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## **Model For Technology Acceptance: A Study Of Student's Attitude Towards Usage Of Wi-Fi Technology**

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***Abstract:***

*Advanced information technology has become an important means of conducting day-to-day business and life-activities. Strong telecommunication infrastructure is imperative to actively participate in the global information economy. However, new market entrants for wireless communications such as Wi-Fi (wireless infidelity) and WIMAX have swiftly replaced existing fixed line mode of communications with their new applications and services. Present empirical study was carried out for the purpose of assessing the effect of a number of determinants to affect the use of free Wi-Fi by university students pursuing higher studies, the mediating effect of attitude towards formation of usage of Wi-Fi and finally acceptance of Wi-Fi technology. .*

*The study uses constructs from information technology, human resource management, industrial psychology and, diffusion and consumer adoption of innovation. Quantitative data (N=30) were collected through self-administrated questionnaire from university students especially research scholars. Data are analyzed using logistics and multiple regressions. The results provide effect of the proposed factors where relative advantage, facilitating conditions, and wireless trust environment are found to be strong determinants of attitude towards Wi-Fi usage. Technology Complexity is found to be strongly but negatively affect Wi-Fi usage. Social influence is found to have less effect on attitude towards formation of Wi-Fi usage. Study proposes a model that reveals positive effect of attitude towards Wi-Fi usage on technology acceptance. Six propositions are developed to promote and facilitate future empirical research relating to Wi-Fi usage.*

***Keywords:*** *technology acceptance model, wireless infidelity ,industrial psychology, diffusion, adoption of innovation.*

## 1.Introduction

In India internet penetration is in its infancy, with substantial consumers using broadband technology. Internet access through a wide variety of different technologies has been offered by a plethora of organisations. New delivery methods of wireless data technologies such as 3G and WiMAX, have been adopted rather than traditional fixed-line access points. This paper examines influence of various factors towards formation of attitude towards use of free Wi-Fi and its mediating effect on intention to accept the technology.

Wireless communication allows consumers and businesses to transcend time and place, thus increasing accessibility and expanding both social and business networks (Palen, 2002). Wireless communication also promises to provide convenience, localization, and personalization of services (Clarke, 2001). One of the driving forces behind wireless technology growth was the creation of the working group of Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard of 1997, called wireless fidelity and popularly known as Wi-Fi (Bianchi, 2000). Vic Hayes has been called the father of Wi-Fi due to his involvement in negotiating the initial standards within the IEEE while chairing the workgroup. A Wi-Fi-enabled device can connect to the Internet when within range of a wireless network. The coverage of one or more (interconnected) access points — called hotspots — can extend from an area as small as a few rooms to as large as many square miles. Coverage in the larger area may require a group of access points with overlapping coverage. Wi-Fi provides service in private homes, high street chains and independent businesses, as well as in public spaces at Wi-Fi hotspots set up either free-of-charge or commercially. Organizations and businesses, such as airports, hotels, and restaurants, often provide free-use hotspots to attract customers. Enthusiasts or authorities who wish to provide services or even to promote business in selected areas sometimes provide free Wi-Fi access. Many traditional college campuses provide at least partial wireless Wi-Fi Internet coverage. Many universities implement a campus-wide Wi-Fi coverage for its students, faculty, and staff. Wi-Fi allows cheaper deployment of local area networks (LANs). Also spaces where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs. Manufacturers are building wireless network adapters into most laptops. Use of free Wi-Fi is advantageous over use of other methods to access internet as the price of chipsets for Wi-Fi continues to drop, making it an economical networking option . Different competitive brands of access points and client network-interfaces can inter-operate at a basic level of service.

Devices such as laptop computers and personal digital assistants (PDAs) enabled with Wi-Fi can send information to and receive it from the Internet anywhere within the range of an access point. Omni directional Wi-Fi access points are currently capable of transmitting signals up to 300 feet at up to 54 megabits per second. Wi-Fi , is a popular technology that allows an electronic device to exchange data wirelessly (using radio waves) over a computer network, including high-speed Internet connections. The Wi-Fi Alliance defines Wi-Fi as any "wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards". However, since most modern WLANs are based on these standards, the term "Wi-Fi" is used in general English as a synonym for "WLAN". The focus of this study is on factors influencing the attitude formation and acceptance of Wi-Fi technology of university students pursuing higher studies.. In doing so, this study draws upon several well-established acceptance models, specifically the technology acceptance model (TAM; Davis, 1989), rooted in the theory of reasoned action (TRA; Ajzen & Fishbein, 1980), and the diffusion of innovation theory (DIT; Rogers, 1983, 1995, 2003). The results of this study will extend the current knowledge of technology acceptance, and Wi-Fi in particular. The research outcome is useful to (a) academics, in extending, integrating, and refining the TAM and DIT; and (b) government and non-profit organizations, for better assessing the benefits of free Wi-Fi. For clear communication of the research findings, this paper will first present a review of the current technology acceptance literature, followed by a discussion of the theoretical framework for the study. The paper then describes the methodology and data analysis results. It concludes with a discussion of the findings, conclusions, contributions to theory and practice, limitations, and future research. Research regarding both commercial and free Wi-Fi Internet access acceptance is sketchy; therefore, it has become imperative to understand the critical factors that affect the user acceptance of Wi-Fi. The focus of this study is on free Wi-Fi users, with the objective to better understand factors influencing their attitude towards and acceptance of Wi-Fi.

## **2.Scope Of The Study**

Current study is confined to the students of university pursuing higher studies. The study is confined to these universities of JAMMU region and respondents of the study shall comprise the students who have free access to WI-FI.

### 3.Objective Of The Study

After evaluating scope of the study and analyzing parameters of the study, following objectives have been framed:

- 1) To study the factors of Attitude Formation towards usage of free Wi-Fi.
- 2) To suggest a model for Technology acceptance free Wi-Fi.

### 4.Hypothesis

Hypothesis for the present study are:

- H 1: Relative Advantage of free Wi-Fi has a significant effect on the attitude to use free Wi-Fi
- H 2: Facilitating Conditions have a significant effect on attitude to use free Wi-Fi.
- H 3: Wireless trust environment has a significant effect on attitude to use free Wi-Fi.
- H 4 : Social Influences have a significant effect on attitude to use free Wi-Fi.
- H 5 : Technology Complexity have a significant effect on attitude towards use of free Wi-Fi.
- H 6 : Attitude towards use of free Wi-Fi has significant effect on acceptance of Wi-Fi Technology.

### 5.Review Of Literature

The term 'acceptance' is used from authors with different background and approaches. TAM (Davis, 1989) describes acceptance as 'users decision about how and when he will use technology'. Martinez (Martinez-Torres et al., 2003) notice that initial use (acceptance) is the first critical step toward e-learning, while sustainable success depends on its continued use (continuance). In this study are presented some of the most common models that used in this topic.

The Theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975) to explain the people's behaviour in a specific situation. TRA is a well-known model in the social psychology domain. According to TRA a person's actual behavior is driven by the intension to perform the behavior. Individual's attitude toward the behavior and subjective norms are the 'loading factors' toward behavior intention. Attitude is a person's positive or negative feeling, and tendency towards an idea, or behavior. Subjective norm is defined as an individual's perception of whether people important to the individual think the behavior should be performed.

Technology acceptance model (Davis, 1989; Davis, Bagozzi & Warshaw, 1989) was

adapted from the Theory of Reasoned Action –TRA. May be the most well-known and widely accepted and cited model is the technology acceptance model (TAM). Davis (1985; 1989) developed the TAM to explain the computer usage and acceptance of information technology. According to Davis ‘user acceptance is often the pivotal factor that determines the success or failure of an information system’. The term external variables include all the system design features.

The most widely accepted model used to understand end-user adoption and acceptance of information technology is the TAM (Davis 1989; Davis, Bagozzi, & Warshaw, 1989) and its extension, referred to as TAM2 (Venkatesh & Davis, 2000). Many studies have successfully applied TAM, its extension, and other theories to explain end-user acceptance of various information and communications technology systems and applications (Ajzen, 1991; Moore & Benbasat, 1991; Mathieson, 1991; Taylor & Todd, 1995b). Based on the TRA notion that a person’s behavioral intention depends on the person’s attitude towards the behavior and subjective norms, TAM theorizes that an individual’s behavioral intention to use a system is determined by two factors: perceived usefulness and perceived ease of use. Both perceived usefulness and perceived ease of use directly affect a person’s attitude towards the target system and indirectly affect actual system use (Davis, 1993). While TRA was designed to explain virtually any human behavior, the goal of TAM was to specifically provide an explanation for information systems acceptance. TAM also provides an explanation of the determinants of computer acceptance that is general and capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while simultaneously being theoretically justified (Davis et al., 1989). The Szajna (1994) study found that the perceived usefulness (PU) and ease of use (EU) instruments demonstrate reasonably good predictive validity. Legris, Ingham, and Collette (2003) concluded that TAM has proven to be a useful theoretical model for understanding and explaining user behavior. TAM has also been tested frequently in empirical research and the tools used with the model have proven to be of quality and to yield statistically reliable results (Legris et al., 2003)

A number of studies have successfully utilized TAM to study the acceptance of Internet related technologies. Such technologies include e-mail (Gefen & Straub, 1997), the World Wide Web (Agarwal & Prasad, 1997; Fenech, 1998; Moon & Kim, 2001), microcomputers (Igarria,Guimaraes, & Davis, 1995), the computer resource center (Taylor & Todd, 1995a), voice mail (Straub, Limayem, & Karahanna, 1995),

telemedicine (Chau & Hu, 2001; Hu, Chau, Sheng, & Tam, 1999), a digital library (Hong, Thong, Wong, & Tam, 2002), and online shopping (Gefen, Karahanna, & Straub, 2003).

Innovation diffusion theory (IDT) (Rogers, 1983), is another model also grounded in social psychology. Since 1940's the social scientists coin the terms diffusion and diffusion theory (Rogers, 1983). This theory provides a framework with which we can make predictions for the time period that is necessary for a technology to be accepted. Constructs are the characteristics of the new technology, the communication networks and the characteristics of the adopters. Innovation diffusion theory is a set of four basic elements: the innovation, the time, the communication process and the social system. Here, the concept of a new idea is passed from one member of a social system to another. Moore and Benbasat (1991) redefined a number of constructs for use to examine individual technology acceptance such as relative advantage. Relative advantage is defined as "degree to which an innovation is perceived as being better than its precursor"(Moore and Benbasat ,p.195)

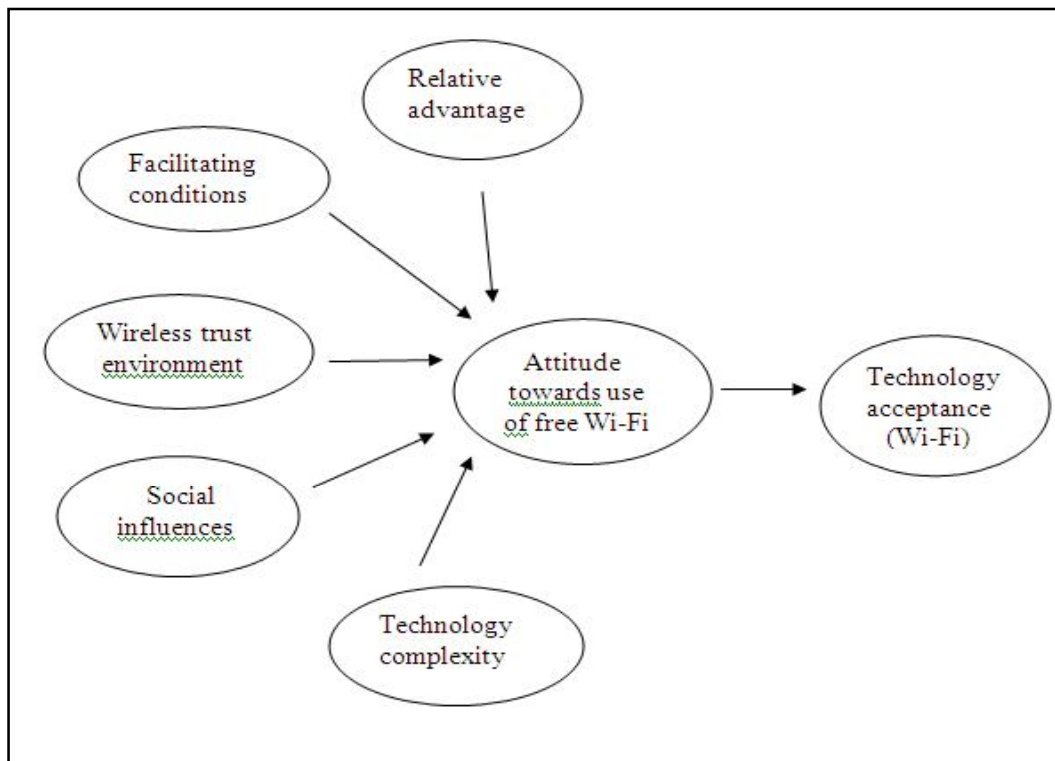


Figure 1: The research model

Model of PC utilization -Derived largely from Triandis (1977) theory of human behavior this model presents a competing perspective to that proposed by TRA and TAM. Thompson et al. (1991) adapted and refined Triandis model for IS contexts and used the model to predict PC utilization. However, the nature of the model makes it

particularly suited to predict individual acceptance and use of range of information technologies. Thompson et al. (1991) sought to predict usage behavior rather than intention, however in keeping with theory's roots, the current research will examine the effect of these determinants on acceptance. Based on Roger and Showmaker (1971) technology complexity is the "the degree to which an innovation is perceived as relatively difficult to understand and use."(Thompson et al. 1991, p.128).one of the construct proposed by the model is social influence factors. Derived from Triandis "Social influence factors are the individual's internalization of the reference group's subjective culture and specific interpersonal agreement that the individual has made with others, in specific social situations" (Thompson et al. 1991,p.126).

Facilitating Conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system (Venkatesh et al., 2003). Moreover, FC encompass environmental factors that make it easy or remove barriers to perform a desired behavior (Thompson, Higgins, & Howell, 1991). Thus, FC were described as factors in the environment that encourage or discourage a behavior (Triandis, 1979). According to Lu et al., (2003a), in the context of workplace technology use, FC are believed to include the availability of training and the provision of support. FC are confirmed as an important factor affecting Internet and WWW usage (Cheung, Chang, & Lai, 2000). Other empirical results indicate that FC do have a direct influence on usage beyond that explained by behavior intention alone (see, e.g., Cheung et al., 2000; Taylor & Todd, 1995b; Thompson et al., 1991; Venkatesh et al., 2003). Therefore, FC will be examined as a determinant of free Wi-Fi acceptance. Facilitating conditions –objective factors in the environment that observers agree make an act easy to accomplish. For example returning items that are purchased online is facilitated when no fees is charged to return the item. In an IS context "Provision for support of PC's may be one type of facilitating conditions that can influence system utilization" (Thompson et al.1991 ,p.129).

WT can be defined as the extent of a user's belief that privacy protection, security assurance, and system reliability are achieved within a wireless technology (Lu, Yu, Liu & Yao, 2004). Lu et al., (2003a) argued that trust is a complex social phenomenon that reflects technological, behavioral, social, and psychological, as well as organizational aspects, of interactions among various human and non-human agents. Trust is someone's assurance that he or she may predict the actions of the third party, may rely upon those actions, and



that those actions will follow a predictable pattern in the future, especially under risky circumstances and when no explicit guaranty is provided (Jones, 2002). Consumer trust was found to be important in on-line commerce, and a widely accepted antecedent (Gefen et al., 2003). McKnight, Cummings, and Chervany (1998) defined institutional based trust as an individual's perceptions of safety and security within the institutional environment, in this case wireless technology, and the structural characteristics of the Internet. According to a survey conducted by the Boston Consulting Group (Goldman, 2001), nearly 75% of U.S. consumers are concerned about security and privacy in the wireless environment. For example, computer hackers with appropriate software can steal the personal information of users (Brewin, 2002). Compared to wired Internet, wireless access to the

Internet is exposed to a greater danger of security breaches (Lu et al., 2003a). The open nature of the Internet as a communication and transaction infrastructure and its global reach has made trust a crucial element of transactions, such as e-Commerce (Hoffman, Novak, & Peralta, 1999). Lu, Yu, Liu, & Yao (2003b) proposed WT as one of the determinants affecting acceptance of wireless Internet for mobile devices. WT has three key elements: security, privacy, and system reliability (Lu et al., 2004). Reports of privacy and security concerns in using the wireless Internet have been on the rise (Desai, Richards, & Desai, 2003; Phillips, 2002). Privacy concerns often arise with new information technologies, such as the wireless technology that supports enhanced capabilities for collection, storage, use, and communication of personal information (Culnan, 1993; Milberg, Burke, Smith, & Kallman, 1995; Webster, 1998). In addition to security and privacy, overall system reliability also contributes to user perceived trustworthiness. In fact, system reliability serves as the basis for system trust (Lu et al., 2004). Because trust is a complex psychological construct, it is not easy to define its antecedents. The use of the TAM infused with the trust element is perceived to be adequate and efficient to assess users' trust levels and acceptance in virtual on-line shopping and wireless environment (Gefen et al., 2003; Lu et al., 2003a; 2003b; 2004; McKnight, Choudhury, & Kacmar, 2002; McKnight et al., 1998). Dahlberg, Mallat, and Öörni (2003) proposed the applications of the trust-enhanced TAM to investigate user acceptance of mobile payment solutions. It is impossible to implement business applications in a public wireless environment without first setting up a trustworthy on-line environment (Lu et al., 2003a). Therefore, all communications and transactions require an element of trust; especially those conducted in the uncertain environment of



wireless technology (Lee, 1998), Therefore, WT closely relates to the RA and the attitude to intention to use free Wi-Fi.

### **6. Research Methodology**

The research study was conducted by collecting both primary and secondary data. Primary data have been collected by administering a self designed questionnaire to the students who have an access to Wi-Fi in the universities located in Jammu. Secondary data was obtained from various books, journals, published papers, newspapers, websites etc.

To determine whether questionnaires can accurately measure latent variables, before conducting the conceptual model, this study uses reliability analysis and exploration of reliability factor analysis to evaluate the reliability and validity of research tools. Reliability refers to the trustworthiness or stability of scores obtained by a scale. The Cronbach alpha was calculated for the data and value for the same has been 0.800. Since the value is higher than 0.5, therefore it shows that data for the study is reliable. It further shows that the data is fit for factor analysis. Then factors affecting student's acceptance of free Wi-Fi technology were carved out by applying factor analysis technique using SPSS 17 software. Thereafter, a detailed analysis was carried out by applying appropriate statistical tools such as Mean and ANOVA technique.

### **7. Results And Analysis**

A questionnaire was created with items validated in prior research adapted to the technologies and organizations studied. TRA scales were adapted from Davis et al. (1989); TAM scales were adapted from Davis (1989), Davis et al. (1989), and Venkatesh and Davis (2000); TPB/DTPB scales were adapted from Taylor and Todd (1995a, 1995b); IDT scales were adapted from Moore and Benbasat (1991); and SCT scales were adapted from Compeau and Higgins (1995a, 1995b) and Compeau et al. (1999). WT scales were adapted from (Lu, Yu, Liu & Yao, 2004). Five-point scales were used for all of the the aforementioned constructs' measurement, with 1 being the negative end of the scale and 5 being the positive end of the scale. Out of 45 questionnaires only 30 were usable.

### 8. Profile Of Respondents

A statistical elaboration of the sample took place. The gender distribution of the survey respondents is 60 per cent males and 40 per cent females. The results also indicated that the samples have age predominantly below 25 years, which is 75 per cent. More than 90 per cent of the respondents are research scholars in different discipline.

### 9. Factor Analysis

Factor reduce the number of items, and identify the dimensions of latent variables. Any item that failed to load on a single factor at 0.5 or is dropped out there are 4 items which have been dropped in this analysis thereby leaving 15 items and 5 factors. The factor analysis process of dropping an item was repeated until all items loaded at 0.5 or greater on one and only one factor (Lederer et al., 2000; Vijayasarathy, 2004).

### 10. Reliability Analysis

The reliability of scale indicates that the study is free from random error. Internal consistency is measured in this research using Cronbach's coefficient alpha, ( $\alpha$ ). The statistic provides an indication of the average correlation among all of the items that make up the scale. Values range from 0 to 1 with higher values indication greater reliability. Table 1 indicates the result of analysis of the Cronbach's alpha scale for relative advantage , facilitating conditions , wireless trust environment , social influences and technology complexity where value of all variables is more than 0.7 . This indicates that the survey instrument (questionnaire) can be a reliable tool to measure all constructs consistently. Moreover, all of the measures of constructs had been used in past studies, and have thus been validated.

Variables	Cronbach's Alpha
Relative advantage	.841
Facilitating conditions	.821
Wireless trust environment	.903
Social influences	.819
Technology complexity	.879

*Table 1: Reliability Analysis*

### 11. Correlation Analysis Of Variables

Pearson correlations were calculated to identify the correlations between the variables and to describe the relationship of the dependent variable and the outcome. All the major variables were correlated together using the correlation test. The average score of the multi-items for a construct was computed since a single construct in the questionnaire was measured by multiple items, and the score was used in further analysis such as correlation analysis and regression analysis (Wang and Benbasat, 2007). As cited in Wong and Hiew (2005) the correlation coefficient value ( $r$ ) range from 0.10 to 0.29 is considered weak, from 0.30 to 0.49 is considered medium and from 0.50 to 1.0 is considered strong.  $p$  value of all predictors taken together on the dependent variable is highly significant (.000).  $r$  value for the variable relative advantage is .84 i.e. variable is highly correlated to the attitude towards usage of free Wi-Fi. Variables facilitating conditions ( $r=.76$ ), wireless trust environment ( $r=.80$ ), Social influences ( $r=.67$ ), and technology complexity ( $r=.75$ ) are highly correlated and significant. Variable technology complexity is scored reversely and therefore it is strongly but negatively correlated to the dependent variable attitude towards usage of free Wi-Fi.

### 12. Multiple Regression Analysis

Multiple Regression analysis was performed to test the hypothesis relationship between independent and dependent variables. Six hypotheses were proposed and results were enumerated. H1 posited that a Relative Advantage of free Wi-Fi has a significant effect on the attitude to use free Wi-Fi. Results revealed significant result ( $p = 0.000$ ) The coefficient of determination  $R$  is 75 per cent. Thus, the factor can significantly account for 75 percent of student's attitude towards use of free Wi-Fi. Thus, H1 is supported stating that relative advantage is a major determinant of attitude formation towards use of free Wi-Fi.

Investigation of study was performed on second proposed hypothesis on whether facilitating conditions has significant effect on Attitude towards usage of free Wi-Fi. Results revealed significant result. The  $R$  value is found to be .68 per cent with  $p=.000$ . Thus, the facilitating factors can significantly account for 68% percent of user's attitude towards use of free Wi-Fi.

Hence H 2 is verified.

The third hypothesis H 3 proposed that wireless trust environment has a significant effect on students attitude formation towards use of free Wi-Fi. Here  $r$  value found out to be .89

and  $p=.000$ . Here  $p<.05$  which posited that H 3 is strongly supported.

Hypothesis 4 is verified with R value .59 and  $p=.03$  thereby indicating 59 % effect on attitude formation. Hypothesis 5 posited a significant effect of technology complexity on attitude formation on free use of Wi-Fi. Values depict a strong ( $R=.81$ ,  $p=.01$ ) but significant effect of the factor on attitude. Lastly final hypothesis is verified with p value  $=.00$  and  $R=.1$  which means there is 100 percent effect of attitude towards use of Wi-Fi on acceptance of Wi-Fi technology.

Factor	R Value	Significance
Relative Advantage	.75	.000
Facilitating Conditions	.68	.000
Wirelesstrust Environment	.89	.03
Social Influence	.59	.03
Technology Complexity	.81	.01
Technology Acceptance	.10	.000

*Table 2: Model summary*

### 13. Conclusion And Recommendation

This paper has examined the factors influencing students attitude towards use of free Wi-Fi with major factors from different theories as the guiding principle. Results showed that students attitude is determined by their perception of how complex it is to use, relative advantage of using it, social influence, and wireless trust environment. Further, the results highlighted the effect of Attitude towards use and technology acceptance.

Among the five factors Social influence was found to have less effect on attitude but it is a significant factor in determining the acceptance. It may be a necessary condition, but not the sufficient criterion to lift students attitude to adopt technology. This is unusual exception to general technology acceptance situations and thus it is worthy of the consideration. All things considered, the current findings significantly enhance understanding of user acceptance of Wi-Fi. This study can act as a reference for those researchers that are interested in this field of Information Systems. Future research can extend the study to different samples and extended the proposed model to include other technology adoption factors. The model could also be used to study the adoption of other technologies apart from Wi-Fi. Factors could show a different result owing to different samples.

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