technology Acceptance, and TTF to explore perception of system use (Breen et al., 2010 ; Ghobakhloo et al., 2010 ; Kang and Lee, 2010 ; Lu et al., 2010; Sipior et al., 2010).

There are several authors who used the popular models such TAM, UTAUT and Seven principles of good practice in undergraduate education to understand perception of technology use in the organizational context. Of particular note is the need to differentiate among models and theories used; analyzed variables and empirical studies in perception of technology use are presented in Table 3.

Business sector

Bringing the force of information technology to the enterprise is a challenge for many major organizations that are facing competitive consumer pressure due to the growing popularity of perception in information systems. Cascio et al. (2010) results suggest that salespeople perceive signals from the commitment of top management on implementing IT systems. Alignment between management and supervisors commitment to the technology is the main factor on influencing system adoption besides usefulness of the system. In Ghobakhloo et al. (2010) research study, a devised interactive model of technology acceptance and satisfaction model is developed and proposes that influence of perceived ease of use and perceived usefulness over attitude is mediated by individual innovativeness in IT.

From Heikkila and Smale (2010) findings, it was observed with regards to language standardization which affects effort expectancy that UTAUT model is influenced by the level of language competence, whereas performance expectancy leads to consistency and functionality of reporting tasks in the e-HRM system. The user acceptance model is used to explore the effect of user reaction and their actual use of the e-HRM system. Kang and Lee (2010) study suggest that to use TAM as a theoretical backbone in a study of continued technology use, researchers should focus recent research findings on continued IS use. The study also demonstrates the important role of perceived usefulness in forming continuance intention of an online website service.

In return, users and consumers dealing with businesses will have access to a comprehensive digital dashboard which provides a trending analysis of transactions as well as a complete historical data of past transactions traced. Indeed, TAM model is found to be useful in determining these factors.

Education sector

So far, IT has automated much of the education standard workflow, creating space for the information system to provide more service to educators and students. These information systems is geared towards providing services such as the network and website, supporting communication systems, teaching and research and development including the administrative work.

Babb et al. (2010) highlight that the use of online websites with perceived user friendliness would increase student involvement; provide interaction between faculty–student, provide prompt feedback mechanism and communicate high expectations which conclude as good practices in hybrid system instruction. The study demonstrates the applicability of using Chickering and Gamson (1987) theory on students' perceived satisfaction and performance using hybrid course system. Grandzol et al. (2010) research study measured that time spent by student in course management system have increased level of interaction through home pages activity per student. Interaction in learning especially online course is the important key attribute in this research. The result also implied that the key implication for online learning management system includes measurement features such as hits, time, ease of use and integration with existing system to enhance evaluation criteria of perception in learning.

Table 2. Models and theories used for perception on IT use in the sectors level.

Model / theories used	Business	Government	Education	Manufacturing	Healthcare	Financial institution
Technology acceptance model (TAM)	Cascio et al. (2010), Ghobakhloo et al. (2010), Kang and Lee (2010)	Diez and McIntosh (2009), Lu et al. (2010), Sipior et al. (2010)		Al-Jabri and Roztocki. (2010), Autry et al. (2010), Chen and Li (2010), Heyder et al. (2010), Toto et al. (2010)	Breen et al. (2010), Marriott et al. (2008), Rahimpour et al. (2008), Soroush et al. (2010)	Adesina and Charles (2010), Safeena et al. (2010)
Extension of the technology acceptance model (TAM2)	Ghobakhloo et al. (2010)			Heyder et al. (2010)		
Unified theory of acceptance and use of technology (UTAUT)	Heikkila and Smale (2010)	Chan et al. (2010), Medeni et al. (2010)			BenMessaoud (2011), Or et al. (2011)	Agarwal et al. (2009)
IS success model	Tan (2010)					Andoh-Baidoo et al. (2010), Hasri et al. (2010)
Theory of reasoned action (TRA)		Sipior et al. (2010)				
Theory of planned behaviour (TPB)		Lu et al. (2010), Sipior et al. (2010)				
Theory of task technology fit (TTF)					Breen et al. (2010)	
Integrated model of User Satisfaction and Technology Acceptance	Ghobakhloo et al. (2010), Kang and Lee (2010)					
Seven principles of good practice in undergraduate education			Babb et al. (2010), Grandzol et al. (2010), Lymn and Mostyn (2010), Sandler (2010), Urwin (2011), Ward et al. (2010)			

Table 3. Selected widely used models and theories for comparative analysis.

Model / theories used	Authors	Analyzed variables	Sampling size / subjects	Tools / software
Technology acceptance model (TAM)	Adesina and Charles (2010)	Technology → perceived ease of use; perceived usefulness. Organization → perceived credibility. External variables → self-efficacy; customer attitude.	500 survey questionnaires with 292 customers analyzed	Online electronic banking
	Al-Jabri and Roztocki. (2010)	Technology → perceived ease of use; perceived usefulness. Organization → social expectation; perceived transparency. External variables → regulatory, cultural economic settings.	Not empirical work	Enterprise system
	Autry et al. (2010)	Technology → perceived ease of use; perceived usefulness. Organization → intention to use. External variables → knowledge based technology resources.	Survey with deemed qualified 195 respondents	Supply chain system
	Breen et al. (2010),	Technology → perceived ease of use; perceived usefulness. Organization → behavioral intentions; perceived of costs. External variables → system implementation.	Not empirical work	Ehealth services, electronic medical record and electronic prescription ordering system
	Cascio et al. (2010)	Salespersons perceptions → Management commitment alignment effect adoption. Perfect alignment → positive impact adoption; other alignment condition. Misaligned management commitment → positive impact adoption.	Online survey and email; 292 salespeople	Drug Intrusion System
	Chen and Li (2010)	Technology → perceived behavioral belief. Organization → top management support; organizational learning. External variables → customer involvement.	Survey questionnaire with 172 qualified manufacturers	New Product Development

Table 3. Contd.

Diez and McIntosh (2009)	Technology → perceived ease of use; perceived usefulness. Organization → top management support; skills; user participation. External variables → training; external pressure; external information sources.	3 databases analyzed – Scopus, Web of Knowledge and Cranfield University library catalogue	IS life cycle implementation
Ghobakhloo et al. (2010)	Technology → user acceptance; user satisfaction. Organization → system usage behaviour. External variables → resource constraints; management method; interaction external environments.	Not empirical work	Interactive Model of Technology Acceptance and Satisfaction
Heyder et al. (2010)	Technology → perceived usefulness; perceived system relevancy. Organization → perceived output quality; perceived external pressure. External variables → perceived costs.	Online survey with 234 companies responded	Tracking and tracing system
Kang and Lee (2010)	Technology → Information and system satisfaction. Organization → perceived usefulness; perceived enjoyment. External variables → continuance intention.	100 questionnaires with 281 responses	Online service website
Lu et al. (2010)	Technology → perceived usefulness; perceived ease of use. Organization → attitude. External variables → perceived behavioral control.	Questionnaire with 422 respondents	Online Tax filing
Marriott et al. (2008)	Technology → perceived ease of use; perceived usefulness. Organization → self-efficacy. External variables → knowledge.	Survey with 250 medical staffs	Computerized Decision Support System
Rahimpour et al. (2008)	Technology → perceived intention to use; perceived ease of use; perceived usefulness. Organization → self efficacy; perceived of cost. External variables → anxiety of use; clinical support.	10 focus group interview with 12 patients	Home Telecare Management System
Safeena et al. (2010)	Technology → perceived usefulness; perceived ease of use. Organization → consumer awareness; customer attitude. External variables → perceived risk acceptance.	Questionnaire interview with 53 respondents	Online electronic banking

Table 3. Contd.

	Sipior et al. (2010)	Technology → perceived access barriers; perceived ease of use. Organization → perceived usefulness. External variables → internet experience; income.	Questionnaires with 37 respondents	E-Government services
	Soroush et al. (2010)	Technology → perceived usefulness; perceived ease of use. Organization → user satisfaction. External variables → level of education.	Observation and focus group with 22 participants	Telehealth system
	Toto et al. (2010)	Technology → perceived ease of use; perceived usefulness. Organization → internet self efficacy. External variables → internet anxiety.	Questionnaires with 100 operators responded	Internet
Unified theory of acceptance and use of technology (UTAUT)	Agarwal et al. (2009)	Technology → perceived satisfaction; perceived usefulness. Organization → perceived attitude; social influence. External variables → facilitating conditions; security and trust; customer attitude.	Questionnaire interview with 50 respondents	Online electronic banking
	BenMessaoud (2011)	Technology → perceived usefulness; perceived ease of use. Organization → social influence; attitude toward technology. External variables → facilitating conditions; perceived behavioral control.	Interview with 21 surgeons	Robotics Assisted Surgery
	Chan et al. (2010)	Technology → effort expectancy. Organization → performance expectancy; social influence. External variables → facilitating conditions – trust, convenience; customer satisfaction.	Online survey with 1,179 citizens	Smart card access e-government service

Table 3. Contd.

	Heikkila and Smale (2010)	Technology → user reaction on effect language standardization; perceived ease of use. Organization → performance expectancy; social influence. External variables → facilitating conditions; actual use.	13 interviews in 11 different units: Brazil, Canada, Finland, Germany, Guatemala, Italy, Indonesia, Norway, Pakistan, Sweden and the UK.	e-HRM system
	Medeni et al. (2010)	Technology → perceived ease of use. Organization → information quality; level of service. External variables → facilitating conditions – security and trust.	95 citizens analyzed	Online e-government application
	Or et al. (2011)	Technology → perceived effective use; perceived ease of use. Organization → predict patients' acceptance; perceived behavioral control. External variables → healthcare knowledge; subjective norm.	Questionnaire with 101 participants responded. Follow up with phone interview and mail.	Web based interactive self management system
	Babb et al. (2010)	Technology → student perceived satisfaction. Organization → perceived performance. External variables → student-student interaction; professor feedback; active learning; perceived relatedness.	Online survey with 75 students	Online Experiment Management System
Seven principles of good practice in undergraduate education	Grandzol et al. (2010)	Technology → student perceived satisfaction. Organization → improved learning outcome. External variables → leaner-learner interaction; learner-faculty interaction.	Online program; 6 community colleges with 349 students	Online courses
	Lymn and Mostyn (2010)	Technology → perceived satisfaction learning. Organization → perceived student performance. External variables → enhancing learning; enabling teaching.	Online questionnaire; 8 pharmacology lectures with 33 students responses	Audience response system

Table 3. Contd.

Sandler (2010)	Technology → perceived student attitude. Organization → perceived learning outcomes. External variables → student-faculty contact; active learning; prompt feedback.	Online survey; 43 questions; 4,800 students with 44% response rate	Online course learning management system
Urwin (2011)	Technology → perceived student behaviour; perceived system use. Organization → student learning engagement. External variables → instructor feedback; perceived on system support.	Online program; system's log files - academic year from 2003-2009	Integrated online learning environment
Ward et al. (2010)	Technology → perceived students and instructors use. Organization → perceived quality learning; perceived quality on courses. External variables → interaction between instructor and students.	Face to face interview with 14 instructors; Online survey with 93 respondents	Online learning system

In Lymn and Mostyn (2010) study, 92% of the students surveyed acknowledged that audience response technology system have assisted them in identify their learning needs and 87% perceived that the technology useful in enhancing integration of concepts. The use of audience response technology system follows main principles of education from Chickering and Gamson (1987). Sandler (2010) studies highlighted that a clear indication technology is a lever for teaching and learning on regards to Seven Principles of Good Practice of Chickering and Ehrmann (1996). By using reliable measures and evidence based on principles of good undergraduate practice (Chickering and Gamson, 1987), IT was used to map the effects of the students at different points in time.

In Urwin (2011) reviews, it is noted that there is a strong correlation between a student's subject and their preference for integrating technology use into their study. Authors also found that when there is a strong motivation engagement between students and tutors, the users would more likely be motivated to use the systems. Ward et al. (2010) found that students provide positive ratings to the overall quality of the learning experience in synchronous interactive online instruction system enabled courses. It is noted that the overall quality of engagement and interaction between the students and instructor influence both student performance and satisfaction. With these findings, the learning institution is able to optimize education strategies for the best results. Another key success project for the learning institution information system is building a constructive web community which promotes the interaction of learning among student and faculty members.

Financial industry sector

Most of the huge financial services institutions would have a centralized IT system that should be a warehouse of information (large scale of data size such as databases, non edited format - PDFs, web pages - HTML, documents – in any forms) and there are several tools that can search different information sources and use logic intelligent indexes to store knowledge content. In Adesina and Charles (2010) studies, it clearly observed that perceived usefulness is the main factors in users' perception of using the e-banking system. Statistical analysis findings showed that perceived usefulness, perceived ease of use, perceived credibility and computer self-efficacy factors attributed to evaluate users' attitude towards perception of using e-banking system.

Agarwal et al. (2009) survey showed that in respondents using e-banking system, more than 84% use it at least once a month. The findings showed that the users' perception of perceived usefulness in balance enquiry is very useful to them in e-banking system. Customer perception toward technology availability and system usefulness is the crucial factor toward increasing level of satisfaction.

The key determinants of online banking use in Safeena et al. (2010) findings are perceived usefulness, perceived ease of use, consumer awareness and perceived risk. Analysis also concluded that perception of online banking use have been accepted by majority of consumers whilst having strong and positive effect on them.

There is also a lot of uncertainty in performing financial transactions, but it seems the basis for these sentiments

is not necessarily founded on a good understanding of the real threats with use of the system and other determinants in technology acceptance.

Health care sector

Some of the healthcare management information system such as telecare system, ehealth system and prescription medicine system is a process whereby the rich health metadata are stored, recorded and processed for the purpose of planning, implementation, evaluation of health programs and policy making.

BenMessaoud et al. (2011) findings have shown three main dependent variables, mainly perceived ease of use and complexity, perceived usefulness and perceived behavioral control affecting perception of technology use. This study identifies key aspects that affect surgeon's perception and acceptance of robotic technology use to contextualize the UTAUT model. In Breen et al. (2010) analysis, it is noted that the TAM have satisfied the criteria, perceived usefulness and perceived ease of use in evaluating the feasibility and rationale of technological usage of the health information technology resources. The analysis also depicted that IT implementation and use is viable to support medical type services by eliminating shorthanded manpower and complication associated with skilled staff. For example, health and welfare issues among counter administrative staffsin these sectors will differ significantly from the support needed for manufacturing or logistics staff.

There are over 70% and above of respondents who perceived that the antibiotic approval system was easy to use by clinicians (Marriott et al., 2008). Clinicians perceived that with technology use, it could enhance their evidence based practices in their daily workflow. Or et al. (2011) studies reveal that patients have stronger intention to use a health technology because they perceived using technology would improve the ability and effectiveness in managing diseases. With technology in use, patients also perceived usefulness in reporting their disease through high usage of the technology. The drivers of subjective norm and patients' perception of ease of use was found to be significantly related in determination of the perception of usefulness in this research. In addition, the tasks performed were also simplified.

In consistency with TAM (Davis, 1986; Davis, 1989), Rahimpour et al. (2008) studies found that users will adopt a new technology system if they perceive the system is useful which lead to intention to use. Understanding the usefulness aspect of the system will increase technology use. Preliminary findings of Soroush et al. (2010) indicated that more than half of the participant from hospitals during the observation studies perceived digital stethoscope as a useful tool in telehealth system especially for education purpose. With the electronic driven work environment, the efficiency of medical workers has markedly increased, and the direct communication of information has also improved significantly.

Physicians and specialists have become more efficient as they now spend less time writing down the records and waiting for patients test reports. As the execution of medical officer's feedback is confirmed electronically within the system, steps in the workflow cycle have been reduced whilst the risk of human error has been subsequently minimized. Here, the relationship between technology use and other constructs of technology acceptance are closely linked together as illustrated in TAM and UTAUT.

Government sector

The government has invested in and implemented the electronic payment systems and cash card technology, and now, the information systems and technology community has built the contactless card infrastructures. General public has also, in increasing numbers, been using all the electronic transaction channels available and perceived less hassle with ease of use to them.

Chen et al. (2010) empirical studies showed that performance expectancy, effort expectancy and facilitating condition from UTAUT model are the primary key on positive effects on users intention use of technology. Additionally, citizen perceived easy to use e-government system as a support tool for the system use. Diez and McIntosh (2009) findings denoted that there are significant dependencies of user participation, user satisfaction, perceived usefulness and computer self efficacy in supporting intention to use technology.

Lu et al. (2010) also indicated that perceived usefulness has a positive significance on perceived behavioral control and attitude which implies the taxpayers believe when technology such as online tax filing system use is able to increase the effectiveness and convenience of tax filing. The system allows taxpayers to check tax exemptions and simulate the tax payable calculation in a tidy and efficient manner.

The literature result of Medini et al. (2009) highlighted that the perception of usefulness and intention to use is clearly interconnected with the motivation and needs for citizens to use e-government technology system. In these findings, it is noted the importance of citizens' experiences of the actual use and related perceptions of use and quality as well. Sipior et al. (2010) quantitative analysis indicated positive significant relationship of technology use between perceived access barriers and perceived ease of use. E-government use is vital toward the transformation and impact on citizen daily lives which creates more engaged citizen in democratic government with utilization of technology. Based on the several studies in TAM and UTAUT, researchers have uncovered

positive perception on technology use resulting from mining the massive citizen sentiment, compliant and enquiry data to better understand the explicit relationships and associations between the events.

Manufacturing sector

IT is critical, in that it is anticipated to be in the forefront of the manufacturing sector years to come. Al-Jabri and Roztocki.(2010) studies indicated that use of IT implementation in mandatory settings which involve perception of accepting the new enterprise systems significantly relates to organizational transparency. With TAM model illustrated in this framework, there are four factors such as perceived usefulness, perceived easy of use, social expectations from user and perceived transparency that are found to be very significant. Research studies by Autry et al. (2010) yield important factors on supporting the relationship between perceived usefulness and the intention to use a supply chain technology, and provide salient evidence which stipulate that group level cognitions (perceived usefulness and ease of use) can lead to the organizations' intent to use technology.

Chen and Li (2010) findings surveyed from high-tech manufacturers stated that the perceived advancement of technology use and design customization creates a successful new product development. The findings lead to value-added deliverables with greater product development process control that can deliver greater predictability in product development outcomes. Moreover, with the use of IT application, project managers are able to control the project processes, detect problems and obtain assistance from others in rapid manner at early phases of the product development. It also concluded that the effect of IT behavioral belief on new product deployment success was through technology use and design customization.

In Heyder et al. (2010) observation studies, food manufacturers perceive traceability system as a useful tool to ensure product safety and from external pressure. The study highlighted the preliminary of positive effects on traceability system use for food industry organization. Toto et al. (2010) descriptive analysis showed that respondents tend to perceive use of internet as useful for their business. More than 50% of the respondents' perceived that their business performance will be improved with internet technology use in their organization. Degree of technology use by these food processing organization is affected by their perceived usefulness, perceived ease of use, internet self efficacy and internet anxiety.

With the continued proliferation of perception in IT use, perceived usefulness in the system is set to increase steadily. Ease of use in the system will help to provide a larger and more demographically diverse potential participant pool. In contrast to the fundamental TAM that focuses on technology acceptance and technology related factors, there are other considerations such as system implementation and social expectations from the users also need to be reviewed.

CONCLUSION AND FUTURE WORK

This current literature reviews IT perception models and theories used in various industries. Most empirical research is expanded from the TAM theory and UTAUT theory whereas in education, seven principles of good practice in undergraduate education theory applied. For this reason, an extensive analysis of the application was done on the used models and theories. One should expect the technology use perception to continue at the progressive high pace, so it will eventually extend the traditional methodology to the relevant variables in the research fields.

Adding to that, here, we will see more and more interconnection between systems and people being inter connected with IT. There are a couple of initiatives of standardization going on and they all aim to make it easy to perceive for the users to combine technologies use. It is simply a more simple and efficient way to complete the day-to-day tasks across the IT environment with positive perception and attitude in using the technology. Generally, mistakes or errors are not usually technology-related. They tend to come from an enterprise not giving enough attention to perception of change management and end-user acceptance.

Businesses and financial sectors all over the world make justifiable investment in information systems projects due to perceived need, usefulness and benefits that such technologies use will provide long haul return on investment.

In today's governments' agency, forums, poll functions, blogs and wikis, for instance, all the relevant work to create vertical and horizontal decision-making was bringing members of a community closer and allowing better communication between citizens and politicians. They also perceived that a whole new complex IT paradigm on usage would emerge in the near future by addressing the perception gap.

Technology in healthcare creates the expectation of improved quality of care, minimized errors and costs that expense in the health care delivery. The immediate societal advantages of numerical analysis disclosing the efficacy of treatments and the performance of individual medical staff are tremendous. Perceived ease of use both directly and indirectly affects on perceived usefulness of system. There is no doubt on the importance of technology use in any organization especially in health. With technology in place, hospitals and clinics could contribute more on developing information health society rather than just focusing on applying the system for

internal use.

The culture of collaboration in technology perception is clearly a paradigm shift for students, faculty members and institution of higher learning. With the pervasiveness in perception of IT use, we will be able to view more of universities requirement such as processes, deliverable instruction, methodologies, knowledge and rules being embedded onto IT systems. For instances, many researchers have identified the major path of information technology in education but very few exploring the correlation information system in learning.

Across the manufacturing industry, the quest for energy efficiency and open standard adoption are gathering momentum, and the information system solution scaling expected to fulfill the users' needs in these areas would emerge in the digital age. Systems today must evolve into a robust, services-oriented platform that enriches emerging, innovative, composite applications and yet, still manage to balance technology and operation processes in manufacturing engine.

While this study is review in nature, it serves as a basis for further research. We think that for more new technology adoption, it is important to combine more than one theoretical model to achieve a better understanding perception of technology use phenomenon. More specific research needs to be carried out in the respective sectors in order to validate the construct or create a new framework on technology use in form of localized or national level.

Another finding was that no one has specific responsibility for research and development, and for vetting the emerging technologies' tools that might contribute to an IT perception innovation. It seems that the IT perception is not in anybody's mind; in that it is not a desirable situation for new creative growth.

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