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A QUANTITATIVE INVESTIGATION OF STUDENTS' ATTITUDES TOWARDS ELECTRONIC BOOK TECHNOLOGY

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Declarations of Interest

None

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Abstract

The purpose of this study is to analyze the factors that have an impact on technology adoption for e-books utilizing the Analytic Hierarchy Process (AHP) and Multiple Regression Analysis methods. Findings indicate that perceived usefulness and ease of use are the most significant determinants in using e-books. Of key significance is that AHP results show that consumers make pairwise comparisons, adding environmental concerns to the selection process. Recognizing the importance of all these factors is valuable to e-book developers and marketers in presenting products that meet all consumer choice criteria. AHP provides researchers with a more thorough decision making analysis.

Keywords: Electronic Books (e-books); Decision Analysis; Technology Acceptance Model (TAM); Analytic Hierarchy Process (AHP); Multiple Regression Analysis

1. Introduction

Electronic books (e-books) are described as digital versions of printed materials. These materials are moved through mediums that consist of iPads, smartphones, Kindles and tablets (Poon, 2014). E-books are used for different purposes such as highlighting, investigating and note taking. Advances in technology have given rise to an increase in the use of e-books because of their ease of accessibility, enhanced reading experiences and effective learning performances (Poon, 2014).

Although there are many advantages of e-books, they are not adopted universally. The aim of this research is to find out the determinants that affect users' adoption of technology for e-books. The Technology Acceptance Model (TAM), which explains and estimates the reasons behind acceptance or rejection of information systems, is used to describe and understand the adoption of technology since the 1980s (Szajna, 1996). TAM is comprised of two main factors that are perceived usefulness and perceived ease of use. Perceived usefulness is the belief that the use of the application will influence the task performance positively (Davis, 1989; Hiraoka, 2009; Khosrow-Pour, 2004). Perceived ease of use is the belief that using a specific system would be free of effort (Davis, 1989;

Hiraoka, 2009; Khosrow-Pour, 2004). These factors can be extended with various external variables, which may differ depending on users' tendencies, also having an influence on users' acceptance of information technology.

In this study, apart from the main factors of TAM (i.e. perceived usefulness and perceived ease of use), several external variables are also included in the model. The impacts of perceived risk, environmental concerns, social influences and cost factors on information technology acceptance are also recognized in the existing literature (Antil, 1984; Bansal, 2011; Chiang and Chia-Chen, 2014; Guo and Barnes, 2011; Hsiao, 2013; Lin, Tzeng, Chin and Chang, 2010; Pavlou, 2003; Poon, 2014; Wu and Wang, 2005). These factors are selected specifically because each of them plays a significant role and has an effect on consumer's decision making process for purchasing. Perceived risk, which is related to psychological factors, is defined as the feeling of the degree of anxiety and uncertainty consumers face about purchase decisions. It is associated with the perception of uncertain consequences of carrying out a behaviour that has a connection with privacy, operating and health issues. Perceived risk has a negative influence on the behaviours of information technology usage (Lin, Tzeng, Chin and Chang, 2010; Pavlou, 2003; Wu and Wang, 2005). Environmental concerns and social influences, which are described as forces influencing consumer's buying behaviours, are a part of personal and environmental uncontrollable factors. Environmental concerns are the general attitudes for taking care of the environment and positive ones result in positive behaviours (Antil, 1984; Bansal, 2011; Hwang, 2014; Poon, 2014). Social influence, which is defined as the importance and the impact of others' opinions on using the information system, has a positive connection with users' intentions about the use of technology (Chiang and Chia-Chen, 2014; Poon, 2014). Cost, which has a role in consumer's purchasing process, is essential for motivations to purchase the product (Constantindes, 2004). It is associated with the readiness of consumers to pay the asking price for acquiring a product or using a service. Even though consumers claim that price is positively associated with quality, price usually has a negative relationship with technology adoption (Au and Kauffman, 2003; Guo and Barnes, 2011; Ittersum et al., 2006; Wu and Wang, 2005). Hence, these factors are employed along with the main factors in TAM to make comprehensive analysis in this research.

Questionnaires are prepared to collect the data. The factors are analyzed with the Analytic Hierarchy Process (AHP) and Multiple Regression Analysis (MRA) Methods. These two methods are compared to find out if both of the results are coherent. Analytic Hierarchy Process (AHP) Method (Saaty, 1980; Saaty, 1983), which is a multiple criterion decision making tool, is used to analyze and structure complex decision making problems (Hanine et al., 2016). It aims to determine the best decision that is suitable to the problem's objective and it is employed in numerous decision making applications to obtain the weighted importance of the determinants. By this way, the overall influence of the determinants on TAM can be monitored. It is a simple, stable, direct, adaptable, convenient and more realistic method for decision makers to understand on account of its hierarchical structure and sensitivity analysis (Vaidya and Kumar, 2006).

There are some reasons why this study is important. Comprehension of the factors which has a positive effect on consumers use of e-books leads to an enhancement in the way technology is developed. It may help or guide technology development strategy to improve consumer satisfaction and purchase of e-books. The steady development of technology causes changes in e-books. For a product not to vanish, it has to keep up with the new improvements by updating continuously. Not only should it be updated but also this technology should be accepted by the consumers for a long period of time. This can be accomplished by figuring out what the consumer wants from the product and analyzing the determinants that influence the process of product adoption.

This research makes some important contributions. TAM is enhanced with several new factors that are perceived risk, environmental concerns, social influences and cost. AHP and MRA are used to investigate the influence of the determinants on e-book adoption, to contrast the results of different methodologies and to see if the results of both techniques are consistent. The AHP and MRA results suggest the significance of perceived usefulness and perceived ease of use for attitudes toward using e-books. According to the AHP results, another interesting finding is that environmental concerns is an important factor that affects e-book acceptance. This finding emphasizes that making comparative judgements between environmental concerns and other criteria (i.e. perceived risk, social influences and cost) helps to understand the relative importance of these concerns in the decision making process.

The organization of the paper is as follows: the next section consists of the literature review. Section 3 includes hypotheses development and the proposed model. Data and methodology are discussed in Section 4. Section 5 gives information about data analyses and results. Finally, discussion and conclusion are involved in the last section.

2. Literature Review

E-books are defined as electronic versions of traditional printable books or materials that can be transmitted through various media (Poon, 2014). Currently, e-book markets have enlarged with various types of e-books available (textbook, newspaper, article, reference book, magazine, etc) and with different forms of software and devices (kindles, tablets, smartphones, iPads, etc) (Ashcroft, 2011).

Improvements in technology have given rise to an increase in the availability of different e-book types and featured devices. The diversity of these features has led to an increase in the use of e-books. Importance and advantages of e-books increase with those improvements. They are as follows. Documents are easy to access and can be downloaded whenever needed. E-books can be read when the user is online or offline and they can be carried everywhere. There are no delivery or shipment costs. There is no use of paper, which is a benefit to the environment. Reading experiences and learning efficiencies will be enhanced because of easy and fast access to e-books, content relevance and appropriate educational model. The usage of e-books will teach everyone to share because the increase in the use of e-books will improve information sharing habits (Poon, 2014; Sasson, 2016).

The literature on technology acceptance has mainly concentrated on the factors that affect TAM or improvements to basic TAM with models, methods or theories. This section is comprised of firstly, an introductory description of TAM, factors influencing TAM and improvements to the basic model.

2.1. Technology Acceptance Model

Technology Acceptance Model (TAM) is designed to figure out the technology adoption of users among different courses of actions. This is performed by developing new ways for the design and

application of information systems. TAM also facilitates the assessment of the user acceptance method before putting the new systems into use (Davis, 1985). TAM is proposed by Davis (1985) and he came up with a conceptual model which is formed to suggest motivation is a tool for explaining system use and stimulus has an influence on this usage (Davis, 1985). According to Davis (1989), the Technology Acceptance Model (TAM) is "an adaptation of Theory of Reasoned Action (TRA) specifically tailored for modelling user acceptance of information systems" (Davis,1989). The conceptual model is readdressed depending on a former study of Fishbein and Ajzen (1975) that has a link with the TRA. As stated in TRA, previous behavioural intention and belief for that behaviour can be used to determine a person's actual behaviour. Behavioural intention can be described by two factors that are attitudes toward behaviour and subjective norm (Chuttur, 2009; Fishbein and Ajzen, 1975).

The redefined model, which is introduced by Davis (1985), indicates that three factors which are perceived ease of use, perceived usefulness and attitude towards using can be utilized to explain the actual system usage. The attitude of a user toward a system helps to understand whether user accepts or rejects the system. It is stated that perceived ease of use and perceived usefulness influence attitude towards using a system directly (Davis, 1985). The first version of the Technology Acceptance Model is proposed by Davis et al. (1989) and it combines the redesigned conceptual model with various variables from former studies (Davis et al., 1989). The TAM (first version) (Davis et al., 1989), which is comprised of 6 concepts, is presented in Figure 1. The factors in the model help to understand the attitude towards using a new technology (Chuttur, 2009; Davis, 1985; Davis, 1989; King and He, 2006). External Variables (EV) are the factors that have an effect on perceived usefulness (PU), perceived ease of use (PEU) and attitude towards using (ATU) (Phan and Daim, 2011). PU means that a person believes the usage of the application will have a positive impact on doing the job and will increase the work performance. It has a direct effect on attitude towards using a new technology so higher levels of PU leads to more positive attitudes toward using a technology (Al-Adwan, Al-Adwan and Smedley, 2013; Chuttur, 2009; Davis, 1985; Davis, 1989; Davis et al., 1989; King and He, 2006; Phan and Daim, 2011; Porter and Donthu, 2006).

PEU means that a person believes the use of a particular system will be free of effort and it influences technology acceptance attitudes significantly. Similar to PU, an increase in the level of PEU causes more positive attitudes toward using a technology (Al-Adwan, Al-Adwan and Smedley, 2013; Chuttur, 2009; Davis, 1989; Davis et al., 1989; King and He, 2006; Porter and Donthu, 2006).

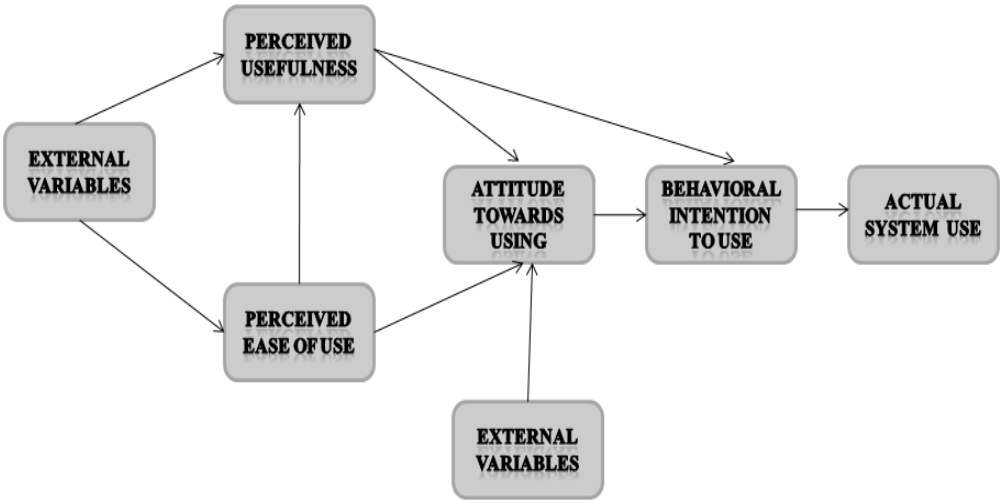


Figure 1: Technology Acceptance Model (First Version) (Davis et al.,1989).

ATU, which is described as the eagerness of the usage of the application, can be either negative or positive. Behavioural intention to use (BIU), which is defined as whether a person has considerate plans to act or not, is determined from ATU and PU that leads to actual system use (ASU) (Davis et al. 1989; Lala, 2014; Legris, Ingham and Collerette, 2003; Venkatesh, 2002; Venkatesh, Morris, Davis and Davis, 2003).

TAM is used in several studies because of its various advantages. It is a specific model for information systems that tries to implement factors of PU and PEU. It is also a parsimonious model that has simple assumptions for data formulation. It is parsimonious and robust because it has a limited number of factors that can be combined with several other models. It can be used to account for specific information system. Next, TAM is tested in many empirical types of research that show it is a reliable model. Since TAM can be utilized with a combination of TRA and some other theories, it is expected to predict attitudes toward using a technology more accurately than these theories. TAM is able to forecast technology adoption under different conditions (i.e. culture and time) with different

determinants and it is adaptable to various technologies (Li, Li and Chen, 2011; Olushola and Abiola, 2017).

2.2. Factors Affecting Technology Acceptance Model

Many studies concentrate mainly on various factors that affect TAM. The primary researches related to TAM started with examining the factors of PEU and PU in order to predict behaviours of people. Shultz and Slevin (1975) and Robey (1979) discovered that PU is a significant predictor of decision making and there is a strong relationship between PU and ATU. Apart from PU, Bandura (1982) and Davis et al. (1989) found that PEU also has a significant impact on understanding behaviours.

Besides PU and PEU, the influence of several other factors is also examined. Lin, Tzeng, Chin and Chang (2010) investigated users' perception of the influence of recommendations, perceived trust and perceived risk on intention to use e-books. The findings of Multiple Regression Analysis showed that word of mouth is the most important determinant that influences the intention of e-book use (Lin, Tzeng, Chin and Chang, 2010). Letchumanan and Tarmizi (2011) analyzed different factors by integrating gender as an external factor to TAM. The results of Factor Analysis and Structural Equational Modeling (SEM) pointed out that while perceived ease of use and gender do not have a significant impact on intention to use e-books, perceived usefulness has a positive significant influence on it (Letchumanan and Tarmizi, 2011). Like Letchumanan and Tarmizi, Bansal (2011) tested the effect of additional determinants of personality, environmental consciousness and past usage on e-book use. The results of the regression analysis indicated that environmental consciousness affects attitudes toward using e-books negatively and the other factors have a positive influence on e-book preferences (Bansal, 2011).

On the other hand, Phan and Daim (2011) harmonized several factors of technology, social factors and habits with the main factors of TAM although none of them were found significant as a result of AHP and Cluster analyses (Phan and Daim, 2011). Seet and Goh (2012) examined the impact of different factors that are perceived affordance and acceptance. PLS findings indicated that only

collaborative, immediacy, connectivity, support and mobility considerations have a salient impact on user's acceptance (Seet and Goh, 2012).

Apart from these factors, different determinants such as demographics, media usage/ownership and personal traits/perception were tested by Jung, Chan-Olmsted and Kim (2012) with the aim of understanding the process of technology acceptance. Hierarchical multiple regression analyses revealed that demographics and innovativeness are the most effective factors that help to forecast e-book reader diffusion (Jung, Chan-Olmsted and Kim, 2012). Huang and Hsieh (2012) also concentrated on innovation attributes (compatibility, complexity and relative advantage) and combined them with switching costs (financial, relational and procedural). Confirmatory Factor Analysis (CFA) the findings of which pointed out that only procedural and relational switching costs play a significant role in e-book readers usage (Huang and Hsieh, 2012).

On the other hand, Poon (2014) integrated TAM with four variables that are environmental consciousness, perceived costs, social influences and personal innovativeness. The findings showed that Partial Least Squares (PLS) method demonstrates the validity of the model (Poon, 2014). Besides, Tsai and Yen (2014) combined original TAM constructs with computer self-efficacy, reading self-efficacy and perceived enjoyment. PLS analysis confirmed that reading self-efficacy has a positive impact and computer self-efficacy has a negative influence on e-book usage (Tsai and Yen, 2014).

Al-Suqri (2014) focused on different factor influences of language and personal characteristics on perceived usefulness, perceived ease of use and acceptance. According to the results, higher levels of perceived ease of use, male gender type and occupations (i.e. engineers, business, arts and humanities) have a connection with more use of e-books (Al-Suqri, 2014). Nevertheless, Williams, Slade and Dwivedi (2014) investigated the influence of perceived usefulness, ease of use, subjective norm, cost and image on consumers' intentions to use e-readers utilizing PLS. They found that only perceived usefulness and subjective norm have a positive effect on e-readers' use of intention (Williams, Slade and Dwivedi, 2014).

All the same, Bergstrom and Hoglund (2014) analyzed the impact of demographics, the frequency of reading and book reading habits on e-book adoption and it is obtained from bivariate and multivariate analyses that the main changes in e-book reading can be explained by this model (Bergstrom and Hoglund, 2014). Similarly, Aharony (2015) adjoined several determinants of personal innovativeness, personal characteristics of motivation and cognitive appraisal to TAM. SEM analyses showed that these factors are the main determinants of behavioural intention to use e-books (Aharony, 2015). While Aharony (2015) focused on many factors, Teng and Cheng (2016) concentrated on the role of recognition in the adoption of an e-book reader. It is found that purchasing of a product is related to recognition, not the decrease in the price (Teng and Cheng, 2016).

Furthermore, Maduku (2017) extended TAM with social influence and facilitating conditions. SEM analyses suggested that perceived ease of use, perceived usefulness and social influence have a direct impact on e-book continuance intention among users (Maduku, 2017). Besides, Smeda, Shiratuddin and Wong (2017) tested the effect of self-efficacy, social influence, gender and student's attitude on adoption of e-books in two different groups of students who are from departments of statistics and mathematics. The findings of SEM analyses indicated that student's attitude has a strong influence on students' adoption of e-books. There is only a significant difference between males and females for the factor perceived ease of use (Smeda, Shiratuddin and Wong, 2017). Apart from Smeda, Shiratuddin and Wong (2017), Anton, Camarero and Rodriguez (2017) also tested various determinants of how perception of technology and its suitability with consumer values figure out the pleasure in using e-books. The results of the regression analysis revealed that while free downloading and appraisal of the device's reading features increase pleasure in using e-books, the frequency of the use of paper books decreases it (Anton, Camarero and Rodriguez, 2017).

2.3. Extending the Basic Technology Acceptance Model

Several studies focus mainly on combination of several models, methods or theories to TAM. Rather than just dealing with TAM, some previous studies integrated it with various Diffusion Theories (Chen, Yen and Peng, 2018; Jin, 2014; Lai and Chang, 2011; Lai and Ulhas, 2012; Lee,

2013), some others merged TAM with the Theory of Planned Behaviour (TPB) (Brown, 2011; Brown; 2012; Hsiao and Tang, 2014; Jin, 2014; Koul and Eydgahi, 2017), some combined it with Unified Theory of Acceptance and Use of Technology (UTUAT) (Hsiao and Tang, 2014; El-Masri and Tarhini, 2017) and the others merged TAM with various other theories (Aharony, 2014; Anton, Camarero and Rodriguez, 2013; Brown, 2011; Brown; 2012; Chen, Yen and Peng, 2018; Hsiao and Tang, 2014; Jin, 2014; Lai and Chang, 2011; Lee, 2013; Torres, Johnson and Imhonde, 2014).

There exist various differences when this study is compared to the research that is explained above. E-book devices, which may include Kindles, tablets or smartphones, are used rather than other devices. AHP and MRA are used to explain the influences of the factors on e-book adoption or use process and compare the results of different methods that are used in this study. They are also employed to see if the results of both techniques are consistent. Even if the prior works performed include factors of TAM with several external variables, this study contains perceived risk, environmental concerns, social influences and cost factors along with the main factors of TAM. TAM is improved with the described factors. These factors are chosen because they are significant determinants of consumer's decision making process of purchasing (Constantinides, 2004).

Some parts of this study are based on a former research of Phan and Daim (2011) the purpose of which was to identify the determinants that influence mobile services' acceptance. Instead of mobile services, e-books are used for analyses in this research. The factors are determined utilizing TAM and considering the relevant literature in each study. While the factors which were used in Phan and Daim's research are perceived usefulness, perceived ease of use, technology, social factors and habits, this investigation involves perceived usefulness, perceived ease of use, perceived risk, environmental concerns, social influences and cost. Phan and Daim analyzed the effect of the determinants on mobile service adoption using AHP and Cluster analysis. As a novelty, AHP and MRA are employed for testing the data in this study.

3. Conceptual Model and Hypotheses Development

3.1. Conceptual Model

Different people have different preferences for features of e-books and the priority given to each feature differs. TAM, which is employed with the aim of understanding the behaviour of e-book adoption, is explained thoroughly in Section 2.1. The conceptual model, the purpose of which is to examine the impact of each determinant on technology adoption, is proposed and created by exploring the existing studies in the literature. It is included in Figure 2.

Adoption of e-books is obtained as a result of attitude towards using (ATU) which is the goal for AHP and dependent variable for MRA. Perceived usefulness (PU), perceived ease of use (PEU), perceived risk (PR), environmental concerns (EC), social influences (SI) and cost (CO) are explanatory factors affecting e-books' acceptance by means of ATU. The definition of each construct is included in the relevant hypotheses in the following section.

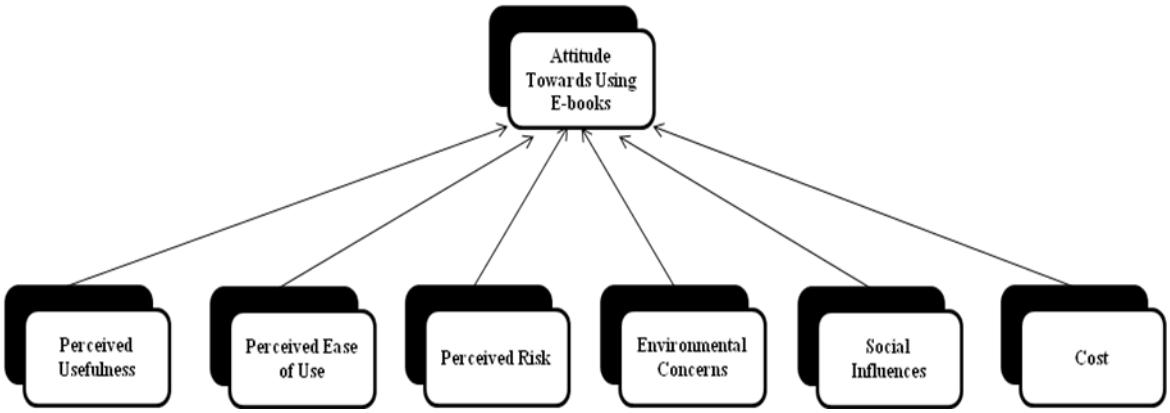


Figure 2: The Conceptual Model

3.2. Hypotheses Development

In this study, ATU relies on the main determinants of TAM and external variables. Factors of perceived usefulness and perceived ease of use are determined by taking into account TAM. The other factors (perceived risk, environmental concerns, social influences and cost) are considered based on

the factors that come to the forefront in the relevant literature. It can also be observed from Figure 2 that ATU counts on PU, PEU, PR, EC, SI and CO. Seven different hypotheses, which represent the expected relationship of each construct with ATU, are developed to test the conceptual model.

3.2.1. Perceived Usefulness

Perceived usefulness is described as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis, 1989). PU assists to comprehend and figure out directly the attitude towards using a new technology (Chuttur, 2009; Davis, 1985; King and He, 2006; Porter and Donthu, 2006). The higher the level of perceived usefulness, the more positive attitudes are toward using a technology (Al-Adwan, Al-Adwan and Smedley, 2013; Davis, 1989). Thus, it is hypothesized: For AHP,

H_{1a}: Perceived usefulness is an effective dimension for attitude towards using e-books.

For MRA,

H_{1b}: Perceived usefulness has a significant positive effect on attitude towards using e-books.

3.2.2. Perceived Ease of Use

Perceived ease of use is described as "the degree to which an individual believes that using a particular system would be free of effort or difficulty" (Davis, 1989). It helps to determine and understand the adoption of information technology and it influences attitudes toward accepting a technology directly (Chuttur, 2009; Davis, 1985; King and He, 2006; Porter and Donthu, 2006). High level of perceived ease of use leads to more positive attitudes toward using a technology (Al-Adwan, Al-Adwan and Smedley, 2013; Davis, 1989). Hence, it is hypothesized:

For AHP,

H_{2a}: Perceived ease of use is an effective dimension for attitude towards using e-books.

For MRA,

H_{2b}: Perceived ease of use has a significant positive effect on attitude towards using e-books.

3.2.3. Perceived Risk

Perceived risk, which is defined as the perception of uncertain consequences when performing a behaviour, the possible consequences of which is about various risk types that have a connection with operating, privacy and health issues in this research. The performance of the e-book device is related to operating risk which is a concern that the product will not operate as it is expected and described. Privacy risk deals with hesitation to trust online financial activities. Risk about health issues is related to the negative effects of the product on our body (Lee, 2013; Lin, Tzeng, Chin and Chang, 2010; Wu and Wang, 2005).

People show attitudes of risk in indefinite situations. While a risk seeker person likes to take risks, a risk-averse person does not enjoy taking risks. Risk has an effect on consumer behaviours and decisions **(**Lin, Tzeng, Chin and Chang, 2010; Rohrmann, 2005; Wu and Wang, 2005). People are more anxious about various risks in online purchasing activities rather than the physical environment because of its intangible characteristics. Since anxiety or uncertainty is confirmed to reduce consumers online shopping attitudes, perceived risk has a negative influence on behaviours of information technology usage (Ahn, Lee and Park, 2001; Ittersum et al., 2006; Lin, Tzeng, Chin and Chang, 2010; Pavlou, 2003). Regarding this view, it is hypothesized:

For AHP,

H_{3a}: Perceived risk is an effective dimension for attitude towards using e-books.

For MRA,

H_{3b}: Perceived risk has a significant negative effect on attitude towards using e-books.

3.2.4. Environmental Concerns

Environmental concerns are "the general attitude or value orientation towards protecting the environment" (Hwang, 2014). Since the concerns for the environment reflect a person's consumption behaviours, positive environmental attitudes cause positive and attentive consumption behaviours (Antil, 1984; Bansal, 2011; Hwang, 2014; Poon, 2014). Thus, it is hypothesized:

For AHP,

H_{4a}: Environmental concerns are effective dimensions for attitude towards using e-books.

For MRA,

H_{4b}: Environmental concerns have a significant positive effect on attitude towards using e-books.

3.2.5. Social Influences

Social influence is described as how important others have an effect on decisions toward using the information system. It takes place through social pressure or the frequency of the peers' product use (Chiang and Chia-Chen, 2014; Hsiao, 2013; Poon, 2014).

In this study, social influence deals with the influence of peers and environment on users' eagerness to shift their habit from traditional books to e-books and it influences users' intentions of using e-books positively (Chiang and Chia-Chen, 2014; Hsiao, 2013; Guo and Barnes, 2011; Ittersum et al.,2006; Phan and Daim, 2011). In this regard, it is hypothesized:

For AHP,

H_{5a}: Social influences are effective dimensions for attitude towards using e-books.

For MRA,

H_{5b}: Social influences have a significant positive effect on attitude towards using e-books.

3.2.6. Cost

Cost refers to the price that consumers pay for acquiring a kind of service or product (Ho, Lu and Lin, 2013). Consumers believe that price has a direct connection with quality (Chiang and Chia-Chen, 2014; Ho, Lu and Lin, 2013; Wu and Wang, 2005). Seeing that higher cost limits the purchasing behaviour (Williams, Slade and Dwivedi, 2014), price generally leads to a decrease in technology acceptance (Au and Kauffman, 2003; Guo and Barnes, 2011; Ittersum, et al., 2006; Phan and Daim, 2011; Poon, 2014). Regarding this view, it is hypothesized:

For AHP,

H_{6a}: Cost is an effective dimension for attitude towards using e-books.

For MRA,

H_{6b}: Cost has a significant negative effect on attitude towards using e-books.

3.2.7. Interaction Effect of Perceived Risk and Cost

Perceived risk has a relationship with cost in a way that its influence may reduce through economic incentives that consist of products with lower prices or reduced costs. People are more prone to using technology with lower risks that decrease with lower costs (Ahn, Lee and Park, 2001; Engemann and Miller, 2015; Salam, Rao and Pegels, 2003). The higher the level of cost and perceived risk, the lower becomes the positive attitude towards the use of e-books. Similarly, the lower the level of cost and perceived risk, the higher the level of usage attitudes of e-books is. So the impact of perceived risk on attitude towards using e-books changes with different values of cost (Ahn, Lee and Park, 2001; Engemann and Miller, 2015; Salam, Rao and Pegels, 2003).

This interaction effect of perceived risk and cost is investigated utilizing MRA in this research. It is believed that cost moderates the effect of perceived risk in a way that cost reduces the influence of perceived risk so that perceived risk becomes less important. In other words, when there is a decrease in the value of cost, people may disregard perceived risk due to more importance given to cost. This relationship is hypothesized:

H_7: Cost increases the negative effect of perceived risk on attitude towards using e-books.

4. Data and Methodology

This section consists of data (survey design, variable measurement, sampling and data collection) and the methodology that is used.

4.1. Data

4.1.1. Survey Design and Variable Measurement

Data is collected using a survey study through questionnaires because it is suggested to be the most appropriate survey type for this study. The questionnaire, which is developed based on previous research, is prepared with the aim of observing consumers' attitudes toward using e-book devices. It includes two sections. Section 1 is prepared for Multiple Regression Analysis (MRA) to understand the explanatory power of the determinants in the model. The questions are prepared in line with the researches of Gefen and Straub (2000), Venkatesh et al. (2003), Wu and Wang (2005), Porter and Donthu (2006), Lee (2013), Hwang (2014), Jin (2014) and Mulholland and Bates (2014). Five-point Likert-type scales are used to measure attitudes toward using e-books for each construct. Section 2 is designed to collect data for the Analytic Hierarchy Process (AHP) Method and it is prepared to observe the effectiveness or the priority of the factors on attitudes toward using e-books. The questionnaire design is improved depending on the previous studies of Phan and Daim (2011) and Oz (2011a and 2011b). Measurements are carried out with a 1-9 frequency scale and the respondents are asked to assign scores to each factor of the model depending on their preferences. By this way, a comparison of two items can be made at a time.

4.1.2. Sampling and Data Collection

Data is collected from primary sources utilizing the questionnaires described in Section 4.1.1. The unit of analysis for the research is postgraduate students of Business Administration, Electrical and

Electronics Engineering and Computer Engineering departments of a well-established university. A survey was applied to 150 students who use e-books. Since personal judgement is required when choosing the sample, nonprobability sampling is used. Convenience sampling is also performed because the subjects are postgraduate students of different departments from the mentioned university. This sampling technique is selected because it is not easy to find the participants who use e-books considering a high number of graduate students in various universities. Because of the fact that there are many students, the cost of reaching to those students is high and there is a time constraint, so non-random sampling is applied.

4.2. Methodology

This is exploratory research the purpose of which is to investigate the factors that influence e-book adoption. Two different methods, which are the Analytic Hierarchy Process Method and Multiple Regression Analyses, are employed to examine the hypotheses in the proposed conceptual model.

4.2.1. Analytic Hierarchy Process Method

The Analytic Hierarchy Process (AHP) (Saaty, 1980; Saaty, 1983) which is one of the most important tools of decision makers, is commonly used in multiple criteria decision making processes. It has several advantages. It is an easy, straightforward, stable, flexible and convenient method for decision makers to understand. It is comprised of a sensitivity analysis that leads to more realistic scenarios. The fact that it uses weights and pairwise comparisons to come up with the best decision makes it a simple method. The effect of upper levels on lower levels can be observed with the hierarchy and consistency check helps to reduce errors (Saaty, 1980). Overall, the ability to design complex, multi-attribute, multi-period and multi-person problems in the hierarchy and its simple use make AHP a strong model (Moffett and Sarkar, 2006; Shahroodi et al., 2012).

Although AHP brings forth several advantages, it also has some disadvantages. A 1 to 9 ratio scale may lead to inconsistencies. Having different opinions about the weights of each criterion may cause complexity. The subjective evaluation of AHP, which requires knowledge and skills, may result in conflicts among decision makers. Risks and uncertainties are not taken into consideration in AHP

(Moffett and Sarkar, 2006; Shahroodi et al., 2012).[1] In order to make sure that judgements are consistent, consistency checks are performed by calculating consistency ratios using the rule of thumb approach (Saaty, 1990).[2] If CR is less than 0.1, there is no concern for inconsistency. After checking consistencies, the scores for alternatives are acquired utilizing weights and the ones with the highest score are selected. Finally, a sensitivity analysis is carried out to observe how sensitive the preference is to the changes in decisions (Saaty, 1990).

4.2.2. Multiple Regression Analyses

Multiple regression analysis (MRA), which is a statistical technique that is used to analyze the relationship between a single dependent variable and multiple independent variables, broadens Simple Regression by adding several independent variables (predictors) (Hair Jr, Black, Babin and Anderson, 2010). MRA is a flexible method that helps to analyze sophisticated hypotheses, avoid non-optimal mergers of predictors and discover relationships among independent and dependent variables (Tabachnick and Fidell, 2001). The assumptions of MRA (Doane and Seward, 2011) are checked for the analyses.

5. Data Analyses and Results

The importance of the factors on e-book adoption in the proposed model is tested utilizing the Analytic Hierarchy Process Method and Multiple Regression Analyses.

5.1. Analytic Hierarchy Process Method

Although the data is collected from a total of 150 postgraduate students, 22 of them are excluded from the analyses due to inconsistencies. Hence, 128 students, 64 of whom are from Business Administration (BA) and 64 of them are from Electrical and Electronics Engineering (EEE) and Computer Engineering (CE) departments, are involved in the analyses. The normality tests indicate that all the variables show approximately normal distributions.

[1] For a detailed exposition of the AHP Method see (Saaty, 1987; Saaty, 1990).
[2] For details of rule of thumb approach see (Saaty, 1990).

Analytic Hierarchy Process (AHP) Method, which is explained in Section 4.2.1, is considered suitable to investigate the role of the determinants on e-book adoption. Since there are multiple criteria of the factors, this study is appropriate for AHP. Weighted importances for the factors help to understand their roles on e-book adoption process and to determine which factor has more effect or which factor is the best decision (preference) on acceptance of e-books.

The research of Phan and Daim (2011) is taken into consideration when performing AHP analysis. It is implemented mathematically based on the stages of AHP[3] and the obtained results are checked from a website to achieve more precise information (Goepel, 2016). While performing the analyses, a decision hierarchy for attitude towards using e-books is set up similar to the conceptual model in Figure 2. Everything is the same except that the hierarchy goes from top to bottom and acceptance of e-books can be removed since one objective is needed. The general objective is understanding attitude towards using e-books and attributes are the determinants.

5.1.1. Results

After obtaining the data from the participants, consistency ratios and weights for each participant are calculated. While a low consistency ratio indicates that the consistency of participant's decision is high, a high consistency ratio states that the consistency of participant's decision is low. The acceptable range for consistency ratio is above 0.1 that is equal to 10% inconsistency rating and 90% consistency rating (Oz, 2011a; Oz, 2011b). Since the consistency ratios whose values are higher than 0.1 are not involved in the analyses, 22 of the participants are eliminated. The computed average consistency ratio (CR) for the determinants, which is less than 0.1, is 0.06. This means it has a consistency rating of around 94% and the decisions with respect to each attribute are highly consistent.

The weighted importance of the factors, which present its importance relative to others, is calculated in order to observe the influence of determinants on e-book adoption. Higher weights indicate more priority or more effect on decision making (Oz, 2011a; Oz, 2011b). The average value of each weight (or priority) is included in Table 1 and Figure 3.

[3] For a detailed exposition of the stages of AHP Method see (Saaty, 1990).

In this study, the threshold value for the weights is specified as the average value of the number of independent factors out of 100. Since there are 6 independent variables, the average value is calculated as 0.166 (16.6%). The variables with weights that are higher than the threshold value are considered as an effective dimension. It may be observed from Table 1 and Figure 3 that perceived usefulness (weight=0.253) is the first priority, perceived ease of use (weight=0.222) is the second priority, and environmental concerns (weight=0.196) is the third priority when prioritising the six attributes for ATU. Since the weights for the factors PU, PEU and EC are greater than the threshold value of 0.166 (16.6%), they are considered as effective dimensions for attitudes toward using e-books.

Table 1: Attribute Priorities for Students

FACTORS	PARTICIPANTS
Perceived Risk	0.111
Environmental Concerns	0.196
Perceived Usefulness	0.253
Perceived Ease of Use	0.222
Cost	0.144
Social Influences	0.073

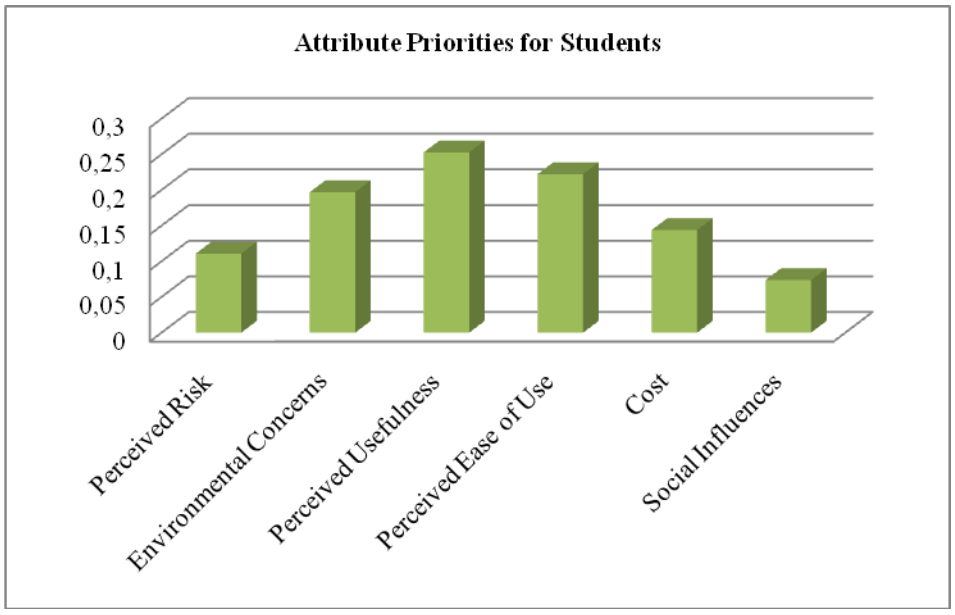


Figure 3: Attribute (Factor) Priorities for Students

5.2. Multiple Regression Analyses

Multiple Regression Analyses, which is clarified in Section 4.2.2, are carried out utilizing Minitab 16 and Eviews 8 Statistical Software Programmes. Although the data is acquired from a total of 150 postgraduate students, 1 outlier is excluded from the analysis leaving 75 BA and 74 EEE and CE students. The variables, which are included in the conceptual model of Figure 2, satisfy the assumptions of MRA.

Since the influence of determinants on ATU are examined, ATU is the dependent variable and PU, PEU, PR, EC, SI and CO are the independent variables for the regression model. The interaction between PR and CO is also investigated employing MRA. The proposed model in this research is suitable for MRA because there is one dependent variable, a set of independent variables and an interaction term.

5.2.1. Results

MRA is used to test if several factors significantly predict ATU e-books. The results of the regression analyses are included in Table 2.

Table 2: The Results for Regression Analyses

Variable	Coefficient	Std. Error	t-Statistic	p-value	Standardized Coefficient
C	1.205	1.302	0.926	0.355	
PU	0.518	0.124	4.164	**0.0001**	0.336
PEU	0.455	0.115	3.971	**0.0001**	0.305
PR	-0.814	0.440	-1.847	0.066	-0.563
EC	0.155	0.125	1.2495	0.214	0.086
SI	0.165	0.091	1.817	0.071	0.125
CO	-0.605	0.398	-1.521	0.130	-0.426
PR*CO	0.235	0.149	1.575	0.117	0.727
R-squared	0.435		**Mean dependent var.**		3.825
Adjusted R-squared	0.407		**S.D. dependent var.**		0.941
S.E. of regression	0.724		**Akaike info criterion**		2.244
Sum squared resid	73.946		**Schwarz criterion**		2.405
Log-likelihood	-159.226		**Hannan-Quinn criter.**		2.310
F-statistic	15.531		**Durbin-Watson stat.**		2.024
p-value	p<0.0001				

The results indicate that the variables statistically significantly predict ATU and the predictors explain 43.53% of the variance, ($F(7,141)=15.531$, $p<0.01$, $R^2=0.435$). It is found that PEU ($\beta=0.455$, $p<0.01$) and PU ($\beta=0.518$, $p<0.01$) significantly predict ATU. The results confirm that PEU and PU have a positive influence on attitudes toward using e-books so ATU increases when there is an increase in the level of one of these determinants (Al-Adwan, Al-Adwan and Smedley, 2013; Davis, 1985; Davis, 1989; Teo, Lee, and Chai, 2008). On the other hand, PR ($\beta=-0.814$, $p=0.066$), EC ($\beta=0.155$, $p=0.214$), SI ($\beta=0.165$, $p=0.071$), CO ($\beta=-0.605$, $p=0.130$) and PR*CO ($\beta=0.235$, $p=0.117$) do not have significant influence on ATU. The regression equation is as follows:

ATU = 1.20 + 0.518 PU + 0.455 PEU – 0.814 PR + 0.155 EC +0.165 SI – 0.605 CO + 0.235 PR*CO

5.3. Hypotheses Testing

In this section, the hypotheses, which are developed in Section 3.2, are tested by using results that are obtained from AHP and MRA.

According to the findings of the MRA, it is identified that perceived usefulness (PU) has a positive significant influence on ATU e-books ($\beta=0.518$, $p<0.01$). Similarly, the findings of the AHP show that PU is an effective dimension for attitudes toward using e-books for participants (weight=0.253). Besides, these findings are in line with the previous studies of Davis (1985, 1989), Letchumanan and Tarmizi (2011), Phan and Daim (2011), Lai and Ulhas (2012), Anton, Camarero and Rodriguez (2013), Liu, Liao and Peng (2005), Park (2009), Pavlou (2003), Wu and Wang (2005) and Chang, Yan and Tseng (2012). Consistent with these findings, Hypotheses 1a and 1b (H_{1a} and H_{1b}) are supported.

Not only the results of the MRA show that perceived ease of use (PEU) is a positive significant determinant for participants ($\beta=0.455$, $p<0.01$) but also AHP results point out that PEU is an effective dimension for attitudes toward using e-books for participants (weight =0.222). Both of the results are in parallel with the previous indications of Davis (1985, 1989), Phan and Daim (2011), Anton, Camarero and Rodriguez (2013), Al-Adwan, Al-Adwan and Smedley (2013), Liu, Liao and Peng

(2005), Park (2009), Pavlou (2003) and Chang, Yan and Tseng (2012). Consistent with the evidence in these studies, Hypotheses 2a and 2b (H_{2a} and H_{2b}) are supported.

While perceived risk (PR) is found to be a nonsignificant factor on attitudes toward using e-books based on the findings of MRA, it has a negative relationship with ATU (β=-0.814, p=0.066). Likewise, PR is not an effective dimension for attitudes toward using e-books in accordance with the results of AHP (weight=0.111). Although Pavlou (2003), Wu and Wang (2005), Lin, Tzeng, Chin and Chang (2010) and Lee (2013) state that PR has a significant influence on the adoption of e-books, Liu and Wei (2003) and Claudia, Alexandra and Ionut (2012) conclude that PR does not have a significant impact on e-book adoption. Coherent with these findings, Hypotheses 3a and 3b (H_{3a} and H_{3b}) are not supported.

MRA confirms that EC do not have a significant influence on attitudes toward using e-books for participants, whereas they have a positive connection with e-book usage behaviours (β=0.155, p=0.214). EC are effective dimensions for attitudes toward using e-books according to AHP (weight =0.196). The researches of Bansal (2011) and Hwang (2014) also reveal that EC have a significant effect on attitudes toward using e-books books using different methods. Considering these results, while Hypothesis 4b (H_{4b}) is refuted by MRA, Hypothesis 4a (H_{4a}) is supported by AHP method.

It can be reported based on the results of MRA that SI do not have a significant impact on attitudes toward using e-books and they have a positive relationship with ATU (β=0.165, p=0.071). The results of the two methods are consistent in a way that SI are also not effective dimensions for ATU when AHP is used for analyses (weight=0.073). The studies of Hsiao (2013) and Chiang and Chia-Chen (2014) entail that SI have a significant effect on the acceptance of e-books. However, the researches of Guo and Barnes (2011) and Phan and Daim (2011) imply that SI do not have a significant influence on the adoption of e-books. Consistent with these findings, Hypotheses 5a and 5b (H_{5a} and H_{5b}) are refuted.

According to the results of MRA, CO is not a significant determinant for e-book acceptance but it has a negative influence on attitude towards using e-books (β=-0.605, p=0.130). The findings of MRA

are in line with the results of AHP in such a manner that CO is not an effective dimension for attitudes toward using e-books (weight=0.144). The research performed by Chiang and Chia-Chen (2014) and Williams, Slade and Dwivedi (2014) reveal that CO does not have a significant effect on attitudes toward using e-books but Wu and Wang (2005) and Phan and Daim (2011) confirm the opposite. Consistent with the evidence in these studies, Hypotheses 6a and 6b (H_{6a} and H_{6b}) are not supported.

Hypothesis 7 (H_7) is only tested utilizing MRA. The interaction term PR*CO does not have a significant effect on the acceptance of e-books (β=0.235, p=0.117). So, Hypothesis 7 (H_7) is not supported.

6. Discussion and Conclusion

Electronic books (e-books) are recognized as the next generation of traditional printable books (Poon, 2014). Improvements in technology have given rise to an increase in the availability of different e-book types and featured devices. The diversity of these features have led to an increase in the use of e-books. The acceptance of the technology for e-books varies depending on users' interests and preferences. The purpose of this study is to investigate and determine the factors that affect the acceptance of technology for e-books. The Technology Acceptance Model (TAM) is used to explain the reasons behind the adoption of technology in this study. Existing researches are reviewed to determine the factors which influence e-book technology adoption. While factors of perceived usefulness and perceived ease of use are selected based on TAM, the other factors (perceived risk, environmental concerns, social influences and cost) are determined considering the relevant literature.

These factors are selected because each of them plays a critical role and has an effect on consumers' decision making process of purchasing that consists of psychological, personal and environmental uncontrollable and content factors. Each factor in the conceptual model is involved in one of these factors. Perceived risk is included in psychological factors, environmental concerns and social influences are considered as a part of personal and environmental uncontrollable factors and cost is related to content factors. Motivations to purchase products are affected directly by these factors (Constantinides, 2004).

A conceptual model (as given in Figure 2) is developed based on the factors that are mentioned above. By using the conceptual model, questionnaires are prepared to obtain the data from 150 postgraduate students of BA, EEE and CE departments from the university.

The methods of AHP and MRA are used to analyze the effects of factors on e-book adoption and to test the proposed model. Several inconsistent data (22 students) for AHP and outliers for MRA (1 outlier) are eliminated for the analyses. The results of the AHP and MRA Methods present significant implications about the importance and effects of the factors. According to the results of AHP, it is reported that PU, PEU and EC are considered as effective dimensions for attitudes toward using e-books. PU, PEU and EC are the most important factors that have an influence on e-book adoption for participants. PU is the first priority, PEU is the second priority and EC is the third priority for participants.

According to the results of the MRA, it is reported that PU and PEU are the significant predictors of attitude towards using e-books for participants. They affect acceptance of e-books and they both have a positive relationship with attitude towards using e-books. The results reveal that the findings of the two methods are consistent. It is noted that PU and PEU are the most important factors that have an impact on the acceptance of electronic books for students. The results are expected because TAM focuses on mainly two factors which are perceived usefulness and perceived ease of use. These factors help to develop an understanding and determination of the attitude towards using a new technology. Since PU is related to the usages that improve job performances, people give more importance to this attitude. PEU is also a significant factor because it is about ease of the use of the system (Davis, 1989). It has a direct influence on attitudes toward adopting a technology. Higher levels of PU and PEU bring about more positive attitudes toward using a technology (Davis, 1989; Al-Adwan, Al-Adwan and Smedley, 2013). The results align with the previous findings of Davis (1985, 1989), Letchumananand Tarmizi (2011), Phan and Daim (2011), Lai and Ulhas (2012), Anton, Camarero and Rodriguez (2013), Al-Adwan, Al-Adwan and Smedley (2013), Liu, Liao and Peng (2005), Park (2009), Pavlou (2003), Wu and Wang (2005), Agarwal and Prasad (1997) and Chang, Yan and Tseng (2012).

EC is determined to be an important dimension in AHP but not in MRA. EC can or cannot be considered as an important dimension because it depends on people's consciousness of saving the environment. This finding points out that environmental concerns are at the forefront of e-book users' decision making process when their decisions are based on the priorities between these concerns and other factors (i.e. perceived risk, social influences and cost). These findings indicate that AHP method may provide more thorough and detailed analysis. This is due to the fact that it uses weights, pairwise comparisons and consistency checks. All of these properties help to solve the decision problem in a more realistic and simpler way with smaller errors.

This study is significant because the way technology develops is related to an understanding of the factors that positively affect consumers' use or purchase of e-books. This may cause technology advancement procedure to improve consumer satisfaction and purchase of e-books. The features of e-books change with the improvement of technology. The product must be updated continuously with new improvements and it must be widely accepted in the long run. This can be attained by understanding consumer needs, satisfying those needs and exploring the factors that influence product acceptance. If environmental concerns are to be addressed when offering these products to consumers, consumers should be encouraged to make pairwise comparisons with the other mentioned factors. By this way, environmental concerns can be revealed so that purchasing behaviour of the product can be strengthened in the decision making process.

The main contributions of this study are as follows. This study integrates new factors of perceived risk, environmental concerns, social influences and cost with the main factors of TAM. Thus, TAM is enhanced with the described factors. Methods of AHP and MRA are used to analyze the influence of the factors on e-book adoption and to see if both of the results are consistent. The results of AHP and MRA indicate the importance of perceived usefulness and perceived ease of use for attitudes toward using e-books. Apart from these factors, the findings of the AHP lay stress on another determinant, environmental concerns, that is considered as an efficient dimension for e-book using behaviours. It implies that making pairwise comparisons between environmental concerns and other criteria (i.e. perceived risk, social influences and cost) uncovers the relative importance of this factor among the

other determinants. Understanding the significance of these factors is valuable to marketers and e-book developers in displaying products that meet all criteria in consumer decision making process. Researchers may benefit from the AHP method to achieve a deeper selection analysis.

There are also some limitations of this study. This study may further be developed in line with these limitations as a future work. This research is conducted with 150 students from a well-known university. They are from Business Administration, Electrical and Electronics Engineering and Computer Engineering departments. It is limited to postgraduate students of different departments. These departments and education level may not be enough to explain the influence of factors that affect acceptance of e-books.

Several factors, which are identified from the literature, are selected considering the features of e-books. Other researchers might select these factors differently because external variables may vary depending on the researcher and literature. Moreover, the research is only confined with the two methods that are: AHP and MRA.

This study may be developed further in some other dimensions. For future research, the number of participants of the survey can be increased to get more precise results. Using online surveys instead of hard copies can save time and can help to increase the number of participants.

Since use of the AHP method is more thorough and detailed, its results may be more valuable for the ones who will apply this method in the future. AHP can be preferred because weights of the factors are assigned by the users and it consists of comparative judgements between the determinants.

To sum up, the adoption of the technology varies even if there is an increase in the use of e-books. The used analyses' methods in the studies indicate different evaluation types of the consumers in the decision making processes. The significance of EC can exemplify this situation in a way that its significance differs with MRA and AHP. The findings of different methods may be very helpful to understand the behaviours of e-book usage. One method may cover the weakness of the other method and it can be more explanatory. In order for a product to be accepted by consumers for a long time, the needs of the consumer must be fulfilled, the factors that influence product adoption process must be

analyzed, the behaviours must be understood in a better way utilizing different methods that will help to obtain more correct implications and shed light in the future.

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