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Acceptance of e-book reading among higher education students in a developing country: the modified diffusion innovation theory

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Abstract: This study explores the students' intention towards the e-book adoption in Pakistan by using the modified diffusion innovation theory. Student attitude, awareness, perceived innovation characteristics (PIC) are taken as independent variables; actual usage is taken as a dependent variable, whereas intention plays the role of the mediator in the relationship. The data is collected through five-point Likert questionnaire from 620 university students. The confirmatory factor analysis (CFA), partial least square structure equation modelling (PLS-SEM) has been applied. The results show that compatibility, complexity, observability, trialability, attitude and awareness has a significant positive effect on behavioural intention, whereas, relative advantage has an insignificant effect on behavioural intention. Moreover, behavioural intention creates a significant positive effect on actual usage. This study will be useful in understanding the factors associated with the adoption of e-book reading. This work will help the managers to understand the role of PIC in adoption of new product or technology.

Keywords: e-book reading; modified innovation diffusion theory; actual usage; Pakistan.

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1 Introduction

Information technology has been changing the individual lifestyle and their technology adoption. The innovation in information technology gives the opportunity to produce the unique products (Waheed et al., 2015). The technological advancement creates a significant impact on the lives of the peoples, now they are not satisfied with the traditional means of learning and obtaining knowledge (Xiao et al., 2014). E-book technology has changed the consumer reading experiences and reading patterns. E-book makes the reading process convenient and ubiquitous (Folb et al., 2011). In 2000, the first e-book 'Riding the Bullet' by Stephen King becomes the first mass-market e-book, and give expansion to the e-book industry (Lee et al., 2002). The e-book development changes the relationship between the publishers and the readers (D'Ambra et al., 2013); furthermore, it also changes the nature of publishing and behaviours of the readers (Bhattacharjee et al., 2011).

The e-book adoption also increases the demand for e-readers such as Apple iPad, Amazon Kindle, etc. (Jung et al., 2012). According to the companies Apple, Amazon and Barnes and Noble they sell thousands of e-books every year (Rao, 2012). E-book sales grew 200% in 2010 compare to 2011 which is 169.4% and the sale of printed book decline by 24.8% (Jung et al., 2012). By 2025, 75% of the books will be in the digital format (Rao, 2012). Moreover, the demand for e-book will increase because of the penetration of smartphone in Asia Pacific and the availability of e-readers in the North America (PriceWaterhouseCoopers, 2010).

Electronic books (e-books) are the books in the digital form that can be accessed on computers, handheld devices, i.e., personal digital assistants (PDAs), tablets, smartphones, e-readers (Lam et al., 2009, Rao, 2012, Reitz, 2014). E-reading has become one of the leading media because of the faster broadband services and relatively smaller

computer devices (Brown, 2001). The electronic books (e-book) demand has been increasing drastically, which slow down the printed book sales. E-book is preferred over textbooks because of the flexibility, accessibility, searchability sustainability, visual appeals (Shelburne, 2009; Woody et al., 2010).

Despite the advantages the usage of e-book has some obstacles attached to it which includes incompatibility, navigation issues, digital right management issues (DRM), on screen reading problems and internet service issues (Gibbons, 2001; Chu, 2003; Shelburne, 2009; Chong et al., 2009). All these factors hinder the use of e-book extensively (Chong, et al., 2009). One of the utmost barriers in the acceptance and use of e-book is customer apathy (Lam et al., 2009) which means customers are not comfortable with the idea of the reading through e-book, however, they admit the benefits of using the e-book technology, but still like some features of the paper books (Worlock, 2009).

Previously, many studies examined the factors affecting the adoption of e-book in the context of higher education (Simon, 2002; Wilson, 2003; Hernon et al., 2007; Nelson, 2008; Lam et al., 2009), in the context of library (Tedd, 2005; Just, 2007; Renner, 2007), medical contexts (Morton et al., 2007), e-book as learning aids (Larson, 2010; Halliday, et al., 2010; Smeets and Bus, 2012), the role of user preference on e-book (Chang and Tung, 2008), the ease and difficulty in using an e-book (Rao, 2001; Sottong, 2008) barriers in acceptance of e-book (Gibbons, 2001; van der Velde and Ernst, 2009), e-book in place of printed books (Bredning, 2000; Rojeski, 2012). Some empirical studies also investigate the role of cloud computing applications on e-book (Lu et al., 2005). Despite the concerns on the usage of e-book (Kang et al., 2009) very few studies have been conducted which analyse the factor which affect the e-book adoption (Vernon, 2006; Aharony, 2014).

As e-book is an innovative product several factors affect its adoption, which includes individual innovation characteristics (Moore and Benbasat 1991), individual innovation adoption, self-efficacy level (Thomson et al., 2005; Eiamkanchanalai and Assarut, 2012; Duane et al., 2014), attitude (Cviko et al., 2012; Aldunate and Nussbaum 2013) and awareness (Jung et al., 2012). All the above factors play a vital role in the adoption of the technology.

E-book is considered as a novel product for the young students (Terpend et al., 2014) and higher education universities are spending a substantial amount to promote e-book usage among students and teachers (Muir and Hawes 2013). For the acceptance of novel products intention plays an important role and according to Venkatesh et al. (2003) behavioural intention is the significant factor in the technology usage. To explore the student's acceptance towards e-book most of the studies have been conducted in the developed countries (Walton, 2013; Aharony, 2014) and no study in the context of Pakistan has been conducted to examine the factors that affect student's intention to adopt e-book in higher education.

According to the global formation report the technology acceptance in Pakistan is quite fluctuating. In 2012–2013 it was in a position of 102nd then in 2013–2014 it reached up to 111th position, however, in 2014–2015 the ranking got improved and currently has 97th position. Since, the acceptance of technology is quite uncertain in Pakistan this research is conducted to figure out whether the technical innovative products like e-book is accepted in this country or not. Hence, this study is carried out to examine the adoption of e-book technology among university students.

The present paper is arranged in five sections. Section 2 presents the literature review. Section 3 discusses the methodology, Section 4 presents the empirical results, Section 5 presents the discussion on the results and Section 6 shows the conclusion and recommendations.

2 Literature review

2.1 Theoretical background

In the past, numerous theoretical models have been introduced regarding the innovation adoption (Jung et al., 2012). Among them the diffusion innovation theory (DIT) has been used frequently and has been considered as a reliable framework in investigating the diffusion and acceptance of the technology (Moore and Benbasat, 1991; Venkatesh et al., 2003).

The theory was established in 1962 by Rogers and further modified by Rogers in 1995. Diffusion Innovation theory (DIT) was developed to identify the acceptance of innovating products. (Waheed et al., 2015). The theory emphasis how, why and to what extend the innovate technologies and ideas are spread throughout a society with the passage of time (Rogers, 1962). According to Rogers (1983) innovation is an object, idea or practice that can be supposed as novel by a person in any other group of adoption. Whereas, the diffusion is the process by which the innovation is transmitted over time with the members of a social system by using different communication networks (Rogers, 2003).

Rogers (2003) described that the decision related to innovation involves five steps, i.e.,

- 1 knowledge
- 2 persuasion
- 3 decision
- 4 implementation
- 5 confirmation which follows each other in a chronological manner.

The first step is known as knowledge stage in which an individual came to know about the innovation and collect information regarding it. In this phase, the individual explores what is the innovation and how it works (Rogers, 2003). The second step is the persuasion in which, the individual develops a positive or negative attitude towards the innovation, and however, this does not mean adoption or rejection of the innovation. In this stage the individual is more sensitively involved with the innovation and the reviews from peers, colleagues, etc. influence its beliefs or opinion related to innovation (Sahin, 2006). In the third step, the individual adopts or reject the innovation. According to Rogers (2003), in this step the adoption means full use of innovation and rejection means no adoption of the innovation. At the implementation stage, the innovation has practically come into practice. In the confirmation stage the individual reconsidered his decision and may change its decision if he finds anything conflicting about the innovation.

DIT discusses the five Perceived characteristics of innovation (PIC) namely relative advantage, compatibility, complexity, and trialability and observability as a key predictor which affects the individual attitude towards the adoption of innovation (Rogers 1983). IDT theory argues that the potential users accept or reject the innovation on the basis of their beliefs regarding innovation (Agarwal, 2000).

Therefore, we use the modified version of the Roger's innovation theory by using the all the five DIT characteristics and added the role of attitude and awareness of e-book reading to increase the effectiveness of the study.

2.2 Empirical evidences and hypotheses

In this study, we use the Rogers (1983) perceived characteristics of innovation (i.e., relative advantage, compatibility, complexity, trialability, and observability), attitude and awareness to predict the intention towards the actual usage of the e-book reading. The empirical evidences of each variable are explained separately in the following sections.

2.2.1 Relative advantage

Relative advantage is the user perception related to the level of advantage gained by the innovation. If the user believes that the new innovation will bring in more advantage compared to the preceding one, the new innovation has a greater relative advantage (Rogers, 1983). The more is the relative advantage of the innovation the more is the changes of the adoption (Ooi et al., 2011).

The previous researchers show that the perceived relative advantages have a positive relationship with the users' intention to use the technology (Shih, 2007; Lee, 2006). Likewise, the relative advantage of mobile commerce (Chung, 2014), a mobile payment (Duane et al., 2014) changes the consumer attitude towards its acceptance. The advantages of e-book reading includes convenient to use, easy access to relevant material, time saving, economical. All these factors influence the individual intention to adopt the e-reading technology. The following hypothesis is used to explain the relative advantage:

- H1 The relative advantage of e-book reading has a significant effect on behavioural intention.

2.2.2 Compatibility

According to Rogers (1995) compatibility is a user's belief that how the innovation fits with their current needs, values and past experiences. The more compatible the innovation is with the user needs and values, the more is the changes of its adoption (Tornatzky and Klein, 1982; Shih and Fang, 2004; Antón et al., 2013; Chung, 2014). Previous studies show that the compatibility has a direct effect on the behavioural intention (Wu and Wang, 2005; Chang and Tung, 2008). The e-book reading gives the same personalise feeling as reading through normal books, the option to add bookmarks and comments make it compatible and easy to use for the users. The proposed hypothesis for compatibility is:

- H2 The compatibility of e-book reading has a significant effect on behavioural intention.

2.2.3 Complexity

It is the user feeling related to the level of difficulty in learning, operating and understanding the innovation (Rogers, 1983). The innovation that is less complex and user friendly are easily accepted by the users (Chung, 2014). Some studies show that the significant negative relationship exists between the complexity and the intention to use. (Shih, 2007; Lee, 2006) In other words, the more complex the technology is, the less intention the user have to use the technology (Lin, 2006). The e-book reading interface is easy to understand and user friendly which influence the users to adopt this technology. The hypothesis used for complexity is:

H3 The complexity of e-book reading has a significant effect on behavioural intention.

2.2.4 Trial-ability

Trialability is the possibility of trying the innovation before its actual use by the individual. It increases the changes of the adoption of the innovation (Rogers, 1983). The innovation which can be tried or tested by the users increases the users' attitude to adopt it (Chung, 2014). The users prefer to try an innovation to increase their comfort level (Waheed et al., 2015). Previous studies show that the positive association exists between the trialability and the intention of users towards the technology (Lee, 2006; Yang, 2007). We use the following hypothesis:

H4 The trialability of e-book reading has a significant effect on behavioural intention.

2.2.5 Observability

Rogers (1983) explains observability as the extent to which the innovation results are visible to others. The innovation visibility encourages the individual to discuss it with their friends and neighbours and creates positive intention to adopt the technology (Duan et al., 2010). Several studies reported that the positive relationship exists between the observability and the intention to use (Lee, 2006; Yang, 2007). Chung (2014) found that the facility of observing mobile commerce increases its adoption among the users. The hypothesis used is:

Rogers (2003) proposed that the innovation that has the greater relative advantage, compatibility, trialability, and observability and less complexity are rapidly adopted by the individual compare to the other innovations. These PIC identified by Rogers are considered as important predictors that explains the innovation adoption (Hsu et al., 2007).

H5 The observability of e-book reading has a significant effect on behavioural intention.

2.2.6 Attitude

According to Venkatesh et al. (2003) attitude is the individual reaction towards the usage of the system. The successfulness of the technology is highly dependent on the users' attitude towards it (Waheed et al., 2015). In past studies several models have been used to investigate the role of attitude as a mediator between intentions and beliefs (Fishbein and Ajzen, 1975; Davis et al., 1989; Taylor and Todd, 1995). Many studies show that the

users' attitude plays a vital role in the adoption of the new technology or innovation (Cviko et al., 2012; Aldunate and Nussbaum, 2013). The hypothesis used to represent the attitude variable is:

H6 Attitude has a significant effect on behavioural intention.

2.2.7 Awareness

The adoption of the innovation starts with its awareness (Rogers, 1995). Innovation awareness is the key variable for the technology adoption (Jung et al., 2012). Lack of awareness has a negative association with the adoption process (Feldstein and Glasgow 2008; Solomons and Spross, 2011). In the context of e-book, Gunter (2005) conducted survey on the awareness of e-book in UK and reported that respondents are aware of e-book. On the contrary, the survey conducted by Abdullah and Gibb (2006) on e-book awareness and usage in British academic library indicates that the e-book awareness and its usage both are low among the students. The hypothesis used for awareness is:

H7 Awareness has a significant effect on behavioural intention.

2.2.8 Behavioural intention

Behavioural intention (BI) is the individual willingness to adopt new technology (Tsai, 2012). Actual behaviour can be gauged through intentions (Jackson et al., 1997; Webb and Sheeran, 2006) and considered as an important variable in acceptance of the technology (Irani et al., 2009). In the past, many studies have considered behavioural intention as an important factor in determining the acceptance of the technology (Teo, 2011, 2010; Park, 2009). Aharony (2014) identifies that the personal characteristics play an important role in the adoption of the technology. Ngafeeson and Sun (2015) by using the data of 158 undergraduate students reported that only high innovative individuals converted their intentions to the actual adoption of the technology. The hypothesis used in this study for behavioural intention is:

H8 Behavioural intention has a significant effect on adoption of e-book.

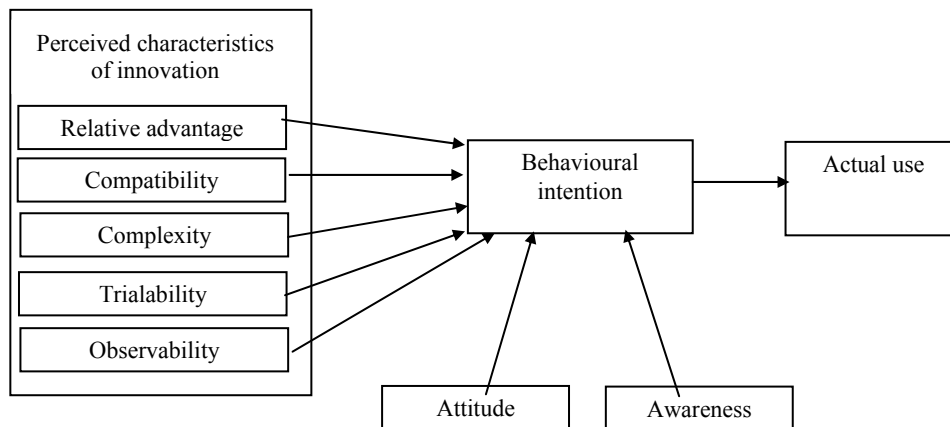
2.2.9 Adoption

Adoption is the individual willingness to accept or reject the technology or innovation (Straub, 2009). There are numerous factors that change the individual decision to use technology (Venkatesh et al., 2003). According to Ajzen and Fishbein (1980) the acceptance of technology can be determined by the intention of the individual. Lee et al. (2011) reported that the DIT characteristics have a significant effect on the individual's intention to use systems. The DIT characteristics have a direct effect on innovation adoption (Rogers, 2003). According to Rogers (1995) even if the innovation seems to be useful cannot be adopted by the individual due to the influence of the contextual factors. Therefore, it is extremely important to understand those factors which create obstacles in user willingness towards e-book.

3 Methodology

The conceptual model of our study is illustrated in Figure 1. The model demonstrates the effect of the Rogers perceived innovation characteristics (PIC) that are relative advantage, compatibility, complexity, trialability, observability, multi-dimensional attitude and awareness on the actual usage of e-book whereas, intention plays a role of a mediator in this framework.

Figure 1 Modelling framework



Source: Authors' construction

3.1 Measurement instrument

The PIC items are taken from Waheed et al. (2015) who adapted the Moore and Benbasat (1991) PIC scales. This study uses the 20 items of the PIC. Awareness items are taken from Meng et al. (2015). Attitude, intention and actual usage items are also adapted from the Waheed et al. (2015). All the items in the questionnaire were stated in English while the content validity was endorsed by independent market and academic expert. A pilot study was also performed by distributing the questionnaire to the university students who use the e-book reading. A five-point Likert scale which ranges from (1) 'strongly disagree', (2) 'disagree', (3) 'neutral', (4) 'agree' and (5) 'strongly agree' was used to evaluate the student adoption of e-book reading. Moreover, the demographic data is also collected from the respondents of the study. The sample data is collected from survey method and the convenience sampling technique was used. The sample size was based on the guidelines given by Comrey and Lee (1992) and Ali and Raza (2015) which consider the sample size of 50 as poor, 300 as good, 500 as very good and 1,000 is considered as excellent for the purpose of factor analysis. The same guidelines are also adopted by us in this study and total sample of 620 is collected. The total questionnaire items are 42 which satisfy the minimum questionnaire requirement given by Hair et al. (2006).

Throughout the data collection process, all respondents are requested to participate voluntarily and assurance was given that their information will be kept confidential. The impact of independent variables (PIC, attitude, awareness, intention) is analysed on dependent variable (actual usage of e-book) through this questionnaire. The basic regression models of the study are:

$$y_n = a + bx_n + \ln, \quad (1)$$

$$y_n = a + bx_n + \ln, \quad (2)$$

In equation (1) y represents a dependent variable (intention) and a denotes the intercept term. X represents explanatory variables (relative advantage, compatibility, complexity, trialability, observability, awareness, attitude) while b represents the regression coefficient.

In equation (2) y represents a dependent variable (actual usage) and a denotes the intercept term. X represents the independent variable (intention) while b represents the regression coefficient.

The basic functional form of the above equations is:

$$\text{Intention} = f(\text{relative advantage, compatibility, complexity, trialability, observability, awareness, attitude}) \quad (3)$$

$$\text{Actual usage} = f(\text{intention}) \quad (4)$$

The following regression models are used for the purpose of the study:

$$BI = \alpha_0 + \beta_1 RA + \beta_2 CPT + \beta_3 CPX + \beta_4 TR + \beta_5 OB + \beta_6 ATT + \beta_7 AWR + \varepsilon_t \quad (5)$$

$$AU = \alpha_0 + \beta_1 BI + \varepsilon_t \quad (6)$$

In equation (5) BI is the behavioural intention, RA is the relative advantage, CPT is the compatibility, CPX is the complexity, TR is the trialability, OB is the observability, ATT is the attitude, AWR represents the awareness, and ε_t is the error term.

In equation (6) AU shows the actual usage where BI represents the behavioural intention and ε_t is the error term.

3.2 Demographics

The sample represented the responses of the students from different universities and in total 671 questionnaires was filled and returned. After deletion of outliers and erroneous responses 620 responses were found useable. The details of demographic profiles are presented in Table 1. As seen from demographic characteristics the 77% respondents were the students of private universities, 22% were the students of public universities and 1% was student of semi-private universities. In terms of gender, the 51% of respondents were male, while 49% were female hence equally distributed. The majority of the respondents were undergraduates (53%) whereas, 37% were graduates and 10% were postgraduate. The respondent age group category showed that 78% were falling in the age bracket of 18–25 whereas 17% were in the age bracket of 26–30 and the rest 5% were in the age bracket of 31–35. The field of study shows that 53% respondents were

studying business studies, 17% were studying engineering, 13% were studying computer science, and the rest 15% were studying medical and other study program.

Table 1 Profile of respondents ($N = 620$)

<i>Demographic items</i>	<i>Frequency</i>	<i>Percentile</i>
Student of university		
Public sector	136	22%
Private sector	478	77%
Semi-private sector	6	1%
Gender		
Male	316	51%
Female	304	49%
Education level		
Under graduate	329	53%
Graduate	229	37%
Post graduate	62	10%
Age		
18–25	484	78%
26–30	105	17%
31–35	31	5%
Field of study		
Business	328	53%
Engineering	108	17%
Computers	83	13%
Medical	57	9%
Other	44	8%

Source: Author estimations

4 Data analysis

4.1 Common method biasness

To examine the potential existence of common method variance bias among the dependent and independent variables, we have applied the Harmon's one factor test (Chuang and Lin, 2013). In this test, all the proposed variables under the varimax rotation were loaded in a single exploratory analysis (Karahanna et al., 1999). According to the Harmon's test assumption, if a single or general construct shows more than 50% of the variance among the variables, then there exists a sufficient evidence of common method variance (Kim and Park, 2012). In this study, we have extracted the variables that represent our dependent and independent variables with the division of different factors, while each factor account for less than 50% of the total variance. Therefore, the findings revealed that the common bias is not a serious problem for our sample data.

4.2 PLS-SEM analysis

In this study, the PLS-SEM is used to test the developed model shown in Figure 1 through Smart PLS 3.2.3 software (Ringle et al., 2014), by using a method of bootstrap resampling of 5,000 subsamples (Hair et al., 2011). PLS is a structural path estimation method (Chin, 1998) preferred and considered as a multivariate method in social sciences for experimental and non-experimental data (McIntosh et al., 1996). PLS-SEM was developed by Joreskog and Wold (1982) and Wold (1975, 1980). PLS-SEM examines the associations among multiple latent variables (LV). LV is an unseen construct that is accountable for the association among the measured variables (Waheed et al., 2015). PLS-SEM is competent enough to work with unobservable LV and can identify the errors in the development of LV (Chin, 1998). In this study, the items are perception-based assess through a Likert scale, normality cannot be verified, and the model is complex as well, therefore, PLS-SEM is preferred over other structural equation models (Hair et al., 2012). The competency of the model is evaluated by the individual item reliability analysis, convergent validity and the discriminant validity.

For the assessment of individual item reliability, the standardised loadings (or simple correlation) are examined. As proposed by Tabachnick and Fidell (2007) and Raza and Hanif (2013) 0.55 is a cut-off point. All the items in this study have loadings above 0.55 as shown in Table 2. In PLS, the convergent validity of the measured items is validated by two tests

- 1 Cronbach's alpha and composite reliability results
- 2 average variance extracted (AVE).

Table 2 shows that Cronbach's α is greater than 0.70 which means that all the variables have good reliability and meets the suggested benchmark of 0.60 by Churchill's (1979) and Raza and Jawaid (2015). The composite reliability is measured through the Nunnally et al.'s (1976) benchmark of 0.7 and Table 2 shows that composite reliability is greater than 0.7. The average extracted (AVE) is above 0.5 which is according to the Fornell and Larcker (1981). As all the constructs exceed the benchmark, the convergent validity is established for the constructs.

After evaluating the individual item reliability and convergent validity, the discriminant validity is analysed by using two tests

- 1 cross loading analysis
- 2 AVE analysis.

The cross loading analysis presented in Table 4 shows that the individual items of each construct are loaded higher in their relevant constructs compare to the other constructs and the cross loading difference is also higher than the suggested threshold of 0.1 (Gefen and Straub, 2000). In Table 3 the diagonal of the matrix represents the square root of the AVE and shows that the correlation matrix for each construct and the absolute value of their correlation is below than the AVE square root of each construct (Fornell and Larcker, 1981). Thus, explains the adequacy of discriminant validity. Furthermore, Table 5 shows that the heterotrait-monotrait ratio of correlations (HTMT) shows that none of the HTMT criteria are higher than the criteria of 0.85 (Henseler et al., 2014).

Table 2 Measurement model results

<i>Constructs</i>	<i>Items</i>	<i>Loadings</i>	<i>Cronbach's α</i>	<i>Composite reliability</i>	<i>Average variance extracted</i>
Behavioural intention	BI1	0.7790	0.7710	0.8540	0.5960
	BI2	0.8380			
	BI3	0.7220			
	BI4	0.7350			
Attitude	ATT1	0.8220	0.8120	0.8880	0.7250
	ATT2	0.8600			
	ATT3	0.8710			
Actual usage	AU1	0.8380	0.8000	0.8830	0.7160
	AU2	0.8740			
	AU3	0.8200			
Awareness	AWR1	0.6960	0.7380	0.8340	0.5580
	AWR2	0.7680			
	AWR3	0.7270			
	AWR4	0.7920			
Compatibility	CPT1	0.8350	0.8280	0.8860	0.6610
	CPT2	0.8560			
	CPT3	0.7830			
	CPT4	0.7810			
Complexity	CPX1	0.8280	0.7690	0.8660	0.6840
	CPX2	0.8380			
	CPX3	0.8180			
Observability	OB1	0.7180	0.7470	0.7690	0.5320
	OB2	0.8440			
	OB3	0.6150			
Relative advantage	RA1	0.7620	0.8240	0.8710	0.5330
	RA2	0.6580			
	RA3	0.7510			
	RA4	0.8020			
	RA5	0.7600			
	RA6	0.6460			
Triability	TR1	0.6730	0.7000	0.8050	0.5130
	TR2	0.6980			
	TR3	0.7430			
	TR4	0.7680			

Table 3 Correlation matrix

Constructs	Correlation matrix								
	BI	ATT	AU	AWR	CPT	CPX	OB	RA	TR
BI	<i>0.772</i>								
ATT	0.668	<i>0.851</i>							
AU	0.622	0.486	<i>0.846</i>						
AWR	0.527	0.600	0.459	<i>0.747</i>					
CPT	0.510	0.575	0.344	0.395	<i>0.813</i>				
CPX	-0.502	-0.537	-0.343	-0.461	-0.649	<i>0.827</i>			
OB	0.419	0.391	0.285	0.394	0.205	-0.320	<i>0.729</i>		
RA	0.447	0.507	0.341	0.459	0.690	-0.647	0.238	<i>0.730</i>	
TR	-0.312	-0.422	-0.299	-0.451	-0.307	0.517	-0.459	-0.403	<i>0.716</i>

Notes: BI = behavioural intention; ATT = attitude; AU = actual usage;
 AWR = awareness; CPT = compatibility; CPX = complexity; OB = observability;
 RA = relative advantage; TR = trialability. The diagonal elements (italics)
 represent the square root of AVE

The structural model is depicted in Figure 1 whereas the path of the structural model is presented in Figure 2 and Table 6. Each path corresponds to a hypothesis. The hypothesis is tested on the basis of sign, size, and statistical significance of the co-efficient between each LV and dependent variable. The higher the co-efficient value, the stronger is the impact of the LV of the dependent variable. The hypotheses are considered on the significance level of 0.1. Result shows that 8 out of 7 paths are significant. Moreover, the path co-efficient linking relative advantage to behavioural intention is positive but insignificant and does not support the (H1). The path linking compatibility, trailability, observability, attitude, awareness to behavioural intention is positive and significant, hence supported the H2, H4, H5, H6 respectively. The path linking complexity to behavioural intention is negative and significant (H3). The path co-efficient linking behavioural intention to actual usage is positive and significant (H8).

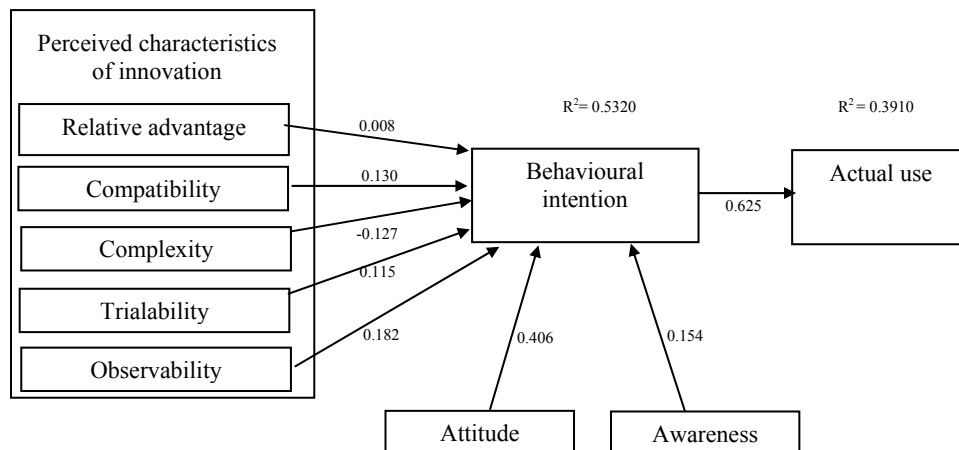
Figure 2 Path analysis

Table 4 Loadings and cross loadings

	<i>BI</i>	<i>ATT</i>	<i>AU</i>	<i>AWR</i>	<i>CPT</i>	<i>CPX</i>	<i>OB</i>	<i>RA</i>	<i>TR</i>
BI1	0.7790	0.6460	0.4820	0.4350	0.4810	-0.4540	0.3440	0.3710	-0.3260
BI2	0.8380	0.5650	0.4950	0.4780	0.4590	-0.3870	0.3410	0.3710	-0.2260
BI3	0.7220	0.4530	0.4150	0.4060	0.2860	-0.3920	0.2850	0.3350	-0.2680
BI4	0.7350	0.3610	0.5260	0.2930	0.3170	-0.3060	0.3140	0.2960	-0.1320
ATT1	0.4740	0.8220	0.3860	0.5090	0.4620	-0.4160	0.2490	0.4200	-0.2800
ATT2	0.5830	0.8600	0.3760	0.5170	0.5310	-0.4820	0.3330	0.4870	-0.3950
ATT3	0.6290	0.8710	0.4730	0.5110	0.4740	-0.4690	0.3980	0.3910	-0.3870
AU1	0.5360	0.4250	0.8380	0.4020	0.2870	-0.3210	0.2320	0.2970	-0.3070
AU2	0.5500	0.4230	0.8740	0.3900	0.3270	-0.3190	0.2580	0.3290	-0.2620
AU3	0.4890	0.3830	0.8200	0.3700	0.2530	-0.2220	0.2320	0.2310	-0.1820
AWR1	0.3290	0.4030	0.3320	0.6960	0.3080	-0.3170	0.3180	0.3050	-0.3160
AWR2	0.3560	0.3880	0.3600	0.7680	0.3220	-0.3040	0.2100	0.3510	-0.2250
AWR3	0.3550	0.4190	0.3130	0.7270	0.2720	-0.3860	0.2820	0.3600	-0.4630
AWR4	0.4980	0.5510	0.3650	0.7920	0.2890	-0.3680	0.3530	0.3560	-0.3460
CPT1	0.4190	0.4910	0.2440	0.3370	0.8350	-0.5410	0.1430	0.6190	-0.2400
CPT2	0.4580	0.4840	0.3190	0.3080	0.8560	-0.5240	0.1300	0.5790	-0.1810
CPT3	0.3980	0.4770	0.3080	0.3000	0.7830	-0.4880	0.2190	0.4980	-0.2400
CPT4	0.3820	0.4180	0.2460	0.3470	0.7810	-0.5660	0.1860	0.5520	-0.3540
CPX1	-0.4290	-0.4890	-0.2400	-0.4180	-0.5800	0.8280	-0.2910	-0.6240	0.4220
CPX2	-0.4180	-0.4500	-0.3390	-0.4230	-0.5290	0.8380	-0.3100	-0.5010	0.4570
CPX3	-0.3990	-0.3930	-0.2720	-0.3000	-0.5000	0.8180	-0.1900	-0.4770	0.4040
OB1	0.2880	0.2430	0.1920	0.3200	0.1550	-0.2870	0.7180	0.1910	-0.4080
OB2	0.3400	0.3860	0.2810	0.3870	0.1430	-0.2460	0.8440	0.2330	-0.4080
OB3	0.2860	0.2120	0.1410	0.1410	0.1550	-0.1690	0.6150	0.0870	-0.1790
RA1	0.3500	0.4280	0.2640	0.4250	0.5460	-0.5160	0.1560	0.7620	-0.3240
RA2	0.2540	0.2850	0.1630	0.3690	0.3420	-0.3910	0.1430	0.6580	-0.3560
RA3	0.3800	0.3710	0.3150	0.2650	0.5390	-0.5590	0.1840	0.7510	-0.2260
RA4	0.3520	0.4000	0.3070	0.3700	0.5190	-0.4770	0.2250	0.8020	-0.3260
RA5	0.3470	0.3570	0.2250	0.3160	0.5620	-0.4650	0.1940	0.7600	-0.2720
RA6	0.2500	0.3810	0.1850	0.2890	0.4990	-0.4030	0.1290	0.6460	-0.3050
TR1	-0.1990	-0.2680	-0.1270	-0.2750	-0.2230	0.4000	-0.2600	-0.3010	0.6730
TR2	-0.1850	-0.3980	-0.1800	-0.3180	-0.3050	0.3860	-0.3340	-0.3620	0.6980
TR3	-0.1830	-0.2860	-0.2070	-0.3750	-0.2580	0.3410	-0.3630	-0.3060	0.7430
TR4	-0.2980	-0.2860	-0.3060	-0.3380	-0.1490	0.3730	-0.3640	-0.2360	0.7680

Notes: BI = behavioural intention; ATT = attitude; AU = actual usage;
 AWR = awareness; CPT = compatibility; CPX = complexity; OB = observability;
 RA = relative advantage; TR = trialability. All self-loadings are significant (italics).

Table 5 Heterotrait-monotrait ratio (HTMT) results

	<i>BI</i>	<i>ATT</i>	<i>AU</i>	<i>AWR</i>	<i>CPT</i>	<i>CPX</i>	<i>OB</i>	<i>RA</i>	<i>TR</i>
BI									
ATT	0.822								
AU	0.792	0.599							
AWR	0.675	0.759	0.594						
CPT	0.625	0.698	0.419	0.51					
CPX	0.648	0.675	0.434	0.605	0.812				
OB	0.640	0.565	0.424	0.599	0.311	0.491			
RA	0.549	0.620	0.406	0.590	0.825	0.800	0.345		
TR	0.400	0.558	0.374	0.625	0.428	0.702	0.727	0.556	

Notes: BI = behavioural intention; ATT = attitude; AU = actual usage;
 AWR = awareness; CPT = compatibility; CPX = complexity; OB = observability;
 RA = relative advantage; TR = trialability.

Table 6 Standardised regression weights for the research model

<i>Hypothesis</i>	<i>Regression path</i>	<i>Effect type</i>	<i>Co-efficient</i>	<i>Remarks</i>
H1	RA --> API	Direct effect	0.002	Unsupported
H2	CPT --> API	Direct effect	0.127*	Supported
H3	CPX--> API	Direct effect	-0.131*	Supported
H4	TR --> API	Direct effect	0.122*	Supported
H5	OB --> API	Direct effect	0.186***	Supported
H6	ATT --> API	Direct effect	0.411***	Supported
H7	AWR --> API	Direct effect	0.150**	Supported
H8	API --> AU	Direct effect	0.622***	Supported

Notes: SRW = Standardised regression weight
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

From the above it is concluded that, except for the hypothesis (H1) all the other hypotheses were accepted, i.e., H2, H3, H4, H5, H6, H7 and H8.

5 Discussion of the results

The major objectives of the study are supported by the results. The result shows the good measurement and structural fit and seven out of eight hypotheses were supported. The path between the relative advantage and behavioural intention is insignificant, but positive, $p < 0.1$ and $\beta = 0.008$. The results are inconsistent with the past studies (Shih, 2007; Lee, 2006; Ooi et al., 2011). Thus, it implies that relative advantage (usefulness) is not important when it come to the adoption of the innovation.

The second hypothesis about the effect of compatibility on behavioural intention is also supported and shows a significant and positive association ($P < 0.1$, $\beta = 0.130$). The results are consistent with the studies of Wu and Wang (2005) and Chang and Tung (2008). This indicates that the potential benefits such as searchable readings, personalise

feeling, remote access (Lam et al., 2009) increases the compatibility. High Compatibility increases the intention of the users to use the technology (Wu and Wang, 2005).

The third hypothesis regarding the effect of complexity on behavioural intention shows the significant, but a negative relationship ($P < 0.1$, $\beta = -0.127$). The studies which supported that relationship includes Shih (2007), Lee (2006) and Lee et al. (2011). The user friendliness should be the basic requirement of the innovation (Waheed et al., 2015) and if the user find the technology complex it will decrease its intention to use it (Lin, 2006; Aldunate and Nussbaum, 2013).

The other innovation characteristics, i.e., trialability and observability indicates significant and positive effect on behavioural intention ($P < 0.1$, $\beta = 0.122$; $P < 0.1$, $\beta = 0.186$). The result is similar to the work done by Hardgrave et al. (2003) Yang (2007) and Lee et al. (2011). Thus, it is evident that if the users are provided with the opportunity to try the innovation this would result in creating individuals' intention to use it (Chung, 2014). The explanation is plausible for observability, if the users have an opportunity to observe the use of innovation it will contribute in building its intention to adopt it (Duan et al., 2010).

The path between the attitude and behavioural intention was significant and positive and hence supported the hypothesis ($P < 0.1$, $\beta = 0.406$). The results are consistent with the studies of Stoel and Hye Lee (2003), Cviko et al. (2012) and Aldunate and Nussbaum (2013). This implies that if the students have a positive attitude toward the e-book it will creates intention to use it (Letchumanan and Tarmiz, 2011).

The seventh hypothesis related to the role of awareness in creating individual intention was confirmed. Awareness creates a significant positive effect on the individual intention ($P < 0.1$, $\beta = 0.154$). Bennett and Landoni (2005) and Abdullah and Gibb (2008) also reported that awareness of e-book plays an important role in developing individual intention and usage, hence provide support for our result. If the individual is well aware about the innovation it increases its adoption rate (Jung et al., 2012).

The last hypothesis is also supported and shows that behavioural intention has a significant positive effect on the actual usage of the technology ($P < 0.1$, $\beta = 0.625$) which are supported by the studies of Irani et al. (2009) and Teo (2011). This implies that behavioural intention actually leads to the usage of the technology (Teo et al., 2008).

6 Conclusions

The Roger's innovation theory is widely used to predict the individual intention towards the new technology adoption, but the role of attitude and awareness in creating intention towards innovation is discussed sparsely. This study tried to cover up this gap by integrating DIT, attitude, awareness with behavioural intention and its ultimate effect on actual usage. The empirical result shows the good measurement fit model, and seven out of eight hypotheses were supported. The three innovation characteristics (compatibility, observability, trailability), attitude, awareness affect the individual intention significantly and positively, whereas relative advantage has a positive, but insignificant impact, while complexity has a negative effect on individual intention. The result showed that if the students find e-book compatible with their needs, have awareness, positive attitude, and can try and observe it. This formed the positive intention towards the e-book which ultimately results in actual usage.

Moreover, the reading through e-book can save both the time and effort. Convenience, compatibility, trialability and observability create a significant impact on the intention of the individuals and intensify their intention to adopt it. In order to promote e-book acceptance, the users should be given the friendly interface and offer them customised services as this will give the relative advantage to the users over traditional reading. The e-book interface should be easy and simple as complexity is one of the hurdles which affecting the consumer attitude to use the product.

6.1 Managerial implications

The findings of the study show many implications. The outcome will be helpful to develop strategies to capture more consumers to adopt and use e-books. The study will be useful for the marketers in developing marketing strategies as this study identified the factors that they should emphasise for the purpose of promoting e-book technology.

Compatibility significantly affects the individual intention to use the e-book technology, the marketers should enhance the users' perception related to compatibility by notifying the differences between reading through paper books and e-book.

The factors of DIT play a significant role in shaping the consumer attitude to use the technology. So, the marketers and companies who want to become successful in e-book business should develop e-books that are affordable and user-friendly as this will increase the user's intention to adopt e-book. The findings further suggest that the experts should develop features that increase the relative advantage and compatibility by providing user-friendly interface, make resources available as this will encourage students to use frequently.

The educators should use e-book in their teaching and learning process and the educational institutions in order to increase the e-book adoption among students should collaborate with the marketers or other interested parties to give them, enabling infrastructure and technical support department who ensures accessibility and give trialability option to the users as this will increase the e-book usage.

The results of the studies are also beneficial for the researchers and managers who are concerned with the innovation adoption. As seen from the results compatibility, trialability, observability and complexity significantly affect the behavioural intention. These results help the managers in the development of new products or technology. To make the new innovation successful those features should incorporate in new products.

6.2 Limitations of the study

The limitations are also there in the study which needs additional research and further investigation. First, the study is conducted on the students that use e-book reading so it cannot be generalised and the intentions of non-users are ignored. Second, the target population was the higher education students of different domains; therefore, the sample may have affected the results and showed biases. Third, the actual usage is analysed, but the usage frequency, digital and social convergence also matters which is ignored in this study. Fourth, this study has not considered the impact of demographic characteristics which is considered significant predictor that can affect the technology acceptance among users in many studies (Morris et al., 2005; Annafari and Bohlin, 2014; Kang et al., 2014). Lastly, the results of the studies are applicable to the studies conducted in the context of Pakistan because of the cultural differences.

6.3 Future research

Future research should investigate the factors that create resistance to the users to opt e-book. Furthermore, the same study can be conducted by adding the demographic factors. The cross-sectional studies with more diverse sample are also suggested to the researchers. As this study targets the university students of different fields, the future research can also be done by targeting university students of one specific domain. Moreover, the impact of factors like subjective norms, facilitating conditions, and self-efficacy should also be evaluated in upcoming studies.

6.4 Contribution to the study

In this study, we modified the Rogers DIT theory by adding two more variables attitude and awareness and the mediating role of intention in the model to examine the adoption of e-book. The combined effect of all these variables is investigated for the first time in the context of Pakistan. This type of model has not been used before. Moreover, the PLS-SEM technique is used to analyse the relationship.

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