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An Empirical Study of the Factors That Impact Medical Representatives" Attitude toward the Intention to Use M-Learning for Career Development

The proliferation and popularity of mobile phone usage in Sri Lanka has created an untapped potential for educators and organizations. The very recent introduction of m-learning to the higher education sector of the country is set to exploit much of this opportunity, but there remains some doubt on the readiness of people toward this revolutionary distance learning method. This paper critically evaluates the factors that would affect the intention to use m-learning among medical representatives, and also intends to shed some light on the barriers that hold the pharmaceutical sector back from utilizing it as a training tool. A sample of 210 medical representatives was selected, from an urban population of 450. The instrument of data collection was a Likert scale questionnaire. Data analysis was carried out using the statistical software SPSS 16.0. Correlation studies, simple linear regression and one-way ANOVA tests were conducted to establish relationships and test hypotheses. The results supported past literature through ten of the hypotheses with the exception of perceived self-efficacy and present level of education, which were not found to bear an impact on the intention to use m-learning. This empirical study is a first of its kind in Sri Lanka, and hopes to contribute to the existing body of literature on technology acceptance, in addition to providing invaluable insights to the pharmaceutical, mobile telephony and education sectors of this country.

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1. Introduction

The complex and dynamic nature of the business environment today calls for adaptive organizations. According to Keith Denton (1998), a pivotal characteristic of an adaptive organization is the ability to train and cross-train its workforce in order to cope with and meet the challenges posed by a rapidly evolving environment. Therein, knowledge has become an invaluable asset, in this so-called Knowledge Age. Harun (2001) notes that learning is indeed a prerequisite for the survival of individuals, organizations and nations swaddled in the present environment of chaos, and many academics and professionals would go on to share a similar sentiment.

Peter Senge (1994, p.11), who revolutionized organizational learning through his work the "Fifth Discipline," emphasized the components systems thinking, personal mastery, mental models, shared vision and team learning, a combination of which would lead to the advancement of an organization's capacity to learn. He further professed the role of systems thinking as the Fifth Discipline in enabling integration among the components and organizations to view themselves as part and parcel of the external environment, and not as independent entities. The emergence and growth of the Information Communication Technology (ICT) industry has no doubt facilitated systems thinking through increased integration and interactivity between organizations and their internal and external environments. Further, the rapid development of ICT has created many exciting opportunities for the education industry itself, by enhancing the process of learning and making education more accessible and economic. Distance education has been propelled to a whole new level with e-learning, which allows timely interaction and study material to students. In much of the developed world, where ownership of computers and access to broadband Internet is high, demand for online education continues to rise. From a corporate learning standpoint, e-learning has been accepted and utilised as a tool in employee training. A report by the Chartered Institute of Personnel Development (2008), found that a significant 57 percent of organizations in the U.K. used e-learning as an employee training method, with 79 percent of the companies being larger organizations.

The manifestation of m-learning through handheld devices, acknowledged as the next generation of e-learning, has opened new avenues for on-the-job training. According to Cobcroft (2006), characteristics that differentiate m-learning from e-learning are spontaneity, informality, situationism and the product's portability, which allows for ease of mobility. This unique combination of features lends itself to a learning experience that can take place "anytime, anywhere." The importance of m-learning in corporate training becomes evident given the fact that over 50 percent of employees spend a substantial amount of time outside the office, and on the move (Landers, 2002).

Mobile penetration in Sri Lanka is among the highest in the South Asian region with 8 million subscribers; a 38.2 percent of the total population (Dialog Telekom, 2007). The telecommunication industry has showed no sign of slowing despite the staggering economy, and is perceived to be the country's best performing sector providing direct and indirect employment to many. High penetration of mobile phone usage and the available infrastructure leaves the potential of this medium to provide and enhance learning in the corporate as well as education sector untapped. However, m-learning remained non-existent in Sri Lanka until very recently (Samarasinghe, 2008, p.1; The Sunday Times, 2008, p.11). As a preliminary investigation, this report attempted to study the potential barriers faced by pharmaceutical organizations in the adoption of m-learning, which is clearly in the introductory stage in Sri Lanka, and evaluate the factors that would impact employee readiness toward on-the-job learning with the use of mobile technology.

1.1 Problem Overview

Outside sales representatives have been noted to spend on average 40 percent of their time visiting existing or prospective clients (U.S. Bureau of Labour Statistics, 2007). Such positions leave little room for in-house training, despite the need for it. Sales representatives of the pharmaceutical industry, better known as medical representatives, are required to possess and exhibit a wide range of skills and knowledge on technical and medical aspects, as they have to deal with professionals in the medical industry on a regular basis. Due to the nature of their job, medical representatives could serve as a possible market for m-learning in the future. Many authors have reckoned it befitting just in time on the job training. Moreover, most global research on m-learning in a corporate user context pertains to the medical sector, and medical students and nurses have been used in a number of studies to evaluate the usefulness of m-learning (Maag, 2006; Walton, *et al.* 2005; Kenny, *et al.* 2005). In fact, a study by Jill Burger (2006) revealed that 20 percent of customers in the U.S. m-learning market came from the healthcare industry. Notwithstanding the potential and benefits to the frequently traveled employee, m-learning has several identifiable issues. Technical limitations of the product alone (screen size, memory, data input difficulty) suffice to create doubts in the minds of people. Additionally, a number of pedagogical barriers challenge the acceptance of m-learning. Smith (2001) reports that employees" reluctance to undertake self-directed learning is a serious barrier to flexible and innovative learning in organizations. Therefore, it would be useful to assess what factors would impact medical representatives" attitude toward the intention to use m-learning for career development.

1.2 Objectives of the Study

Objectives have been founded on the newness of the technology to Sri Lanka. Therefore an assessment of the barriers and prediction of user acceptance are deemed appropriate and useful to the key stakeholders in this instance. The main objectives concern the identification of the barriers to m-learning in the pharmaceutical sector, the factors that would impact representatives" intention to use m-learning and a study of the relationship between these factors and intention to use.

1.3 Scope and Limitations

The Western Province acted as the sampling frame, and as such the subjects of the sample are limited to this particular region although medical representatives are based throughout the country. When studying the acceptance of new technologies it has been found that moderator variables (Raaij and Schepers, 2006) help in explaining key relationships very well, but the theoretical framework of this study excluded the affect of moderator variables. Furthermore, not all factors contributing to behavioral intention have been included. Factors such as technology anxiety, perceived behavioral control and facilitating conditions have not been taken into consideration. Demographic factors such as age and gender had to be excluded due to the nature of the sample, which was mostly male and young. The sample also showed disproportion in other characteristics, particularly where the level of education and phone usage was concerned. The subjects also lacked any experience in the use of m-learning, which resulted in the study of intention to use only, and not actual usage.

2. Theoretical Background

Aspen's (1991) Theory of Planned Behaviour (TPB) model has been used extensively to understand the facets of human perception that subsequently lead to their behavior in the acceptance of a good or service. However, more frequently used in the assessment of people's perception toward new concepts of technology is the Technology Acceptance Model (TAM) that was introduced by Fred Davis (1985). The TAM is effectively an adaptation of the TPB model in that it includes Aspen's attitude and behavioral intention to use as measures of acceptance. Behavioral intention to use could be defined as a person's keenness to use a particular technology in the future (Bates *et al.*, 2008). Attitude refers to an "individual's positive or negative affective feelings about performing the behavior" (Hubona and Kennick, 1996). Much of the research on behavioral intention toward e-learning and m-learning has used TAM exhaustively, with certain alterations in some cases. In similar fashion to the TPB, this model asserts the role played by perceived ease of use, perceived usefulness and subjective norms in the probability of system acceptance by users.

Venkatesh *et al.* (2003) reviewed eight models commonly utilised in studying user acceptance of technology to arrive at The Unified Theory of Acceptance and Use of Technology (UTAUT) model, which has consequently been used in the study of attitude toward mobile learning. The major determinants of usage behavior were found to be performance expectancy, effort expectancy, social influence and facilitating conditions. Similar to perceived usefulness and perceived ease of use, these factors too are belief oriented in nature. Belief factors represent an "individual's subjective assessment that performing some behavior will result in a specific consequence" (Hubona and Kennick, 1996). However, the TAM and UTAUT model fall short of recognizing individual differences such as age, gender, education level, employment category and tenure as factors that carry a direct predictive power over behavioral intention, and have incorporated age and gender as moderating factors to the belief constructs. This lack

thereof has resulted in the criticism of these models is some instances. Particularly, the work of Hubona and Kennick (1996), Hubona and Jones (2004) and Straub *et al.* (1995) suggest the inadequacy of relying merely on belief constructs when studying user acceptance of a technology.

2.1 Hypotheses Development and the Theoretical Framework

2.1.1 Performance Expectancy
This is one of the core constructs of the UTAUT model developed by Venkatesh *et al.* in 2003. They defined Performance Expectancy (Venkatesh *et al.* 2003) as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance." Performance expectancy is a combination of the factors, perceived usefulness, extrinsic motivation, job-fit, relative advantage and outcome expectations, which have all been examined individually at one point or another in relation to intention to use. The relationship between performance expectancy and intention to use too has been studied several times, following its establishment by Venkatesh *et al.* (2003). Grant and Danziger (2007) found that performance expectancy had a significant impact on intention to use. Further, research by Keller (2007), Park *et al.* (2007) and Wang *et al.* (2007) all found that performance expectancy had a significant positive influence on intention to use. The study by Wang *et al.* (2007) is of immense importance to the current study, as it concerned the effect of performance expectancy on the intention to use m-learning. Additionally literature also supported relative advantage and perceived usefulness, two constructs of performance expectancy. Lu *et al.* (2005) found that relative advantage played a significant role in intention to use. Thus, it can be assumed that performance expectancy will have a significant positive impact on medical representatives" intention to use m-learning.

Hypothesis 1: There is a relationship between performance expectancy and the intention to use m-learning for career development.

2.1.2 Perceived Usefulness
Despite being considered as a component of performance expectancy, this factor deserves to be studied separately, as one that has been consistently supported in literature as a significant contributor to intention to use. Perceived usefulness has been defined by Davis (1989) as the "degree to which a person believes that using a particular system would enhance his or her job performance."

Numerous authors have supported the relationship between perceived usefulness and intention to use. Of special significance are the studies by Huang *et al.* (2006) and Sriprapaipong *et al.* (2007), which studied perceived usefulness in relation to behavioral intention to use m-learning, while the rest concerned e-learning and technology acceptance. Masrom (2007) concluded that learners" willingness to adopt a new technology is particularly weighed down by their perception of its potential benefits, and thus it is important that they have a positive outlook of the technology's usefulness. Hence, it can be assumed that the degree to which medical representative view m-learning to be useful will have an impact on their intention to use.

Hypothesis 2: There is a relationship between perceived usefulness and the intention to use m-learning for career development.

2.1.3 Effort Expectancy

The second construct of the UTAUT model by Venkatesh *et al.* (2003) is defined as the "degree of ease associated with the system by an individual." It is a combination of the factors perceived ease of use, complexity, and ease of use. The work of authors" Grant and Danziger (2007), Park *et al.* (2007) and Wang *et al.* (2007) has supported the relationship between effort expectancy and intention to use. Venkatesh *et al.* (2003) observed that effort expectancy was more significant for individuals with less experience, and with the accumulation of experience the significance of it on intention to use decreased. Christensen *et al.* (1999) also found that technology familiarity was positively correlated with receptivity to distance learning. Consequently, the more experienced and familiar a person is with a particular technology, the lesser the effect of effort expectancy on their intention to use it. Thus, it may be assumed that effort expectancy has a significant bearing on medical representatives" intention to use m-learning, as they have no experience with it.

Hypothesis 3: There is a relationship between effort expectancy and the intention to use m-learning for career development.

2.1.4 Social Influence

Social influence is a derivation of the factors social norm and subjective norm introduced in earlier theories of behavior, and has been defined by Venkatesh *et al.* (2003) as "the degree to which an individual perceives that important others believe he or she should use the new system." Social influence has been proven to vary in its impact on intention to use, from sample to sample, especially where different cultures and demographics are concerned. Keller (2007) found that social influence had a significant impact on intention to use virtual learning environments, with culture as a mediator. Park *et al.* (2007) found that social influence was a significant factor on the acceptance of mobile technologies among Chinese consumers. Kim (2004) found that socio-cultural influence was more significant to Chinese students" intention to use e-learning, over that of U.S. students due to cultural differences. Lu *et al.* (2005) found that image was a critical factor to the non-experienced user's intention to use e-learning. Grant and Danziger (2007) have also supported social influence on the intention to use e-learning, especially among older workers. More noteworthy to us is the study by Wang *et al.* (2007), which supported the relationship between social influence and intention to use m-learning among Taiwanese employees. Thus, it can be presumed that due the prevalent collectivist culture in Sri Lanka, social influence will have a significant affect on medical representatives" intention to use m-learning.

Hypothesis 4: There is a relationship between social influence and the intention to use m-learning for career development.

2.1.5 Perceived Playfulness

The prominence of intrinsic factors of motivation in technology acceptance has been noted by several authours. Agarwal and Karahanna (2000) stated that intrinsic motivation occurs when individuals completely immerse themselves in a technology, with the objective of deriving pleasure out of it. Perceived playfulness, perceived enjoyment and cognitive absorption are all aspects of intrinsic motivation. In addition to the finding by Wang *et al.* (2007) that exposed the significant positive relationship between perceived playfulness and intention to use m-learning, Huang *et al.* (2006) found perceived enjoyment to have a positive impact on the attitude toward intention to use m-learning. Several studies on e-learning have supported the impact of intrinsic motivation on intention to use as well. Perceived enjoyment and intention to use was also supported in the studies by Liaw *et al.* (2007) and Lee *et al.* (2003), while Saade *et al.* (2007) supported the relationship between intrinsic motivation and intention to use in their study. Thereby, it can be assumed that intrinsic motivation in the form of perceived playfulness will have a significant impact on medical representatives" intention to use m-learning.

Hypothesis 5: There is a relationship between perceived playfulness and the intention to use m-learning for career development.

2.1.6 Perceived Self Efficacy

Perceived self efficacy has been defined as "people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1991 cited in Ajzen, 2002). Simply put, for the purpose of the current study, perceived self efficacy refers to an individual's belief about his or her ability to use a mobile phone effectively in any given scenario, including learning.

Several empirical studies have supported the direct and indirect impact of perceived self efficacy on intention to use. With reference to the literature review, studies by Liaw *et al.* (2007) and Chang and Tung (2007a,b,c) have shown the direct significant positive impact of perceived self efficacy and intention to use e-learning. Pillay *et al.* (2007) also found it to directly affect the readiness of students toward e-learning. The indirect impact of perceived self efficacy on intention to use m-learning was confirmed in the findings of Sriprapaipong *et al.* (2007), whereby it was found to have a significant impact on perceived ease of use, which in turn affected the intention to use. Thus, it can be assumed that perceived self-efficacy would have a direct impact on medical representatives" intention to use m-learning, based on empirical evidence.

Hypothesis 6: There is a relationship between perceived self efficacy and the intention to use m-learning for career development.

2.1.7 Self-management of Learning

Self-management is a must, in flexible and ubiquitous learning environments, and has been defined as the "extent to which an individual feels he or she is self-disciplined and can engage in autonomous learning." (Smith *et al*., 2003 cited in Wang *et al.*, 2007). M-learning is essentially on the job training, and entails a high level of commitment and self-directedness as with other forms of distance learning methods. Smith (2000)

contended, based on empirical studies, that students" readiness for online learning is clouded due to their preference for traditional methods and lack of self directedness. With reference to the literature reviewed, Christensen *et al.* (1999) found that learning preference for traditional methods was negatively correlated with receptivity to distance learning. Of the two types of learning, taught learning and self-directed learning, the potential learners of m-learning will be those who prefer the latter, and in turn encompass a higher level of self-management of learning. The positive significant relationship between self-management of learning and intention to use m-learning was clarified in the pioneering research by Wang *et al.* (2007), in which they concluded that individuals with better autonomous learning skills are more likely to adopt m-learning. Hence, it can be assumed that the medical representatives" intention to use m-learning will be affected by their degree of self-management of learning.

Hypothesis 7:   There is a relationship between self management of learning and the intention to use m-learning for career development.

2.1.8 Perceived Mobility Value
This is a relatively new factor that has come into being in the limited research on m-learning. Huang *et al.* (2006) introduced perceived mobility value to the TAM in their research, in order to make it more relevant to m-learning. Perceived mobility value refers to "user awareness of the mobility value of m-learning" (Huang *et al.* 2006). The three value dimensions to mobility are convenience, expediency and immediacy. Although, Huang *et al.* (2006) investigated its affect on perceived usefulness, and not directly with regard to intention to use m-learning, their findings argued that perceived mobility value was a strong indicator of user intention itself. They further noted that as a significant feature of the product, user perception of the potential value of mobility had a significant bearing on their acceptance of m-learning. Therefore, it can be assumed that medical representatives" perceived mobility value of m-learning would positively affect their intention to use it.

Hypothesis 8: There is a relationship between perceived mobility value and the intention to use m-learning for career development.

2.1.9 Compatibility
Introduced originally by Moore and Benbasat (1991 cited in Venkatesh *et al.*, 2003), compatibility is defined as "the degree to which an innovation is conceived as being consistent with existing values, needs and experiences of potential adopters." Compatibility has been widely supported in literature, as a factor that significantly affects intention to use a technology. Lu *et al.* (2005) and Chang and Tung (2007a,b,c) found in their studies on e-learning acceptance, that compatibility had a significant positive impact on intention to use. Phuanthong and Malisawan (2005) acknowledged the same, on a study conducted on the acceptance of mobile Internet. Based on this empirical evidence, a presumption can be reached that medical representatives" intention to use m-learning will be affected by whether and to what extent they perceive it to be compatible to their line of work.

Hypothesis 9: There is a relationship between compatibility and the intention to use m-learning for career development.

2.1.10 Experience
The lack of literature focusing on the impact of individual traits or external variables on the technology usage behavior of individuals was brought to light in the studies by Hubona and Jones (2004) and Hubona and Kennick (1996). Their studies revealed the significant impact individual characteristics have over technology usage, to the point of suggesting that they held a higher predictive power over usage than the commonly tried and tested belief constructs. Hubona and Jones (2004)"s study found that the seniority or tenure of an employee had a negative impact on their usage behavior of word processing, while at the same time it had a positive impact on the usage behavior for email. Therefore, it can be assumed that there is a relationship between intention to use m-learning and the employment tenure of a medical representative.

Hypothesis 10: There is a relationship between experience and the intention to use m-learning for career development

2.1.11 Average Monthly Phone Bill
The study by Kim and Jee (2005) revealed that present usage levels of broadband Internet had an impact on their sample's willingness to subscribe to portable Internet services. Present usage was measured by the respondents" average cost of communication per month. A similar study by Suki and Suki (2007) of heavy and light mobile phone users, and their likelihood of using m-learning, too found that heavy mobile phone users differed from light mobile phone users by showing a stronger willingness to subscribe to m-learning service. Therefore, an assumption can be reached that there is a relationship between the average monthly mobile phone bills and the intention to use m-learning.

Hypothesis 11: There is a relationship between the average monthly mobile phone bill and the intention to use m-learning for career development.

2.1.12 Education
Several studies have established a relationship between a person's level of education and their usage behavior or intention with regard to technology. Hubona and Kennick (1996) found education to have a direct impact on information technology usage behavior. A follow up study by Hubona and Jones (2004), reconfirmed the findings of the previous research, whereby education was found to have a negative impact on the usage behavior toward word processing, but at the same time had a positive one on email usage behavior. Kim and Jee (2005) too, asserted that the level of education had an impact on their sample's willingness to subscribe to portable Internet services. In their study on e-learning acceptance, Wagner and Flannery (2004) added to the growing body of literature that showed a link between the present level of education of a person and the intention to use e-learning. Therefore, an assumption can be reached that there is a relationship between the level of education and intention to use m-learning.

Hypothesis 12: There is a relationship between the level of education and the intention to use m-learning for career development.
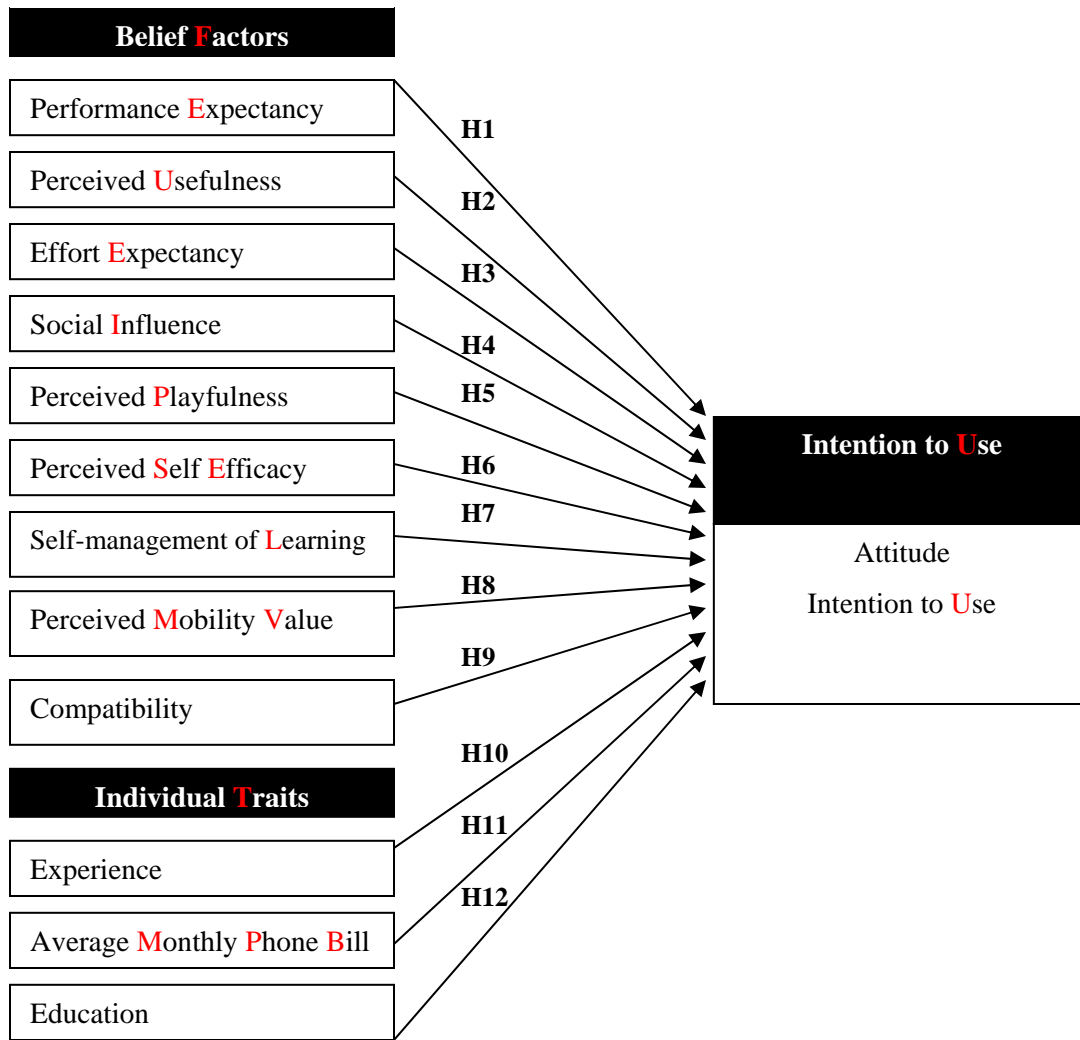
2.2 The Theoretical Framework

Figure 1: The Theoretical Framework

3. Research Methodology

3.1 Subjects

The population under study was two fold. Firstly, organizations in the pharmaceutical industry were considered for the qualitative component that attempted to study the barriers to m-learning in the pharmaceutical sector. Secondly, medical representatives employed in the pharmaceutical industry were surveyed to identify the factors that impact intention to use. The sample of organizations for the study of potential barriers to implementing m-learning was limited to 10 major organizations from a population of 60 accredited companies in the industry. This sample however, accounted for over 50 percent of the market share, and included a combination of the top players and a select number of smaller organizations. (2008, pers.comm., 23 June). According to Palitha

Jayathilleke, Secretary of the Sri Lanka Chamber of the Pharmaceutical Industry, there are approximately 450 representatives deployed to distribute drugs in Colombo and suburbs (2008, pers.comm., 23 June), which served as the sample frame. Using Krejcie and Morgan's (1970 cited in Sekaran, 2007, p. 294) generalized table for sample size determination, a sample of 210 subjects was drawn for the study, with a 5 percent margin of error. A pilot study ensured that the questionnaire was made appropriate for this particular group of people. The response rate of the final study was satisfactory, with the acquisition of 205 usable questionnaires from the sample. The characteristics of the sample are displayed in Table 1.

Table 1: Characteristics of the Sample

Characteristic	Number	Percentage
Age		
18-30	149	72.7
31-40	48	23.4
>41	8	3.9
Gender		
Male	199	97.1
Female	6	2.9
Work experience		
0-3 years	83	40.5
4-7 years	79	38.5
>8	43	21.0
Schooling province		
Western	95	46.3
Central	58	28.3
Southern	19	9.3
Northern	4	2.0
Eastern	3	1.5
North western	4	2.0
North central	1	.5
Uva	16	7.8
Sabaragamuwa	5	2.4
Subject stream - A/L examination		
Science	87	42.4
Mathematics	27	13.2
Commerce	79	38.5
Arts	12	5.9
Level of education		
Intermediary - A/L or A/L with Diploma	110	53.7
Tertiary - Graduate or professional qualification	85	41.5
Tertiary - Post graduate qualification	10	4.9
Area of tertiary education		
None	110	53.7
Management	71	34.6
Human resource	2	1.0
Science	18	8.8
Information technology	1	.5
Accounts and finance	3	1.5
Place of tertiary education		
None	110	53.7
Local state university	32	15.6

Local institute	32	15.6
Local institute with affiliation to foreign professional body	18	8.8
Overseas university	4	2.0
Local institute with affiliation to foreign university	9	4.4
Mobile phone ownership	205	100
Features available on mobile phone		
0-2 features	111	54.1
3-4 features	54	26.3
5 features	40	19.5
Current uses of mobile phone		
0-3 uses	64	31.2
4-6 uses	77	37.6
7-9 uses	38	18.5
10-12 uses	26	12.7
Average monthly phone bill		
SLR 1500 or less	37	18
SLR 1600-2000	53	25.9
> SLR 2100	115	56.1
Average number of calls made per day		
0-2 calls	1	.5
3-4 calls	10	4.9
5-6 calls	19	9.3
7-9 calls	25	12.2
10 or more calls	150	73.2
Mobile phone usage frequency		
Very infrequently	1	.5
Infrequently	1	.5
Occasionally	29	14.1
Frequently	71	34.6
Very frequently	103	50.2
Frequency of on the job traveling		
Very infrequently	12	5.9
Infrequently	2	1.0
Occasionally	20	9.8
Frequently	47	22.9
Very frequently	124	60.5

3.2 Measures

The statistical software package SPSS 16.0 was utilized for data tabulation and analysis. The reliability of the dataset was confirmed by computing the Cronbach Alpha, for each defined scale variable. Each variable came within the satisfactory range of .69 - .89, indicating that the obtained data was satisfactory, and free from major error bias. Nominal data gathered through the first section of the questionnaire were number coded for analytical purposes. The data gathered in the second section of the questionnaire were automatically coded as they were in 5-point Likert scale form. Whereby, 5 denoted "strongly agree", 4 denoted "agree", 3 denoted "neutral", 2 denoted "disagree" and 1 denoted "strongly disagree." The work of Venkatesh *et al.* (2003), Huang *et al.* (2006) and Wang *et al.* (2007) were referred in the development of questionnaire items, and adapted accordingly to the present study. Hypothesis testing of interval data was accomplished through simple linear regression. Hypothesis testing between nominal and

interval data was achieved by one-way ANOVA tests. In addition, correlation analysis was conducted to study the relationships between all variables.

4. Data Analysis and Results

4.1 Discussion of Findings from the Qualitative Study
The main technical issues as seen by the organizations were limitations to do with the device itself. The screen size would limit the type of content that could be sent, as well as become a strain on the eyes of the reader. The size of the keypad and battery life was also expected to hinder the process. The device related technical issues raised remain more or less on equal par with what has been said in the existing literature. Incompatibility of phones was one of the most commonly shared views, but this may be more relevant to Sri Lanka than developed countries. In spite of high mobile penetration levels, the percentage of high-end mobile phone users is less; a fact that has been supported through descriptive statistics of the sample, where it was found that of the five-listed features, 54.5 percent of participants had only two or less, while a mere percent had all. A final issue was pertaining to the network insufficiencies of the country. This barrier too, would be more relevant to a developing country such as Sri Lanka, where 3G networks necessary to support an m-learning system are still in an expansion phase. In conclusion, technical issues mattered more to some organizations than others. Table 2 shows that the very optimistic are in the minority, however. This supports Smith's (2000) argument that management myopia was a major cause for concern in the execution of autonomous learning environments in an organizational context. Device and infrastructure related technical issues do not pose as large a barrier as do pedagogical issues, which will be discussed at this point since it is a matter of time and development in the technological front to iron out such limitations.

Potentially more sinister in nature than technical issues are pedagogical issues as the underlying causes are subjective in origin. Lack of awareness was one of the points brought out, and refers to a lack of mobile phone technical soundness among users. This was substantiated in the descriptive analysis, where 68.8 percent of the sample had six or fewer uses for their phone from the listed twelve. The issue of acceptance was the chief concern among organizations, and the view that employees lack the self-direction required to survive in an autonomous learning environment supports Smith's (2000) argument that reluctance to engage in self-directed learning was a serious barrier to the implementation of innovative training techniques in organizations. Other pedagogical issues concerned the possibility of information overload. This is a plausible issue, considering that a majority 84.8 percent of the sample rated themselves as frequent or very frequent mobile phone users, with 73.2 percent making on average ten or more calls a day. Two other issues included the lack of a mode of assessment on the effectiveness of m-learning. This was in contrast to traditional methods, which allowed an organization a greater control over its employees. The second was the "9-5" mentality of people, which lead to shunning office related matters once the standard work hours had passed. Interestingly, not all supported the pedagogical issues raised, and the divide of opinions attests to Smith's (2000) assertion that all in all management posed a considerable barrier to the adoption of new learning technologies. To conclude, overcoming pedagogical

barriers may be the biggest challenge yet faced by m-learning in establishing itself as a serious tool for corporate training. Other limitations included an industry specific issue, the code of ethics that governed the use of mobile phones in the pharmaceutical sector, restricting usage of phones to a great degree during the work hours of a medical representative. There are no means to overcome such a barrier, thus the challenge lies in working around it. Another was the cost versus benefit of m-learning. As a new technology, a considerably higher cost at the start is acceptable, but as with other technical limitations discussed earlier, time is likely to soften the impact of this. Table 2 provides a breakdown of the issues.

Table 2: Overview of Limitations to M-learning

Barrier	Number of organizations that viewed it as a barrier	Number of organizations that were neutral	Number of organizations that did not view it as a barrier
Technical			
▪ Screen size	6	2	2
▪ Battery life	3	7	0
▪ Keypad	1	9	0
▪ Incompatibility of phones	8	2	0
▪ Infrastructure insufficiencies	2	8	0
Pedagogical			
▪ Lack of awareness	1	8	1
▪ Acceptance – no motivation to learn	1	8	1
▪ Acceptance - Resistance to change	4	3	3
▪ Information overload	2	8	0
▪ 9-5 mentality	3	7	0
▪ Lack of a mode of assessment	1	9	0
Other			
▪ Pharmaceutical code of ethics	2	8	0
▪ Cost v benefit of m-learning	4	3	3

4.2 Discussion of Findings from the Empirical Study

4.2.1 Correlation Analysis

Table 3: Summary of Correlation Table

Independent factors on intention to use	Pearson correlation	Significance (2-tailed).
Performance expectancy	0.476**	.000
Perceived usefulness	0.555**	.000
Effort expectancy	0.536**	.000
Social influence	0.399**	.000
Perceived playfulness	0.529**	.000
Perceived self-efficacy	0.026	.713
Perceived mobility value	0.596**	.000
Self management of learning	0.478**	.000
Compatibility	0.706**	.000
Experience	-0.174*	.013

Monthly mobile phone bill		-0.212**	.002
Level of education		0.068	.334

N = 205
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The correlation between each independent variable and the dependent variable is shown in Table 3. The independent constructs, performance expectancy, perceived usefulness, effort expectancy, social influence, perceived playfulness, perceived mobility value, self-management of learning, compatibility and the average monthly mobile phone bill, had a Pearson correlation that was significant at the 99 percent confidence interval ($p<0.01$). The correlation between experience and intention to use was significant at the 95 percent confidence interval ($p<0.05$), whereas perceived self-efficacy and education were not correlated to the dependent construct as the significance was in excess of the accepted threshold of 0.05 ($p>0.05$).

4.2.2 Belief Factors

Table 4: Model Summary and ANOVA Summary Table

Independent variable	Adjusted R square value	F value	Significance
Performance expectancy	.223	59.495	.000[a]
Perceived usefulness	.305	90.513	.000[a]
Effort expectancy	.284	82.006	.000[a]
Social influence	.155	38.510	.000[a]
Perceived playfulness	.276	78.746	.000[a]
Perceived self efficacy	-.004	.136	.713[a]
Self management of learning	.224	60.021	.000[a]
Perceived mobility value	.353	112.120	.000[a]
Compatibility	.496	202.101	.000[a]
Constant: Intention to use (the dependent variable)			

Table 4 summarises the results of the hypotheses testing derived through simple linear regression. A significant relationship was found between performance expectancy and intention to use, resulting in the acceptance of Hypothesis 1. The findings coincide with that of previous authors" (Wang *et al.*, 2007; Grant and Danziger, 2007; Keller, 2007; and Lehto *et al.*, 2007). This signifies the importance of performance expectancy to the users in their ultimate decision over the use of a particular technology regardless of their professional background or individual differences. The implication of this to m-learning is to not only present itself as something that would result in a tangible benefit, but also to keep good to the promise and deliver, in order to ensure continued usage.

The results strongly corroborated those of past literature (Huang *et al.*, 2007) indicating a very significant relationship between perceived usefulness and intention to use m-learning, resulting in the acceptance of Hypothesis 2. The results of the present study are also consistent with the large body of literature on technology acceptance that have supported the power of predictability perceived usefulness exerts over intention to

use. The effect of perceived usefulness on intention to use is greater than that of performance expectancy. This maybe interpreted as medical representatives valuing the usefulness of the technology to their line of work over any tangible benefit they perceive it to offer. The implication of this relationship to m-learning is that it should be flexible enough to adapt to and complement an employee's line of work in order to ensure a strong fit between usage of m-learning and the expediency it lends to their work.

A very significant relationship was found between effort expectancy and intention to use, resulting in the acceptance of Hypothesis 3. This is in accordance with past literature (Wang *et al.*, 2007). This relationship could be attributed to the lack of experience the sample has had with m-learning. Venkatesh *et al.* (2003) observed that effort expectancy was more significant for individuals with less experience and with the accumulation of experience the effect was likely to reduce.

Social influence was found to have a moderate impact on intention to use, resulting in the acceptance of Hypothesis 4. The present study generated findings very similar to that of past studies concerning samples of Asian origin in that, it has been found that social influence was more significant to respondents coming from strong collectivist cultures. Kim (2004) found that socio-cultural influence had a stronger impact on Chinese students than on U.S. students. The strength of this relationship was however weaker, in contrast to what performance expectancy, perceived usefulness and effort expectancy had with intention to use. Nevertheless, the results were somewhat consistent with that of the study by Wang *et al.* (2007). The impact of social influence implies the need to gain the overall support of an organization and its management in the event of establishing m-learning as a tool for corporate training.

A strong positive relationship was found between perceived playfulness and intention to use, resulting in the acceptance of Hypothesis 5. This finding is consistent with past literature that has substantiated the power of intrinsic motivators in predicting user behaviour (Liaw *et al.*, 2007; Huang *et al.*, 2006; Lee *et al.*, 2003). In addition, it is somewhat consistent with the findings of Wang *et al.* (2007), where social influence was found to account for a 21 percent change in intention to use m-learning. The implication of this relationship to m-learning is in making the content or learning experience one that is enjoyable for the learner.

The present study did not support the relationship between perceived self-efficacy and intention to use, leading to the rejection of Hypothesis 6. While this is inconsistent with a number of studies (Chang and Tung, 2007a, b, c; Sriprapaipong *et al.*, 2007), there exist a few studies that have not supported this relationship (Hwang and Yi, 2003). In reference to the descriptive statistics carried out, there is strong evidential support suggesting the sample of the present study comprised experienced and heavy mobile phone users. A 100 percent of the sample claimed ownership to a mobile phone, a 56.1 percent of this reported a monthly phone bill exceeding SLR 2100, and a 73.2 percent made ten calls or more on average per day. The profile of the sample is such to suggest extensive use of the phone. This could be interpreted as the sample having sufficient experience in the use of mobile phones, to the point of holding a positive and high view

of their ability to exercise control over using their mobile phones for the purpose of learning. In any case, this necessitates an area for further study involving a sample of lighter mobile phone users perhaps, to study if a relationship between the two exists as the demographics of the sample change.

The findings confirmed pervious studies that concluded a higher self-management of learning results in a higher intention to engage in autonomous learning environments. A significant relationship was found between self-management of learning and intention to use resulting in the acceptance of Hypothesis 7. This adds to the body of literature that confirmed a similar relationship (Christensen *et al.*, 1999; Wang *et al.*, 2007). This also complements the findings from the qualitative study, where it was suggested that medical representatives preferred trainer-led learning, to self-directed learning. This ascertains an important implication for m-learning, in that it cannot expect an employee who prefers trainer-led learning to accept m-learning to the same extent that a self-directed learner would. A second implication is that it is best left unforced, and the most effective results may be achieved by giving employees a choice. Yet, steps may be taken to improve the self-directedness of employees, and this remains a challenge for organizations that want to implement innovative and autonomous training systems.

The findings of this study lend strong support to the circumstantial evidence of a relationship between perceived mobility value and intention to use, that was found by Huang *et al.* (2006) in the their study on m-learning. A very significant relationship was found between the two constructs in the present study, which led to the acceptance of Hypothesis 8. As a relatively new construct brought about in the study of factors that affect the behavioural intention toward m-learning, this construct has received far less attention in literature than those previously discussed. The significant relationship found between the two in the present study is an important contribution to the literature on m-learning, and deserves further study. The implication of this finding is to promote mobility, and the resultant convenience as the principal advantage in m-learning.

A strong positive relationship was found between compatibility and intention to use m-learning, resulting in the acceptance of Hypothesis 9. The strength of the relationship between these two constructs was far greater than of the other eight belief factors and intention to use. This finding lends strong support to past literature, which has found a similar relationship between the two constructs (Lu *et al.*, 2005; Chang and Tung, 2007a, b, c). In particular, these findings very strongly corroborate the findings of Chang and Tung (2007c), where compatibility accounted for a 34 percent change in nursing students" intention to use an e-learning system, and also carried the highest predictive power over the dependent variable. This significant relationship, seen in the present study, may be explained by the sample, where a large percentage (83.4) stated on the job traveling was very frequent or frequent to them. The implication to m-learning in a corporate context is that it should be relevant and compatible to the working style of individuals.

4.2.3 Individual Traits

Table 5: ANOVA Summary Table

Independent variable	F value	Significance
Experience	3.470	.033
Monthly mobile phone bill	4.731	.010
Level of education	1.008	.367
Constant: Intention to use (the dependent variable)		

Table 5 summarizes the results of the hypotheses testing derived at through One-way ANOVA testing. The findings indicated that there was a relationship between employment tenure and the intention to use m-learning, consistent with past literature (Hubona and Jones, 2004). However, this relationship is an area open to further study due to a of dearth literature concerning work experience and its impact on the intention to use a particular technology. Furthermore, it would be interesting to study the nature of this relationship. A limitation in research toward the study of this relationship was found in the sample, which consisted of a significantly larger percentage (40.5 percent) of people belonging to the 0-3 years of experience category. This was unavoidable, given the fact that medical representatives are usually young. Descriptive studies of the sample revealed that 72.2 percent of the sample was below 30 years of age. Future research may take this into account and seek samples that include proportionately balanced categories.

The findings pointed toward a strong relationship between the average monthly mobile phone bill and intention to use m-learning leading to the acceptance of Hypothesis 11. This is consistent with past literature that verified a similar relationship (Kim and Jee, 2005; Suki and Suki, 2007). However, as with the relationship between work experience and intention to use, this too is worthy of further study due to certain limitations of the sample. A significant proportion of the sample was leaning toward the high user category, with 56.1 percent claiming their average monthly mobile phone bill was SLR 2100 or more. Future research should take this into account as well, and seek samples that include proportionately balanced categories.

The findings did not support the relationship between the present level of education and intention to use m-learning, resulting in the rejection of Hypothesis 12. These findings are contradictory to those of Hubona and Kennick (1996), Hubona and Jones (2004) and Kim and Jee (2005) who found a relationship between education and behavioural intention to use a technology. It is also disputes the results of Wagner and Flannery (2004), who found education had an impact on the acceptance of e-learning. This could be due to a number of reasons, of which the nature of the sample maybe key to explanation. The sample was heavy (53.7 percent) toward the category of people with Advanced Level as the present highest level of education. The 46.4 percent with a tertiary education, at the graduate or postgraduate level may have been partial toward m-learning, as they are already educated to an extent. Nonetheless, this necessitates further study in this area as well.

4.2.4 Strength of Relationships between Belief Constructs and Intention to Use

Table 6: Summary of Regression Equations for the Belief Constructs

Dependent variable	β0 (Constant)	β1 (Coefficient of X)
Performance expectancy	2.142	0.432
Perceived usefulness	1.744	0.518
Effort expectancy	1.797	0.516
Social influence	2.543	0.336
Perceived playfulness	2.146	0.459
Self management of learning	2.077	0.423
Perceived mobility value	1.753	0.516
Compatibility	1.480	0.607

The regression models available in Table 6 represents the relationships between the dependent variable and validated belief constructs, with Y denoting intention to use and X denoting the relevant belief construct. Perceived usefulness, effort expectancy, perceived mobility value and compatibility proved to have the highest predictability power over intention to use.

5. Conclusion

This work proposed and verified the impact of elements, as identified in existing literature concerning technology acceptance, in the context of m-learning as a corporate training tool for medical representatives. A qualitative component was also included to better understand the current standing of this new technology in Sri Lanka. Statistical analysis supported ten of the derived hypotheses, with perceived self-efficacy and the present education level showing to have no impact on the intention to use m-learning among the sample under study.

The future holds much promise for m-learning, but that is not without trials. Mobile phones have penetrated much of our lives, and the use of the device as a tool for learning, would no doubt become commonplace in the future. Presently though much uncertainty prevails where learner acceptance of the technology is concerned. The success of it largely depends on the extent to which people are willing to forego their comfort zone of taught-learning, and indulge in more innovative and autonomous learning environments. This study would be beneficial to the growing body of academic research on technology acceptance, by supporting earlier findings and providing new perspectives on the widely studied area. Above all, it would benefit the many stakeholders in the pharmaceutical, mobile telephony and education sector by offering worthy insights that would assist in future decision-making.

6. Recommendations

With regard to short-term recommendations, Pharmaceutical organizations can work around the issue of the screen size by finding the right mix of content that can be shared

effectively though mobile phones. A referencing system for clinical studies and journals, sales and competitor related information, performance indicators and achievements are ideal. Audio-based tutorials that could be listened to without an issue even in the midst of traveling can overcome the issue of medical representatives constantly being on the move, driving.

Organizations may deal with the issue of preference for trainer-based learning, and its impact on employee intention to engage in autonomous learning by not resorting to a forceful approach. Employees could be given a choice at the start so as not to set off a strong resistance to change, and using of the system incentivized by giving recognition and praise where due to evoke an overall positive reaction and participation. Evidence of this research suggested that above any tangible benefit, medical representatives valued the usefulness of the technology to their line of work. Since perceived usefulness has to do with the perception of people, organizations that are interested in implementing m-learning, should set about communicating how m-learning would enhance and benefit their work, in order to create the desired frame of mind. Medical representatives especially stand to benefit from such a system, as they spend a substantial portion of their time travelling. Interested organizations may also conduct a research into what aspects of m-learning medical representatives find useful in their day-to-day tasks. This would help them implement systems that hold true value to the user.

Intention to use was also affected by extrinsic motivators, and for this reason organizations should involve some benefit of using the system to the employee, other than what it offers to their work. Benefits do not refer to those that are monetary in terms, but once again could be in the form of recognition at the monthly company meeting held by most pharmaceutical companies. They can initiate a "top contributor" or "top learner" programme, where medical representatives with high participation will receive recognition in appreciation of their effort. Since compatibility was the chief indicator of intention to use, interested organizations may seek to make any m-learning initiatives as focused as possible on the end learner, and their work style. This would mean ensuring that m-learning is compatible with all aspects of their work life. For instance, it should not interfere with their time spent with clients, or driving. If the organization fears an information overload due to medical representatives' high usage of mobile phones, m-learning should not be forced, but something encouraged at their own free time and will. Therefore the system should be flexible enough to give each employee some control over content and time.

Organizations that look forward to implementing m-learning should also start with a top-bottom approach. Since it has been found that social influence was significant in the intention to use m-learning, the senior management of the organization should actively promote it to their employees, as this would motivate employees to embrace m-learning themselves. The importance of intrinsic motivators should also be considered by organizations in the implementation of m-learning. Companies should take measures to minimize the formality of a system, and include aspects that would motivate the learner to use it, and personalize it as much as possible.

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In the short term, the significant relationship between compatibility and intention to use is important to the telecommunication sector or m-learning service providers as well. They should seek to identify segments to which m-learning is most compatible and promote it to those segments. Segments such as nursing and medical students could be potential targets as they make up the largest market for m-learning in countries such as the United States. Providers should also set about to create an awareness of the potential m-learning holds. Awareness building is crucial at this early stage of the technology's life cycle. All attempts should be taken to generate as much interest as possible, in order to create an interest in m-learning. In particular, there is a good opportunity to promote it to senior managers of organizations in industries to which the technology holds a true potential such as the pharmaceutical or medical industry. Discussions held with pharmaceutical companies revealed a lack of awareness, and sometimes pessimism. Service providers should seek to educate senior managers if m-learning is to take on the corporate sector; their approval is needed first and foremost. Secondly, they should seek to increase awareness among secondary audiences such as doctors and medical professionals.

The impact of effort expectancy can be increased by initiating the necessary awareness building programmes. Effort expectancy is related to experience with the system, and as such m-learning service providers can visit organizations and hold demonstrations on how an m-learning system would work in an organizational setting. The influence of perceived playfulness should be noted as well, and in developing content all measures should be taken to make the system as user-friendly and enjoyable as possible. Further, content should be diversified, and easily personalised to fit the needs of different employees and industries. The significance of perceived mobility value should be taken note of, and m-learning service providers should find segments that perceive mobility to be of value. Further, the value of "anytime, anywhere" associated with m-learning should be communicated to such segments.

In the long-term, pharmaceutical companies should make it a goal to increase learner preference for self-directed learning. The problem of learner preference for trainer-led learning cannot be overcome overnight. An organization should make it their mission to build a learning organization. To that end they should take measures to recruit the right people, especially since it has been found that there was no relationship between the level of education of medical representatives and their intention to use m-learning. Over half of medical representatives did not possess a tertiary education, so organizations should take measures to encourage tertiary education among them.

Where the m-learning service providers and telecommunication sector is concerned, focus is needed in the expansion of 3G services as these networks are necessary to m-learning in the long run. M-learning service providers should also seek to build in proper control mechanisms into m-learning system to overcome the issue of a lack of assessment mode. The control mechanism should take into account effective

feedback mechanisms and monitoring of training so as to allow organizations to assess the progress of employee learning done through the system.

7. Areas for Further Study

The influence of individual characteristics should be studied further in relation to intention to use, including that of age and gender, as there is a dearth of literature on the direct impact these factors exert over behavioral intention. Additionally, future studies should also focus on the relationship between intention to use and actual usage of m-learning as it would provide real insights into the power of predictability the factors verified in this study have over actual usage.

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