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Understanding Physicians' Internet Adoption Pattern: A Hybrid Approach for Pharmaceutical Marketing

Avadhut Patwardhan*, Neeraj Pandey, S. M. Dhume*****

Abstract

The phenomenon of user acceptance of technology including Internet has become one of the key research themes by various researchers. The emergence of Internet has brought changes in traditional methods of marketing communications almost for every sector including the pharmaceutical industry. Previous researchers have mentioned that the Internet adoption among the physicians' (especially in developing countries context) is need to be examined by deploying predominantly established models like TAM, IDT and TRI. Therefore an extensive review of literature emphasizing on IDT, TAM and TRI studies has been conducted; also the studies which examined physicians' adoption of technology have been reviewed. The review of literature indicates that the prominent model and theories like TAM and IDT has some limitations in explaining user acceptance and these limitations could be tackled by integration. The literature also supported that integrated models of TAM and IDT and TAM and TRI have explained user acceptance phenomenon superiorly to TAM. Therefore, the various relationships which have been postulated in previous studies were recorded and analyzed. The literature reported that TAM examines effect of perceived beliefs, IDT examines effect of innovation attributes, and TRI examines effect of individual's readiness on acceptance and no framework is available which checks combine impact of these models. Hence based on a critical analysis of literature, this study suggests an integrated framework consisting of Innovation Diffusion Theory (IDT) Technology Acceptance Model (TAM) and Technology Readiness Index for examining adoption pattern of Internet among physician. Future research directions about the integration have also been suggested.

Keyword: Technology Adoption Model (TAM), Innovation Diffusion Theory (IDT), Technology Readiness Index (TRI), Pharmaceutical Promotion, Physicians

Introduction

The number of Internet users has been continuously increasing and has witnessed a quantum jump in last decade. Globally, about 2.4 billion individuals are using the Internet and Asia contributes 44.8 percent of this Internet user population; out of these 44.8 percent India has 12.72 percent of Internet users (Internet World Stats, 2012). This increased usage of Internet has also impacted the healthcare sector. Kaissere (1995) and Silberg, Lundberge and Musacchio (1997) opined that the Internet has emerged as an inclusive technology for the healthcare sector. The previous survey data of American Medical Association (1997, 1999 and 2000) and Canadian Medical Association (1999) consistently showed that physicians' usage of the Internet has increased significantly. The Internet was being used for accessing personal e-mails; searching information about medical advances in specific diseases, travel bookings and gathering information about personal and healthcare products; and for the purpose of professional communication. Bhangale (2008) reported that over the years, various traditional means of pharmaceutical marketing techniques have been used by the pharmaceutical companies. These various pharmaceutical marketing strategies are targeted towards various customers like physicians and retailers. Out of these various strategies deployed by the pharmaceutical companies, advertising and personal selling were targeted towards physicians. The personal selling strategy

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consisted of medical representative visits for providing information about the product viz. detailing and providing drug samples to the physician. The advertising consisted of advertisements published in the medical journals and mailers to physicians. These strategies have been deployed for generating prescription by physicians that may eventually lead to sales of that pharmaceutical product.

According to Confederation of Indian Industries (CII Report, 2010), the increasing marketing opportunities had attracted many players in Indian pharmaceutical market that enhanced the competition. This has resulted in large availability of "me-too" products which accelerated business competition. These challenges of increased competition and busy physicians impacted time allotted by physicians to the medical representatives which got reduced significantly (Bhangale, 2008). These challenges may be tackled by finding new ways of communication and by developing new media mix for managing physicians effectively.

Buckley (2004) and Masood, Ibrahim, Hassali and Ahmed (2009) mentioned that the challenge of enhanced competition can be tackled through adopting Internet as an emerging marketing communication medium for pharmaceutical promotions.

Further, Masood *et al.* (2009) mentioned that in rapidly changing global and technological environment the pharmaceutical promotions need to incorporate modern techniques of pharmaceutical promotion like telephone detailing, e-detailing, Internet meetings and web advertising. One of the prominent modern techniques of pharmaceutical promotion includes Internet based drug promotions and detailing besides engagement through blogs, online healthcare forums and social networking websites.

Organization of Pharmaceutical Producers of India (OPPI) has defined pharmaceutical promotion as any activity undertaken, organized or sponsored by a member company which is *directed at healthcare professionals* to promote the prescription, recommendation, supply, administration or consumption of its pharmaceutical product(s) *through all media, including the Internet and mobile SMS*(OPPI Code of Pharmaceutical Marketing, 2012). This definition indicates that in India, pharmaceutical promotions are physician directed unlike developed countries where direct to consumer advertisements (DTCA) strategies are used. Therefore, the pharmaceutical marketers operating in India need to understand the Internet adoption and usage patterns of the physicians for survival and growth in this competitive environment. Masters (2008) mentioned that physicians' Internet usage has been extensively examined by adopting various approaches for various levels like individual level, institutional level, national level and international level. These studies have used various methods for collecting the data including self-administered questionnaires and postal questionnaires. Masters (2008) reported that even though these various approaches are used to examine physicians' Internet usage; there is a lack of uniform and systematic approach or methodology. He claimed that there is no knowledge of Internet usage by doctors in the developing world. As the less number of studies are available from the developing countries. Masters (2008) concluded that theoretical frameworks like Diffusion of Innovations, Technology Adoption Model, the Unified Theory of Acceptance and Use of Technology and other theoretical frameworks may provide a uniform approach to examine physicians' Internet usage. This conclusion reported by Master's (2008) indicates that there is a lack of scholarly work related to "*examining physician's Internet usage*".

Patwardhan, Pandey and Dhume (2014) reported that adoption of technology has been viewed as a *decision making process* (by Rogers, 1983) which is viewed in terms of behavioural action resulting from *willingness*(by Dillon & Morris 1996). Patwardhan *et al.* (2014) have examined physicians' technology adoption phenomenon by adopting a meta-theoretical framework proposed by Markus and Robey (1988). The findings of this study revealed that physicians' technology acceptance phenomenon has been viewed as an individual's user acceptance decision. This study revealed that physicians' technology acceptance phenomenon is predominantly examined by Technology Acceptance Model (TAM) proposed by Davis (1986). The TAM model is representative, robust, and prominent model used for examining technology acceptance phenomenon. Further, this study suggested integration of IDT and TRI constructs with TAM constructs.

Formal Method used to conduct the literature review

Therefore for better understanding of the theoretical back ground and to understand the Internet adoption

phenomenon in a better way; an extensive and systematic literature review emphasizing on TAM, IDT and TRI has been conducted.

Literature Review

Search Strategy (keywords used to search articles)

Masters (2008) mentioned that search strategy and inclusion-exclusion criteria considered for selection of scholarly article are need to be reported in a systematic review. The present study has adopted sensitive search strategy (previously used by Masters, 2008) for searching the literature. In sensitive search strategy, all the possible ways that an author might describe key words and phrases are thought of and are used for collecting the scholarly literature. An objective oriented search strategy has been adopted to find scholarly articles emphasizing on TAM, IDT and TRI. The Famous Boolean Operators 'And', 'Or' are used to get expected outcomes.'Language of writing' has been used as a criterion for inclusion of a study; hence studies written in English language are included whereas relevance was considered as a criterion for exclusion.

Journal Database Used to Get the Articles

Published literature and reference sections of published work were used as a starting point for the search. Structured literature review was carried out in "Science Direct", "EBSCO" and "PROQUEST" for all the available years and research institute libraries. In some cases the authors were contacted successfully for the access to the literature. The details about scholarly journals considered for the literature revieware shown in Table 1 and details of year wise classification of the scholarly articles are presented in Figure 1.

How the articles are narrowed down into the final number of articles

A stepwise approach proposed by Master (2008) was customized and adopted for narrowing down into final number of articles. The approach is diagrammatically presented as Figure 2.

Table 1: Journal-wise Presentation of Scholarly Articles Considered for Review

Journal	*No. Articles*	*Journal*	*No. Articles*
MIS Quarterly	5	Topics in Health Information Management	1
Decision Sciences	3	Journal of Service Management	1
Decision Support Systems	1	New England Journal of Medicine	1
Information Systems Research	3	Communications of the Association for Information Systems	1
Information Resources Management Journal	1	Educational Technology and Society	1
Journal of Medical Marketing	1	Psychology and Marketing	1
Journal of Retail Banking	1	International Journal of Medical Informatics	2
Technovation	1	Journal of Consumer Research	1
Journal of Management Information Systems	2	Journal of Clinical and Diagnostic Research	1
Information and Management	9	Journal of Global Information Technology Management	1
Australian Journal of Business and Management Research	1	Journal of Service Research	1
Family Medicine	1	Journal of Global Information Management	1
Proceedings of various conferences	6	Journal of American Medical Association	1
Management Science	3	Information and Software Technology	1
Annual Review of Information Science and Technology	1	Med Care Res Rev	1

Figure 1: Year-wise Classification of Scholarly Articles Considered for Review

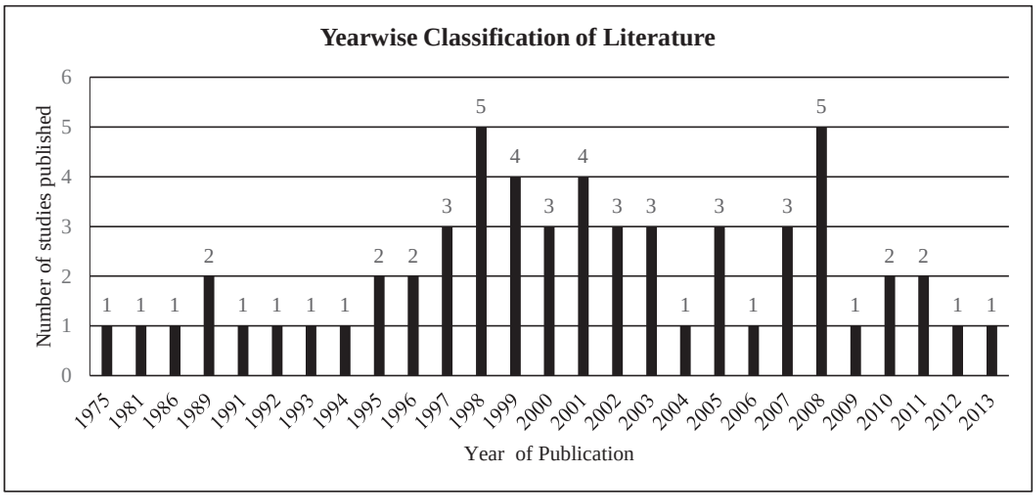
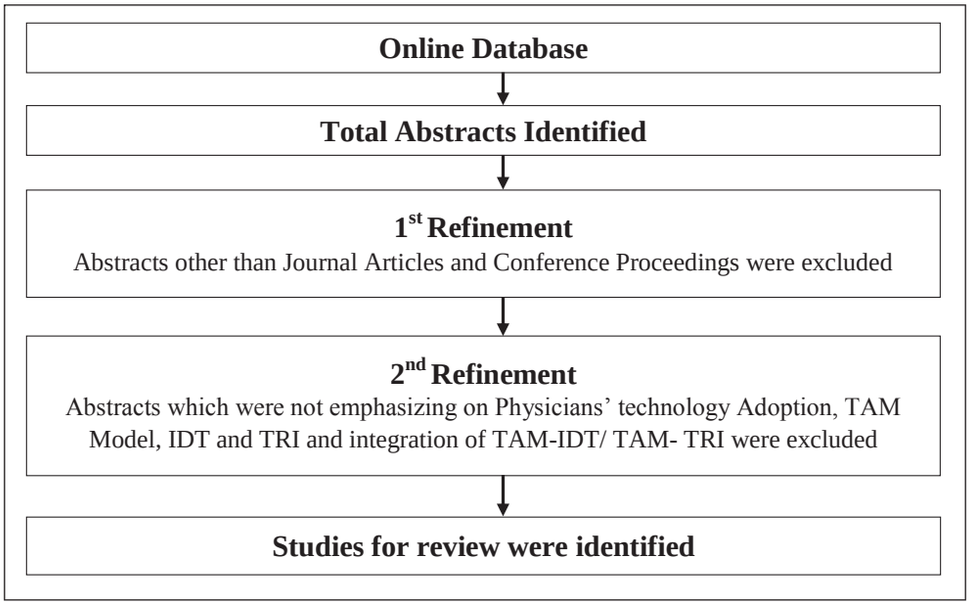


Figure 2: Stepwise Approach Adopted for Narrowing Down Scholarly Articles



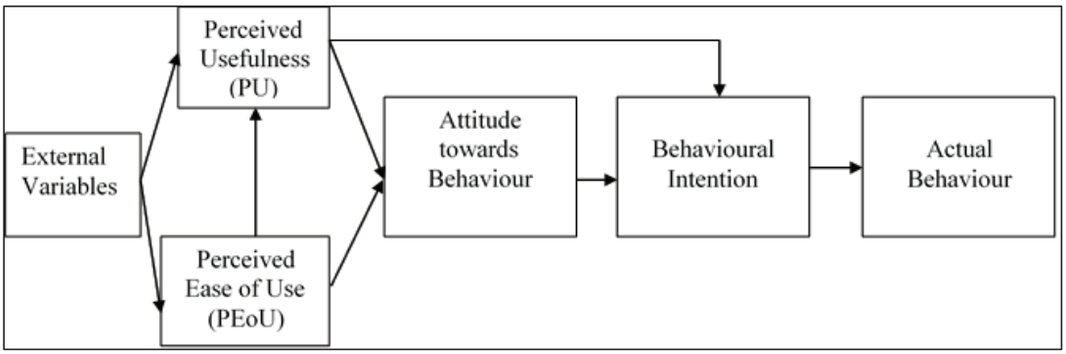
Understanding About the Theoretical Background

The systematic review of literature has helped in understanding the theoretical background in a better way the understandings are mentioned respectively for Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT) and Technology Readiness Index (TRI)

Technology Acceptance Model (TAM)

The TAM model is an intention-based model (Hu, Chau, Olivia, Sheng & Tam, 1999) which was developed by Davis (1986) for explaining and predicting user acceptance. The TAM has used Theory of Reasoned Action (TRA) model as foundation. The TRA model had been proposed by Fishbein and Ajzen (1975) for predicting and explaining human behaviours. TAM consists of two important determinants i.e. Perceived Usefulness (PU)

Figure 3: Technology Acceptance Model (TAM) (Davis, Bagozzi and Warshaw, 1989)



and Perceived Ease of Use (PEoU) which are defined as "the prospective user's subjective belief that using a specific application system will increase his or her job performance within an organisational context" and "the degree to which the prospective user expects the use of the target system to be free of effort" respectively (Davis, 1986).The TAM model is presented in Figure3.

The PU and PEoU have been widely used for measuring acceptance, adoption, and use of information technologies (Davis, 1989). These two constructs (PU and PEoU) could explain an individual's attitude towards the adoption of an application or which further impacts behavioural intention to use (BI), and actual system use (AU). The TAM has provided an explanation of the determinants of technology acceptance that helped in understanding user behavior for various types of information technologies and user (Davis, Bagozzi & Warshaw, 1989).The TAM has been found applicable for individuals of varied IT competency, genders, and ages (Yu, Ha, Choi & Rho, 2005). Venkatesh and Davis (2000) reported that TAM explained individuals' technology acceptance in mandatory and voluntary technology usage settings. Various authors (Straub, Keil & Brenner 1997; Rose &Straub 1998; Al-Gahtani 2001; McCoy, Everard & Jones, 2005) have confirmed that TAM model is suitable across most cultures.

Extensions of TAM

Due to the applicability, simplicity, robustness and parsimonious nature TAM has been explicitly used (ex. Davis *et al*., 1989; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Lee, Hsieh & Hsu, 2011). Further, TAM has been tested (Hendrickson, Massey & Cronan, 1993; Hu & Chau, 1999; Chismar & Patton, 2002), extended (Adams Nelson & Todd, 1992) and compared with other models (Davis *et al.*, 1989). These models include an integrated model of TAM and Theory of Planned Behaviour by Taylor and Todd (1995), TAM 2 proposed by Venkatesh and Davis (2000), Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh, Morris, Davis and Davis (2003), an integration of TAM and TRI (Walczuch Lemmink & Streukens, 2007; Lin Shih & Sher, 2007) and a combined model of Task-technology fit and TAM given by Chang (2008). The technologies that have been considered and users examined in the TAM studies are presented in Figure 4 and 5.

The observation revealed that few studies (12 studies) have considered adoption of the Internet (Figure 1) and a few studies (4 studies) have focused on technology adoption by physicians as users (Figure 4). This observation indicates that Internet adoption of physicians has been a less explored research area. Further Masters (2008a,b) mentioned about same kind of observation in developing country's context as an outcome of a systematic review. study also reported that applicability of various models like TAM, IDT and TRI need to be reviewed in physicians' Internet adoption context. Therefore studies considering TAM model for examining physicians' technology adoption have been reviewed.

TAM for Understanding Physicians Adoption of Technology

Six published scholarly articles and two literature reviews have been studied to understand applicability of TAM in healthcare sector. The major findings of these studies are presented in Table 2.

Figure 4: Technologies studied in TAM Literature (Authors' Analysis)

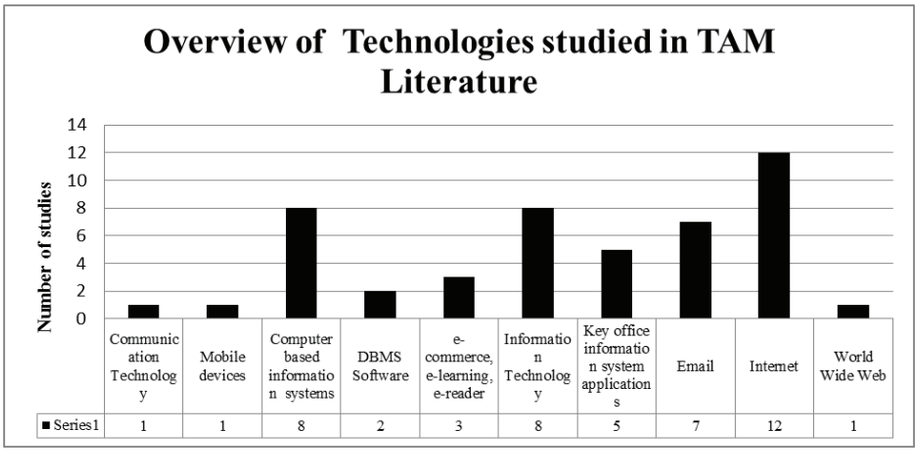
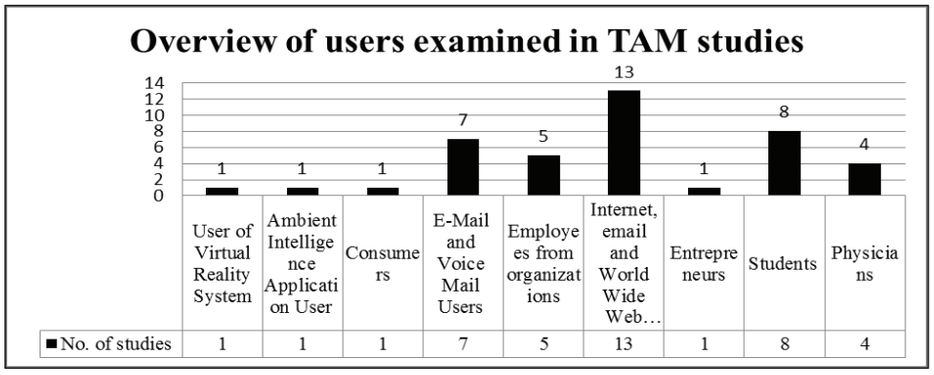


Figure 5:Users examined in TAM Literature (Authors' Analysis)



Innovation Diffusion Theory (IDT)

IDT has been widely used in various disciplines like education, sociology, communication, agriculture, marketing, and information technology (Lee*et al.*, 2011). IDT has been oriented around the central concept of innovation diffusion. Rogers (1962) gave Innovation Diffusions Theory (IDT) which also explained individual's adoption decisions or intentions. According to IDT, potential users 'make decisions to adopt or reject an innovation based on beliefs that are formed about the characteristics of innovation'. The Innovation diffusion is the process in which an innovation is communicated over time among the various members through definite channels (Chew, Grant and Tote, 2004 and Masters, 2008). In context of medical practice, the IDT has been previously used by scholars for understanding physicians' acceptance of new drugs as well as for understanding the adoption of medical technology such as electronic order entry, interactive video and rural telemedicine (Chew *et al.*, Grant and Tote, 2004).

The IDT considers five significant innovation characteristics titled as relative advantage, compatibility, complexity, trialability, and observability respectivelyas predictor for explaining user acceptance and as a basis for modeling intention (Rogers, 1995). These factors have been defined as Relative Advantage (RA)-the degree to which it is perceived to be better than what it supersedes, Compatibility (COMP)-consistency with existing values, past experiences and needs, Complexity (CMPX)-difficulty of understanding and use, Trialability (TRY)-the degree to which it can be experimented with on a limited basis and Observability (VI)-the visibility of its results respectively. Previous studies have reported

Table 2: Overview of Major Findings

Prior studies	*Major Findings*
Dixon and Dixon (1994)	This study was based on TAM and 'end user sophistication' model which considered adoption of computerized literature searching. This study states that perceived characteristics of the innovation affected perceived usefulness and sophistication. Education, training and practical experience enhanced user capabilities which further increased the rate of adoption. Though this study has mentioned about innovation characteristics, how these characteristics impact perceived usefulness was not postulated and tested.
Hu, Chau, Olivia, Sheng and Tam (1999)	This study examined adoption of telemedicine technology by physicians associated with public tertiary hospitals of Hong Kong. It tested applicability of TAM for healthcare sector empirically. This study has postulated individual causal links for explaining physicians' adoption of telemedicine.
Dixon and Stewart (2000)	This study proposed Information Technology Adoption Model (ITAM) based on impact of perceived usefulness, fineness, external factors, and knowledge for examining adoption of information technology. This study measured the impact of TAM variables (perceived usefulness, perceived ease of use), finesse and knowledge on a stratified sample of physicians. This study concluded that these factors showed significant difference among stratified groups.
Chau and Hu (2001, 2002)	These study compared TAM and TPB (Theory of Planned Behaviour) in "professional" context and examined 400 physicians' behavioural intentions empirically. It concluded thatTAM is a suitable model for explaining physicians' intention to use telemedicine technology as compared to TPB. The study (2002) gave framework consisting of three contexts individual context, technological context and implementation context and concluded that compatibility contributed significantly in explaining physicians' technology acceptance.
Chismar and Wiley-Patton (2002)	This study considered seven factors proposed in TAM2 and examined their impact on perceived usefulness of pediatricians. These factors were related to cognitive process and social influence process. The study recommended that a modified version of TAM2 would explain physicians' Internet acceptance in a better way and physicians' technology acceptance needed to be examined across various specialties, disciplines, geographical contexts and cultures.
Yarbrough and Smith (2007)	This study reviewed 18 scholarly articles (screened from 526 abstracts) related to physicians technology acceptance and mentioned that there werefewer studies (18 studies) in physicians technology acceptance in last ten years (1996-2006). Out of theses 18 studies only seven studies had used TAM model and other eleven were non-TAM studies. The study also stated that barriers like interruption to traditional practice patterns have impacted physicians' technology acceptance.
Ketikidis, Dimitrovski, Lazuras, and Bath (2013)	This study conducted review of literature for understanding acceptance of electronic health record (EHR) and reported that the modifications, extensions and combinations of TAM have significantly added to the predictive power of TAM.

that predominantly relative advantage, compatibility, and complexity have impacted innovation adoption (Agrawal &Prasad, 1995).According to Rogers (1983) awareness, interest, evaluation, trial and adoption are the five stages which are involved in adoption decisions and these factors impact persuasion which is an important stage involved in decision making process (Figure 6).

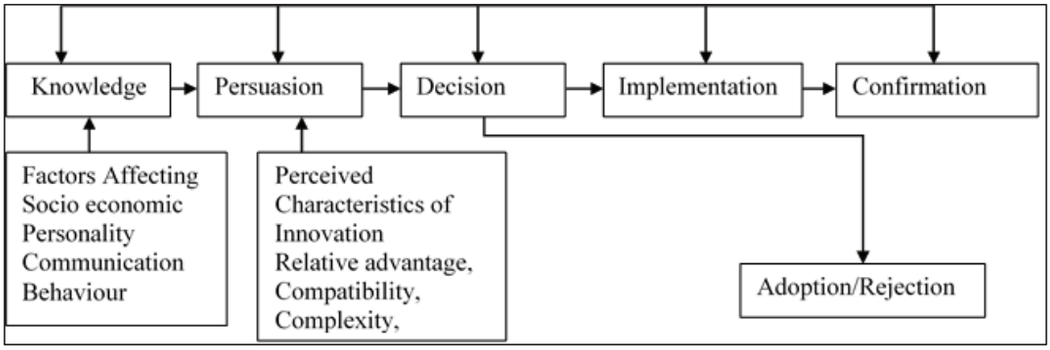
Further, Wu and Wang (2005) stated that compatibility explained a higher proportion of the variance than TAM constructs and is the most important determinant for behavioural intention to use. Hence, compatibility has been considered as leading factor to adoption in few studies like Plouffe, Hulland and Vandenbosch (2001) and Chen, Gillenson and Sherrell (2002).

Moore and Benbasat (1991) proposed that measuring potential adopter's perception is essential examining user acceptance. Moore and Benbasat (1991) developed a 38 item scale considering eight characteristics of innovating. These perceived characteristics of innovating are i) voluntariness of use, ii) image, iii) relative advantage, iv) compatibility, v) ease of use, vi) trialability , vii) result demonstrability, and viii) visibility respectively. This measure is useful for measuring potential adopter's perception related to adoption of a specific information technology in context of IT innovations technology.

IDT for Understanding Physicians Adoption of Technology

The IDT has been used by Chew *et al.* (2004) for explaining physicians' Internet adoption. This study has investigated

Figure 6: Model of Stages in the Innovation-Decision Process (Rogers, 1995)



58 family physicians' perceptions and use of the Internet situated in a midsized northeastern metropolitan area in the United States through a mail survey. This study has revealed two pathways that describe how family physicians incorporate the Internet. The first path mentioned that family physicians observe their colleagues benefiting from use of the Internet (observability) and will investigate about relative advantage which may further lead to a demonstration (trialability). The second pathway described that the physicians may use Internet after attaining a sufficient level of Internet skill. This study concluded that innovation attributes of IDT theory act as predictors of Internet usage among family physicians. The study has confirmed that demographic factors such as gender and training regency have no influence on Internet use by family physicians.

Interestingly while conducting the review; results of the study conducted by Dixon and Dixon, (1997) have concluded that increased 'ease of use' increases the physician's adoption of the system where as Hu*et al.* (1999) have mentioned that perceived ease of use was not a significant determinant of attitude and intention.

Outcomes of review emphasizing on TAM and IDT

It was also observed that in few studies (like Dixon &Stewart, 2000) relative advantage, compatibility and complexity (which are treated as separate constructs in IDT) have been included as items for measuring perceived usefulness (included relative advantage and compatibility) and ease of use (included complexity).

It has been also confirmed in few studies that the extension of TAM has performed better in comparison with TAM. For example, Moon and Kim (2006) conducted a study and compared extended TAM with the original TAM, the results of this study revealed that both the models have explained a considerable variance in individual's attitude (TAM 33 percent and extended TAM 38 percent) and behavioural intention (TAM 35 percent and extended TAM explained 39 percent) toward using the Internet.

The studies which have tested the applicability of TAM and IDT in a healthcare setting lacked methodological rigor. These studies have confirmed that even though the perceived ease of use construct has not fully supported; the TAM is appropriate model for physician population and the incorporation of physician-specific variables into the model will enhance explanatory power. Even though these theories have been regularly used for predicting user acceptance behaviour, these theories have not emphasized on the individual's propensity to adopt the technology. Therefore, the literature related to TRI been studied for better understanding.

Technology Readiness Index

The technology has been emerging as a sophisticated medium in selling and serving customers and has brought vital changes in the nature of interactions occur between company and customers (Parasuraman, 2000).Further, Parasuraman (2000) mentioned that the introduction of technology has changed marketing's traditional domain and structure and made marketing and promotional activities of companies more sophisticated. This has resulted into

transformation of the fundamental ways of customer-company interactions. The traditional pharmaceutical marketing process indicates the involvement of internal and interactive marketing forms suggested proposed in the triangle model of marketing by Berry (1981). According to triangle model internal marketing (treats service personnel as internal customers and prepare them for providing better service through training, motivation and rewords) and interactive marketing (deals with creating a good impression on customers during encounters with service personnel) are additional forms of marketing along with external marketing. The triangle model dose not captures the emerging role of technology which is captured by the proposed pyramid model (Parasuraman, 1996). The pyramid model considers three links technology-company, technology-employee and technology-customer. The model is presented in Figure 7.

Parasuraman (2000) focused on technology-employee and technology- customer links of pyramid model and reported that new technologies have started penetrating into day to day life of individuals through various facets with a much faster rate.These technologies cause both positive and negative feelings because of eight paradoxes (Mick &Fournier, 1998). Considering these feelings a hypothetical technology belief can be drawn and can be anchored by strongly positive at one end and strongly negative at the other on which an individual's position may be fixed by considering the propensity to embrace the technology and use of the technology.

According to Parasuraman (2000) individual's acceptance and use of technology is an outcome of the individual's predispositions. Further, these predispositions are outcome of the overall state of mind of the individuals that is an outcome of collective impact of mental enablers and inhibitors. These factors are Optimism (a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives) and Innovativeness (a tendency to be a technology pioneer and thought leader) are drivers of technology readiness and Discomfort (a perceived lack of control over technology and a feeling of being overwhelmed by it) and Insecurity (distrust of technology and skepticism about its ability to work properly) act as inhibitors.

Further limitations of TAM, IDT and TRI have been reviewed for conceptualizing in a better way.

Limitations of TAM, IDT and TRI

In process of the review, it was observed that most of models had two major limitations viz. relatively low explanatory power and inconsistent influences of the factors across studies. Sun and Zhang (2006) mentioned that a significant difference has been observed in the explanatory power between laboratory experiments and field studies. This study mentioned that field studies which have used students as respondents have shown better explanatory power in comparison with general users viz. knowledge workers and professionals. Similar observations have been reported by Dishaw and Strong (1999) and Moon and Kim (2001).

The limitations of TAM, IDT and TRI; and probable solutions to overcome the limitations suggested by previous scholars are presented in Table 3.

Figure 7: Differences between Triangle and Pyramid Model (Parasuraman, 2000)

Table 3: Overview of Limitations of TAM, IDT and TRI

Study	*Limitation*	*Probable Solution*
Hu, Chau, Olivia, Sheng and Tam (1999) Venkatesh et al. (2003) Legris, Ingham, and Colerette (2003) Sun and Zhang (2006)	The TAM model has been found less parsimonious for health-care sector. Further TAM has low predictive validity and relatively low R-square. Previous TAM studies have reported about inconsistency and ambiguity among relationships across differing contexts. Limitations in explaining the social change process and limited explanatory power in comparison with extended or modified versions of TAM has also been observed.	Incorporation of additional factors, moderating factors, context specific factors or integration with other IT acceptance models will improve specificity and explanatory utility and predictive validity of model. Inconsistency and ambiguity found in TAM studies can be tackled by including some other significant factors. The integration would broader the potential of TAM and would include variables related to both human and social change processes.
Yarbrough and Smith (2007)	The TAM constructs cannot fully mediate the influences of external variables on behavioural intentions for which it was formulated.	This limitation can be overcome by inclusion of variables customized to the sample population especially for healthcare sector.
Lin, Shih and Sher (2007)	The organisational and marketing contexts are different in nature. Previous literature reported that in marketing context the adoption is not mandated hence TAM has less applicability.	Integration of theoretical constructs broadens the applicability and explanatory power of the model.
Roecker (2010)	This study reported that that future technologies will be context specific. Therefore factors like ease-of-use, which has been for predicting technology acceptance for more than 20 years no more remain appropriate.	These factors need to be integrated with other constructs which might play a key role in the acceptance decision. This logic has been supported by Chen, Li and Li (2011).
Lyytinen and Damsgaard (2001)	IDT does not cover important dimensions related to adoptions as the constructs offered are not sufficient to explain the collective adoption behaviours.	Researchers should develop multi-layered theories which may factor out various perspectives related to adoption by including various models and theories.
Lin, Shih and Sher (2007), Jiun-Sheng Chris Lin, Pei-Ling Hsieh, (2012)	Parasuraman (2000) mentioned that scars availability studies which have used TRI scale had created an issue of lack of support. This lack of support has leads to an issue of lack of generalizability which has become a key gap which need to be addressed.	Jiun-Sheng Chris Lin, Pei-Ling Hsieh, (2012) reported that the replication and cross-validation of TRI will enhance the generalizability of the TRI and will address the aforementioned gap by increasing the applicability through refinement, replication and validation across several samples, contexts, and cultures.

Considering the probable solutions suggested by previous scholars; a research scope has been emerged which has offered an opportunity for proposing new models and extensions to both TAM and IDT based on new relationships.

Advantages of Integration

The previous studies have stated about advantages of integration. The innovation diffusion theory provided advantage of more comprehensive factors whereas technology acceptance model offered a better mechanism for explaining user acceptance, recognition and behaviour (Zhang, Guo & Chen, 2008). Also TAM and IDT complement each other as the constructs employed in TAM were fundamentally a subset of perceived innovation characteristics (Lee *et al*., 2011). Hence the integration of these two theories could provide an even stronger model than either standing alone (Chen *et al*., 2002).

Considering these logical arguments, the advantages of TAM, IDT and TRI can be leveraged by integrating these most influential models.

For further understanding of integrative perspective studies dealing with integration of IDT construct with TAM and other models as well as TAM and TRI have been reviewed. The major findings of these studies are presented in Tables4 and 5.

Relationships between the TAM and IDT, TAM and TRI Constructs: An analysis

It has been mentioned that there is an inconsistency related to measuring user acceptance (Sun & Zhang, 2006). Some studies used attitude (AT) for measuring user acceptance while other studies used either behavioural intention (BI) or actual usage (AU) for measuring the same. In light of this postulated relationships among TAM and IDT constructs

Table 4: Integrative Studies (TAM and IDT) on Technology Acceptance

Prior studies	*Major Findings*
Agarwal and Prasad, 1997, 1998	The studies have mentioned that Innovation characteristics like visibility, compatibility, trialability and voluntariness impact current use and future use intentions as relative advantage and results demonstrability were found relevant for future use intention of the target technology. Personal innovativeness exhibits a moderating influence on the relationship between relative advantage, ease of use, compatibility and behavioural intention.
Karahanna et al. (1999)	This study reported that the factors affecting the potential adopters and actual users are different.
Chen et al. (2002)	This study has identified a substantively a statistically justifiable path between compatibility and perceived usefulness.
Wu and Wang(2005)	This study has integrated innovation diffusion theory into TAM for investigating impact of factors that determines user's acceptance of mobile commerce technology. Perceived risk, and cost have also been considered in this study. This study revealed that except perceived ease of use all other variables have shown significant impact on behavioural intention of users.
Yi, Jackson, Park and Probst (2006)	This study has developed a more complete, coherent and unified model for predicting user acceptance based on three closely related theoretical paradigms (IDT, TAM, and TPB). The model has explained 52 percent of physicians' intention to accept an innovation with a good model fit.
Zang, Guo and Chen(2008)	This study has explained about 56 percent of the variance for actual use, which is higher than the average level for prior empirical studies on IT acceptance. This study concluded that the IDT constructs are antecedents for the two key TAM factors and have explained 81% of the variance for PU and 62% variance for PEOU.
Lee, Hsieh and Hsu (2011)	The empirical outcomes of this study have strongly supported the integrative approach as the innovation attributes have significantly impacted behavioural intention and perceived ease of use (TAM variables).

Table 5: Integrative Studies (TAM and TRI) on Technology Acceptance

Prior studies	*Major Findings*
Lin, Shih and Sher (2007)	This study proposed and empirically tested an integrated model (TRAM) which augments TAM by considering TRI constructs in context of adoption of innovations by consumers. This study revealed that the proposed model has ability to broaden explanatory power of TAM and TRI.
Walczuch, Lemmink, and Streukens (2007)	This study has combined TAM and TRI and examined relationship of personality and technology acceptance by measuring personality trait dimensions (optimism, innovativeness, discomfort, and insecurity) and cognitive dimensions (perceived ease of use and perceived usefulness). The study concluded that the personality traits had shown significant impact on the perceptions of users except innovativeness.
Erdogmus and Esen (2011)	This study reported that optimism and innovativeness impact perceived ease of use and perceived usefulness and discomfort and insecurity dimensions have no positive impact on these variables.
Godoe and Johansen (2012)	This study reported that both personality dimensions (optimism and innovativeness) and system specific dimensions (TAM constructs) create impact on technology adoption.

have been reviewed. For fixing up the dependent variable of the framework a review of 29 articles was carried out it has been observed that majority of the articles have considered "Actual Use" (of the system or technology) as a dependent variable. The overview of these 29 articles is presented below (Figure 8) and details of these studies are presented in Table 6.

The remaining relationships have been determined by considering the recently published studies which has considered integrated model consisting of TAM and IDT as well as TAM and TRI. The details of these studies are presented in Annexure 1.

Integrated Model: Conceptual Framework

The TAM model considers technology acceptance phenomenon as a behavioural response of perceived beliefs like perceived ease of use and perceived usefulness which impact use and acceptance of a technology whereas the IDT considers user acceptance as decision making based on innovation attributes. Further TRI checks impact of individual's propensity to adopt a technology. This logic is presented in (Figure 9).

Figure 8 Overview of Dependent Variable Examined in Studies Reviewed (Author Analysis)

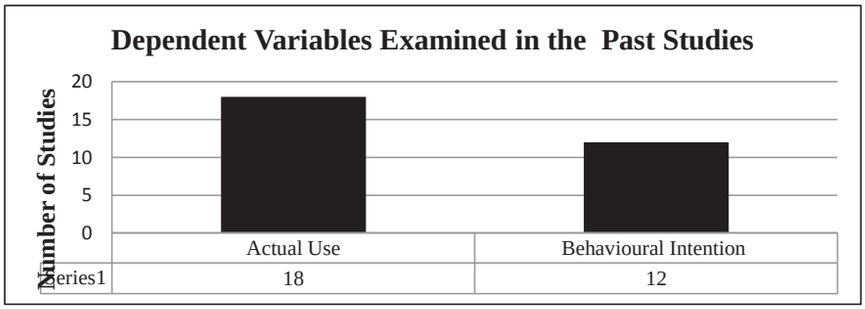


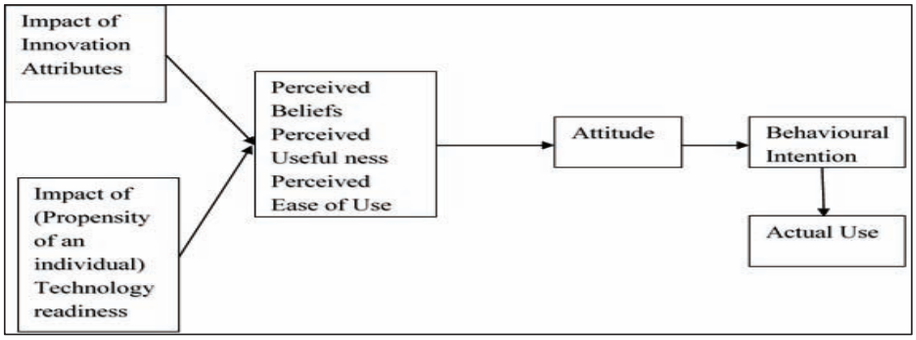
Table 6: Overview of Dependent Variables Considered in Past Studies

Author and Year	*Dependent Variable*	*Total Studies*
Davis (1986); Davis, Bagozzi and Warshaw(1989); Adams Nelson and Todd (1992); Taylor and Todd (1995); Dishaw and Strong (1999); Karahanna and Straub(1999); Dixon and Stewart (2000); Al-Gahtani (2001); Moon and Kim (2001); Chismar and Patton (2002, 2003); Chen, Gillenson and Sherrell (2002); Venkatesh et al., (2003); Chew, Grant and Tote (2004); Wu and Wang (2005); Zhang, Guo and Chen (2008); Masters (2008)	Actual Use	17
Dixon and Dixon(1994); Agarwal and Prasad (1997, 1998); Hu, Chau, Liu Sheng and Tam (1999); Karahanna, Straub and Chervany (1999); Venkatesh and Davis (2000); Chau and Hu (2001, 2002); Yu, Ha, Choi and Rho (2005); McCoy, Everard, and Jones (2005); Yi, Jackson, Park and Probst (2006); Lee, Hsieh and Hsu (2011)	Behavioural Intention	12

On the basis of a systematic review of 73 articles, Turner (2010) stated that behavioural intention is correlated with actual use and need to be considered as predicator of actual use. Further, Turner (2010) stated that actual use could be treated as perceived use and measured by subjective measures. Considering these two observations the present study identifies "Actual Use" (AU) as dependent variable of the framework and "Behavioural Intention" (BI) as predictor of actual use which has also been considered by previous studies emphasizing on integrated model based on IDT and TAM (Chen *et al*., 2002; Wu and Wang; 2005).

As previous studies (Venkatesh & Davis, 2000) reported that attitude is a weak predictor of behavioural intention it has not been considered in the framework. It has been also reported that the TAM constructs (perceived ease of use and perceived ease of use) explain 40 percent of the variance (Legris, Ingham & Collerette, 2003) therefore even though perceived ease of use has shown less impact in case of physicians' technology acceptance context it has been considered in the framework along with perceived usefulness (Dixon & Dixon, 1997; Dixon &Steward,

Figure 9: Internet Adoption According to TAM Model, IDT and TRI



2000; Chismar & Patton, 2002). Therefore the present study has conceptualised a new framework which views adoption of Internet by physicians as behavioural response as well as a decision. This frame work will check impact of TAM constructs considering IDT and TRI constructs as antecedents. Considering the logic and the literature support for the various relationships a conceptual model has been formulated which has behavioural intention as a predictor of actual use (Figure 10).

The Theoretical Background for Categorisation of Physician Internet Adopters

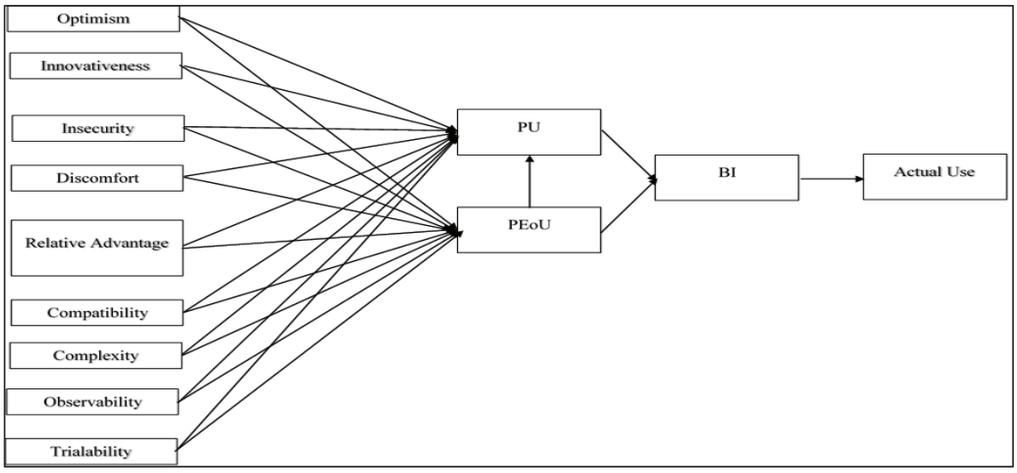
Rogers (1983) reported that individuals adopt an idea or a technology at different times and not at the same time. This adoption follows a time sequence on the basis of "when the individual first used a technology". Rogers (1983) reported that these categorisations have used "actual use" as a basic criterion for categorisation. Therefore the categorisation deals with actual change in behaviour and not deal with cognitive or attitudinal change.

Rogers (1983) reported that distribution of adopter category follows normal distribution and characteristics of normal distribution (Mean and Standard Deviation) can be used for categorizing the distribution into 5 different categories which are i) innovators, ii) early adopters, iii) early majority, iv) late majority, and v) laggards. These adopter categories are further conceptualized as ideal types. Rogers (1983) provided detailed descriptions about these ideal types as well as dominant characteristics and values of each category. These characteristics could be measured and used as parameters of comparison. The generalisations about these ideal types are reported by Rogers (1983). These generalisations are reported in terms of socio-economic status, personality variables and communication behaviour.

Rogers (1983) has emphasized on age of the adopters, year of education, literacy of the respondents and socio-economic status measured in terms of various measures (ex. income, level of living). He reported that social status positively impacts innovativeness. This relationship can be explored as innovativeness is one of the constructs of TRI. Further in case of generalisations related to personality variable Rogers (1983) reported early adopters as individuals with greater empathy, less dogmatic, high level of rationality. Further these early adopters have ability to deal with abstractions, greater intelligence, and more favorable attitude towards science, change and education and less fatalistic.

Rogers (1983) also reported that early adopters have higher ability to deal with uncertainties and risk and higher level of achievement motivation and higher aspirations. In case of generalisations related to communication behaviour of early adopters. Rogers (1983) mentioned early adopters as highly interconnected, more cosmopolite individuals with high inclination towards social participation. Further early adopters have greater exposure to mass media communication and interpersonal communication channels, more actively involved in seeking information

Figure 10: Conceptual Model



about innovation, have higher degree of opinion leadership and have greater knowledge of innovation.

Rogers (2003) reported that if two or more individuals who have certain similar attributes like education, membership of professional bodies, and a "mutual subcultural language" can be considered as "homophilous" individuals of a social system. Further Parasuraman (2000) has mentioned that the Technology Readiness Index (TRI) can be used as a parameter of segmentation and the respondents can be categorized into three categories (Low TRI, Medium TRI and High TRI) based on the mean technology readiness index.

Considering this definition and aforementioned generalisations physicians having same qualification, specialty can be treated as "homophilous" and therefore their adoption can be viewed as a decision making. In case of Internet based physician directed pharmaceutical promotion in specific understanding of such categories will help the pharmaceutical marketers in segmenting the physicians into different segments and in differentiating in promotional strategies.

Conclusion and Future Directions

The use of the Internet has been increasing significantly all over the word and by quantum leaps within India. The enhanced penetration of the Internet has made it prominently visible in almost all sectors of economy including the healthcare sector. The incorporation of the Internet as a medium for pharmaceutical promotions has provided opportunity for better engaging physicians. The present study has reviewed the prominent theories of technology adoption viz. TAM and IDT; and examined limitations of these theories. It has been observed during review that only few studies have examined the acceptance of the Internet and studied adoption behaviour of physicians. It has been also observed that few recent studies have used integration of Technology Acceptance Model (TAM) with Diffusion of Innovation (DOI). Based on theoretical support this study has proposed an integrated framework for understanding the Internet adoption patterns of physicians. This study has considered user acceptance both as behavioural response (Davis, 1995) and a decision (Rogers, 1983) and formulated basis of the framework. This study has analysed various postulated relationships considered in previous researches which may be incorporated in the model based on the framework which may offer advantages of integration. In future the constructs from other theory may be incorporated and the robustness of TAM can be enhanced. These adoptions patterns may help the pharmaceutical marketers in profiling physicians. The knowledge of such profile groups will help in targeted physician directed Internet-based pharmaceutical promotion leading to better sales of specific pharmaceutical products.

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ANNEXURE 1

Table A1: Overview of TAM-IDT Relationships

Relationship among TAM-IDT Constructs	*Studies Author (Year)*	*Justification for consideration*
CPA→ PU	Wu and Wang (2005), Zhang, Guo and Chen (2008), Lee, Hsieh and Hsu (2011)	Even though only three studies have considered this relationship; all these studies have considered the TAM and IDT integration and not a single study has examined physicians. Therefore the relationship has been considered in conceptualisation.
CPA→ PEoU , ADV→PU, TRI→ PEoU, ADV→PEoU, TRI→ PU, CPL→ PU, CPL→ PEoU, OB→ PU,OB→ PEoU	Zhang, Guo and Chen (2008), Lee, Hsieh and Hsu (2011)	These studies have considered the TAM and IDT integration and not a single study has examined physicians as user. Therefore the relationship has been considered in conceptualisation.

Table A2: Overview of TAM-TRI Relationships

Relationships among TAM –TRI constructs	*Author (Year)*	*Justification for consideration*
Optimism→ PU, Optimism→ PEoU, Innovativeness→ PU, Innovativeness→ PEoU, Insecurity→ PU, Insecurity→ PEoU, Discomfort→ PU, Discomfort→ PEoU	Walczuch, Lemmink and Steruken (2007), Erdogmus and Esen (2011), Godoe and Johansen (2012)	These studies haveprovided a theoretical support for considering and conceptualising the relationship.