DEVELOPMENT OF ACTIVITY-BASED mLEARNING IMPLEMENTATION MODEL FOR UNDERGRADUATE ENGLISH LANGUAGE LEARNING

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ABSTRACT

The purpose of the study was to develop an activity-based mLearning implementation model for English Language learning among undergraduates. The development of the model was aimed at how mLearning could be used to support formal learning in aiding students to achieve both learning needs and target course outcomes through networking of language learning activities. Professional Communication Skills course, an undergraduate language course offered in a private tertiary institution was selected as an example to develop the model.

The study adopted the Design and Development Research approach, which was introduced by Richey & Klein (2007) to develop the model. Based on the approach, the study was conducted in three phases. Phase 1 involved needs analysis using survey questionnaire that was conducted among 220 undergraduate students to investigate the need to adopt mLearning and consequently the development of the model. Data for this phase was analyzed using descriptive statistics via Statistical Package for the Social Sciences (SPSS) software. Interpretation of the needs analysis was based on the values of mean and standard deviation. Phase 2 adopted the Interpretive Structural Modeling (ISM) method to develop the model via a panel of eight (8) experts. Interpretation of the data was based on the model generated by ISM software and the classification and relationships of elements (learning activities). Phase 3 involved another panel of experts of 48 members to evaluate the model using a modified Fuzzy Delphi technique. The evaluation was based on their responses to a seven-likert linguistic scale survey questionnaire. The 'threshold' value (d) was calculated to determine the experts' consensus for all questionnaire items while the defuzzification (A_{max}) values for the items would register the agreement (decision) of the experts.

The overall findings for Phase 1 indicated that the students owned at least one mobile technology device (98.6%, n = 217) with 82.2% (n = 181) of their devices were at least Level 2.This concluded that the students have the necessary technology access for the incorporation of mLearning in their formal learning. They also showed high acceptance level and intend to use mLearning in their formal English Language course. Thus, the findings necessitated the need for the study to develop the model. Findings from Phase 2 resulted in the development of the model that consisted of 24 formal and informal learning activities determined by a panel of experts. The experts also viewed that the activities could be divided into three learning domains and four activity clusters to facilitate the interpretation of the roles of the activities. Finally, findings from Phase 3 of the study showed consensual agreement (d = 89.9%) among the experts in terms of the selected language activities (A_{max} = 42.03), relationships among them (A_{max} = 43.05), the classification of the activities (A_{max} = 42.05), and the overall evaluation of the model (mean A_{max} = 41.59) as the values exceeded the minimum value of 33.6. The model proposes how formal and informal learning could converge practically through the incorporation of mLearning activities in formal learning settings in aiding the students to fulfill their language learning needs and target course outcomes.

PEMBINAAN MODEL PERLAKSANAAN mLEARNING BERASASKAN AKTIVITI BAGI PEMBELAJARAN BAHASA INGGERIS DALAM KALANGAN PELAJAR IJAZAH DASAR

ABSTRAK

Kajian ini bertujuan untuk membangunkan model perlaksanaan pembelajaran mudah alih berasaskan aktiviti untuk pembelajaran Bahasa Inggeris dalam kalangan pelajar peringkat Ijazah Dasar. Pembinaan model tersebut bertujuan untuk memperlihatkan bagaimana pembelajaran mudah alih boleh digunakan dalam menyokong pembelajaran formal untuk membantu para pelajar bagi memenuhi keperluan pembelajaran kendiri dan keperluan objektif kursus melalui jaringan aktiviti pembelajaran bahasa. Kursus Kemahiran Komunikasi Profesional (Professional Communication Skills) yang ditawarkan oleh sebuah institusi pengajian tinggi swasta dipilih sebagai contoh dalam pembinaan model.

Kajian ini menggunakan kaedah Kajian Rekabentuk dan Pembinaan (Design and Development Research approach) yang diperkenalkan oleh Ritchey dan Klien (2007) untuk membangunkan model. Berdasarkan kaedah ini, langkah kajian ini terbahagi kepada tiga fasa. Fasa pertama melibatkan analisa keperluan dengan menggunakan soal selidik yang dijalankan ke atas 220 pelajar ijazah untuk menyiasat keperluan bagi menerapkan pembelajaran mudah alih dan seterusnya pembinaan model tersebut. Data yang diperolehi dianalisa melalui statistik deskriptif dengan menggunakan perisian 'Statistical Package for the Social Sciences (SPSS)'. Interpretasi analisa keperluan adalah berdasarkan nilai min dan sisihan piawai. Fasa kedua menggunakan kaedah 'Interpretive Structural Modelling (ISM)' untuk membangunkan model berdasarkan pandangan dan keputusan panel pakar yang terdiri daripada lapan (8) orang. Interpretasi data adalah berdasarkan model yang dijanakan oleh perisian ISM dan juga melalui klasifikasi dan jaringan hubungan antara elemen model (aktiviti pembelajaran). Fasa ketiga melibatkan panel pakar seramai 48 ahli untuk menilai model tersebut menggunakan teknik 'Fuzzy Delphi' yang diubahsuai. Penilaian tersebut berdasarkan respon pakar terhadap soal selidik yang terdiri dari tujuh skala likert linguistik. Nilai ambang (threshold, d) dikira untuk menentusahkan konsensus pakar terhadap semua item soal selidik sementara nilai nyahfuzzi (defuzzification, A_{max}) pula digunakan untuk menentusahkan persetujuan atau keputusan pakar-pakar. Nilai ambang mesti melebihi 75% untuk menentusahkan pencapaian persetujuan bersama ahli pakar sementara nilai nyahfuzzi mesti mencapai nilai minima 33.6.

Dapatan keseluruhan dari Fasa pertama menunjukkan bahawa para pelajar mempunyai sekurang-kurangnya satu alatan teknologi mudah alih (98.6%, n = 217) dengan 82.2% (n = 181) alatan berada sekurang-kurangnya pada Tahap 2. Ini merumuskan bahawa para pelajar mempunyai akses kepada teknologi yang diperlukan untuk pembelajaran mudah alih. Mereka juga menunjukkan tahap penerimaan tinggi dan berniat untuk menggunakan pembelajaran mudah alih di dalam kursus formal Bahasa Inggeris mereka.

Maka, kajian untuk pembinaan model tersebut adalah diperlukan. Dapatan dari fasa kedua menghasilkan pembinaan model yang terdiri dari 24 aktiviti bahasa formal dan tidak formal hasil keputusan bersama panel pakar. Ahli panel pakar juga berpendapat bahawa aktiviti-aktiviti di dalam model boleh dibahagikan kepada tiga kumpulan pembelajaran dan empat kluster aktiviti untuk memudahkan penafsiran peranan aktiviti-aktiviti tersebut. Dapatan daripada fasa ketiga kajian menunjukkan pencapaian persetujuan bersama panel pakar (d = 89.9%) dalam segi aktiviti-aktiviti bahasa yang dipilih (A_{max} = 42.03), hubungan di antara aktiviti-aktiviti (A_{max} = 43.05), klasifikasi aktiviti-aktiviti (A_{max} = 42.05), dan penilaian keseluruhan model (min A_{max} = 41.59) di mana nilai-nilai ini melebihi nilai minima 33.6. Model ini mengusulkan bagaimana pembelajaran formal dan tidak formal boleh digabungkan secara praktikal melalui penerapan aktiviti pembelajaran mudah alih dalam pembelajaran formal ke arah membantu para pelajar untuk memenuhi keperluan pembelajaran bahasa dan keperluan objektif kursus.

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List of Abbreviations

PDA	Personal Digital Assistant
SMS	Short Message System
US	United States
mLearning	Mobile learning
UMTS	Universal Mobile Telecommunications System
ELearning	Electronic learning
UNESCO	United Nations Educational, Scientific and Cultural Organization
ESP	English for Specific Purposes
NHESP	National Higher Education Strategic Plan
CAP	Critical Agenda Projects
GSMA	Groupe Speciale Mobile Association
CEPT	Confederation of European Posts and Telecommunications
MOLT	Mobile Learning Tool
MMS	Multimedia Messaging System
ISM	Interpretive Structural Modeling
PCS	Professional and Communication Skills
LAN	Local Area Network
NCEF	National Clearinghouse for Educational Facilities
WLAN	Wireless Local Area Network
WELCOME	Wireless E−Learning and Communication Environment
MOHE	Ministry of Higher Education
MP3	Moving Picture Experts Group Audio Layer III

GPRS	General Packet Radio Service
WBB	Web-based bulletin board
MKO	More Knowledgeable Other
ZPD	Zone of Proximal Development
LCD	Learner Centered Design (LCD)
SAMR	Substitution, Augmentation, Modification, and Redefinition
UTAUT	Unified theory of acceptance and use of technology
NGT	Nominal Group Technique
SSIM	Structural Self-interaction Matrix

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CHAPTER 1

INTRODUCTION

Introduction

Due to the pervasiveness of wireless technology, university students of today learn differently than the way most of their instructors or even their professors learned without the technology when they were students (Prensky, 2001). The change is largely due to the recent rapid advancement in technology to the level that previous technologies were made obsolete within months. Communication technology has become pervasive and personal. Information and knowledge were no longer limited to printed form and static and could be accessed through various media forms. Knowledge has become dynamic, as learners of today have learned to negotiate knowledge and even construct new ones. These are the result of the affordable personal handheld communication devices (e.g., smart phones, tablets, and PDAs). In short, learning has become increasingly autonomous and social.

However, the present education system is still dedicated to the fundamental approach to formal education that has been always unidirectional (from teacher to learner) and homogeneous (same for all) with a standard curricula and uniform learning methods imposed in a top-down manner. In contrast, the present generation of students are engaging themselves with some form of mobile learning (mLearning) on their own using their mobile phones or similar mobile gadgets. For example, we could observe them either searching for news updates and information, receiving and sending emails or short message system (SMS), or communicating with others through voice calls with their mobile devices. This phenomenon has become a global trend to the level that developed countries such as the US and the European countries have begun incorporating mLearning in their formal education system (Saedah, 2004). Cross (2005) argued that there are times that we cannot count on formal learning alone as only 20% of what we learned on the job comes from formal learning. The rest are through informal learning experiences and through social interactions with others who have more experience and knowledge. Thus, in formal education, students should not be abandoned after formal learning (Sharples, 2006; Sharples, Sanchez, Milrad, & Vavoula, 2007). Learning should be a continuous process where formal learning could provide the groundwork for learning while knowledge or skills could be continuously developed through informal and social learning (e.g., through incorporation of mLearning in formal education).

At the fourth World Conference on mLearning, Keegan (2005) offers three bases for the incorporation of mLearning in mainstream education and training:

1) The future is wireless where Keegan stated that mobile-commerce (M-Commerce) had gain preference over e-commerce since 1999, resulting in the change in how people do business (e.g., stock exchanges and banking through wireless application). For example, in the US alone, 49% of consumers at least once a week made purchases via mobile webs in the past six months (Performics, 2011). Within this 49% of mobile experts, 84% search information from local retailers, 82% opt for online retailers, 73% would find a specific product website, 68% find the best price for a product or service, and 63% would search further information before purchasing a product (Performics, 2011). M-commerce usage reached USD 600 million in US alone in 2005 and mobile commerce sales is predicted to reach $23.8 billion in 2015 (Coda Research Consultancy, 2012). Most major companies were beginning to adopt wireless network as 73% of companies planned to invest in mobile channels in 2011 and half of them intend to adopt mobile commerce (Customer Engagement Report, 2011).

This change not only is irreversible but advancing rapidly with the establishment of 3G (Universal Mobile Telecommunications System) wireless network since 2001 (Svoboda, 2008 ; UMTS World, 2009) and the current 4G wireless network which had been introduced commercially around the world since 2009. In Malaysia, 4G was introduced by YTL Corporation in 19 November 2010 (Nystedt, 2010). Due to the advancement of wireless networking technology, wireless internet subscribers escalated to nearly two billion people worldwide in 2012. These subscribers are able to communicate and gain knowledge through voice and video interface, acquire, transmit, and exchange information-rich content among other individuals in the forms of text, voice, graphics, and videos, effortless anywhere and anytime. This new trend strengthens the case for mLearning (Keegan, 2005).

2) The second basis for the incorporation of mLearning in mainstream education is the irritation with the published scenarios for mobile devices of Ericsson and Nokia. In this point of view, Keegan raised his concern that ever since the development of wireless application and mobile technologies by such giant telecommunication operators, applications for education, training or for learning were actually never in the operators' agenda. Thus, the study of mLearning especially in resolving issues pertaining to wireless application and mobile technologies in education should be conducted especially in the interest of incorporating mLearning in the mainstream education.

3) The third basis for mLearning is the 'law' of distance education research. This basis actually fits best in justifying the need to provide mLearning as the 'law' of research in distance education states that, 'It is not technologies with inherent pedagogical qualities that are successful in distance education, but technologies that are generally available to citizens' (Keegan, 2005, p. 3). The example given was the 12" laser disc, which was introduced in 1990 where later it was discovered to be very useful as an instructional media

for English Language course. However, the idea was abandoned, as it was too costly for most of the people at the time. E-Learning, though was introduced in 1999 actually failed to be embraced widely especially in third world countries such as Africa as it was too costly to provide necessary infrastructure and facilities to support the technologies. For instance, rural areas such as Macha, Zambia in Africa have to fork out $1100 per month for a bandwidth connection of only 128 kpbs shared among all Internet experts within the village to support e-Learning (Pais, 2007).

However, for mLearning, the situation is the opposite. The technology for this sector is widely available to almost everyone in the world in the form of mobile communication devices (Keegan, 2005). Never before in the history of technology in education there has been a widely available gadget as the mobile phone. In 2005, mobile phone experts worldwide reached 1.5 billion people, equivalent to a quarter of the world's population by midyear 2005 (Wikipedia, 2010). Today, based on 2012 statistic compiled by Mobithinking (2013), active mobile phone subscribers have reached 5.98 billion people or 85% of the world population, with China having the most subscribers of 1.09 billion people. In Malaysia, mobile phone penetration reached a staggering 39,822,840 subscribers, more than the country's population of 28,920,000 (Malaysian Communications and Multimedia Commission, 2012). This interprets that some of the subscribers own more than one mobile phone.

Justifying these figures, Quinn (2011a) argues that mobile learning is for real and not a hype- It is not the next big thing; it is the big thing and it is official. Even UNESCO has recognized mLearning and with the help of the mLearning communities around the world, a policy guideline on mobile learning was drafted (UNESCO, 2011). In support of Keegan (2005), Quinn agrees that the foremost factor of the emergence of mLearning is that the devices for it are everywhere. The rapid flooding of mobile devices with their internet access capability could easily shift eLearning to mLearning without any major changes in the learning content (Nyiri, 2002). Kukulska-Hulme and Traxler (2005) in propagating mLearning argued that the learning process of today has actually expanded beyond the physical classroom walls, becoming increasingly globalized and lifelong in nature (Sharples, 2000).

Inevitably, the rise of mobile society and their increasing life-dependency on pervasive communication technology have also brought impact on technology-based education research, which led to the accumulation of literature in the effect of mobile technology in education (Keskin & Metcalf, 2011). For example, the literature reveals that mobile technology has significant impact in supporting teaching and learning (Zurita & Nussbaum, 2004), and improving students' learning achievement and motivation in subjects such as Science and Mathematics (Metcalf, Milrad, Raasch, Hamilton, & Cheek, 2008). Wierzbicki (2002) stressed a pertinent point that wireless technology in education offers solution to the widening digital gap that inflicts most developing and third world countries as mobile phones are more affordable than desktop computers. Recent technology such as wind or solar powered cell towers that could support wireless mobile devices in electric power deprived areas could create infrastructure advantage over wired technology. This factor increase mLearning prospects in the future curriculum for all (Muhammad Ridhuan & Saedah, 2010). The development in mobile technology has also resulted in the launching of mLearning projects both in small and large scales. Among worth noted are 'Leonardo da Vinci Project' and 'IST FP5 in Europe (Keegan, 2005), and UniWap Project (Sariola, Sampson, Vuorine, & Kynaslahti, 2001). Besides this, course and module designs were initiated to be compatible with mobile applications and devices (Bull & Reid, 2004; Megan, 2005).

However, in the incorporation of mLearning in formal education, Quinn (2011a) argued that the whole aim is about taking advantage of the opportunities unique to mobile for learners' performance support where mLearning could be used not only as a tool to augment formal learning but making learning whole and natural by seamlessly integrating it with informal and social learning. In other words, we are talking about thinking beyond formal learning (Cook & Smith, 2004). It is about transforming learning to what is the natural way for learners to learn. Hence, in this study, I explored how the unique capabilities of mLearning could be exploited in formal classroom learning focusing on adopting mLearning as learning support to undergraduate English Language learning. The following section elaborates on the problem statement, which serves as the motivation of the study in undergraduate English language learning. Briefly, the section discusses the issue underlying undergraduate English language learning and mLearning as a solution. As the solution, the mLearning implementation model as learning support in aiding undergraduate language learning is proposed as the focus of the study. The section is then followed by the purpose and the rationale of the study. The objective and a brief description of the theoretical framework are also presented.

Problem Statement

The language discipline is distinctive from other subjects in the curriculum as language learning involves integration and fluent application between the explicit learning of vocabulary and language rules with unconscious skills development (Milton, 2006). This implies that language learners need to master not only grammar knowledge but fluent language use too. However, as it is usually feasible to learn grammar in the formal classroom, it is more difficult to acquire fluency in language use (Steve & Hiroshi, 2013). The factor of large class-size in a language classroom further limit individual students' contact hours with their lecturer, which in turn affect learning (Carbone & Greenberg, 1998; Jones, 2007, p. 4). Although several studies in the past are skeptical that class size affects students' learning (Kerr, 2001, p. 190; Lopus & Maxwell, 1995; Siegfried & Walstad, 1998), in language learning, Meyer and Bo-Kristensen (2009) argued that it is often difficult to provide enough time and space in the classroom for every students to develop fluency. A few hours of lessons per week may practically fail to provide meaningful exposure required for all students to acquire the language skills especially considering their diverse proficiency level and learning needs. However, this does not mean that a reduction of class size alone could significantly increase students' grades (Cho, Glewwe, & Whitler, 2012; Kokkelenberg, Dhillon, & Christy, 2005).

As suggested by McKeachie, Asghar, and Berliner (1990), suitable teaching methods play an important role in students' learning, thus method need to vary suited to class size, subject matter, and students' level. However, in language teaching, most language instruction is still based on drill and exercise principles on language structures, pronunciation, and intonation, sometimes in separate learning units with either artificial context, or worse without proper context (Fang, Baptista, Nunes, & de Bruijn, 2012). Unfortunately, acquisition of language skills often needs individual monitoring and assistance.

At tertiary level, this poses a problem especially among undergraduate students with low language proficiency in coping with English for Specific Purposes (ESP) courses such as Business English, Academic writing, Professional and Communicational Skills, and others. These courses are usually offered to students who are doing their major studies in engineering, medicine, business, science, law, philosophy, or psychology. The courses are generally aimed at professional conduct of students in future job environment in their respective fields. The main ESP skills may largely concentrate on specific language skills based on learners' needs to conduct appropriately in specific vocation. For example, an ESP course may emphasize development of writing skills for news reporters or spoken skills for tourist guides. In ESP courses, undergraduates are usually expected to be proficient in basic written and spoken language beforehand. ESP courses are usually context-based although grammar and structures are occasionally instructed indirectly and integrated in the courses, unlike General English which focuses more on mechanics, language rules, pronunciation and structures (Friorito, 2005; Mihai, Stan, Moanga, Adam, & Oroian, 2012).

Hence, coupled with factors such as time constraint and imbalance lecturer-student ratio as discussed above, ESP lecturers tend to focus more on completing the university ESP syllabus than attending to students' low language competence. As a result, students who lack in language competent compared to their more proficient peers obviously have to deal with their handicap while undergoing their required undergraduate ESP courses (Chowdhury & Haider, 2012). As a result, the less language competent students may need more time, space, and personal guidance or tutoring to help them to the least are able to perform appropriately (Mohr & Mohr, 2007) in class and later in their future job environment. However, as indicated here, it is practically difficult for the lecturers to fulfill these students' needs due to time and logistic constraints.

Nevertheless, these less proficient students' language learning needs could be assisted naturally through the integration of formal, informal, and social learning activities (Quinn, 2011a, p. 19; Quinn, 2011b). Since, mobile technology could act as an efficient mediator for these activities, mLearning is proposed in this study to support students' learning needs as well as achieving the target needs of their ESP course. However, whether mLearning is viable as a learning support or not depends on how it is implemented (Quinn, 2011b, 2012). Quinn (2011b) added that in employing technology in education, the role of the technology needs to be defined and how it should be implemented.

Unfortunately, there is a wide gap in the literature in the implementation guideline of mLearning in formal education in language learning. Past studies in mLearning concentrated largely on mobile devices either on digital functions of mobile devices (e.g., Collett & Stead, 2004; Pownell & Bailey, 2001; Savill-Smith & Kent, 2003), effectiveness of mobile devices on preparation of learning activities (e.g., Collett & Stead, 2002; Vahey & Crawford, 2002; Waycott, 2001), or mobile computer based project (e.g., Burke, Colter, Little, & Riehl, 2005; MOBIlearn Project, 2005; Chen, Kao & Sheu, 2003).

In Malaysia, aligned with the current mobile technology trend, the Ministry's National Higher Education Strategic Plan (NHESP) listed mLearning as one of the 23 Critical Agenda Projects (CAP), which is described as learning through enhanced portable technologies such as mobiles and tablets (PSPTN, 2013). The country's support for mLearning through CAPs project as mentioned here coupled with the high mobile device penetration in the country (Malaysian Communications and Multimedia Commission, 2012), and the fact that a majority of higher institution students own the devices, should provide the opportunity to increase learning effectiveness through mLearning. However, despite of the supporting factors above, mLearning is still at its infancy in Malaysia and research studies are critically needed in the area of mobile assisted education (Embi, & Nordin, 2013). The main factor contributing to the slow pace in adoption of mLearning in this country despite of the high accessibility to technology could be due to the scarcity of research studies in mLearning implementation areas. Most of the mLearning research for education in Malaysia until date has largely concentrated on perceptions (e.g., Hashim, Fatimah, & Rohiza, 2010), learners' satisfaction (e.g., Ismail, Gunasegaran, Koh, & Idrus, 2010), awareness (e.g., Alzaza & Yaakub, 2011), readiness (e.g., Abu-Al-Aish, Love, & Hunaiti, 2012; Hussin, Manap, Amir, & Krish, 2012; Ismail, Bokhare, Azizan, & Azman, 2013), learners' motivation (e.g., Narayananansamy & Ismail, 2012), and factors affecting mLearning acceptance (e.g. Yadegaridehkordi, Iahad, & Baloch, 2013; Yap, Chen, Chew, Tan, & Yeoh, 2012). In order to take full advantage of the mLearning in effective education delivery, research initiatives need to progress beyond investigating perceptions, readiness, or attitudes of the present learners towards mLearning (Saedah, Fadzilah, & Muhammad Helmi, 2013, p. 28). It is undoubtedly that studies in these areas are useful, but since past studies have abundantly reported on positive acceptance towards mLearning adoption (Embi, & Nordin, 2013; Saedah et al., 2013, p. 23), further studies in mLearning implementation should be the next initiative.

However, in Malaysia, studies in support of mLearning implementation are scarce instead limited to software system (e.g., mLearning using SMS by Lim, Fadzil, & Mansor, 2011 or mLearning via open source technology by Mahamad, Ibrahim, Izzriq, Foad, & Taib, 2008), or focusing on mobile devices such as use of mobile phones for mLearning (e.g., Karim, Darus, & Hussin, 2006; Suki & Suki, 2007). Probably, local studies that are more significant in contributing to the implementation of mLearning may for instance an investigation on usability guidelines for designing mLearning portal by Seong (2006) who proposed three categories of usability and ten usability guidelines for highly efficacious, user friendly and usable mobile interface. In another study, Ahmad Sobri (2009) proposed a mLearning curriculum design for Malaysian secondary school that he designed for History lesson. These types of studies described examples on practical implementation of mLearning. However, the studies were conducted either in adoption of mLearning in techno centric view or mLearning as a learning content delivery medium. Although it is useful with the path taken by these studies, there is a wide gap in mLearning studies in view of mLearning as learning solution, for example as a support to a learning problem, which conventional learning could not solve. The argument is that mLearning as a solution or as a support to a learning problem could be more sustainable in its adoption compare to it as a learning replacement to conventional learning (Abdullah, 2013). Consistently, Koller, Harvey, and Magnotta (2008, p. 6) stated that one of the main features of technology-based education is the emphasis on learning solutions and learning results as it is contextual and accessible to learners especially whenever it is needed. An example is an investigation on design and development of a collaborative mLearning module (DeWitt, & Saedah, 2010), which addressed Malaysian secondary school learners needs of the use of technology in science learning.

However, in terms of formal education research areas, past studies in mLearning focused more on science education, but scarcely on language education (Kao, 2006; Wu, 2006). In the studies of mLearning in language learning, most of the studies often focused on formal learning contexts where mobile devices are primarily regarded as learning content delivery media (Kukulska-Hulme & Shield, 2007). Thus, to fill the gap in mLearning implementation studies, focusing on the idea of mLearning as a learning solution in the form of a learning support to aid students in their language learning needs, the mLearning implementation model for undergraduate English Language learning was developed in this study. The implementation model consisted of a network of language learning activities connecting both mobile language learning activities and formal classroom activities. A panel of experts was referred to select the language learning activities. However, identifying the activities alone was not adequate without determining the relationships among the activities. The relationship could guide both teachers and learners to fulfill learning course outcomes through collaborative interactions. In addition, the activities were properly selected according to the employment of mobile technologies and environment in formal classroom learning in order to best facilitate the students' individual language learning needs (Goth, Frohberg & Schwabe, 2006; Laurillard, 2007; Pontefract, 2011). The model was aimed at showing how activities could be connected to result in integration of formal, informal, and social learning. The mobile capabilities of the devices in assisting learners were also considered to take full advantage of mLearning but at the same time not overwhelm the learning process (Goth et al., 2006; Quinn, 2011a).

Purpose of the Study

The general purpose of the study was to develop the mLearning implementation model for undergraduate English Language learning. The model aimed at proposing a guide on how mLearning could be incorporated in a formal classroom language learning not only as a complement but to augment formal learning in assisting low proficient students to support their language learning needs while satisfying the language course outcomes (FitzGerald et. al., 2012; Quinn, 2011a, Terras & Ramsay, 2012). An undergraduate ESP course called Professional and Communication Skills course which is a compulsory subject to be taken among undergraduates of a private tertiary institution in Malaysia was selected as the research focus for the development of the model. The model was developed with the aid of experts' opinion and collective decision on choosing the appropriate learning activities to be included in the model and determining the relationships among the activities in the model structure. Another group of experts was also consulted to evaluate the model. The development process of the model consisted of three stages that were based on the design and development research (DDR) approach (Richey & Klein, 2007): the needs analysis phase, the development phase, and the evaluation phase.

Rationale of the Study

This study was aimed at investigating how mLearning could be incorporated and implemented as a learning support in the formal language learning at the tertiary level. Undergraduate language learners were the focus of the study primarily because of the overwhelming concern of all parties in the country (Malaysia) regarding the low employability skills among fresh graduates which have been constantly highlighted by the media (Omar, Manaf, Mohd, Kassim, & Aziz, 2012). The lack of English Language proficiency has been identified as a major factor in graduate unemployment (Menon & Patel, 2012). Various studies have been conducted on whether English Language competency among graduates are meeting industry needs but unfortunately, similar results across the studies have reported the lack of communication skills among them (Ambigaphaty & Aniswal, 2005; Roshid and Chowdhury, 2013). Other findings have lamented on the poor English competency among graduates on productive skills which hinders them from presenting ideas in group discussions and meetings, report writing on project papers or proposals, or negotiation of ideas especially in impromptu situations (Ambigapathy & Aniswal, 2005; Sirat et al., 2008).

In this study, as a proposed solution to the issue of undergraduate language proficiency, mLearning was employed coincidentally because language learning is a lifelong learning activity for many people and becomes one of the main key application areas of mLearning (Mackiewicz, 2002). Besides being a global compulsory subject in the primary to tertiary level education, the employed society may also return to language learning for other compelling reasons such as seeking a change or promotion in their career or as a requirement in travelling and working in other countries (Kukulska-Hulme & Shield, 2007; Ushioda, 2012). Here, mobile technology could ideally support lifelong activity in learning a new language. Certainly, language learning is also available in other technology-based learning before such as e-Learning through desktops and computer software but with mobile technology, learners could engage in continuous language learning anytime and anywhere especially when it is needed (Koller, Harvey, & Magnotta, 2008; Quinn, 2011a, 2011b, 2012). As such, mobile language applications have been such a boon among informal language learners due to their immediacy and fluid accessibility at minimal cost anytime and anywhere (Kukulska-Hulme, 2007). In fact, in some countries, telecommunication companies have invested largely in mobile language applications as revenue. For example, GSMA a huge telecommunication company formed by the Confederation of European Posts and Telecommunications (CEPT) in 1982 had initiated a global scale mobile language applications called Urban English Language program, which delivered daily English Language lessons via Short Message Service (SMS) (Kukulska-Hulme, 2009).

The rising demand for language learning using mobile devices and technologies not only due to their portability or to their mobility features, but also past research have evidently stressed the positive effect of mLearning on students' language learning. For example, a mobile learning tool (MOLT) developed by Cavus and Ibrahim (2009) showed that undergraduate students were able to enjoy and learn new vocabularies using SMS text messaging through their mobile phones. In another study, mobile phones were found to be more effective as a vocabulary-learning tool compared to traditional vocabulary tools (Basoglu & Akdemir, 2010). Besides these, other past studies had evidently pointed out that mLearning is very effective in language teaching and learning. In one study conducted by Saran Cagiltay and Seferoglu (2008), mLearning via mobile phone was found to enhance students' English Language skills with the incorporation of multimedia using mobile devices. Students were reported to be more motivated to learn the language even during their leisure hours. The study also revealed that Multimedia Messaging System (MMS) and SMS aided effectively in vocabulary improvement and retention among the students. Another interesting study involving illiterate students found mLearning as a key success in the ability of the students to read and write (Collett & Stead, 2002; Traxler, 2007). In support of the mutual relationship between mLearning and language learning, and the effectiveness of mLearning in language learning, another important factor is the wide availability of mobile devices owned by almost any individuals as mentioned in the earlier section of this chapter.

In the context of the study, mLearning was proposed in formal education not only because it complements but also augments classroom learning (Quinn, 2011a; Terras & Ramsay, 2012). This is because learning activities engaged in the classroom could be continued and developed through mobile interaction beyond classroom walls and time, facilitating more students to fulfill learning course outcomes despite students' individual different learning needs. Since mobile devices and technology are readily afforded by the present generation of students, interaction among them is facilitated by social networking unlimited by time and space (Sharples, 2006; Traxler, 2007). Interaction among students of the new generation has taken a new form where personal data and mutual interests could be shared and published through robust social software (Isman, Abanmy, Hussein, & Al Saadany, 2012). For example, through synchronous and asynchronous mobile communication, students could gain help in improving their language competence through social sites and networking such as *Facebook*, *Twitter, Blogs* and more, beyond classroom wall anytime and anywhere.

The flexibility of learning which allows students to participate and manage their own learning here stresses the role of the online environment (Isman, 2004) provided by the mobile communications technology. Once students could facilitate their own learning (learner's autonomy), it indirectly allowing a sense of ownership. Sense of ownership is about giving choices in learning and this motivates students to learn. It also means that they could do things which they chose to do rather than being told to do so (Truby, 2010; Dlodlo, Tolmay, & Mvelase, 2012) although this means that the customary role of teacher-student is challenged where students take charge of the learning process instead of the teacher (Isman et al., 2012).

In the development of the model, not only due to the wide gap in mLearning studies, this study chose to focus on implementation because a guide in the implementation could better describe how mLearning should be incorporated in formal education (Quinn, 2011b; Sharples, 2006). Moreover, implementation is one of the key issues in mLearning that needed to be addressed before establishing an effort to incorporate mLearning in mainstream education (Quinn, 2011b; Saedah, 2004; Saedah & Faridah, 2005). The mLearning implementation model was based on language activities, which comprises both mLearning activities and formal language learning activities. The mLearning activities consisted of both informal and social learning activities mediated by mobile environment and technology. As mentioned in the earlier section, the integration of formal, informal, and social learning could naturally suit learner-centered learning and the integration process could be supported ideally with mLearning (Quinn, 2011a, 2012).

In this study, mLearning mediates students' learning through interaction, which was supported by relevant theories (refer to Chapter 2). On learning, Beetham (2004) defined learning activities as interaction between a learner or learners and an environment (optionally including content resources, tools and instruments, computer systems and services, 'real world' events and objects) that is carried out in response to a task with an intended learning outcome. This definition discloses the close relationship between learning activities and interaction. Since the development of the mLearning implementation model was based on interaction as learning process, the definition rationalizes further the focus on learning activities as the main element of the model.

The language learning activities for the model was selected by a panel of experts. Identifying the activities alone was not adequate without determining the relationship among the activities in guiding both teachers and learners to fulfill learning course outcomes through collaborative interactions. However, determining the appropriate learner's activities in the mobile environment especially in augmenting formal classroom learning could prove a daunting task as the learning situation is complex and dynamic. It may require a great deal of time and commitment to investigate each activity proposed before it could be selected. The task could further become complex as the relationships among the activities selected need to be investigated in order to produce not only a meaningful guide but a practical one for implementers to implement a mobile learning language initiative to aid learners to achieve their learning goals. Based on the circumstances discussed above, interpretive structural modeling (ISM) (Warfield, 1973, 1974, 1976) was employed because not only could it facilitate investigation into the relationships among the learning activities but also an overall structural model could be extracted based on the relationships. The interpretive structural implementation model of mLearning for language learning could aid in describing how mLearning could be utilized as a learning support while augmenting classroom instruction.

Objectives of Study

The main objective of this study was to design an interpretive structural model of mLearning implementation for English Language learning for undergraduates. In the scope of this study, in developing a model for English Language learning for undergraduates, the authors chose to develop it for the 'Professional Communication Skills (PCS)', an undergraduate English Language course subject offered by a private university. The study consisted of three phases. The objectives of each phase were as described:

1. To identify the needs of the development of the mLearning implementation model for Professional Communication Skills course at the undergraduate level based on students' views.
2. To develop the mLearning implementation model for Professional Communication Skills course based on experts' opinion and decision.
3. To evaluate the mLearning implementation model for Professional Communication Skills course based on experts' opinion and decision.

Research Questions

Based on the objectives of the study, the problem statement, and the rationale of the study, the research questions for the study were formulated according to the three phases based on the design and development research approach, which was described in the methodology Chapter 3. For Phase 1, in identifying the needs of mLearning implementation of Professional Communication Skills course at undergraduate level based on students' views, the needs analysis phase seeks to answer the following research questions:

1.1 What are the students' perceptions on their language competence to cope with the Professional and Communication Skills course?

1.2 What are the students' perceptions on the traditional formal Professional and Communication Skills course in aiding them to fulfill their language learning needs?

1.3 What are the students' access to mobile devices and the capability level of the devices?

1.4 What are the students' level of acceptance and intention to use mLearning if incorporated into the formal Professional and Communication Skills course?

For Phase 2, in developing the mLearning implementation model for Professional and Communication Skills course, the development phase seek to answer the following research questions:

2.1 What are the experts' collective views on the learning activities, which should be included in the development of the mLearning implementation model?

2.2 Based on the experts' collective views, what are the relationships among the learning activities in the development of the mLearning implementation model?

2.3 Based on the experts' collective views, how should the learning activities be classified in the interpretation of the mLearning implementation model?

In the final Phase 3, the mLearning implementation model for Professional and Communication Skills course was evaluated based on experts' views.

Thus, the evaluation phase was aimed at answering the following research questions:

3.1 What is the experts' agreement on the suitability of the mLearning activities proposed in the mLearning implementation model for Professional and Communication Skills course?

3.2 What is the experts' agreement on the classification of the mLearning activities based on the three domains (Knowledge Input activities, Enabling Skills activities, and Evaluation and Reflection activities) as proposed in the mLearning implementation model for Professional and Communication Skills course?

3.3 What is the experts' agreement on the list of mLearning activities in the respective four clusters (Independent, Linkage, Dependent, and Autonomous) as proposed in the mLearning implementation model for Professional and Communication Skills course?

3.4 What the experts' agreement on the relationships among the mLearning activities is as proposed in the mLearning implementation model for Professional and Communication Skills course?

3.5 What are the experts' agreement on the suitability of the mLearning implementation model in the teaching and learning of Professional and Communication Skills course?

Theoretical Framework

The study employed two types of theories as its theoretical framework: 1) the learning theories to describe and support the language learning process of learners using mLearning as means of scaffolding, and 2) the theories to develop the technology-based learning model for mLearning implementation for mLearning undergraduate English Language learning. On the learning domain, the study adopted the social constructivist learning theory specifically referring to Vygotsky's zone of proximal development (ZPD) (Vygotsky, 1978) to view how students could be assisted in the learning process through interaction with other learners, the course instructors, content, context, and devices using mLearning. To support further specifically on how students meet their language learning needs, the study adopted the scaffolding theory, a language learning theory (Bruner, 1970). It was my goal to leverage on these learning theories to examine students' learning needs and issues using mobile technology to fulfill learning needs and course outcomes. This goal facilitates the design and the development of the targeted implementation model of this study but the development of the model needed to be orchestrated by a theoretical framework. As a theoretical framework for mLearning model, the development process adopted the transactional distance theory (Moore, 1972, 1993) supported by Park's pedagogical framework for mLearning (Park, 2011). The study also adopted Quinn's four Cs of mobile capabilities and the SAMR model (Puentedura, 2006) to guide in the selection of mLearning language activities in supporting the learning capabilities of learners. Further details on the adoption of these theories and models are elaborated in Chapter 2.

Limitation of the Study

The development of the mLearning implementation model was intended as an example in proposing how mLearning could be incorporated in formal learning to assist the undergraduate English Language learning. In the scope of English Language learning, the study chose 'Professional and Communication Skills course' (an undergraduate English for Specific Purpose course) offered in a private higher institution as the focus of the study. Hence, the development of the model was context specific (Driscoll & Burner, 2005; Richey, Klien, & Nelson, 2004; Wang & Hanafin, 2005) where it was developed for a specific group of undergraduates of a specific tertiary institution for a specific language course subject.

In terms of the methodology, this study relied on the students' opinion in determining their need to develop the implementation model in the needs analysis phase. In the development phase, the study adopted the nominal group technique to determine the elements for the model, the interpretive structural modeling (ISM) in developing the mLearning implementation model, and fuzzy Delphi technique to evaluate the model. These methods were based primarily on experts' opinions. Hence, the developed model was dependent on the selection of experts and their opinions. In the development phase, eight experts (four content experts, who were course instructors of PCS from the private institution, two information technologist or mLearning experts, one policy stakeholder of the institution, and one curriculum expert) were involved. The evaluation phase involved 48 experts with the majority of them (n = 45) were language instructors. In other words, if the study would be conducted using different types and numbers of experts for different setting, the results may differ. Thus, the model should not be generalized to be suitable for all language courses for all higher institutions. However, this study could be replicated to form similar mLearning implementation model customized for different sets of students in a particular institution and even for different course subjects.

Another limitation of the study is that the mLearning implementation model focused on a networking of language activities as the main element for the model. Other elements for mLearning implementation model may perhaps consist of relationships of other variables such as relationships of stakeholders or implementers, context, learning skills or strategies, and others.

Significance of the Study

This study is significant in the domain of educational technology and distance education in language learning as it contributes to extend the knowledge field in defining the role of technology and pedagogical distance in augmenting learning through mLearning. Although it has been introduced more than ten years ago, the concept of mLearning is relatively new in the majority of formal education institutions especially in developing countries like Malaysia. Throughout the literature in mLearning studies, much has been reported about the advantages and successes of mLearning in creating dynamic learning experiences and positive learning achievements. The growing trend in mobile technology dependence of the present society has become the main motivation of mLearning research studies. Unfortunately, successes of mLearning projects and initiatives are in isolations and confined to specific sectors. As discussed in the earlier section of this chapter, previous mLearning studies in language learning were conducted successfully but mainly as content delivery system, management and technical infrastructure and support, learners' acceptance or readiness towards mLearning, and effectiveness of mobile devices in students' motivation and learning achievement. While studies in these areas are useful, the potential and full capabilities of mLearning need to be harnessed in coping with the present learners' language learning style and needs. In doing so, research studies need to explore how mLearning could be incorporated in formal education and implemented. Key research areas need to focus not only in promoting awareness in the potential application and benefits of mLearning in educational settings but more on how mLearning could be implemented. Without a proper guide in mLearning implementation, learners may for instance assume mLearning as merely downloading and accessing information and small language mobile applications through their mobile phones. At the formal education, course instructors and institutions may regard mLearning as providing mobile language content to students or setting up learning management systems. Although it would be interesting to exploit the convenience value of mobile devices to provide and access content and applications, mLearning adopted through this approach may risk discontinuation of use once its novelty wears off or when a newer technology emerge.

Hence, the study introduced a guide in implementing mLearning in formal education by proposing mLearning as a continuous learning support in and beyond classroom learning exemplified through the development of the mLearning implementation model for undergraduate English Language learning. The findings of the study not only have the capacity to impact upon how the model could guide in the mLearning implementation in the formal language learning pedagogically but the study could resulted also in methodological impact in the design and development of educational strategies to solve specific learning problems using technology. Thus, the findings of the study could benefit the undergraduate students, language course instructors or lecturers, instructional designers, and policy makers.

Students could benefit from the findings of the study as mLearning offers a flexible and dynamic learning experience that is convenient anytime and anywhere through their mobile devices. Since the present generation of students is avid users of mobile technology, the learning experience could cater to their learning style both in and beyond classroom learning. Learning would then be more meaningful and motivating especially when it suits their lifestyle. At present, students use their mobile devices to communicate, socialize, seek for entertainment, and more importantly to blend in the current culture. Through the findings of the study, students could learn to use untapped capabilities of their mobile devices to augment their learning performances to cope with the increasing educational workload and demand. In future, students would realize that similar mobile capabilities could be used to support or augment their working performances in the job field. However, what is more significant of the study is that the mLearning implementation model could be used to guide how the students' language learning needs could be supported and overcome through the integration of formal, informal, and social learning to cope with their undergraduate language course outcomes.

Language course instructors or lecturers could use the model to guide them in using mobile technology to extend their classroom teaching performances. At the same time, lecturers could find that using mLearning would not necessarily add responsibilities to their workload; instead, they would assume new and dynamic roles to facilitate their students' learning. Their workload could be lightened, as they could plan their lessons using the model and share the learning responsibilities with the students and devices. Learning would be more captivating and motivating especially when the students have the sense of ownership to their learning process. Based on the model too, suitable mobile applications and devices could be selected to facilitate teaching and learning process according to students' learning needs and stages.

In the process, lecturers could enhance their roles as facilitators, researchers, or even course designers and developers. For example, the methodology used to develop the model in this study could be adapted by the lecturers to design and develop models for other solutions to their students' specific language learning problems. These new enhanced roles could revolutionize their role from being mere course content deliverer. In short, the mLearning support could break the monotony of their traditional classroom practices (chalk and talk) and their academic roles, which not only added value to their teaching and academic skills but they would be kept relevant to technology mediated learning environment to better facilitate the needs of their current students.

Instructional designers could use the model to design and develop course modules to be used in classroom practices with mLearning embedded as learning support to assist students' language learning needs. Based on the model, the course modules would take advantage of the integration of formal, informal, and social language learning activities distributed proportionately across students' language learning process. For example, at the beginning of the language course, formal instructions and interactions between lecturers and students in class would dominate the course structure for introduction to the course and mutual planning of students learning program. However, somewhere in the middle of the learning course program, informal and social learning activities would be dominant to address students' learning needs or to develop their language skills. The model could also assist instructional designers to specify appropriate mobile technology devices and both teaching and learning skills to be included in the modules. Instructional designers could also follow the methodology of the study to gain experts opinion to develop mLearning implementation models for other language course subjects or even develop mLearning curriculum models to the course subjects.

The study is also significant to policy makers at the local education ministry level. Aligned with the Critical Agenda Projects (CAP) under the Ministry's National Higher Education Strategic Plan (NHESP), education policy makers at the technology division could use the findings of the model as one of the strategy to address the issue of poor English Language proficiency among undergraduates using mLearning. The model of the study could assist the policy makers to draft a policy in the incorporation of mLearning in formal classroom learning and appropriate technology to be used. The policy makers could find that through the development of the model, the higher institution language curriculum and syllabus could be maintained; instead, the curriculum could be enhanced with robust implementation of mLearning as learning support. The model could also assist in identifying emerging teaching and learning skills appropriate to mobile technology to be included in the policy in improving student's language competence. This would implicate the types of academic training and skill development at the teacher training institution and university level. The national education funds and allocations for language teaching and learning could be specifically budgeted and used optimally to enhance the formal institution language learning through the incorporation of mLearning once the appropriate skills, teaching and learning aids, and other appropriate learning resources have been identified. The methodology of the study could also be adopted and adapted by the ministry to develop solutions to other education issues including the management of the education sectors.

Summary

This chapter begins with the justification of the study of mLearning focusing on its incorporation in formal classroom learning. In this context, mLearning was described as a tool, which seamlessly integrates formal, informal, and social learning. In the elaboration of this integration, mLearning using mobile tools, and devices should not be regarded merely as a medium to deliver learning content but instead act as a mediator to support interaction among learners, instructors, content, and learning context. Through this notion, learning is augmented which then result in the continuation of learning process and experiences beyond classroom walls.

The justification of the study on mLearning was next supported with the increasing use of mobile technology in all sectors of life, which has reached global mass. However, I proposed that in the incorporation of mLearning in formal education, the initiative should not be based primarily on technology but instead mLearning should be better viewed as a learning support. As a support, rather than viewing it as a replacement, mLearning was described as a tool to support and augment the formal learning process.

In doing so, I chose undergraduate English language learning as a focus of the study, which capitalized on how mLearning should be implemented as support to learners' language learning needs. I attempted to illustrate the implementation through development of an interpretive mLearning implementation structural model for English Language learning among undergraduates and this constitutes the purpose of the study. The rationale section elaborated on the justification of the development of the model.

These sections helped in constructing the objectives and the research questions of the study, which systematically guided the development of the model. A discussion on theoretical framework followed suit to help inform on the elements, which should be included in development process of the model guided by learning theories and models. This helped to describe how the model should be viewed as a guide in the mLearning implementation for language learning among undergraduates.

Definition of Terms

A

Asynchronous Communication: Asynchronous Communication refers to virtual or online communication where interactions between individuals are not simultaneously, though it could be continuous. Responses from either party are commonly not immediate. Examples of asynchronous communication are email, e-mail lists, and bulletin boards (Cobcroft, 2006) as opposed to synchronous communication through telephone conversation or teleconferencing.

B

Blog: A blog is opposed to a normal static websites, rather a public web site where experts post informal views, opinions, comments, and thoughts about an issue. Readers not only could read but response to the postings by commenting to the views post by the blog creator or other experts. Taking advantage to this feature, 'Blogs' could be an avenue for learners to engage in collaborative construction or reconstruction of new knowledge.

Bluetooth: 'An industrial specification for wireless personal area networks using radio frequencies to link enabled devices.' (Wagner, 2005)

C

Chat:

Chat is a synchronous type of online communication. Experts of common interest need to login to engage in on-line conversation through networking of digital devices or more currently through portable mobile devices networking.

Collaborative Learning: This is a process of learning where students work in teams to acquire knowledge. Students could actively share information, ideas, comments, and reflections among themselves either in acquisition of knowledge or solving problems. Through mLearning, students could collaborate asynchronously where students could log into a network and leave their messages or postings on different times and locations for others to respond.

D

Distance Learning: Distinguished form conventional face-to-face learning, Distance learning involves quasi-permanent separation between teacher and learner during the process of learning focusing on individual learning, with a possibility of meetings either face-to-face or by electronic means, for both didactic and socialization purposes' (Keegan, 1996, p. 50). However, planning and organization of course learning, and student support services are prepared by the educational institution. This differs from self-study program learning. Teacher and students are connected both synchronously and asynchronously through various technical media such as print, audio, video, computer, or the latter mobile technology. In most cases, teacher and students rely heavily on two way communication facilitated by these tools in the learning process.

E

E-Learning*:* Web-based training (WBT), also known as e-Learning and on-line learning, is training that resides on a server or host computer that is connected to the World Wide Web (Rossett & Sheldon, 2001, p. 274).

F

4G: It is a short form for 'Fourth-generation mobile telephone technology. It offers higher speed in mobile access compare to its predecessor, 3G of a magnitude of 10 Mbits/s and above. Experts could connect several wireless devices and move seamlessly between them (Wagner, 2005, p. 46).

Formal Learning: In the scope and context of this study, formal learning is learning typically provided by an education or training institution, structured (in terms of objectives, learning time or learning support) and leading to certification. Formal learning is intentional from the learners' perspective

G

General Packet Radio Service (GPRS): A mobile data service usually available to GSM mobile phone experts. It is also known as 2.5G, a mobile data service ranging between second generation (2G) and third generation (3G). It offers moderate data transfer rate by using unused **TDMA** channels in the **GSM** network.' (Wagner, 2005, p. 46)

Global Positioning System (GPS): 'A satellite navigation system used to determine one's precise location and providing a highly accurate time reference almost anywhere on earth. GPS is controlled by the U.S. Department of Defense and can be used by anyone, free of charge' (Wagner, 2005, p. 46). The system is currently available widely in most smartphones, which is important to run mobile applications on the phone. This capability affords learning in context for experts.

Global System for Mobile telephones (GSM): It is the most widely used mobile phones globally. Most phones manufacturers could equip phones with dual bandwidth (900 and 1900 MHz) or tri bandwidth (900, 1800, and 1900 MHz) for GSM phones to enable phones to work in most GSM systems found at any countries (Wagner, 2005, p. 46)

I

Instant messaging (IM): IM is similar to email but conversations are in real time or synchronous. It is like a telephone conversation but it uses text in replacing voice calls. Experts at both end of the online (sender and receiver) need to be present synchronously before they are able to chat (Wagner, 2005, p. 46).

M

Multimedia Messaging System (MMS): It is a successor to SMS. The function is similar to SMS but instead of short text messages, messages are in the form of digital photos, audio, or video. MMS usually is available for mobile phones that have built-in camera and MMS messaging client that the user used to compose, send or receive MMS messages. (Wagner, 2005, p. 47)

S

Short Message Service (**SMS**): One of the oldest and most popular channel of wireless communication that is widely available in most mobile phones as it is convenient, user-friendly, instantaneous, and at minimal cost compare to voice calls. It is a simple application to sent short messages for GSM mobile phones though it is still available for 3G phones (Wagner, 2005, p. 47).

Situated Learning: Lave and Wenger (1991, p. 121) argues that situated learning is learning occurring in context and culture as opposed to classroom learning activities which deals with abstract knowledge that usually out of context or in simulated context. Learning is usually unintentional which involves social interaction as tool of learning. Learning takes place among a community of learners.

Smartphone: A state of the art mobile communication device which integrates other device capabilities such as camera, personal information management, GPS, gaming consoles, telephone, and many more with added wireless internet applications into one device (Wagner, 2005, p. 47)

W

Wireless Communication: As the term stated, it is communication without electronic lines but instead on airwaves. Due to its pervasive advantage to experts, more and more experts switched from online to wireless communication to access the internet.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

The general purpose of the study was to develop the mLearning implementation model for undergraduate English Language learning. The model aimed at proposing a guide on how mLearning could be incorporated and implemented in the formal classroom language learning. mLearning was adopted not only as a complement but to augment formal learning in assisting low proficient students to overcome their language proficiency handicap while satisfying the language course outcomes. This chapter discusses the important relevant concepts and theories of mLearning in its incorporation in formal language learning; theories which define how students learn and achieve their language learning goals through social context, and the theoretical foundation, which serves to scaffold the development of the model. The theories discussed aimed at guiding the selection of appropriate mLearning activities and how the activities could be integrated to be included as elements in the development of the model. Thus, this chapter discusses the following:

1) mLearning in formal education, which provides an overview on how formal learning has been transformed in mobile learning environments, based on past and existing mLearning initiatives and implementation. This is essential to be discussed first to provide an overview of the role of mLearning in transforming the landscape of formal education especially on how feasible or successful mLearning can be in aiding the present generation of students. Coupled with this discussion, the investigation into how widespread mLearning has been implemented in mainstream education especially in developed

countries could further justify the feasibility of the study in employing mLearning in classroom learning. This is followed by the discussion on the concepts and definition of mLearning.

2) Concepts and definition of mLearning discuss how mLearning entails a new paradigm of learning plotting against current teaching and learning practices to provide the foundation of the development of the mLearning implementation model. The discussion could lead to better understanding on how to position mLearning in its incorporation in formal learning. For example, on the basis of the concepts discussed, we would want to know whether in its implementation, mLearning should be taken as wholly substitute of formal learning, or as a supplement to classroom learning, or probably as a tool to enhance formal learning. In other words, how mLearning could redefine not only formal learning but also learning itself.

3) A discussion on theorizing mLearning follows suit to present the underlying principles which serves as a guide on the development of the mLearning implementation model. Next, based on the concept, definition, and theories of mLearning, the chapter presents the theoretical foundation of the study.

(4) The theoretical framework is divided into two main parts: a) Learning theories that proposed the underlying principles and theories on how learners learn through mLearning. Specifically for language learning, theories on language learning were also presented to describe how undergraduate second language learners learn through mLearning and to provide the needs of the elements to be observed in developing the model, and b) Theoretical foundation of mLearning implementation focusing on framing and selecting mLearning activities. This section elaborates on the definition of mLearning activity specifically why it was chosen as the main element for the model. This is followed by the discussion on a pedagogical framework and models that were adopted to determine the

language activities (both formal language activities and mLearning language activities) for the implementation of mLearning.

5) Finally, based on the above discussions, a conceptual framework for the development of mLearning implementation model for undergraduate English Language Learners is presented in the final part of this chapter.

mLearning in Formal Education

The American K-12 formal school environment is an important reference in the educational technology literature in citing successful implementation of mLearning in mainstream education. K-12 school is a sum on primary and secondary education widely used in the US and the Philippines (Garrison & Anderson, 2000). This section presents a brief reference to American K-12 schools in the adoption of educational technology and the wireless university to explore teaching and learning in the mLearning environment. This serves as a center stage on how mLearning could change the landscape of formal education especially in the impact on learning.

As a brief history background on the employment of mLearning, Lederman (1995) presented an article elaborating on the role and aspect of Local Area Network (LAN) in developing a technology plan for schools in the US. The following year, Rothstein (1996) presented a thesis on architecture models, cost evaluation, and benefits of networking the K-12 schools. Rapidly, in 2000, the US government equipped close to 98 percent of public schools with Internet access with an impressive ratio of 5 to 1 in terms of number of students to instructional computers (Cattagni & Ferris, 2001). In no time, widespread wireless wide area networks began to dominate the K-12 school environment (Nair, 2001). Consequently, in 2002, the National Clearinghouse for Educational Facilities (NCEF), Washington DC published an online article promoting the feasibility and benefit of mobile and wireless education in US schools (Nair, 2002). This article reappeared the following year in 2003 coupled with a publication on WLAN guide in K-12 schools by the Consortium for School Networking, Emerging Technologies Committee, Washington DC (Lightbody, 2004).

In the same year, tertiary education institutions in the States began to realize the potential of wireless technology in education and installed the technology around their campuses (Meru Network, 2005). These development results in numerous articles highlighting issues of wireless networking and reports on a growing list of mobile enabled schools (Norris & Soloway, 2008; Pascopella, 2006). One of the issues mentioned was the problem of low bandwidth that resulted in connectivity issue but this issue was quickly brushed off with the entry of 4G Wifi technology in 2009 that greatly supports the continuity of mobile learning environment in both K-12 and higher learning institutions (Meru Network, 2009). Shin, Norris, and Soloway (2007) presented an important and comprehensive review of effectiveness of mLearning in K-12 education. Their findings revealed that besides giving positive impact to students' motivation and achievement, mobile devices were used effectively in researching, managing, and sharing ideas, capturing and analyzing data, and communication and collaboration as well. In 2007, NCEF published another online article on resource lists in the integration of technology in higher education.

In the European block, Germany began to take pride in the adoption of mLearning with the introduction of WELCOME, a mobile architecture model by Lehner, Nosekabel, and Lehmann (2003). The main contribution of the model was the introduction of future mobile layers into main components. The first component consists of elements of mobile education, such as the students, teaching staff, administration, and education system. The second component was the application layer that allows communication among learners, teachers, and content. The final component was the database layer, which held the main resources for mLearning. The database was further divided into two types of databases, one to store educational content and another stored additional feature, which might be useful to the mobile environment in future. The whole mLearning system facilitated learners in four types of assistance:

1) Connect students with lectures or notes on mobile technologies for knowledge acquisition,
2) Managing students learning process by posting information via Learning Management System (LMS),
3) Provides active communication services synchronously and asynchronously through both pull and push technology to scaffold learning, and
4) Monitoring students' learning progress that is reliable and cost effective.

In the Asia region, Japan, South Korea, and Singapore took the lead in mLearning initiatives in the formal school environment but unfortunately other neighboring countries such as Malaysia, Indonesia, Thailand, and the Philippines were still left behind in adoption of mLearning (Chan et al., 2006). However, these countries have taken steps in upgrading their wireless technology and the progress has been robust. In Malaysian context, the Ministry of Higher Education (MOHE) of Malaysia had executed its main national education plan called the National Higher Education Strategic Plan (NHESP). The plan was aimed at developing and transforming the national higher education for the future beginning the year 2007 which reach its maturity targeted goals in 2020 aligned with the national vision 2020 (PSPTN, 2013). The main objective of the plan was to produce high quality human capital and first class intellectuals for the nation in the aspiration of being a developed country by 2020. The plan consisted of four phases, which were Phase 1 (2007 -

2010): Laying the Foundation, Phase 2 (2011 - 2015): Strengthening and Enhancement, Phase 3 (2016 - 2020): Excellence, and Phase 4 (Beyond 2020): Glory and Sustainability. At present, the plan has reached its second stage beginning the year 2011 and ends in 2015. The ministry had developed 23 Critical Agenda Projects (CAPs) containing their respective objectives, indicators, and set target achievements through various activities to ensure smooth implementation of NHESP based on each phases. The activities were collectively executed at all levels of education parties including the ministry, MOHE agencies, and all higher education institutions. In support of the current technology trend, mobile learning (mLearning) has been listed as one of the CAPs project, which was described in the plan as learning through enhanced portable technologies such as mobiles and tablets (PSTPN, 2013).

The present generation of students has engaged themselves with mobile technologies but mostly for edutainment and communication. Mobile devices have apparently becoming an essential part of their lives and have become a trend. Kyriazakos, Soldatos, and Karetsos (2008) stated that with the fourth generation or 4G in wireless technology, mobile technology might overwhelm even developing countries with more and more public demand in affordable devices and connectivity. Soon, with this development, mobile technology will penetrate into the education institutions.

Nevertheless, the US learning institution especially the K-12 schools still sets the best example in excellent mLearning teaching and learning especially considering mLearning is still at its infancy in terms of worldwide acceptance in mainstream education. One of the major contributing factors to the US success in the rapid development of mLearning nationwide is the holistic cooperation among all levels of education stakeholders.

In terms of teaching and learning strategies, research findings revealed that mLearning success thrives on social interactions and collaboration in learners' learning process (Inkpen, 1999) and promotes active participation of learners, productive negotiation of knowledge and creativity. Past studies strongly indicated that collaborative learning is the main approach in students' engagement in mLearning (Gay, Rieger, & Bennington, 2002). Zurita and Nussbaum (2004) identified the use of mobile computer devices in effectively support collaborative learning activities. In a more advanced research in collaborative learning, McArdle, Monahan, and Bertolotto (2006) introduced 3D collaborative virtual environment for mLearning. However, virtual learning environment has been in existence in the past. For instance, in 1997, CoVis or Learning through Collaborative Visualization had been introduced to assist in a collaborative initial testing for science education via Internet. In this initiative, teachers and students were provided learner-centered software powered with high performance computing to engage them in project-based collaborative learning (Cerf et al., 1993; Lederberg & Uncapher, 1989). The key advantage of collaborative learning is that it allows the shift of teacher-centered learning to learner-centered learning and in the process promotes decision-making skills, management skills, as well as equal-participation from all students (Ormrod, 2004, p. 45). Uniquely for mLearning differing from other technology based education employment, mobile community collaboration could also result in collaborative new and customized software design rather than relying heavily on reuse available software. This according to Fischer (2002) is the new identity of the 21st century software technology. The examples that we could observe today are the collaborative knowledge construction through 'Wikis' and 'Blogs' and the mushrooming of mobile applications for mobile devices generated by individuals or groups of novice experts.

In language learning, mobile devices have been discovered to bring impact on both content delivery and collaborative learning (Godwin-Jones, 2011; Kukulska-Hulme, 2010). Although most studies were conducted in higher education (e.g., augmented reality game for undergraduate students learning Spanish), promising results were also identified at K-12 students. For example, one study informed that mLearning could complement formal classroom learning by allowing students to bring the devices home for self-practice (Sandberg, Maris & De Geus, 2011). Another study conducted by Lan, Sung, and Chang, 2007) employed strategies that use mobile devices to implement collaborative reading activities at the elementary level.

Besides the academic aspect, a number of studies revealed that mobile devices could also improve student's behavior. For instance, past studies indicated that classes that allow mobile devices to be used in the classroom experience increase in students' attendance, motivation, higher commitment in completing learning tasks as well as decrease in behavioral problems (Swan, Van't Hooft, Kratcoski, & Unger, 2005; Pollara & Broussard, 2011). Upon investigation into the potential of technology in education, Tinker (2009) stated that information technologies not only provide new type of resources and approaches in teaching and learning. The adoption of technology has also resulted in new level of knowledge and skills among students. His findings verified that middle school students were able to conduct a quantitative forecast on world population using multiple feeds of assumptions; while elementary school students could comprehend the basic calculus concept using a mobile sensor equipped with a computer program that could plot a real-time graph of the students' motion and velocity.

In short, this section discusses the impact of mLearning adoption in mainstream education and resulting in change of teaching and learning approaches. As exemplified by the US K-12 school nationwide implementation of mLearning, the landscape of formal education has gone through a new paradigm shift especially in students' learning autonomy and environment. While issues of mLearning adoption in schools are still being debated especially in developing countries, the US has made a new leap in learning innovation. The role of teachers have shifted from merely teaching to making new discovery in teaching approaches in collaborative designing of new learning experiences with the students to be applied in the fields of mathematics, science, language learning and other fields. The notion of student-centered learning has never become more realistic where students are given the liberty to personalize and manage their own learning at their own time and space. However, being in its infancy stage, although mLearning has transformed the teaching and learning strategies in formal education, the adoption has done little to change the curriculum system and content. Nevertheless, the future and potential of mLearning is very promising and its direction for global acceptance is only forward.

Concept and Definition of mLearning

Concept of mLearning

In his study of mLearning in Africa, Brown (2005) suggested a model for mLearning (shown in Figure 2.1) which offers discussion in the concept of mLearning. Based on the model, mLearning could qualify to be a subset of distance learning in the context of learning beyond the realm of formal traditional classroom learning. In terms of technology accessibility, distance learning could be divided into two main types:

a) Non- electronic distance learning (mail correspondence through postal service) or paper-based distance learning as termed by Brown (2005), and

b) Electronic distance learning aided by technology devices (computers, pc tablets, electronic kiosks, palmtop, PDA, mobile phones, smartphones, MP3/MP4 player, and game stations) and supported by electronic facilities/applications such as the internet, Bluetooth, GPRS etc.

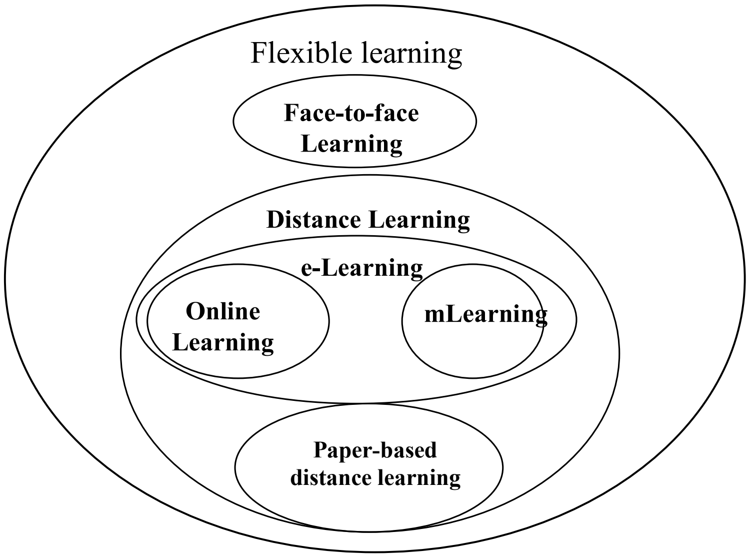


Figure 2.1. mLearning model. Adapted from “Towards a Model for mLearning in Africa,” by T. H. Brown, 2005, *International Journal on E-Learning,* 4(3), p. 310.

Thus, mLearning could naturally be divided into two types in terms of technology accessibility:

a) mLearning type 1: the first type dominantly focuses more on the learners of the olden days who traveled from one place to learning and attaining new knowledge with or without a predetermined intention to seek knowledge. This type is a non-formal learner-centered learning that involves the mobility of learners in engaging themselves to learn through people they meet along their journey and through interacting with the environment as they move. Their knowledge is passed on and exchanged with others when they meet with other people and this promotes development of knowledge themselves and to the knowledge itself.

According to Tokoro and Steels (2003, p. 20), knowledge is only formed when the sender and the receiver of information share a common context of situation which he termed as "common ground". He elaborated that knowledge will be formed in oneself when the information received is "grounded" in the common ground. For example, when the sender gives information about a certain place to a receiver, the information will stay as information to the receiver. However, when the receiver goes to the place mentioned by the sender, meaning will be given to the information and the receiver will gain 'grounded knowledge' and no longer having mere information (Tokoro & Steels, 2003, p. 20). In other words, in this context, mobile learning is explorative, situative, contextual, and cooperative in nature.

b) mLearning type 2: the second type of mobile learning involves learning aided by mobile electronic technology especially mobile communication devices brought about by broadband technologies in aiding learners who are separated from time and distance to learn. It is important to note that the learners of this type still interact with people and their immediate environment to learn similar to mLearning type 1 but making use of the advantages of computational power of the mobile devices (Goth et al., 2006). The main distinctive feature of mLearning type 2 as compared to mLearning type 1 is the learners, both the sender and the receiver could possibly share a common physical ground in gaining knowledge without being there physically. In other words, they could share grounding wherever they are, using mobile technology advancements developed by broadband technologies. Alternatively, the learners could also share a virtual situation/space that closely resembles reality. Thus, the transformation of information to knowledge will be much easier. Hence, the learners are liberated from time and space constraint to gain knowledge.

mLearning type 2 could also be referred to as electronic mobile learning or e-mLearning to differentiate itself from mLearning type 1. However, e-mLearning should not be confused with mobile e-Learning (also commonly addressed or abbreviated in the literature as mobile learning or mLearning). Mobile e-Learning is e-Learning using mobile computational devices (Quinn, 2000; Trifonova & Ronchetti, 2003), which is also an e-Learning perspective of defining mLearning. This will be elaborated further in this chapter. E-mLearning on the other hand is mLearning mediated by mobile computational devices. In this study, the term mLearning refers to mobile learning type two or electronic mobile learning (e-mLearning).

Perspective and Definition of mLearning

Defining mLearning not only establishes a shared understanding but it could also help to us to observe its evolution and direction (Traxler, 2009). However, the mLearning community of practice has yet to come to a single agreement on the definition of mLearning though mLearning has emerged since the first published studies in 2000 (Sharples, 2000; Traxler, 2009). This was especially due to the dynamic nature of mLearning as a new concept of learning. Early attempts to conceptualize mLearning were techno centric which focused on technology where scholars in this field were referring to online learning to describe mLearning as means of training using mobile devices especially through mobile phones besides PDAs, iPods, digital audio players, and other such devices (Van't Hooft, 2013; Keskin & Metcalf, 2011). Examples of definitions based on these perspectives are mLearning as learning through mobile devices such as Palms, PDA and mobile phones (Quinn, 2002) or mLearning as any educational provision where the sole or dominant technologies are handheld or palmtop devices (Traxler, 2004). Another definition is mLearning as learning away from one's normal learning environment or learning involving the use of mobile devices (Sharples, Taylor, & Vavoula, 2005). Definitions that are more recent could be mLearning as any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediated through a compact digital portable device that the individual carries on a regular basis, has reliable connectivity, and fits in a pocket or purse (Clark & Quinn, 2009). On the other hand, Traxler (2010) defined mLearning as exploitation of ubiquitous handheld hardware, wireless networking, and mobile telephony to enhance and extend the reach of teaching and learning (Traxler, 2010).

I view that techno centric definitions began to overwhelm the literature due to the following three main circumstances:

1) mLearning only began to surface a decade ago at worldwide level to serve the growing mobile community as effect of the development of mobile technology especially mobile communication devices such as hand phones, smart phones, and PDAs and so forth. Although roots of mLearning could be detected as far as thirty-eight years ago when Kay (1972) invented the Dynabook, the coinage of mobile and learning to form mobile learning or mLearning was only introduced recently during the flooding of mobile devices throughout the world, which resulted also in conferences, seminars, and workshops on mLearning within the past 10 years.

2) The techno centric definition of mLearning was also resulted from localized and short-term mLearning pilots, trials, and researches where most of them were based on usage of mobile devices in learning either looking into the feasibility of mobile devices in aiding learning or effects of mobile devices on learners in acquiring skills and knowledge (Utulu, Alonge & Emmanuel, 2010).

3) In addition, funding to facilitate these mLearning projects at the time was supported by mobile communication companies such as Ericsson, Motorola, and Nokia. Consequently,

the projects and outcomes of findings were mostly geared toward seeking possible market advantages for mobile communication devices and facilities in education line. Thus, the tendency and inclination of mLearning projects and research were based on the use of mobile devices in learning. These led to the techno centric definition of mLearning.

Another techno centric perspective views mLearning as an extension to e-Learning or a subset of e-Learning where e-Learning is the macro concept, which involves online learning environment and mLearning (Brown, 2005). Here mLearning implicitly means mobile e-Learning. Examples of definition through this perspective are mLearning as e-Learning through mobile computational devices (Quinn, 2000; Trifonova & Ronchetti, 2003), mLearning is eLearning Lite (Clark & Quinn, 2009), mLearning as a subset of e-Learning (Rajasingham, 2010), or as Kadirie (2005) defined it, mLearning as a form of e-Learning where learning could take place anytime and anywhere aided my mobile devices.

However, techno centric or e-Learning definitions of mLearning were criticized as imprecise justified by the transience and diversity of the mobile devices, systems, and platforms, which resulted in a highly unstable definition (Traxler, 2009). mLearning is conveniently placed somewhere on e-Learning's spectrum of portability (Traxler, 2004); thus does not lend in characterizing the unique nature of mLearning (Winters, 2006). An e-Learning definition may assume mLearning as a lesser degree mode of learning comparatively. In the e-Learning definition of mLearning, it is assumed that the small mobile computational devices serve similar active role in replacing desktop or laptop computers. This could inevitably raise some technical drawbacks of mLearning due to the small screen size of mobile devices and short battery life span compared to desktops or laptops, and conveniently limiting mLearning in its prospect for future learning (Kukulska-Hulme & Traxler, 2007; Kukulska-Hulme, 2009). mLearning will then be perceived as merely a branch of a primary mode of e-Learning.

In e-Learning, computers wired by the internet play a dominant and active role where learning materials are delivered, the learning process is moderated, and context of learning is designed for learners who comparatively assume a passive role. However, in mLearning, the mobile computational devices activate learners to interact with the physical, conceptual, or abstract place to do and think during the learners' learning process. Goth et al. (2006) argued that the real physical context of learning or the immediate environmental setting of the learner should be the main foreground of the learners' focus in the learning process. Instead, the mobile devices (e.g., mobile phones, PDA, smartphones, etc) should be the background of the learning focus, which could be switched to the foreground of the user's attention instantaneously when needed but only temporarily as the learner needs to return their focus to the environment. The role of computer device here is to enrich the physical environment on demand and allow additional activities. Hence, in mLearning, it is a passive role for the mobile devices in contrast to the learners' active role in being activated by the devices to do and think in their learning process. This active role of the learner is also the main characteristic shared in mobile learning type 1 as discussed above. In other words, learners assume an active role in learning while the devices play a passive role in facilitating learning. This characteristic of mLearning is in actual fact in contrast with the electronic learning (e-Learning) concept where in e-Learning, computers assume an active dominant role in the learners' learning process by delivering the learning material, moderating the learning process and designing the context of learning (Goth et al., 2006). Hence, e-Learning and mLearning should be perceived as two different mode of learning, and placing mLearning in the e-Learning domain will not take full advantage of the distinctive capabilities of mLearning as described.

Consequently, a newer perspective that was more human-centered approach gradually dominated the techno centric or e-Learning perspective. The new perspective shifted the focus of mLearning away from technology to learner-centered such as focusing on the learning process of learners, mobility of learners, learners' lifelong learning, learners' learning autonomy, or individualism. For example, the human-centered perspective of mLearning argues that the focus of mLearning should not be in the mobility of mobile devices but rather the mobility of the user and content (Winters, 2006; Kulkulska-Hulme, 2009) or learner centered (Winters, 2006). Examples of definition based on this perspective are 'any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies" (O'Malley et al., 2003). Similarly, the Lehner et al. (2003) definition of mLearning not only covers learning via mobile devices, network and wireless, but it has expanded covering any service or facility that provides a learner with general electronic information and educational content that assists in knowledge acquisition anywhere and anytime. This is supported by Kukulska-Hulme (2009) who suggested that devices learners use might be hardly relevant; what should be of importance is the mobility and the construction of learning conversations in that process. However, Kukulska-Hulme (2009) did not deny of the influence of mobile device choice in learning. The availability of technology of learners in fact influences the learners' learning choice. For, example, language learning through mobile phones could be through oral conversation or electronic text (blogs) between learners while learners who own a Nintendo DS, designed for games could engage learners in language learning games instead. Conversations between learners is a vital mode of learning in mLearning as defined by Nyiri (2002) which describes mLearning as learning which occurs when individuals communicate wirelessly.

A more recent perspective in conceptualizing mLearning is viewing mLearning as augmenting learning whether in augmenting the present education system, the learning process, or even augmenting learners' capabilities to learn. In the case of incorporating mLearning in mainstream education, mLearning is viewed as augmenting formal education. Through this perspective, mLearning attempts to unfold the misconception of formal education as categorized merely as a stereotype face-to-face classroom bounded learning as often described in technology-based or electronic based learning literature. However, the existence of distance education for over 100 years (Peters, 1998) evoked questions on relationship of mobile learning in all forms of traditional learning besides classroom learning. Therefore, it is natural to perceive mLearning as a support to traditional learning or even to enrich classroom learning as proposed in the development of the implementation model for mLearning in this study. An example of defining mLearning through this perspective is mLearning as taking advantage of the opportunities unique to mobile for learners' performance support where mLearning could be used not only as a tool to augment formal learning but making learning whole and natural by seamlessly integrating it with informal and social learning (Quinn, 2011a). Quinn argued that augmentation is a fundamental basis of thinking about mLearning. To elaborate his point, mLearning is about augmenting what our brains are good at by supporting in the areas where our brains cannot do well. He argued that our brains are good at pattern-matching and executive monitoring such as applying different sets of knowledge or skills appropriately to different situations or making decision based on calculated factors, but lack in the ability for rote operations such as remembering arbitrary facts or complex rote processing (e.g., lengthy mathematical calculations). Ironically, rote operations are the major tasks that students need to perform well in the traditional classroom learning to the extent that students will be honored as high achievers if they could memorize the multiplication tables, Shakespeare's poems, or recalling geographical statistics of a country. Certainly, our brain could be trained to perform these tasks through brute force method or drills but this will only turn us into automatons instead of thinkers or inventors (Quinn, 2011a).

Through mLearning, digital devices support our brain function in rote processing such as storing information and displaying it when needed, sensing, data recording, and even performing complex calculations. Certainly, desktop computers or our laptops could also perform these tasks but through mobile devices, these rote tasks could be performed anywhere and anytime but most importantly when needed. On the basis of the inputs from the devices, we could execute better judgments and make decisions of a situation, which our brains are good at doing. This elaborates the point about the distinctive feature of mLearning as augmenting learning and learners' performance, not learning delivery through courses on the phones. As Cook (2010) describes, it is about thinking beyond formal learning.

Other perspectives such as one focusing on individualism where mLearning is defined as any learning activity that an individual engages to become more productive through consuming, interacting and creating information using portable compact digital devices which the individual carries on a regular basis and has reliable connectivity (Wexler, Brown, Metcalf, Rogers, & Wagner 2008). Individualism perspective could be viewed as a form of a learner-centered perspective where learning goals specifically focus on individual achievement.

However, although the present perspectives in defining mLearning have shifted towards learner focused which seemed to be more humanistic, the past perspectives should not be dismissed totally, as they have their use in building the concept of what mLearning is known today and could still be relevant. For example, the techno centric or e-Learning perspective could be applied to develop mLearning course applications for job-training purposes.

As a conclusion, there are different perspectives of mLearning in the literature according to different features of focus point such as technologies, e-Learning, mobility, learners, or individualism. Winters (2006), and Kukulska-Hulme and Traxler (2007) classified theses perspectives into the following four perspectives:

1) Techno centric,

2) A subset to e-Learning,

3) Learner centered, and

4) Augmented formal learning

Based on the perspectives above especially from the more current ones, the mLearning elements which consist of mobile devices and applications, the learner (and the mobility of the learner), and the learning context or learning environment are actually inseparable and interact with each other to form mLearning. mLearning will cease to exist in the absence of any of the elements. Not only do the elements need to interact with each other in order for learners to be able to engage themselves in mLearning; the elements complement each other in the process. To illustrate this, the learners need to interact with their mobile devices and the context to develop their knowledge. Interaction between the mobile devices and the learners' immediate environment will enrich further the environment to improve learning. The learners' progress in knowledge acquisition will lead to construction of new knowledge due to enriched learning environment. This will lead to new needs of learning, which then require new developments in mobile devices and applications; thus, the interaction among learners, the learning context, and the mobile devices will further develop the mobile technologies.

However, focus should be the main priority in defining mLearning. Since, learners are end recipient of any learning initiatives; they should be the focus of mLearning but without denying the great importance of the role of mobile technologies and learning context. In other words, as discussed earlier here, in mLearning, the learners play an active role while the mobile devices and applications assume a passive one, which is to enrich the physical environment on demand and allow additional activities. In other words, the mobile technology, devices, and mobile environment serve to augment the learners' capabilities to learn and their learning process (Quinn, 2011a, 2011b).

In the context of this study, the operational definition of mLearning to develop the mLearning implementation model for undergraduate English Language learning is learning activities via interaction mediated through mobile technologies to augment language learning in aiding undergraduate's language learners to achieve both target needs and their language competency needs. The definition takes into account 'interaction' as learning approach for language learning and language activities as element for the model.

The definition was also proposed based on the adaptations of the mLearning definitions by O'Malley et al. (2003), Lehner et al. (2003), Clark and Quinn (2009) and Quinn (2011a). There are two main adaptations, which needed to be elaborated as the following:

1) The word 'interaction' was used in this definition to describe 'learning that happens' (O'Malley et al., 2003) when the learners take advantage of the learning opportunities. Interaction here not only involve learners consuming electronic information, interacting with the information, or creating their own electronic information (Clark & Quinn, 2009) but also involve interaction among the learners, learning context and the learning community (for example, other learners, instructors, facilitators, teachers or lecturers) to facilitate their learning needs.
2) The word 'offered' in O'Malley's definition was replaced with 'mediated' as 'offered' implies dominance and dependency of technology devices and applications over the learners as in favor of the techno centric view of mLearning. In mLearning,

mobile technologies especially mobile applications should be viewed as mediating tools in the learning process as they should be related to other learning tools, which are also used by students and teachers, and/or tools that are developed through technical developments (e.g., social software). In other words, the mobile applications should not be ends in themselves (Winters, 2006). Furthermore, Tella (2003) noted that the *m* in mLearning could mean both mobile and mediated. Augmentation is regard as the next level of mediation where the mobile technologies not only mediate but also serve to support and extend the learners' performance in learning through the integration of formal, informal, and social learning (Quinn, 2011a).

Theorizing mLearning

The increasing widespread application of mLearning in educational institutions, museums business organizations and other contexts justifies the need for a theory in defining the education practice across these contexts, and also because of the ability of theory in defining the research agenda and producing predictions and generalizations (Traxler, 2009). Hein (2013) expressed the need of a theory of education as making an "effort to think through the underlying principles on which we base educational activities" (p. 15). Especially, when there is scarce empirical evidence of effective learning using mobile technologies, a theory is needed to inform user guidelines (O'Malley et al., 2003). In the early stage of an instructional design, a theoretical perspective could aid in the design of instructional strategies, methods of evaluation and analysis approach of the learning content. However, similar to its definition, the communities have different views in theorizing mLearning.

Based on past research, there were studies suggesting theorizing of mLearning in relation to the existing learning theories namely behaviorist, constructivist, situated, collaborative, informal/lifelong, and learning and teaching support. Behaviorist theory involves learning activities that target learning as a change in learners' observable actions. In the context of mLearning, what is most significant is the facilitation of mobile devices in quick learning feedback and reinforcement elements. Projects and research studies such as delivery of content through text messages using mobile phones and PDAs for language learning (Thornton & Houser, 2004) and classroom response system for learning feedbacks (Dufresne, Gerace, Leornard, Mestre, & Wenk, 1996) fall into this theory.

In constructivist theory, learning involves activities in which learners actively construct new ideas or concepts based on previous and current knowledge. Relating to mLearning, the most compelling example is the use of mobile devices in enabling learners to participate in immersive experiences through dynamic mobile systems such as mobile gaming. Projects and studies such as the Virus Game which involved use of PDAs to simulate the spread of a virus (Colella, 2000) and the Environmental Detectives where students investigate an environmental problem using GPS in pocket PC (Squire & Klopfer, 2007) are examples of constructivist theory based learning. Other examples based on this theory are exploring media issues using videos, animations, documentaries of educational concepts and news bulletins with mobile phones (Chesterman, 2006), and Savannah (Benford et al., 2004).

The situated learning theory promotes learning within an authentic context and culture. Mobile devices are especially suitable for context-aware applications as learners can be in different contexts. Among the examples are Ambient wood that involved learners using PDAs to explore environmental habitats (Rogers et al., 2002), and multimedia tours at the Tate Modern which applied the use of pocket PCs to view videos and listen to expert commentary (Proctor & Burton, 2003). Other examples include participation in role-playing to investigate social interactions among family and friends with mobile phones (Strom, 2002), and MOBILearn (Lonsdale, Baber, Sharples, & Arvanitis, 2003; Lonsdale et al., 2004). In relation to collaborative learning, mLearning entails learning through social interaction assisted by mobile devices synchronously or asynchronously disregard of time and location among learners. An example of a mobile collaborative learning is the mobile computer-supported collaborative learning conducted by Cortez, Nussbaum, Santelices, Rodriguez, and Zurita (2004), which involved dissemination of activities, collaboration, and analysis of results using hand held computers.

In comparison, informal and lifelong learning involve activities that promote learning beyond the formal learning environment and curriculum. Research regarding this theory recognizes learning at any time depending on environment and particular situations faced by learners. This theory encompasses learning intentionally or unintentionally through daily conversations, electronic media or any experiences outside the classroom. Being portable, mobile devices are valuable in supporting this view of learning. An example is the study conducted by Attewell and Savill-Smith (2004) on disadvantaged youth on using mobile phones to deliver interactive stories and quizzes among themselves. Another example involved medical treatment of breast cancer where the patients were able to access anytime, anywhere information during their course of treatment through text images and audio-visual materials via PDAs (Wood, Keen, Basu, & Robertshaw, 2003).

Learning and teaching support theory involves any activities that aid in coordination of learners and resources for learning activities. In this view, the availability of mobile devices at all times greatly improves the learning support such as checking of course schedule, monitoring of attendance, and tracking of learning activities. Examples of learning using mobile technologies in this context are management of teachers' workloads in recording attendance, grading students' achievement, and organizing lesson plans (Perry, 2003). Other examples include supporting students at risk through SMS messages on appointments, teachers' feedback on their learning, room changes and study tips (Riordan & Traxler, 2003), and learning assessment through 'phone exams' where experts' voice print indicates students as test takers (New Media Consortium & Educause, 2006). Similarly, Kim, Mims, and Holmes (2006) introduced a support system, which enables information access through e-books, courseware, and learning timetables through PDAs.

However, theorizing mLearning through these existing theories especially the main traditional learning theories (behaviorism, cognitivism and constructivism) are problematic as these theories have limitations in relation to the present learning trend, context, situation and technology. These theories are argued as unsuitable to describe the present learning as they were developed when technology had not yet affect learning (Siemens, 2004). The theories in addition were developed in times when the development of knowledge was at a very slow rate in contrast to the present rapid knowledge development. Knowledge of today tends to be obsolete at very much faster rate compared to knowledge in the past as clearly described by Gonzalez (2004) in the following:

> One of the most persuasive factors is the shrinking half-life of knowledge. The half-life of knowledge is the time span from when knowledge is gained to when it becomes obsolete. Half of what is known today was not known 10 years ago. The amount of knowledge in the world has doubled in the past 10 years and is doubling every 18 months according to the American Society of Training and Documentation (ASTD). To combat the shrinking half-life of knowledge, organizations have been forced to develop new methods of deploying instruction (para. 1)

Siemens (2008) argued further that these theories do not consider the learning process that take place outside the learner and within organizations. Kuhn (1962) in his famous treatise, *The Structure of Scientific Revolutions* had warned us when he predicted that theories could be not in favor once the theories are inadequate to explain or describe some types of learning.

However, Christensen and Overdorf (2000) advised us not to be too quick in discarding the role of these traditional theories such as behaviorism as they are still relevant in explaining certain learning problems or to achieve certain learning goals. For example, in describing how learners learn to improve performance on a specific job or task or mastery of certain skills using mobile phones or PDAs, behaviorism theory is needed. In addition, the fact that there exist successful studies and projects relating mLearning to these theories as discussed above support Christensen and Overdorf's point.

Some researchers opted to introduce new theories against traditional ones for mLearning such as connectivism theory (Siemens, 2004). Dubbed as the learning theory for the digital age, connectivism is a learning theory, which posits learning as a process that occurs within nebulous environments of shifting core elements - not entirely under the individual's control (p. 3). Siemens further added that connectivism defines learning as a continual process occurring in different contexts including communities of practice, personal networks and through completion of work-related tasks. The crucial difference between connectivism and traditional learning theories lies in the management of knowledge where the former concerns what information form then database should be delivered to the right person at the right time. However, connectivism faced issue of validity as it is dismissed by other researchers as a learning theory at all. Verhagen (2006) argued that connectivism is not a learning theory but merely a pedagogical theory as he claims that the main idea in connectivism has been covered by traditional learning theories.

Though Siemens insisted that connectivism is a learning theory justifying that the theory explains and interprets what happens when learning takes place, the main question is if learning could occur in appliances such as computers or mobile devices as suggested by Siemens.

The final option in theorizing mLearning considered by the majority of mobile learning communities is the tendency to choose a more general and abstract theory such as the activity theory (Engestrom, 1987) where the underlying theory is to explain human activity and behavior (Er & Kay, 2005). Based on this theory, learning is analyzed as a cultural-historical activity system, mediated by tools that constrain and support the learners (Traxler, 2009). Activity theory claimed to be a powerful vehicle in the design of mobile learning (Uden, 2007). However, this theory is criticized for being somewhat abstract in actual design work. To overcome this, Kaptelinin, Nardi and Macaulay (1999) suggested developing an artifact (activity checklist).

Based on the discussion above, it is obvious that due to the nature of mLearning being labeled as 'chaos' and 'noisy' (Traxler, 2004, 2009), the mobile learning communities have yet to agree to a unifying theory. Yet this is also true for a theory in learning in general (e.g. in the present education system) based on the fact of the many theories existed in guiding practices. The point learned here is that there is no right or wrong in any of the options discussed here in theorizing mLearning. mLearning could be theorized based on new theories, general and abstract theories, or depend on conventional e-Learning theory, or even the traditional ones. However, whichever options taken to theorize mLearning, it depends on the instructional problem or goals and then select the most appropriate theory options to help address the problem or goals of instruction (Christensen & Overdorf, 2000)

Theoretical Framework of the Study

The following section discusses the theoretical foundation for the current study. The theoretical foundation is divided into two main parts consist of several theories and models to guide in the study. The first part elaborates the theories and model involved in scaffolding learners via mLearning to achieve the learning outcomes. The second part frames the development of the interpretive structural model that serves as a visual representation on how mLearning could be implemented in supporting undergraduate language learning.

The first part starts with the learning theories chosen to describe the students' learning process based on the scope of the study. The theories describe how students learn in formal learning setting mediated by mLearning and how they could be assisted in the process to fulfill both the language course outcomes and their individual language needs. Before the theories were selected and discussed, a brief discussion is presented on how undergraduate students naturally learn language through interaction and collaboration to aid in selection of the theories. A set of theories describe how students learn through interaction to achieve their learning goals and another theory focusing on students' language learning under the same learning framework. Based on the learning theories selected, a suitable mLearning theory would be selected and discussed in view of the learning framework.

Based on these theories and capitalizing on interaction, the second part of the theoretical foundation dealt with the development of the model. The discussion consists of elaboration of models in determining the suitable mLearning activities and formal learning language activities that formed the elements in the model.

Part 1: Learning Theories

Learning through interaction. This section of the study is to describe theoretically how undergraduate students use interactions to facilitate their language learning. In the area of English for specific purposes, the literature has revealed at least two important aspects in the conduct of an effective language course or program: 1) the language course or program needs to accommodate not only the target needs but also the students' learning needs (Vifansi, 2002; Momtazur, Thang, Mohd, & Norizan, 2009). Target needs refers to the skills expected to be achieved as stated in the course outcomes and learning needs refers to students' difficulties in attaining the goals of the course or program; and 2) the language course or program ought to consider both skills needed by students to fulfill academic tasks and perform job related activities after graduation (Bacha, 2003).

Often, students who are unable to express themselves competently compared to their peers who are more language competent have to deal with their handicap while undergoing their required undergraduate language courses. They need more time, space, and personal guidance to help them to be able to perform appropriately in class and later in future job environment. However, as discussed earlier, it is difficult for the lecturers to fulfill students' individual language needs due to time and logistic constraints. In certain cases, some of the students somehow managed to overcome their difficulties assisted by their peers. For example, one of the methods to improve their language competence is through peer feedback where students (Zeng, 2006) respond to their peers' written work or oral presentations. In writing activity, peer feedback means having other writers read and give feedback on what one has written (Hyland, 2005); or in speaking activity, it means other students give feedback on quality of oral presentations of other students. In short, peer feedback allows students to negotiate their strength and weakness (Williams, 1957; Spear, 1988; Hyland, 2005) where the students can negotiate ideas, comments, corrections, and suggestions (Jiao, 2007; Kamimura, 2006; Zeng, 2006), allowing students to have the opportunities to improve their writing or speaking skills. However, it is important to note here that it is not the intention of the study to focus on peer feedback as students' strategy in compensating their shortcomings. Peer feedback is briefly discussed here to illustrate an example of a method based on interactions could aid students to overcome their limitations in language learning.

Interaction has been regarded as an essential component of the learning process (Tu & Hsiang, 2000), and the level of interaction among learners affects the quality of their learning experience (Navarro & Shoemaker, 2000; Vrasidas & McIsaac, 1999). Interaction should promote learners to be active participants in the learning process where ideally learners involve in meaningful listening, speaking, reading, and writing activities as well as opportunities to reflect upon ideas, issues, and concerns (Meyers & Jones, 1993, p. 6). Learning through interactions also allows the shift from the traditional focus on teachers and learning materials to the students where they actively engage themselves in the learning process where knowledge is negotiated and acquired among their peers, instructors, materials, and learning context.

Past studies have revealed the impact of interaction on learning. For example, higher levels of interaction improve students' learning achievement (Gokhale, 1995; Kekkonen-Moneta & Moneta, 2002) and encourage positive students' learning attitudes (Althaus, 1997; Fulford & Zhang, 1993). In a more recent study, Grant and Hui Huang (2010) conducted a study on effectiveness of peer interaction aided by technology in facilitating language learning at undergraduate level. Their study reported that the integration of online 3D virtual learning environment into formal classroom-based undergraduate Chinese language and culture became popular and effective among 400 Monash Chinese language and culture students. This was because the integration successfully offered more opportunities to learners to be involved in meaningful communicative activities. The major factor contributed to the success was the role of online integration in overcoming some pedagogical and logistical limitations of formal classroom-based curriculum such as overly teacher-focused curriculum and large class sizes. In another study using web-based bulletin board (WBB) to facilitate student interactions in veterinary distance learning, it was revealed that students who participated in the WBB discussions significantly improved their critical thinking skills (Yang, Newby, & Bill, 2008).

Since interaction is an established criterion in effective learning, mLearning could further facilitate learning as mobile technologies could enhance interactions among students and instructors. The pervasiveness of mobile technologies and devices such as mobile phones, PDAs, smartphones, and the new revolution IPads also supports synchronous and asynchronous communication that leads to collaborative learning among students and instructors. Furthermore, the variety in channels of communication that students can choose from such as SMS, MMS, voice calls, podcasts, blogs and many more could overcome cultural and communications barriers among students, instructors and the institutions. This further enhances meaningful interaction that is essential for meaningful learning. The media rich environment offered through mobile technologies that can be accessed by students at anytime, anywhere and just-in-time support different students' learning needs that enables personalized learning, thus enhancing student-centered learning.

Social constructivist learning theory. The notion where knowledge is best negotiated and acquired through interaction with each other, aligned with beliefs of social constructionists (Kurt & Atay, 2007). The social constructivist theory is one of the pillars in constructivist theory that capitalizes on effective instruction delivery method through collaboration and social interaction (Powell & Kalina, 2009). This theory is frequently associated to Lev Vygotsky who outlined that learning develops within a social environment and not as an individual process (Hall, 2007). Vygotsky (1978) envisaged that social interaction precedes development where consciousness and cognition is the product of socialization and social behavior. He highlighted three (3) main themes in his learning theory:

1) Social interaction. Vygotsky argued that learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function (1978, p. 90). In other words, his theory holds that social learning precedes a child's cognitive development. He stated that children's cognitive development begin at the social level via interaction with other people (interpsychological) leading to the children's development within themselves (intrapsychological). Social interaction is in fact the major theme in Vygotsky's theoretical framework. This differs with Jean Piaget's argument of child development, in which the child's development precedes learning,

2) The More Knowledgeable Other (MKO). This theme suggests that a learner could learn from another person who has a better understanding or higher ability in a particular task, process, or concept. The MKO not only could be a teacher, trainer, coach, a lecturer or other more knowledgeable adult but the MKO may also come from their peers, a younger person, or even computers or in this study, a mobile phone,

3) Zone of Proximal Development (ZPD). ZPD is the most prominent theme, which describes Vygotsky's theory. In his theory description, Vygotsky (1978) proposed that learning creates the zone of proximal development where a variety of internal developmental processes is triggered by the learning that operates only when the learners interact with people in their environment and in cooperation with their peers. Once the processes are internalized, they become part of the learners' independent developmental achievement (p.90). Vygostky defined the ZPD as "The distance between the actual developmental level as determined by individual problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygostky, 1978, p. 86). In other words, referring to Figure 2.2, ZPD is the distance between the most difficult task someone can do alone and the most difficult task someone can do with help (Mooney, Carol, & Garhart, 2000, p. 83). Vygotsky stressed that an interaction is vital for a learner in the edge of learning where learners can benefit from the interaction to enhance their learning achievement. He added that interaction between the learners and other more skilful peers could effectively aid in developing their skills and learning strategies. In the context of this study, lecturers may include cooperative language activities where skilful peers could help less competent language learners within the learners' zone of proximal development.

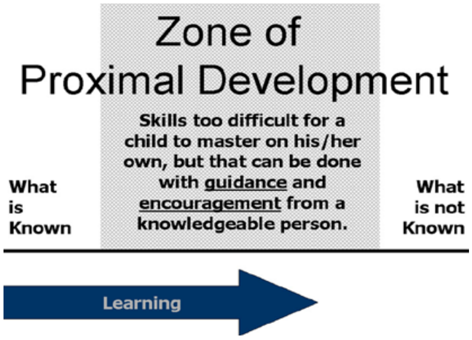


Figure 2.2. Zone of proximal development. Adapted from *Mind in society: The development of higher psychological processes* (p. 73), by L.S. Vygotsky, 1978, Cambridge, MA: Harvard University Press.

These more skilful peers are what Vygotsky termed as the 'More Knowledgeable Other' (MKO). MKO is an important concept that relates to the difference between what students can achieve on their own and what they can achieve with the guidance and encouragement from a more skilled partner. This concept implies that not necessarily higher interlocutors such as lecturers or instructors but other students could also qualify to be the MKO. Past studies have revealed that development of language skills such as writing (as product) in peer feedback activities (as process) is not always determined by higher-lower interactions as interaction at peer level can generate development of writing too (Zainurrahman, 2010). The assistance given by the more skilled learners here is what is also termed as 'scaffolding'. However, Vygotsky never used the term scaffolding in his theory. The term was first introduced by Wood, Bruner, and Ross (1976) as a metaphor to idealize the role of a teacher who described it as, "…process that enables a child or a novice to solve a problem, carry out a task, or achieve a goal which is beyond his unassisted efforts... (p. 90)".

Vygotsky suggested that when students are at their ZPD, they should receive the appropriate assistance (scaffolding) by their MKO just enough to achieve the task. Once the students gain mastery of the task, the 'scaffolding' may be removed and they could face the task themselves. This is likened to scaffolding as a metaphor taken from building construction where the scaffolds are use to support workers to construct a building and the scaffolds will be removed once the building is completed (Johnson, Christie, & Wardle, 2005). However, in education, this metaphor is argued as more suitable for a "well-defined end" and is teacher-centered (Duffy & Cunningham, 1996, p. 183). This type of scaffolding is known as 'Directive' scaffolding where students are expected to acquire standard skills and knowledge taught through series of specified content and strategies designed by an instructor.

However, in practice, scaffolding should be a learner-centered strategy where learning ends are determined by the learners' needs. This type of scaffolding, better known as 'Supportive' scaffolding manifests in instructions tailored to students needs depending on their own ability and interest (Lenski & Nierstheimer, 2002). In scaffolding, the ZPD actually serves as a critical concept. The ZPD concept was originally applied in face-to-face tutoring but later it was found to be also successful in other settings where computer software could serve as scaffolding support. For example, a software design framework, the Learner Centered Design (LCD) was developed based on scaffolding as main support for learners (Soloway et al., 1996; Wood, Bruner, & Ross, 1976). ECOLAB (Luckin, 1998), a tutoring system developed based on the Vygotskian design framework provided interactive environments to assist children aged 10-11 years to learn about food chains and webs. ECOLAB was also found effective in assisting the children through providing appropriate challenging activities. The learner model was also able to track the learners' individual capability and potential in order to provide the right amount of collaborative assistance during the activities. In this way, ECOLAB not only assists learners in reaching beyond what they could not achieve alone through the activities but also explicitly direct them through the activities with success.

Other examples such as QUADRARIC (Wood & Wood, 1999) assisted learners when needed where a tutor could continually monitor and respond to their activities that are logged into the system. The system also helped the tutors to determine the type of help to be given to the learners. Instead, DATA (Wood, Wood, & Marston, 1998) offered online assessments to learners and tutoring to them based on evidences of errors made. All these tutoring system capitalized on scaffolding the learners to reach their projected learning outcomes where assistance were offered based on the learners' individual needs, level, and pace within their ZPDs. In all the examples given above, the MKO plays a significant role in providing the scaffolding for the learners to deal with their ZPD and the MKOs are usually a more capable peer, a tutor, or a lecturer.

However, the MKO may not necessarily be in human form. For example, Cook (2010) in his attempt to reconceptualize Vygotsky's notion of ZPD, presented a study on augmented contexts for development mediated by mobile phones. He argued that the context of learning for the century is augmented and accelerated by mobile devices and technologies through new digital tools and media. This actually supports augmentation as a fundamental way in conceptualizing mLearning (Metcalf, 2006; Quinn, 2011a; Quinn, 2011b).

In short, Vygotsky's theory of education as a fundamental human activity (Moll, 1992) involves people with roles as instructors and as learners where communication process exists between them in order to assist the learners to solve learning problems that they are not able to do so by themselves. In fact, Rogoff (1990) argued that problem solving in Vygotskian's perspective is cultural based as she stated, 'Interactions in the zone of proximal development are the crucible of development and of culture'. This means that education is not merely interaction between teachers and learners but also interaction between problems and knowledge in a culture of how to deal with the problems.

Conclusively, in ZPD, Vygotsky specifies four (4) factors in the educational process:

1) Someone in the role of the learner,
2) Someone in the role of the teacher, and
3) Something that constitutes a problem that the learner is trying to solve with the help of the teacher. The problem not only in the form of information or knowledge gap; it could also in the form to overcome one's need to acquire competency or skill, and
4) The knowledge needed to solve the problem.

(Tiffin & Rajasingham, 1995, p. 24)

The interactions among these four factors are fundamental communication process, which constitutes education. In other words, all the factors need to be present for education to happen. However, the presence of each of the factor needs to be in relation to the other for a limited time of period until the learners have solved their problem. This means that once the learners are capable of solving their problem, their ZPD disappears, and they no longer need a teacher for the particular problem. In the educational view, the theory implies that knowledge only exists in relation to a particular learner's problem, and the role of the teacher only exists in the role of the learners for a particular problem.

In short, as Vygotsky's theory of ZPD postulates learning through interactions in facilitating learners' learning and cognitive development, the theory supports mLearning as mLearning also thrives on interaction and communication among individuals for learning too. Interestingly, if taken in the opposite perspective, mLearning could in turn support this learning theory. For example, one of the criticisms of ZPD is that it is impossible for a teacher or an instructor to attend to all students' ZPD in the classroom due to time constraint and large class size. To add to the odds, different students have different ZPD and time taken to attend to each of the ZPD could be different as students learn at different paces. However, through mLearning, via mobile technologies and devices, there is a larger repertoire of communication channels. This enables the students to seek help from other 'experts' (MKO) besides their instructors to meet their learning needs at their own pace in or beyond classroom walls detached from time constraint. Thus, Vygotsky's theory of zone of proximal development serves as a theoretical foundation for mLearning in this study. The concept of mLearning outlined by the study and the theory adopted complements each other.

Scaffolding theory. Building upon Vygotsky's ZPD, Bruner (1970), a cognitive psychologist introduced the scaffolding theory. This theory is most associated to development of language skills. In fact, Bruner developed the theory to describe the development of young children's oral language acquisition through instructional support and process mediated by the adults in learning through the joint construction of language and gradually withdrawing their support as children gain independent mastery of the language. The key element here is learning through interaction between the adult and the child in assisting the child to develop something beyond his or her independent efforts. The assistance (scaffolding) will be gradually removed as the child gains independence in his or her learning. To give a brief example of how scaffolding is administered, Malcolm (2010) illustrates how a teacher guides his student in the process of 'emergent writing'. At the initial stage, the teacher may take down notes while engaging the child to talk about a topic. Then the teacher could compose the essay together with the child throughout the writing process until the child could complete the writing the task independently. One could observe that through scaffolding, the role of the teacher changes along the child's learning process from recording the child's speech, guiding using instructions, to feedback corrections and encouragement, and finally to observation. However, Tharp & Gallimor

(1988) explained that scaffolding is not simplifying the task given to the learners, but rather simplifying the learners' role in solving the task through gradual assistance from their instructor or more skilled peers.

In instructional setting, Brush and Saye (2002) identified two levels of scaffolding: soft and hard scaffolds. Soft scaffolds are dynamic, situation-specific, immediate, and continuous assistance provided by a teacher or peer in the learning process. A teacher may approach her students one after another in a classroom and converse with them in monitoring their progress. However, this level of scaffolding is impractical in large classrooms as it is difficult to attend to all students' needs (Gallagher, 2011). Hard scaffolds on the other hand are static supports that are planned in advanced to assist students with a difficult task. This level of scaffolding is more student-centered where the teacher could provide cues or hints. For example, hyperlinks to information databases embedded in the students' learning software (Jacobson, Maouri, Mishra, & Kolar, 1996) could assist the students in completing their task leading to higher level of thinking. These type of scaffoldings illustrated here are called 'expert scaffolding' where the teachers or instructors are considered experts responsible in providing scaffolds for their students. The main aim of the instructors as experts is to decrease the gap in students existing knowledge and the targeted knowledge. This gap is identified as the students' ZPD as discussed earlier in this section and the main goal of the instructor is to assist the student across their ZPD (Bruner, 1985; Vygotsky, 1978).

Another type of scaffolding is the reciprocal scaffolding; a method involving a pair or a group of learners working collaboratively on a task (Holton & Thomas, 2001). These learners in the process could learn from each other's experiences and knowledge that may lead to higher-level thinking skills. According to Holton and Thomas (2001), in reciprocal scaffolding, the instructor and the student may switch their roles as an expert or a student, where learning would be a mutual goal. The student might learn about a new learning experience while the instructor could learn a new technique in doing a certain thing that is discovered by the student. In short, both could learn more through mutual interaction compared to following an action guideline.

The next type of scaffolding is self-scaffolding. Self-scaffolding capitalizes on the idea of a learner who takes charge in assessing his or her ZPD using available and appropriate scaffolds (Holton & Clarke, 2006; Knouzi, Swain, Lapkin, & Brooks, 2010). In doing so, the student could resort to learning through self-reflection or independently seeking for the right reading article or electronic materials in completing a task or fulfilling a learning need.

A newer type of scaffolding approach is the technical scaffolding where the experts or guides are in the form of technology devices and applications such as computers, mobile devices, web links, online tutorials, help pages, or social software (Yelland & Masters, 2007). What Vygotsky did not perceive in the pre-computer era he lived in was the possibility of the medium of assistance for the learners could be a non-human form. Little could he anticipated that the development of computer and telecommunication technology could be so robust to the level that teachers or instructors could be anywhere and present at anytime virtually to the learners. However, ZPD does allow this and the existence of this new technical scaffolding reflects the acceptance of neo-Vygotskians to the broader application of the theory.

The theories above are adopted in describing how undergraduate language learners learn through peer interactions at tertiary level in the context of mLearning in undergraduate language learning. The following section discussed on the appropriate theories to develop the model.

Part 2: Theoretical Framework of mLearning Language Activities

This section discusses the theoretical framework in framing the development of the mLearning implementation model for undergraduate English Language learning. This section elaborates further on the respective theories, framework, and models to guide in the selection of mLearning language activities to develop the model. The discussion begins with the definition of mLearning activities to be adopted for the study. This is followed with the adoption of the theory, the pedagogical mLearning framework, and other models to guide in the selection of appropriate learning activities to be included as elements for the mLearning implementation model.

mLearning activities. Falconer, Conole, Jeffery, and Douglas (2006) defined learning activities as interaction between a learner or learners and an environment that is carried out in response to a task with an intended learning outcome. The environment refers to not only interaction with other learners, but also the content resources available, the mobile tools and devices (in the case of mLearning), the context of learning (may refer to subject of learning, issues or problems related to learning), mobile systems and services, or real world or objects. Since the study capitalized on interaction in aiding the students' learning process through mLearning, the definition indicates why learning activities are chosen as the main element for developing the model in this study. Examples of learning activities are capturing of data and sharing through blogs, video conferencing, receiving and sending SMS, record oral presentation and post it on blogs to elicit comments, and others. Selecting appropriate learning activities is vital for a successful implementation of mLearning. Thus, suitable frameworks or models need to be identified to guide in the selection of the activities. The following section elaborates on transactional distance theory, Park's pedagogical mLearning framework, and SAMR model to guide in the process of selecting appropriate mLearning activities to be included in the mLearning implementation model.

Transactional distance theory. Transactional distance theory proposed by Moore (1972, 1993, 1997) falls under educational theory to define the concept of distance learning. The theory informs on the relationships between instructors and learners specifically on how these relationships could aid in the learners' learning process. In describing the relationship, his theory capitalizes on the cognitive distance between instructors (lecturer or teacher) and learners in educational setting especially in the field of distance education. Based on the theory, the concept of distance or separation here is not physical (geographical) but rather a pedagogical one. This separation constitutes what transactional distance means. The distance involves psychological and communication spaces to be overcome between teacher and learners as these spaces could potentially create misunderstanding between the instructor's input and the learners' understanding (Moore, 1997, p. 22). The psychological and communication spaces vary from one learner to another and could affect the behavior of both instructors and learners. The spaces could consequently affect the teaching and learning strategies and techniques employed by the instructors. The strategies and techniques should aim at minimizing transactional distance to maximize learners' learning outcomes. In shortening the transactional distance, Moore introduced three key interactive variables, which have to work together to provide an effective and meaningful learning experience namely dialog, structure, and learner's autonomy (Moore, 2007, p. 89-105).

Dialog is the interaction or series of interactions between the instructor and the learners. Moore emphasized that dialog should only refer to meaningful and positive interactions which result in educational value to maximize students' understanding. The effectiveness of the dialog depends on the educational philosophy behind course design, instructor and learners' personalities, the course subject matter, and environmental factors. In environmental factors, the communication media is the most important determinant. In his example, Moore compared educational program between teacher and students via television and computer-mediated program. Through television, communication between teacher and students do not have any dialog resulting in high transactional distance. In comparison, computer-mediated communication promotes two-way interactions between them that contribute to dialog increase, thus minimize transactional distance. In short, communication media need to be manipulated to increase dialog and decrease the gap in transactional distance. In this study, the use of mobile devices coupled with wireless technology could provide robust interactive medium in facilitating interactions not only between the instructor and learners but also among learners, and learners with learning content. As a result, dialog could increase significantly and transactional distance could be reduced. Structure relates to the flexibility of an educational program in accommodating to learner's individual learning needs. The structure of a program ties closely to dialog in determining transactional distance. A recorded television educational program is considered highly structure as it does not allow learners to give inputs, thus no dialog involved. In contrast, a teleconferencing educational program is low structured as it allows inputs from the learners in their learning process. This type of media allows high dialog between the instructor and the learners; thus requires less structure.

The third variable is learners' autonomy. Moore described learner's autonomy as the extent to which learners determine their own learning goals, learning experiences, and evaluation decision in an educational program. Learner's autonomy as he argued could be used to examine distance programs in terms of how much control could be distributed between the instructor and the learners in the learning program. In collecting data for his theory, Moore found that students who were more competent preferred educational program with less structure and low dialog while less dependent learners preferred programs with more dialog and structure. On the basis of the presence or absence of dialogue (D) and structure (S), Moore (1997) presented four types of transactional distance ranging from low dialog and low structure (–D–S), low dialog and high structure (–D+S), high dialog and high structure (+D+S), to high dialog and low structure (+D–S) which could generate endless types of teaching and learning (Park, 2011). The four types of types of transactional distance here could be illustrated in Figure 2.3.

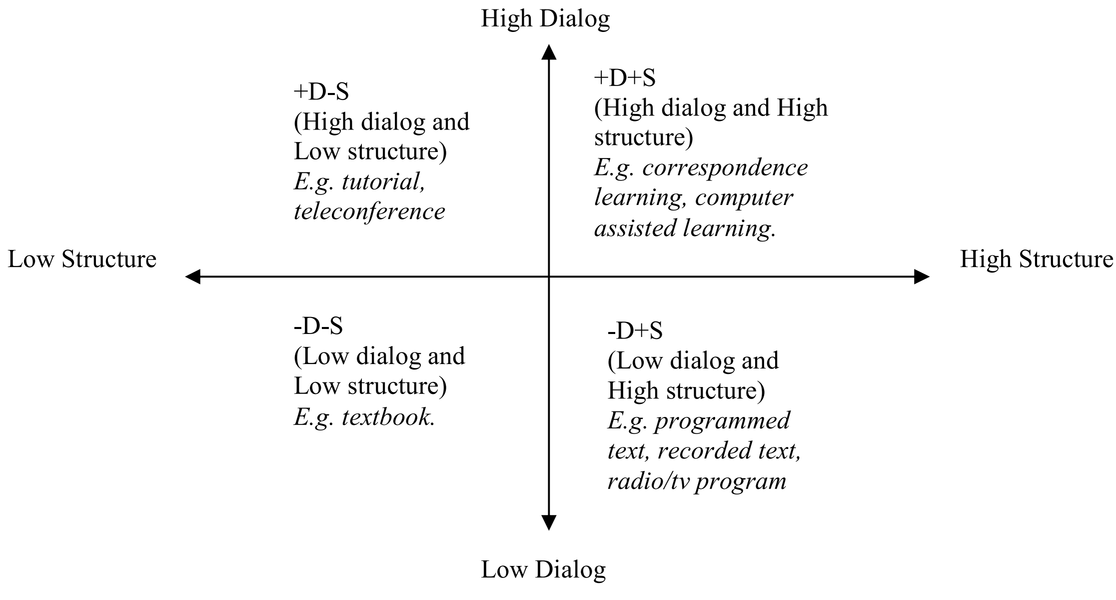


Figure 2.3. Types of transactional distance (Moore, 1997). Adapted from *Theory of Transactional Distance*, by M.G. Moore, 1997, in Theoretical Principles of distance education (pp. 22-38) by D. Keegan (Ed.), NY: Routledge Studies in Distance Education.

The adoption of the transactional distance theory in this study could guide the various types of language learning activities to be included in the model. Since mLearning is categorized under distance education, the theory could describe the types of learning activities involved where pedagogical spaces exist between the learners and the instructors mediated through mobile devices. Based on the types of transactional distance introduced in the theory, the types of language learning activities could be theorize according to interactions among dialog, structure, and learners' autonomy. For example, since the study proposed learners' learning process to be assisted through scaffolding, the amount of dialog (interactions between learners and instructors), structure (course content), and learners' autonomy could be different according to learning stages. For instance, in the introduction of a learning topic, structure could be high and the amount of dialog could instead be low to allow students an overview on what they have to learn. As the learning progresses to practical session, structure would be loose allowing more interaction (dialog) among learners and instructors to develop learners' language skills.

Park's pedagogical framework for mobile learning. In the context of this study, I also adopt Park's pedagogical framework for mobile learning (Park, 2011) to conceptualize the implementation of mLearning in this study. The pedagogical framework is a modification of transactional distance theory to serve as a theoretical framework for the implementation of mLearning. Since the framework is based on transactional distance theory and appropriated for mLearning, the framework could further elaborate the types of mLearning activities based on learners' interaction in effective implementation of mLearning. Park (2011) designed the framework (Figure 2.4) as reference to instructional designers to effectively design and implement mLearning (p. 95). In this framework, Park focused on the social aspect of learning with mobile devices as mediating artifacts. In fact, Park developed the framework based on the definition of mobile learning as mediated learning through mobile technologies that he adopted from Winters (2006). Since the current study also adopted similar definition, Park's pedagogical framework is comparable to the purpose of the study in the context of learning through social interaction among learners, instructors, devices, content and learning context mediated by mobile devices; hence the adoption of the framework. The adoption of the framework also conforms to suggestion by Sharples et al., (2005) on selecting appropriate mLearning theory. In their suggestion on mobility of learners, the framework was designed based on 'mobility hierarchy' indicating the level of learners' interaction and the way they work individually or in groups, and technological affordances (Wilson, 2012). In his framework, Park (2011) proposes four types of mobile learning activities generated in the context of distance education as summarized in Table 2.1. The types are as the following:

(1) High transactional distance socialized mLearning (HS)

(2) High transactional distance individualized mLearning (HI)

(3) Low transactional distance socialized mLearning (LS), and

(4) Low transactional distance individualized mLearning (LI)

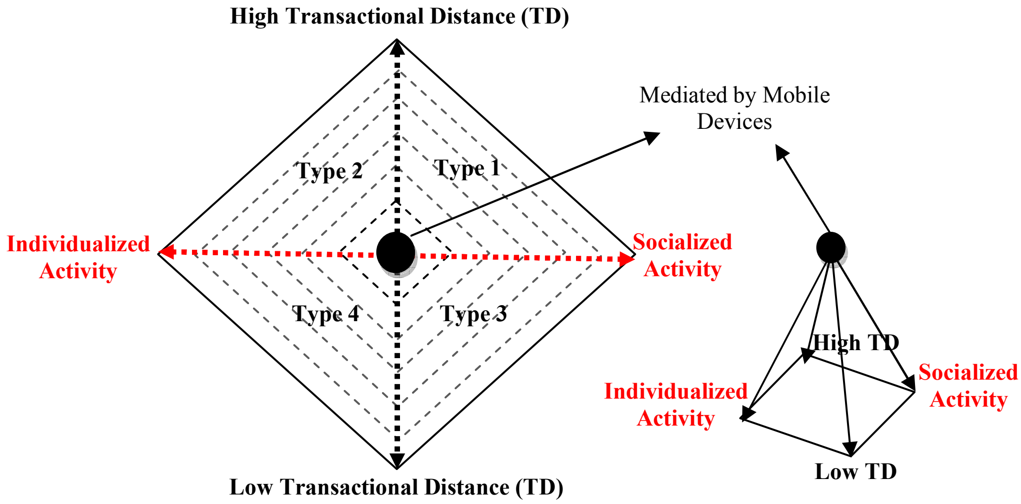


Figure 2.4. Four types of mobile learning: A pedagogical framework. Adapted from "A Pedagogical Framework for Mobile Learning: Categorizing educational applications of mobile technologies into four types," by Y. Park, 2011, *The International Review of Research in Open and Distance Learning*, 12(2), p. 89.

According to the framework (refer to Figure 2.4 and Table 2.1), mLearning activities are divided into four types based on high versus low transactional distance and individualized versus socialized activity. As mentioned earlier in this section, transactional distance is defined not only as a geographical separation but also more importantly as a pedagogical concept (Moore, 1997). It is a psychological separation or distance between the learner and the instructor. This distance is governed by the three mentioned variables: the program structure, the dialogue exchanges between the instructor and the learners, and the learner's autonomy. Based on transactional distance theory, transactional distance becomes higher when program structure increases or the dialogue decreases but result in higher learner autonomy (Saba & Shearer, 1994). Table 2.2 shows examples of high and low structure and dialogue to give a clearer picture of the above discussion on what it means by distance.

Table 2.1

Summary of Pedagogical Framework of Mobile Learning Activities (Park, 2011, p. 90-95)

Type of mLearning Activities	Psychological and Communication space with instructor	Activities	Learning course/material	Transaction	Example
Type 1:HS	High	Collaborative learning projects	Predetermined (prepared by instructor-course outline, syllabus)	Mainly among learners	**NetCalc** (Vahey, Roschelle, & Tatar, 2007; Vahey, Tatar, & Roschelle, 2004 ; **MCSCL system** (Cortez, Nussbaum, Santelices, Rodriguez, & Zurita, 2004) ; **Math MCSCL project** (Zurita & Nussbaum, 2007)
Type 2:HI	High	Well organized individual learning process.	Predetermined tightly structured and well-organized content & resources.	Learner and content, Self-directed learning	**Australian National University off-campus postgraduate program** (Beckmann, 2010), **MALL** (Kukulska-Hulme, 2009, p. 162) **Mobile learning for students in remote sites**(Vyas, Albright, Walker, Zachariah, and Lee , 2010) ; **Mobile learning project for underserved migrant indigenous Latin American children** (Kim, 2009)
Type 3:LS	Low	Collaborative learning projects	Loose structured and undefined program	Frequent interaction among learners	**Environmental Detectives** *(*Klopfer, Squire, and Jenkins, 2002) ; **Audio-based learning forum project** (Chang, 2010) ;
Type 4: LI	Low	Learning lead by instructor but maintaining learner's independence.	Loose structured and undefined program	Learner and instructor	**Blended classroom project in China** (Shen, Wang, Gao, Novak, & Tang, 2009; Wang, Shen, Novak, & Pan, 2009) ; **Mobile butterfly-watching and bird-watching learning system (BWL) projects** (Chen, Kao, & Sheu, 2003; Chen, Kao, Yu, & Sheu, 2004)

Table 2.2

Examples of High and Low Structure and Dialogue

Types of Structure and dialogue	**Example**
Low dialogue and Low structure	Learning from reading a textbook.
Low dialogue and High structure	Learning from a radio program or programmed text.
High dialogue and High structure	Learning through correspondence or computer-assisted instruction.
High dialogue and Low structure	Learning via tutorial or teleconference.

In the scope of this study, the aim of the research is to develop the mLearning implementation model for undergraduate English Language learning based on learning activities. Since, it is an effort to incorporate mLearning in a formal classroom instructional course, the course outcomes have been predetermined by the instructor and the institution. However, higher students' autonomy is given through the engagement of mLearning activities as support to formal learning. Learning through communication could be robust as mobile devices mediate interaction and collaboration among students not only to fulfill the course outcomes but also shared learning needs or targets. Hence, based on Table 2.1, the type of mLearning activities for this study could generally fall under Type 1 that is high transactional distance socialized mLearning.

SAMR model. In order to guide the selection of appropriate mobile learning language activities based on technology adoption for the model, the study employs the SAMR model developed by Ruben R. Puentendura (2006). The adoption of the model supports Hockly's (2013) argument that SAMR is suitable to be used to design mLearning language activities for English Language teaching. Henderson (2012) suggested that the SAMR model could serve as a rubric in helping the teachers in assessing the suitability of their lesson plans in the incorporation of technology. The model was developed by Puentendura to view how one should use or incorporate educational technology. It is a system to measure the level of technology usage in education. The model aims to assist teachers in the design and development of technology-based learning to enhance learning experiences among students to reach their highest potential. In the process, the model provides the teachers with a way to self-reflect and refine their practice and pedagogy using instructional technology. The model consists of four stages: substitution, augmentation, modification, and redefinition as shown in Figure 2.5. To elaborate how the SAMR model could practically be applied, this section presents two examples from the business setting and education setting to develop a shared understanding of the technology use levels.

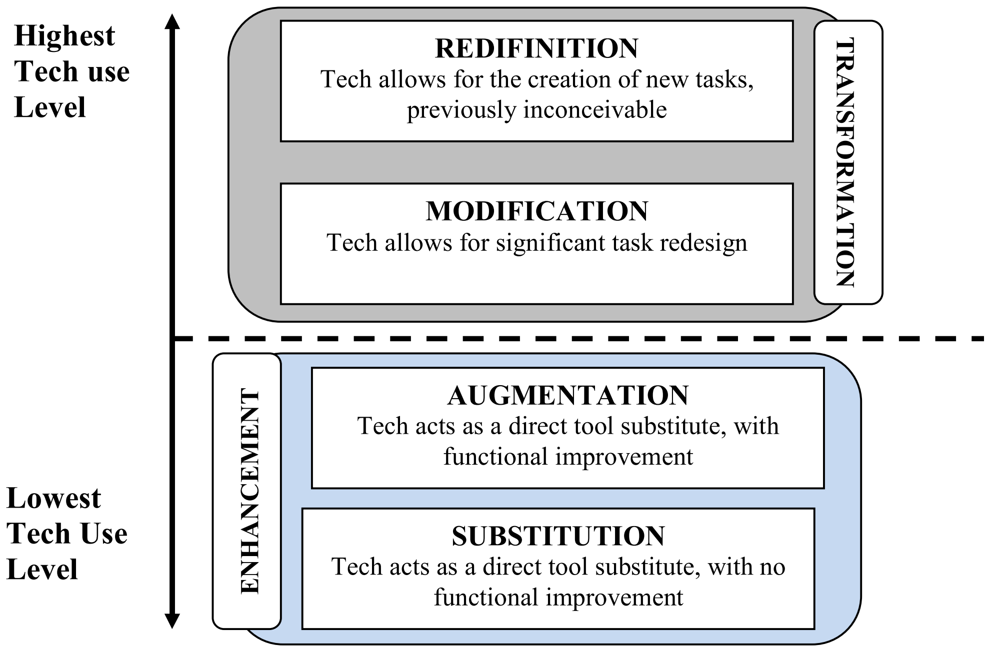


Figure 2.5. The SAMR model. Adapted from *Transformation, Technology, and Education* presented by R. Puentedura, 2006, in Strengthening Your District Through Technology workshops, Maine, US. Retrieved from http://hippasus.com/resources/tte/ part1.html.

Referring to Figure 2.5, substitution is the lowest level of technology use. This level involves technology use as a direct tool substitute of conventional method. In a business setting, the word processor is used like a typewriter for bills, letters, and memos. Instead of using the 'copy and paste' or 'spell-check' function available in the word processor, the employee uses the 'Delete' key to correct spelling and other errors. This does not improve in efficiency compared to the conventional typewriter and does not contribute to business performance or growth. At the augmentation level, technology acts as a tool substitute but with some improvement. For example, in the business setting, when the employees are using the word processor as substitute for the typewriter, they use the tools available in the software such as spell-check and grammar check. They may also use templates available to generate mailing labels or the routine letters that they have to type daily. Here, we could see some improvement in business efficiency but that is the limit of contribution at the augmentation level. The augmentation and substitution level of the model are levels that enhance routine activities or tasks.

Thus, in business settings, if technology is used at the substitution and augmentation level, it could improve efficiency and can be useful in the appropriate context of work. It can also provide the framework for employees to move to the next level of technology use. It also allows employees to gain skills and knowledge about how technology can be used and gain some confidence in the process. It could also provoke some thoughts in how technology could be used in different ways. Technology uses at these levels are thus identified as transitional levels of technology use. However, if business would to remain at the substitution and augmentation level, they would experience very little growth or change in their business performance. At the modification level, technology use could result in significant change tasks performance. For example, in the business setting, employees could use spreadsheets for inventory or sales and these become living documents that could be updated or archived. The documents could also visually display data about employee sales and inventory. In the past, a business employer may have to hire a graphic designer to produce the visual display chart, but today, the employee could perform a similar task on their own using a variety of software tools. A business could also email customers about sales events or build advertising products web pages. Thus, at the modification level, there is significant change in the way business in conducted. At the redefinition level, technology use allows creation of new tasks where in business; employees could participate and collaborate to generate living or working documents about the company's performance using collaboration tools. A company could also enable RSS web feed on its websites to update customers or stockholders regularly about business activities and performance. The company could also share documents with other parties through the website to view and provide feedback. They could also enable tools on the website to allow customers to comment on the products purchased and service received. The company could also begin to use social networking such as *Twitter* or *Facebook* to advertise its business. At the modification and redefinition level, technology use is at the transformation level that allows change in task that we are unable to do without the technology. At this level, business conduct could be highly efficient and the company may experience significant growth in performance and sales. Investment in technology could then be highly worthwhile.

In the educational model, take for example an English Literature course on Shakespeare's Macbeth. At the substitution level, students could create a Noteshare Notebook (refer to Figure 2.6) with links to websites with the original text of Macbeth, a critical commentary about the text, information about Shakespearean stage, and video clips on classical performances of Macbeth.

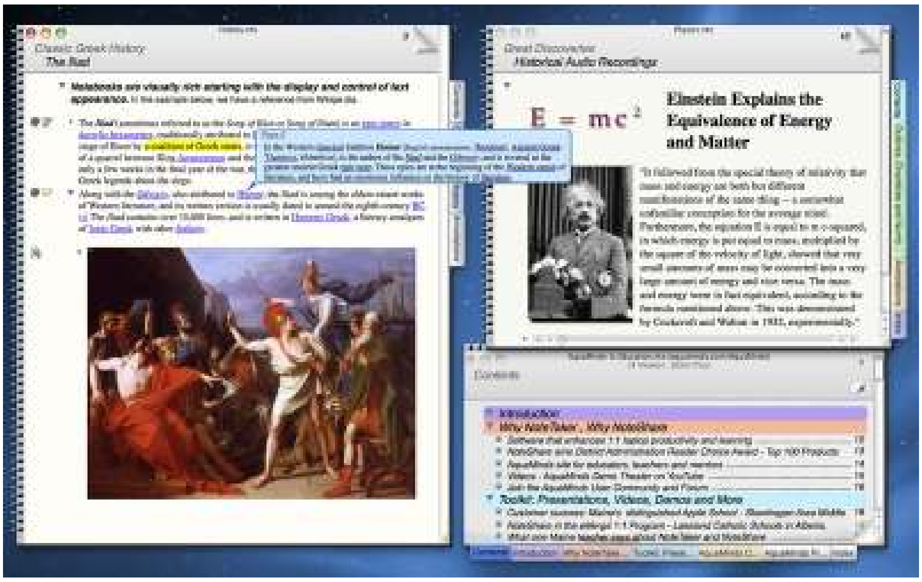


Figure 2.6. Noteshare notebook from mac.software.com. Adapted from Noteshare by Aquaminds Software Corporation in *MacApp Store Preview*, 2012. Retrieved October, 28, 2012 from https://itunes.apple.com/us/app/noteshare/id428850465?mt=12.

This is a direct substitute to a reading list or a library list. Certainly, it is innovative to have these resources online and organized for students to share among themselves but this is still a direct substitution to what could be possibly be done with library books, videos and a reading list. This would not result in significance impact on students' engagement, performance, or achievement.

At the augmentation level, students could add some resources that are not in the traditional category of library resources or reading lists. For example, teachers could direct students to a 'Flickr Shakespeare group' where they could observe how others visualize Macbeth. An example of the website group is shown in Figure 2.7. The photographs shared in Flickr represent different artistic representations of Macbeth. Teachers could also direct students to a number of different blogs on Shakespeare's work to learn how his work is being appreciated around the world.

Figure 2.7. Example of Flickr for Shakespeare's Macbeth. Adapted from Shakespeare's Tragedy of Macbeth, 1898, by J.R. William in *Flickr*, n.d. Retrieved October, 28, 2012 from http://www.flickr.com/photos/27398485@N08/sets/72157622548672241/

Students, for instance, could post comments and ask questions through blogs, interacting with Shakespeare actors, directors, and scholars. These technology activities augment what is possible before with traditional library resources or reading lists. The technology use provides entirely new sets of resources for students. At the transformative level of the model, things get more interesting. At the modification level, technology allows significant redesigning of tasks. Macbeth is a complex play with multiple layers of meaning. The meaning is encoded in multiple ways. One way, is the meaning is encoded in the frequency of certain words or phrases appear in the text. Students can use one of the many visualization tools available online such as 'Wordle' (refer to Figure 2.8) or 'Many eyes' to visualize the frequent use of words or phrases in Macbeth.

Figure 2.8. Visualization of word frequency of Macbeth text using Wordle. Generated using Macbeth text via *Wordle* in http://www.wordle.net/

As a result, students may discover words like 'blood', 'fear', 'time' and others are used quite frequently. Then students could compare and observe through photographs and videos how different staging directors use techniques to prioritize 'blood' and 'fear' in their production. These tools help students to modify what they can do with the Macbeth text to build an understanding of the play. However, this does not mean the teacher should discard the traditional analysis of Macbeth. The technology use only adds a significant complement or redesign of how students could build understanding of the literary text. Finally, at the redefinition level, students could experience how technology use allows for the creation of new learning tasks that were previously inconceivable without technology. In this example, students could upload their own performance of Macbeth on the internet using 'Xtranormal', or 'Second life' (Figure 2.9).

Xtranormal

(Source: http://www.xtranormal.com/)

Second life

(Source: http://secondlife.com/whatis/)

Figure 2.9. Xtranormal and Secondlife. Xtranormal adapted from The Long Awaited User Review Of Social Action Web Tools Vol. 1 (intro and review) by Teleri, 2009 in *Mysocialactions.* Retrieved October, 26, 2012 from http://my.socialactions.com/profiles/ blogs/the-long-awaited-user-review. Secondlife adapted from

Students could use all the knowledge from the resources from the substitution level to the modification level to upload their performance in 3D using the virtual movie software as shown in Figure 2.9. This was inconceivable before the use of technology. Students could reach a vast audience and receive feedbacks and perspectives that they were unable to receive before through 2D or 3D live performance. In short, from the SAMR model (Figure 2.5), at the substitution level, technology use at this level is merely to do the same things as conventional means but differently. It could be motivating and exciting at first at trying new things but once the novelty wears off, technology use may risk discontinuation. This explains why most technology incorporations in the formal classroom in the past were only sustained for a short period as the use of technology was not developed to higher level of use based on the SAMR model. The aim in incorporating technology is to conduct learning activities or tasks and produce results not possible before (with the current traditional mode) and to reach this aim. Technology use should involve activities at the modification and redefinition level. However, this does not mean that learning activities at the substitution and augmentation level are unimportant. It is natural to begin a technology-based lesson at these levels, because the levels serve as a transition to the transformative level (modification and redefinition levels).

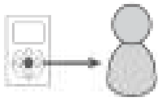
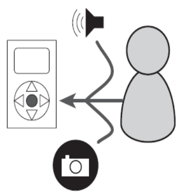
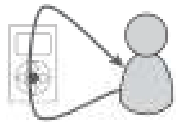
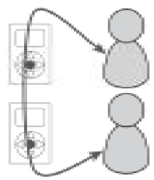
Thus, to incorporate better mLearning in mainstream learning, in the development of the mLearning implementation model, I proposed the selection of mLearning activities by the experts guided by the SAMR model to determine the language activities based on all levels of use in the model.

Quinn's four Cs of mobile capabilities. In the effort to take full advantages and opportunities of mLearning, a balance between the amount of learners' focus on technology and their focus on learning environment need to be achieved (Goth, Frohberg and Schwabe, 2006). Since mLearning is not solely on content delivery, it should be implemented based on Quinn's four Cs of mobile capabilities, which consists of four capabilities: content, capture, compute, and communicate (Quinn, 2011a, p. 98 - 103). Quinn discussed about the four Cs of mobile capabilities in addressing the issue of mLearning design: 1) accessing content in the form of media, 2) capture of information, 3) ability to compute a response, and 4) communicate people with each other. The capabilities are summarized in Table 4 based on Quinn's elaboration. It is essential to take into account of these capabilities in designing learning through mobile devices as it captures what assistance learners exactly need to seek from their mobile devices, which could be exploited in their process of learning while interacting with the external context or environment. In most situations, the capabilities do not work in isolation and work in combination to produce powerful mobile opportunities. For example, capture and compute could be combined for instance in capturing a picture or a QR codes (Quick Response code- a type of matrix barcode or twodimensional code first designed for the automotive industry) to be computed using Google Goggles (a mobile software application) to retrieve more information about the photo or a product bearing the QR code. This will aid the user in making better decision in choosing a product for instance.

In the educational setting, the lecturer may assign students in a marketing course class to gather information on effectiveness of advertisement as a fieldwork. Students may take photos of advertisement billboards around the city using their mobile phones (capture), upload the photos on Google Goggles (compute) to gain more information about the advertisement, and then upload the photos together with extra information onto blogs to be discuss(communicate) with other students on why certain advertisements are more effective than the rest. The use of the combination of these capabilities could allow students to assemble and collaboratively interact with the content and create own content, rather than merely consuming content (Laurillard, 2007; Naismith, Lonsdale, Vavoula, & Sharples, 2004; Quinn, 2011a). This is in turn result in higher level of learning engagement of the students focusing more on the physical learning environment augmented by the mobile capability through their mobile devices. The four Cs of mobile capabilities could serve as a guide to design mLearning especially in capturing its opportunities. In application, Quinn also illustrates how these opportunities could support different categories of learners. In other words, he shows how the learner groups could be connected to their respective mobile opportunities to help them perform. He gives an example how learners of various role in an organization or a company could be suited to the mobile opportunities as shown in Table 2.4. The mobile category opportunities could also be used to map how learners of a different learning context could be connected to the opportunities to perform in mLearning. As an example, Table 2.5 shows how mainstream education context could be placed according to the mobile opportunities.

Table 2.3

Quinn's four Cs of Mobile Capabilities (Summarised from Quinn, 2011a, p. 98 - 103)

Mobile Capability	**Function**	**Medium**	**Form**	**Unique Opportunity**	**Example**
Content 	Access to various media for information	Audio-video media, websites	Dynamic (audio, video) Static (Text, Graphics, Photos)	Contextual access to information (online or pre-loaded)	Refer to text info or a video procedure via mobile phone in repairing electrical fault on site.
Capture 	Capturing information	Sensors on mobile device(microphones, camera, text entry, GPS, Compass etc)	Audio or video files/clips, podcasts, texts, graphics, photos	On-site information capture for future presentation of information or sharing. On-site performance capture for future review or reflection. Context sharing for communication and problem solving.	Capture vacation photos to be shared later. Video recordings of oral presentation for future review.
Compute 	Computation-Processing data to produce relevant and comprehensible information.	Combination of sensors on mobile devices (cameras microphones, text entry, GPS, Compass etc) an mobile apps (Google apps, Navigation apps etc)	Cues like QR codes, RFID, GPS, video data, or merely text data.	Performance support for better comprehension or making decision.	Augmented reality- layers onto reality for contextual info. (Ex: search for hotel using Foursquare apps.)
Communicate 	Connecting with others through communication	Phone, IM, micro blogging, text-messaging, multimedia messaging, VoIP; social networks such as *Facebook*, *Twitter*.	Real-time Voice calls, SMS, MMS, and Blogs.	Ubiquitous social learning.	Supporting learners to help one another, sharing lessons learnt collaborative seeking new solutions via *Facebook*, SMS or voice calls.

Note. The table is based on the summary of four capabilities of mobile elaborated by Quinn. Adapted from *Designing mLearning: Tapping Into the Mobile Revolution for Organizational Performance* (p. 98-103), by C.N. Quinn, 2011, San Francisco: Pfeiffer.

Table 2.4

Mobile Category Opportunities (Quinn, 2011a, p. 104)

Role	Content	Capture	Compute	Communicate
Sales	Product Sheet	Sales Pitch	Pricing	Product expert
Marketing	Sample ad	Customer review	Competitive ad costs	PR company
Executive	Strategy	Presentation for practice	Performance dashboard	Other officers
Field Engineer	Trouble shooting guide	Aberrant performance	Acceptable variation	Second-level support

Note. Adapted from *Designing mLearning: Tapping Into the Mobile Revolution for Organizational Performance* (p. 104), by C.N. Quinn, 2011, San Francisco: Pfeiffer.

The key point is how the mobile opportunities could help learners to support not only the individual learners but to support learners to help one another , negotiating knowledge based on sharing lessons learned, and collaborating to reach a solution to problems and learning needs- in other words the advocating social learning. Hence, this section addressed Quinn's (2011a) four Cs of mobile capabilities (content, capture, compute and communicate) as guiding principle in generating mobile learning activities. Through understanding of the capabilities connected to learners' roles, learners and their instructors could shift their focus to learning environment enhanced by the support of the capabilities of their mobile devices. This is one of the reason why the shift of the focus away from technology and place it at the background of the learners' focus is highlighted here.

Table 2.5

Sample of Mobile Category Opportunities in Mainstream Education Context

Role	Content	Capture	Compute	Communicate
Undergraduate Students of Professional English Communication Course	Lecture motes posted on Twitters, videos or podcasts on samples of effective oral presentation	Self	Pricing	Product expert
Language Lecturers	Lecture motes posted on Twitters, videos or podcasts on samples of effective oral presentation	Customer review	Competitive ad costs	PR company
Primary school Science students	Short video clips on plants and animals.	Presentation for practice	Performance dashboard	Other officers
Science Teacher	Short video clips on plants and animals. Students' profile	Aberrant performance	Acceptable variation	Second-level support

Conceptual Framework of the Study

Based on the review of mLearning implementation in formal education, review of concepts and theories of mLearning, and theoretical framework of the study, the following section presents the conceptual framework of the study to highlight the important main ideas, concept of mLearning, and important variables underpinning the development of the mLearning implementation model for undergraduate English Language learning. Specifically, this section is aimed at conceptualizing the implementation of mLearning specifically for English Language learning of the undergraduate language course subject, 'Professional and Communication Skills course' through the development of an implementation model consisting of mLearning language activities as end product of the study. The conceptual framework is shown in Figure 2.10.

The Conceptual Framework deals with the following:

(a) The objective of the study.

(b) The main variables needed to be considered in the development of the mLearning model.

(c) The theories underpinning the variables and how the variables are connected to serve the purpose of the study.

(d) How the variables are positioned in the development process of the model.

(e) The theories and models involve in guiding the development process of the model.

(f) How the theories, models and development process are connected resulting the end purpose of the study.

In detail, based on the purpose as listed above, the conceptual framework elaborates the following:

(a) The general purpose of this study is to investigate how mLearning should be incorporated in formal learning. Based on the problem statement of the study (refer to p. 20), the main objective of the study is to develop an interpretive structural mLearning implementation model as a support to undergraduate English Language learning. This serve to contribute to the body of knowledge as a proposal on how mLearning could be incoporated in a formal classroom language learning in assisting students to fulfill both learning needs and target learning outcomes. In this context, it is imperative that this model is generated to guide in implementation of mLearning as performance support to students in formal classroom learning and not to suggest how mLearning could replace formal learning.

(b) and (c)

Based on the aim and scope of the study, the statement of problem, and guided by the research questions, mLearning is proposed to be implemented based on students' natural method to cope with learning which is 'language learning through interaction'. In this, regard, the conceptual framework shows the ZPD theory which is linked to this variable. The theory describes how learners could be assisted through scaffolding in the interaction process. Since the model focusing on language learning, Bruner's scaffolding theory, a language learning theory is also adopted to support students' language learning through scaffolding. The theory is also aligned with the main theory (ZPD).

The second main variable is mLearning. Moore's transactional distance theory is adopted to support mLearning for this study. Since the implementation of mLearning is described in terms of language activities, there is a need to frame the selection of mLearning activities. The conceptual framework proposes how mLearning activities could be determined and framed by Park's pedagogical framework, Quinn's four C's of mobile capabilities, the targeted language course outcomes (based on the course objectives of 'Professional Communication Skills' course) and SAMR model. These model, framework, and course outcomes are used to guide in the design of the model (Phase 2 of the methodology).

(d) The variables are connected to the development process of the model through the theories and models connected to them as shown in the framework according to the phases of the methodology (Design and Development Research Approach).

(e) The conceptual framework also included the models and approaches adopted in each phase of the methodology to guide in the development of the model. For example, the unified theory of acceptance and use of technology (UTAUT) model is adopted to guide in the needs analysis of the study. The justification of the adoption of the model is presented in Chapter 3. The interpretive structural modelling (ISM) technique is connected to Phase 2 of the methodology as main tool in development of the model. Finally,the model is evaluated using fuzzy delphi technique as shown in the framework .

(f) Overall, the conceptual framework aims to illustrate how the aim of the study is fulfilled through the connection of the variables, theories, framework, and models to develop the mLearning implementation model. The model as mentioned is to serve as a guide in the effective incorporation of mLearning in formal education.

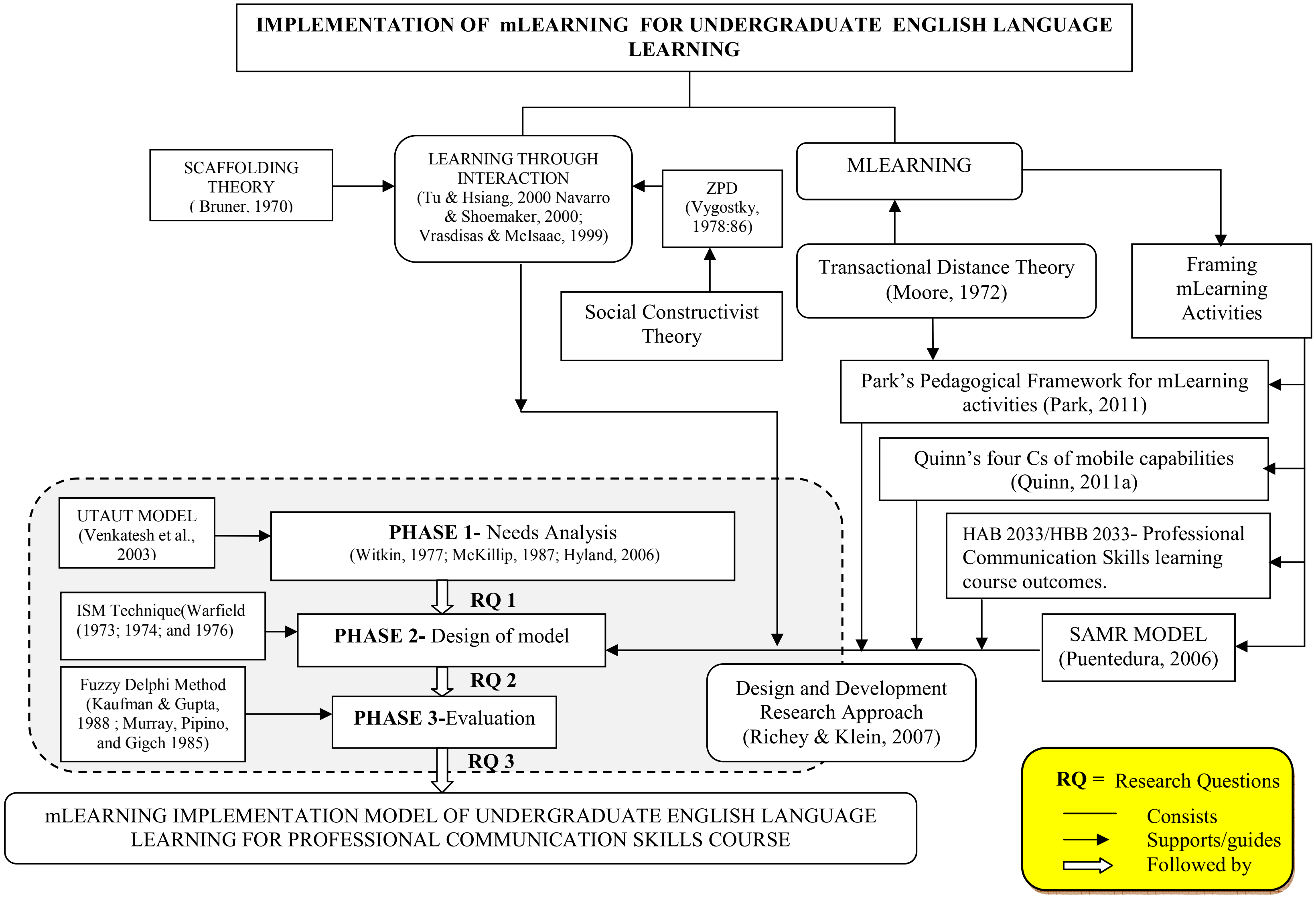


Figure 2.10. Conceptual framework of the mlearning implementation model for undergraduate English Language learning.

Summary

The main aim of this chapter was to present the relevant concepts and theories of mLearning to guide in the development of the model in view of mLearning incorporation in formal learning as a support to undergraduate English Language learning needs. Specifically, the theories were adopted to guide in determining the appropriate mLearning activities and integrating the activities as elements in the development of the model. This chapter began with mLearning in formal education in general to provide an overview on how it has transformed formal learning based on past and existing mLearning initiatives and implementation. This was to provide an overview of the role of mLearning in formal education on how mLearning could aid the present generation of students. The discussion was further supported by past and existing mLearning initiatives in mainstream education of developed countries in an attempt to justify the feasibility of the study in employing mLearning as support in classroom learning.

The second part of the literature review discussed the concepts and definition of mLearning. General discussion into concepts and definitions of mLearning were narrowed down to ascertain relevant concept and definition in the focus of mLearning as a tool to augment formal learning to support undergraduate language learning needs. This led to the discussion on the theoretical framework of the study. As theoretical framework of the study, based on learning through interaction, Vygotsky's zone of proximal development (ZPD), a social constructivist learning theory was adopted to describe how learners could meet their individual learning needs through the interaction process via technological media (mobile devices) with the help of more capable peers. Consistent to this theory, scaffolding theory, a language learning theory was adopted too to specifically theorize how language learners could be assisted to fulfill their language learning needs through scaffolding via technology and capable peers or instructors. Theoretical framework of mLearning implementation was also presented in the chapter. In this section, transactional distance theory, Park's pedagogical framework for mobile learning, the SAMR model, and Quinn four Cs of mobile capabilities were adopted and presented to frame and describe the selection of mLearning activities for the model. Finally, based on the above discussions, a conceptual framework for the development of mLearning implementation model for undergraduate English Language learners was presented in the final part of this chapter.

CHAPTER 3

METHODOLOGY

Introduction

This chapter describes the methodology and procedure applied in the development of mLearning implementation model for undergraduate English Language learning. The main bulk of the methodology centers on the experts panel participation in the interpretive structural modeling session to assist in the development of the model for this study. The chapter also presents the discussion on the past and present use of the interpretive structural modeling as well as how the panel of experts is selected, use of instruments and analysis of data.

Method of the Study

The focus of this research is the development of mLearning implementation model of English Language learning for undergraduates. The development of the implementation model was based on the integrated views and opinions of panel of selected experts. The study adopted the SAMR model, Quinn's four Cs of mobile capability model, and Park's pedagogical framework for mLearning as theoretical framework for the development of the mLearning implementation model as presented in Chapter 2. Based on the focus of the study, the elaborated objectives as discussed earlier on Chapter 1 (pp. 17) are as the following:

1. To identify the needs of mLearning implementation model for Professional Communication Skills course at undergraduate level based on students' views.

2. To develop the mLearning implementation model for Professional Communication Skills course based on experts' opinion and decision.

3. To evaluate the mLearning implementation model for the Professional Communication Skills course.

Consequently, the study employed the design and development research approach (Richey & Klein, 2007) to develop the mLearning implementation model for undergraduate English Language learning. Design and development research method was formerly known as developmental research (Richey, Klein, & Nelson, 2004). The research method was introduced to test theory and validate its practicality (Richey & Klein, 2007). However, the method was also employed to design and develop interventions such as programs, instructional and learning strategies, products, and systems to overcome complex educational problems and to understand further the characteristics and processes of the interventions' design and development (Plomp, 2007). This rationalizes the use of the research method in this study to satisfy the aim in the design and development of the mLearning implementation model. The model was aimed at supporting formal learning practices to improve undergraduate English Language learning. This is consistent with Wang and Hanafin's (2005) view that the method is flexible but systematic which could be employed to improve educational practices.

In terms of the procedure used in the research method, Richey and Klein (2007) described the ability of the method to develop new procedures, techniques, and tools based on identified needs analysis. Consistently, Seels and Richey (1994, p. 127) explained that the method involves a systematic study of designing, developing and evaluating instructional programs, processes and products that must meet the criteria of internal consistency and effectiveness which are particularly important in the field of instructional technology. Wang and Hanafin (2005) added that the method involves iterative process of needs analysis, design, development, and implementation of interventions. Based on these descriptions, the study was conducted in three phases: analysis, design and development, and evaluation.

Briefly, Phase 1 was the needs analysis phase in investigating the need for a support to students' language learning needs. It was also important to probe into their acceptance and readiness to use mLearning to accommodate their learning needs in coping with their language communication skills course. The findings of this phase formed the basis for developing the implementation model for mLearning as a support to the students' language learning needs. Phase 2 was the design and development phase for the implementation model. A panel of experts was selected to assist in the model development. In view of integrating formal learning, informal learning, and social learning, the experts identified the appropriate mLearning activities and how the activities could be connected in the model to form a holistic guide in implementing mLearning in formal language learning. Phase 3 was the final phase where the model was evaluated by experts. In the subsequent sections, the purpose, selection of samples, instruments used, and procedure for data collection are further elaborated for each phase as different methodologies were employed. The justifications of the methods used are also presented.

Phase 1: Needs Analysis.

Purpose. The study began with a needs analysis that aimed at identifying the need to develop the mLearning implementation model for undergraduate English Language communication course based on students' views. In order to achieve this aim, the needs analysis phase attempted to answer the following research questions:

1. What are the students' perceptions on their language competence as preparatory for Professional and Communication Skills course?

2. What are the students' perceptions on the traditional formal Professional and Communication Skills course?

3. What are the students' mobile device capabilities and their level of mobile technology use?

4. What are the students' level of acceptance and intention to use mLearning if incorporated into the formal Professional and Communication Skills course?

Answers to this question is crucial to justify whether there is a need to incorporate mLearning into their existing English communication skills course to assist the undergraduate language learning especially for the lower competent students to cope better with the course subject. In the incorporation of mLearning, this phase attempted to determine students' acceptance of the intervention of mLearning as support to facilitate their language learning needs and their intention to use mLearning as extension to their existing formal language classroom learning. In short, the answers to these questions justified the development of the mLearning implementation model for the language course.

Sample of the study. This phase involved 220 undergraduate engineering students of a Malaysian private university who were undergoing an English Language communication course. Based on Cohen, Manion and Morrison (2007), samples numbering 30 and above are suitable for research study employing statistical analysis. The students were selected from the whole population of students who took the course subject 'HAB 2033/HBB 2033- Professional and Communication Skills Course' an undergraduate English for specific purposes course. Since the study attempted to develop the mLearning implementation model for the language course subject, purposive sampling method was used to select the students for the study. The course was offered as a compulsory elective subject by the institution to inculcate soft skills in students to improve their competitiveness in the job market. The students need to complete the compulsory subject as fulfillment of a four-year undergraduate study. This course emphasizes the theory and practice of professional English Language communication at the interpersonal level, in teams and to a large group. The course serves to build upon the students' academic and professional knowledge acquired through other core engineering or technical courses, and aiming at enabling them to be highly effective in expressing themselves and in imparting their professional and technological expertise in a variety of jobs, business, and professional settings. The whole course is designed for fourteen weeks offered in each semester and is divided into four parts: Process Description (Group Poster presentation), Technical Oral Presentation (Individual presentation), Business Meeting (Group presentation), and Persuasive Oral Presentation (Individual presentation).

Instrument of the study. The instrument used for this phase was a set of needs analysis survey questionnaire (refer to Appendix A). The questionnaire consisted of 48 questions divided into five parts: 1) Students demographic details and their perceived level of language proficiency, 2) Students' perception on self-language competence, 3) Students' perception on the current Professional and Communication Skills course, 4) Students' use of mobile technology use, and 5) Students' acceptance and intention to use mLearning. A pilot study was conducted on 70 undergraduate students from the same higher institution using the instrument to improve the questionnaire items. However, the 70 students were not included in the actual needs analysis study. Six (6) curriculum and instruction technology experts were referred to validate the instrument. Reliability test was conducted on the survey questionnaire for all items, which registers a Cronbach alpha coefficient of .872 as shown in Table 3.1.

Table 3.1

Reliability Testing of Needs Analysis Questionnaire

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.872	.829	64

The questionnaires were posed to the students to assess the students' need to have a learning support in their formal language learning process as well as their level of acceptance on the incorporation of mLearning into their current formal language communication course and more importantly the degree of their intention to use mLearning. Although mLearning could be a viable support to cope with their language learning needs, the support could prove ineffective in the implementation later if the students resent the use of it (Sharples, Taylor, & Vavoula, 2005). The items for the survey questionnaire were constructed based on unified theory of acceptance and use of technology (UTAUT), a technology acceptance theory proposed by Venkatesh, Morris, Davis, and Davis (2003). UTAUT explains user intentions to use an information system (IS) and subsequent usage behavior. The theory posits that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behavior (Venkatesh et al., 2003) as illustrated in Figure 3.1.

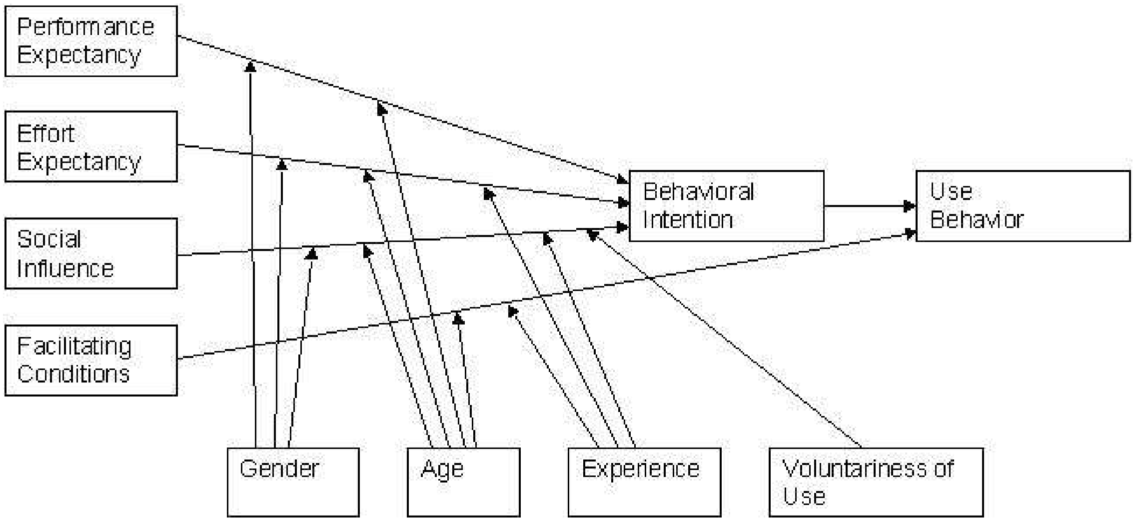


Figure 3.1. Unified theory of acceptance and use of technology (UTAUT) by Venkatesh et al., (2003). Adapted from "User acceptance of information technology: Toward a unified view", by V. Venkatesh, M.G. Morris, G.B. Davis and F.D. Davis, 2003, *MIS quarterly*, p. 447.

Based on the key constructs, the items for the questionnaire were divided into eight expectancies:

1) Performance expectancy – In this study, performance expectancy dealt with the extent of the effectiveness of mLearning as a support in accommodating students' language learning needs. For example, how students perceive the usefulness of mLearning in their learning process to accomplish learning tasks easily, and how mLearning could improve their learning productivity or even their course grades.
2) Effort expectancy – Effort expectancy is defined as the degree of ease in using mLearning (Venkatesh et al., 2003).
3) Attitude toward using technology – This is defined as the student's overall affective reaction in using mLearning (Venkatesh et al., 2003).
4) Social influence – Social influence is defined as the degree to which an individual perceives how important others believe he or she should use mLearning (Venkatesh et al., 2003).

5) Facilitating conditions – Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of mLearning (Venkatesh et al., 2003).

6) Self-efficacy – Self-efficacy deals with the student's individual perception on own ability and skills to use mLearning.

7) Anxiety – Anxiety deals with students' apprehensiveness to use mLearning, for example, due to their concern on the uncertainties of what is expected of them in using mLearning.

8) Behavioral intention to use mobile learning – This deal with students' eagerness and intention to use mLearning

Procedure. Needs analysis was conducted on the participants (undergraduate students) to assess their needs to develop the mLearning implementation model. Witkin (1997) defined needs analysis as a method to identify the gap between the current situation and targeted situation. McKillip (1987) on the other hand, stated that needs is a judgment value that a specific group has a problem, which needed to be solved. In the language field such as English for special purposes, needs analysis has long been identified as an important methodology used in educational planning (Benesch, 2001). Hyland (2005) argued that needs analysis could be classified as a technology in education, which can be employed at the preliminary stage of a language course, during the language course or post language course. Needs analysis, for instance could be used to gather data on a specified situation, which can be used as a basis to construct English for academic purposes course and language materials (Benesch, 2001). In the attempt to define needs analysis, Hutchinson and Waters (1987) identified three useful classifications of needs: necessities, lack, and wants. 'Necessities' refer to what needs to be learned to function effectively in a targeted situation. 'Lacks' refer to the gap between what the learners already knew and the targeted proficiency while 'wants' is associated with subjective needs of the learners.

In the research on language needs, most studies are largely based on classroom settings mainly to improve classroom tasks (Marlyna, Siti Hamin & Mohamad Subakir, 2012). However, Zhu and Flaitz (2005) observed that experiences outside the classroom affect students' overall academic performances where their interactions in a larger institutional context influence their in-class performance. Thus, it is necessary to investigate language skills needed for the students to perform beyond the classroom settings as findings from the study could dictate the types of suitable language activities in the classroom for effective language learning.

In the area of English for specific purposes, the literature has revealed at least two important aspects in the conduct of an effective language course or program: 1) the language course or program needs to accommodate not only the target needs but also the students' learning needs (Momtazur Rahman et al, 2009; Vifansi, 2002). Target needs refers to the skills expected to be achieved as stated in the course outcomes and learning needs refers to students' difficulties in attaining the goals of the course or program; and 2) the language course or program ought to consider both skills needed by students to fulfill academic tasks and perform job related activities after graduation (Bacha, 2003). In short, as students are end receivers of teaching and learning, their views and needs have to be considered in the design of a successful language course or program. Instructors, policy makers, or curriculum designers should not rely on their assumption that they have prior knowledge of students' perception and needs on learning. For instance, through needs analysis, Bacha and Bahous (2008) in their studies on writing needs and language proficiency levels of students in business studies at the tertiary level revealed that students have higher satisfaction level on how they perceive their writing skills compared to their instructors' perception. In another needs analysis study on undergraduate petroleum engineering students, Al-Tamimi and Munir Shuib (2010) found that the students perceived that their current English course did not meet their needs and they could not use English effectively. They perceived that all language skills are important and they need continuous instruction and training to improve their proficiency. These studies indicated the importance of considering not only the institutional needs but also the students' learning needs as well in the conduct of an effective course or program.

As described in the Chapter 1, the main issue of any English Language course for specific purposes is that the learning needs of the students at large were not effectively addressed in the conventional classroom learning to satisfy the course outcomes. The study seeks to investigate mLearning as a support to solve the problem. The needs analysis aimed at investigating existing issues and the need to develop the mLearning implementation model. The model could serve as a practical guide on how mLearning could aid in meeting the needs of the undergraduate language learners to acquire the communication skills through networking of language activities. The needs analysis in this study will be conducted via survey technique to identify the need for the mLearning implementation model based on students' views. The participants of the study were given a set of survey questionnaires to respond to, in order to solicit their needs for mLearning.

Analysis of data. Data were analyzed using descriptive statistics via the Statistical Package for Social Science (SPSS) version 20 software. I propose the analysis of mode and mean scores for this phase to determine the needs of mLearning at the undergraduate level based on students' views. Figure 3.2 shows a flowchart of the steps presented above to describe the methodology used for this phase. The main aim of the results of the data was to justify the need to develop the mLearning implementation model.

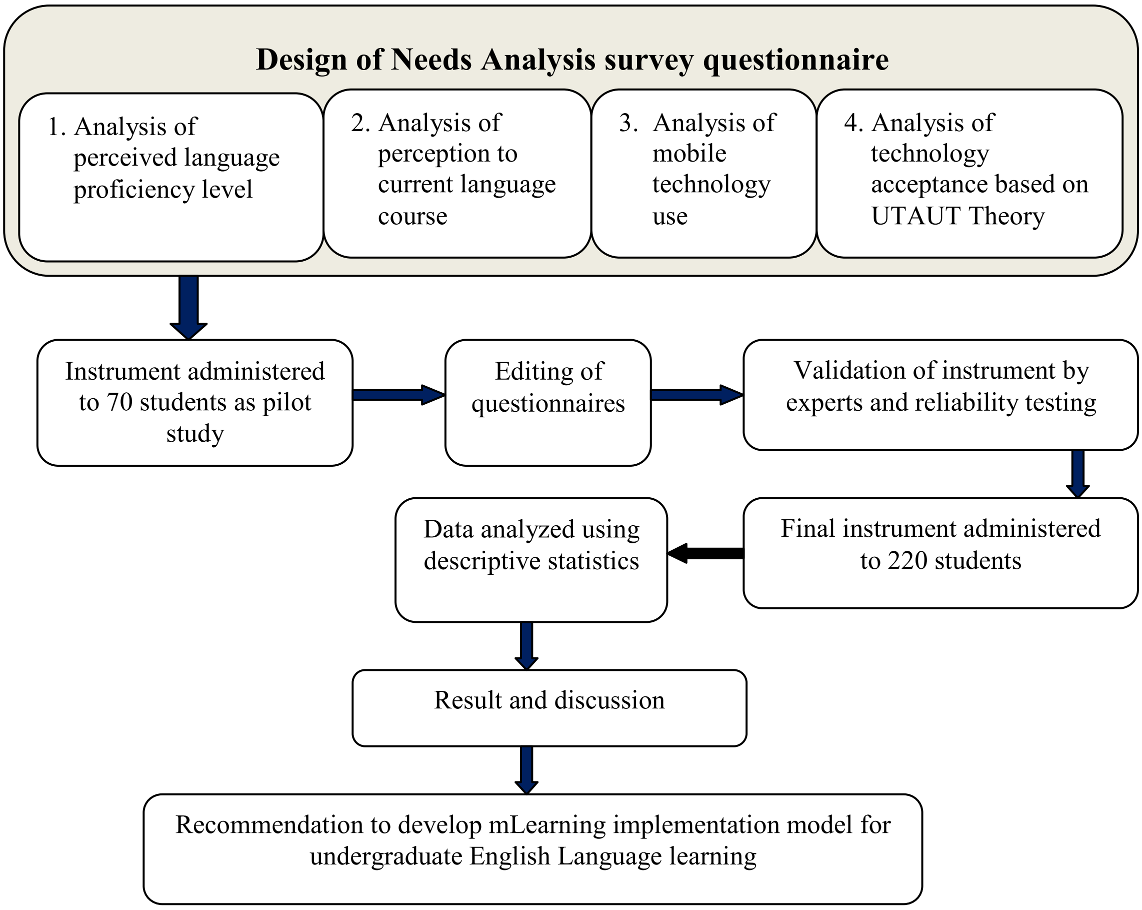


Figure 3.2. Flowchart of Needs analysis phase.

Phase 2: Development of mLearning Implementation Model for Professional Communication Course for Undergraduates

Purpose. The second phase is where the intended implementation model is developed. Thus, holding to the idea of mLearning as a support to aid students to achieve their language learning needs, this study seek to develop the mLearning implementation model to overcome language-learning needs in an English communication course among undergraduates. In this study, the implementation model consisted of a network of language learning activities connecting both mobile language learning activities and formal classroom activities in lieu of incorporating mLearning in mainstream education. As a support to cater to different individual learning needs, mLearning is utilized as augmentation of formal learning, hence the blending of mLearning activities with formal language activities in the model.

The language learning activities were selected by a panel of experts. Identifying the activities alone is not adequate without determining the relationship among the activities in guiding both teachers and learners to fulfill learning course outcomes through collaborative interactions. However, determining the appropriate learner's activities in mobile environment alone especially in augmenting formal classroom learning could prove a daunting task as the learning situation is complex and dynamic. It required a great deal of time and commitment to investigate each activity proposed before it could be selected. The task could further become complex as the relationships among the activities selected need to be investigated in order to produce not only a meaningful guide but a practical one for implementers to implement a mobile learning language initiative to aid learners to achieve their learning goals.

Thus, the elaborated objectives of this phase are:

1. to identify the appropriate language learning activities for implementation of mLearning to aid learners to be competent in communication skills at professional settings;
2. to determine the relationships among the activities in implementation of mLearning;
3. to propose a structural model of mLearning activities in implementation of mLearning; and
4. to classify the identified learning activities into various categories.

Interpretive structural modeling. Based on the circumstances discussed above, interpretive structural modeling (ISM) was employed because not only could it facilitate investigation into the relationships among the learning activities but also an overall structural model could be extracted based on the relationships for the intended mLearning implementation. ISM was first proposed by Warfield (1973, 1974, 1976) to analyze a complex socioeconomic system. ISM is a management decision-making tool that interconnects ideas of individuals or groups to facilitate thorough understanding of a complex situation using a map of relationships between many elements involved in the complex decision situation (Charan, Shankar, & Baisya, 2008). Warfield (1982) described ISM as a computer-assisted learning process that enables an individual or a group user to develop a structure or map showing interrelations among previously determined elements according to a selected contextual relationship. ISM is a technique specifically designed to support the human brain to manage information and ideas in a clear structure through an aerial view of the targeted problem. This facilitates better comprehension on any aspects of the problem. In other words, the technique is context free, irrespective of the content of the situation, enables individuals or groups to consolidate decisions collaboratively if the elements of the model and contextual relation are identified.

ISM involves a process of discussion and analysis that promotes development of a subject matter. The integration of knowledge of the subject matter and structured understanding of the problem could essentially derive solid decision coupled with underlying reason. In a way, ISM is able to dissolve complex issues by allowing experts to focus on two ideas at a time. The ideas and the relationships among them are discussed within the framework of the issue being investigated. The end output of the ISM process is a visual relationship map among ideas and information. This map would reveal the underlying concepts of the issue that is important for experts to discuss, understand, and make sound decision.

In other words, the ISM process transforms unclear, poorly articulated mental models of systems into visible, well-defined models useful for many purposes (Ahuja, Yang, & Shankar, 2009). Since ISM was initially introduced to solve complex problems in the economics field, it is mainly employed in business consultations (Chang et al., 2012; Kaliyan, Govindan, NoorulHaq, & Yong, 2013; Li Hanfang, Tan Zhongfu & Wang Chengwen; 2007) and related fields. However, past studies revealed the widespread use of the technique in other fields such as knowledge management (e.g., Reza, Yeap & Nazli, 2010), supply chain management (e.g., Diabat, Govindan, & Panicker, 2012; Shahabadkar, Hebbal & Prashant, 2012; Pfohl, Gallus & Thomas, 2011), engineering (e.g., Han Jinshan & Tan Zhongfu, 2008; Yang Bin,Yu Bo, & Sun Qian, 2010; Zheng Zhi-Jie, Li Lei, & Zhao Lan-Ming, 2011), transportation system (e.g., Sun Hui, Zhou Ying, & Fan Zhi-Qing, 2012; Yin Hong-Yang, Xu Li-Qun, & Quan Xiao-Feng, 2010), tourism (e.g., Debata, Patnaik & Mahapatra, 2012; Rageh Ismail, 2010), and information system (e.g., Tang Zhi-Wei, Du Ren-Jie, & Gao Tian-Pen, 2005). Studies based on interpretive structural modeling in the education field are still limited but ISM is becoming an emerging trend in education research methodology. Among them are application of ISM in higher education program plan (Hawthorne & Sage, 1975; Warfield, 2009), examining teacher effectiveness (Georgakopoulos, 2009), knowledge management for higher education institution (Bhattacharjee, Shankar, Gupta, & Dey, 2011), and improving service quality in technical education (Debnath, 2012).

However, most of the educational studies that employ ISM concentrated largely on policymaking, program planning, or management of institution. This is unfortunate as being a powerful decision tool; the full capabilities of ISM could be harnessed to reach effective and practical solution in more pertinent education issues. For example, ISM could be used to investigate source of disciplinary problems among teenagers in school based on collective and integrated views of main school stakeholders, teachers, counselors, parents, and even students included. Based on the findings, a more effective solution could be employed targeting the source of the problem. ISM could also be used to improve teaching and learning strategies in dealing specific group of students to aid students to fulfill not only the course outcomes effectively but also to fulfill their own learning goals too. In this context, ISM is especially useful in developing a program using innovations in education. The current study is an example of this is application. The study shows an application of ISM in developing a model to guide in teaching and learning of an undergraduate level English program based on mobile environment mediated by mobile technology. However, it is essential to understand the concept underlying ISM and how it works to understand its potential in educational research as discussed in the following section.

Conceptual view of ISM. Conceptually, ISM employs pair-wise analysis of ideas to untangle complex issue by organizing numbers of ideas into a structured relationship model as illustrated in Figure 3.3. Experts could have a concrete view of the abstract issue at hand.

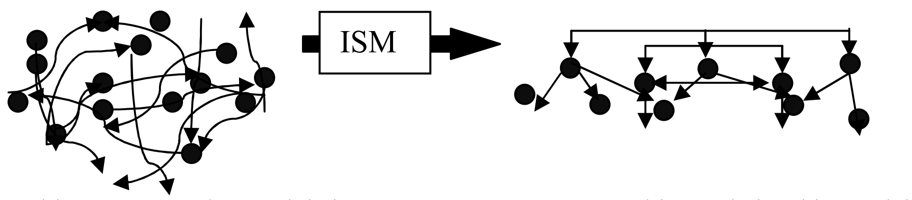
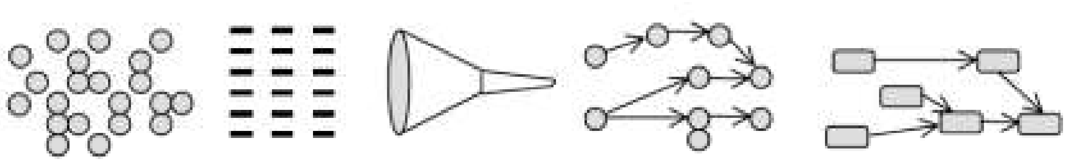


Figure 3.3. Conceptual view of ISM. Adapted from *Structure Decision Making with Interpretive Structural Modeling(ISM)* (p. 3), 1999, Canada : Sorach Inc.

The process involved in converting the ideas or the elements of the issue into comprehensible and logical view of the problem is shown in Figure 3.4. This allows user to synthesize the problem easily to develop ideas and solution.



Generate many ideas	Prioritize & select ideas	Create ISM through pair-wise analysis & discussion	Develop project plan for solution

Figure 3.4. Fundamental steps to construct an effective ISM. Adapted from *Structure Decision Making with Interpretive Structural Modeling(ISM)* (p. 3), 1999, Canada : Sorach Inc.

Based on the concept discussed here, ISM is interpretive because it involves judgment whether there are relationships among elements and if so how they should be connected. The method is structural because an overall structure could be generated using the relationships among the elements. Finally, it is a modeling technique because the overall structure and the relationships among the elements could be illustrated in a graphical model. In the process of modeling the structure, ISM applies a combination of three modeling languages: words, diagrams, and mathematics. Words are used, as they are an elaborate method in communicating the output of the structure of a system symbolically (Mihram, 1972). Diagrams provide a pictorial representation of the issue being studied and it provides powerful means of communication through use of parallel information processing capacity. The diagrams used in ISM is known as Digraph (refer to Figure 3.5).

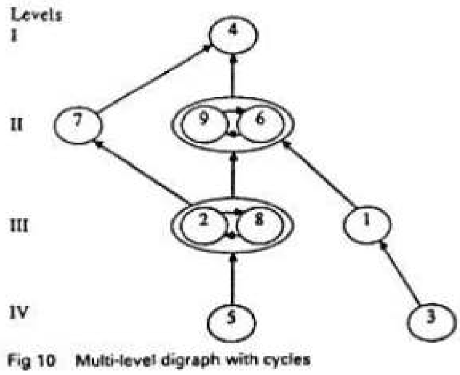


Figure 3.5. Example of a digraph with cycles . Adapted from "Interpretive structural modeling: a methodology for structuring complex issues," by F.R. Janes, 1988, *Transactions of the Institute of Measurement and Control*, 10(3), 145-154.

Mathematics allows symbolic models to be constructed through manipulation of discrete mathematic calculation of logic and structure (e.g., binary relations, set theory, matrix theory, graph theory, and Boolean algebra) (Janes, 1988). This contributes to a quantitative representation of the system. In ISM, binary matrix is used to construct the reachability matrix (Warfield, 1976) which produces a mapping of relationships among elements (ideas). An example of a reachability matrix is shown in Figure 3.6

	e1	e2	e3	e4
e1	1	1	0	1
e2	0	1	0	0
e3	1	1	1	1
e4	1	1	0	1

e1, e2, e3, e4 denote elements

matrix entries : 1 = 'yes'
0 = 'no'

Figure 3.6. Example of a reachability matrix. Adapted from "Interpretive structural modeling: a methodology for structuring complex issues," by F.R. Janes, 1988, *Transactions of the Institute of Measurement and Control*, 10(3), 145-154.

Although ISM could be done manually using paper and pencil, the technique could be employed using ISM computer software. The software facilitates the pair-wise process and generates the model upon completion of the process. The mathematical process is hidden from the experts. This allows experts who are not apt in mathematics to employ ISM in their research studies. An example of the software is one, which has been developed by Sorach Incorporation called Concept Star. Based on the modeling language used, ISM combines both qualitative (through words and diagram) and quantitative (through mathematics) representation of systems involved in dissolving complex issue in a single set of process. The feature makes ISM distinctive compared to other techniques that are either qualitative or quantitative.

The ISM process. Briefly, ISM begins with identifying the variables of the issue at hand. This is followed by problem-solving session in a group of experts with the knowledge of the issue. Then, a contextual relation phrase is identified to best connect the variables based on the context of the issue. A structural self-interaction matrix (SSIM) is developed based on pair-wise comparison of the variables and transitive logic. The SSIM is then transformed into a reachability matrix with the aid of discrete mathematics. Finally, depending on the partitioning of the variables, a structural model called Interpretive Structural Model (ISM) is produced. The model could be interpreted and evaluated by the experts to produce a solution or at least a solid understanding of the issue. This process is further elaborated and demonstrated in the procedure section. The section also shows that ISM can be used in combination with other methods in research studies such as nominal group technique (Delbecq, Van de Ven, & Gustafson, 1975), Delphi technique (Dalkey, 1972), focus group interview (Krueger & Casey, 2001), and others. In this study as described in the procedure, nominal group technique (NGT) is used to generate the variables to be discussed by experts in the ISM session. Coupled with NGT, ISM forms part of the design and development research approach as elaborated earlier.

Sample of the study. The participants of the study for NGT were the same participants for interpretive structural modeling session (ISM) in developing the mLearning implementation model since the participants were involved in the development of the model in the ISM session. The participants were a panel of experts. A correct selection of experts is vital for the success of the study since the output of the study is based on experts' opinion (Parente, et al., 1994; Skulmoski, Hartman, & Krahn, 2007). Dalkey and Helmert (1963) defined experts as individuals who are knowledgeable in a certain field; while Adler & Ziglio (1996) stressed that the selection of experts should be based on four 'expertise' requirements: I) knowledge and experience with the issues under investigation; ii) capacity and willingness to participate; iii) sufficient time to participate in the study; and, iv) effective communication skills. Based on the above experts' criteria of selection, the selection of the participants depends on four criteria:

- Experts should possess a doctorate degree in education or information technology with at least 10 years experience in teaching in the subject matter;

- Experts should have knowledge in curriculum and curriculum implementation;

- Experts in information technology or mobile communication technology who are willing to participate in the study; and

- Experts in mLearning should at least involve in conference paper presentations; researchers in mLearning especially those who have journal publication in mLearning related field, and mLearning project implementers, or involved in such projects.

Another important consideration is that the numbers of experts for ISM related studies is limited to the maximum of eight (8) participants (Janes, 1988). According to Janes, since every individual expert has to interact with every other expert in the panel, the quality of debates will be at stake with the increase in group size. Based on the formula of probability, n(n-1), where n is the number of participants, the number of possible communications among the participants could increase exponentially with a slight increase in the number of participants. To illustrate, if the size of the group panel is six (6) members, the possible communication among them could be 6(6-1) = 30. However, with an additional of four (4) members to the group, the number of possible communications could treble to 10(10-1) = 90 possible communications. This could be too exhausting to the participants in discussing every element brought into discussion. Consequently, individual participation, involvement, and motivation to continue the discussion could tend to decline. Thus, the quality of ISM result could be affected.

Hence, for this study, the experts for both NGT and ISM sessions consist of four (4) content experts, who are course instructors of PCS from the private institution, two (2) information technology or mLearning experts, one policy stakeholder of the institution and one curriculum expert, which totals eight experts. Since the element of the model consisted of language activities and aimed at mLearning as learning support to formal classroom learning, the majority of the experts were content experts and mLearning experts. The profile of experts is as shown in Table 3.2.

Table 3.2

Profile of Experts

	Designation	Field of Expertise	Years of Experience
1	Professor	Curriculum and Instructional Technology	23
2	Associate Professor	E-Learning Mobile language learning	18
3	Senior lecturer	E-Learning Mobile language learning	18
4	Senior lecturer	Language and Communication	15
5	Senior lecturer	Language and Communication	21
6	Senior lecturer	Language and Communication	15
7	Senior lecturer	Language and communication	16
8	Senior lecturer	Organizational behavior	13

Instruments. Three instruments were employed in this phase. First, a draft of pre-listed mLearning activities (refer to Appendix F) generated from literature review was used in the first step of phase 2 during the NGT session. This list served as a guide for the experts to identify the appropriate learning activities for inclusion in the model. The activities in the list would be agreed upon either to be included in the model, grouped together, or discarded totally. Experts were allowed to add other activities that they found suitable to be included in the final list of learning activities for the model. The final list (refer to Appendix G) was presented to the experts. They were needed to assign a ranking number indicating their degree of preference for each learning activity.

The second instrument was the interpretive structural modeling software developed by Sorach Incorporation called Concept Star. The software was used to facilitate discussion and decision making among experts in a closed session to determine the relationships of the learning activities that were loaded into the software. The NGT and ISM were conducted in a three-day session. A sample of the program session is shown in Appendix D. The procedure in conducting this ISM session is further elaborated in the next section.

Procedure and Analysis of Findings. There are eight (8) steps involved in Phase 2 in developing an interpretive mLearning implementation structural model for undergraduate English Language learning course as described in the following.

1. Identifying the elements that are relevant to the problem or issues.

In this study, the authors employed a modified nominal group technique (NGT) to identify the elements (learning activities). NGT is a well-known method to generate ideas or variables linking to an issue, problem, or situation. The classic NGT (Delbecq et al., 1975) is an iterative process to integrate multiple individual opinions to reach a consensus in prioritizing issues. NGT has been associated with five (5) standard steps (Broome & Cromer, 1991):

1) A query in a form of question is presented to a group of people to initiate interest in the situation being studied;
2) Ideas are generated as individuals;
3) The ideas are then displayed to be shared with others in the group;
4) Familiarization of ideas through discussion and clarification of each item among the individuals in the group; and
5) Voting procedure where the participants select the most relevant items.

In this study, unlike the classic NGT that involves time-consuming process of elicitation of ideas from scratch, the modified NGT began with a short survey of pre-listed mLearning activities. Not only does the list offer a description of the scope of the outcomes of the study, it guides the experts with a starting point of ideas to begin with. This shortened the NGT process from 4 hours to 90 minutes. In response to the survey, experts could agree or disagree with the list of the learning activities. The activities that reach positive consensus were included in the model. The experts could then present additional ideas on the activities that are deemed fit for the model. Each learning activity was presented, familiarized, and clarified to allow the experts to make appropriate judgment on whether to include the activity in the final list (Broome & Cromer, 1991). In the final stage of NGT, the final list (Appendix G) was given to the experts individually for them to vote for suitable learning activities by giving a ranking number for every activity. The ranking used was in the scale of one (1) to seven (7) where one (1) indicates the least favorable and seven (7) the most favorable item.

The interpretation of the scale is as follows:

1 = Least favorable
2 = Slightly Favorable
3 = Moderately favorable
4 = Favorable
5 = Very favorable
6 = Highly favorable
7 = Most favorable

The ranking numbers given by the experts were accumulated to give the priority values for the learning activities. Finally, the learning activities were prioritized based on the total ranking number. Learning activity with the highest number would be the most priority activity in the list. The flow chart for the NGT session summarized the procedure as elaborated in Figure 3.7.

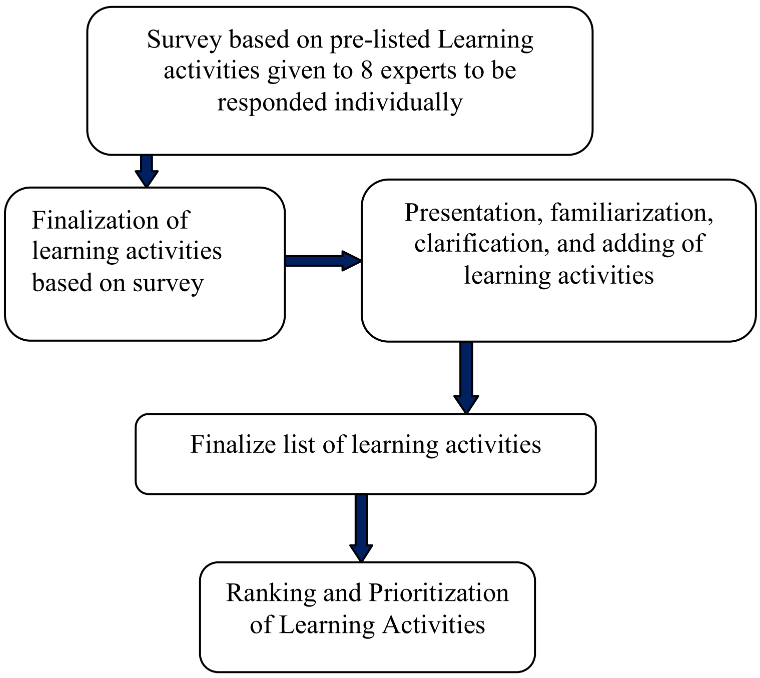


Figure 3.7. Flowchart of nominal group technique session.

In the scope of this study, in developing a model for English Language learning for undergraduates, I chose to develop it for 'Professional Communication Skills (PCS)' course, an undergraduate English Language course offered by a private university. The description of the course was as stated in phase 1.

In this phase, NGT is used together with ISM because both techniques are comparable (Georgakopoulos, 2009; Janes, 1988; Ravi & Shankar, 2005). Similar to NGT, ISM involves participants who have the knowledge and shared interest of a particular issue in making decisions. Blumer (1969) stressed upon the importance of gathering views from a selected group of people who have the knowledge and interest about an issue as more valuable over any representative sample (p. 41). However, unlike NGT, ISM being a computer-assisted methodology takes advantage of mathematical algorithm to minimize the task in exploring the possibilities of relationships among ideas (Broome, 1998; Warfield, 1976). Thus, NGT and ISM are not only comparable but they complement each other. Among the past studies that have employed the integration between the two methods was one conducted by Georgakopoulos (2009) who investigated teacher effectiveness via system approach. In her methods, NGT was used to facilitate U.S. and Japanese students to generate items of characteristics and behavior of effective teachers. The items were placed in categories. ISM was used to construct influence structures to map teacher effectiveness system where students make judgments by pairing behaviors and characteristics of effective teachers using ISM computer assistance.

2. Determine the contextual relationship and relation phrase with respect to how the learning activities (elements) should be connected with each other. The contextual relationship defines what is to be accomplished (goal) and any boundary conditions or constraints along the way. In other words, the context provides focus on how the

learning activities need to be connected while constructing the ISM. The PCS course outcomes (refer to Appendix C) were used to determine the context for the relationship of the activities. The relation phrase determines how the relationships between learning activities are analyzed during construction of the ISM. The contextual relationship and the relation phrase were determined by the consensual experts' opinion on how the activities (elements) should be connected.

3. Develop a Structural Self-interaction Matrix (SSIM) of the learning activities, which shows the connection among elements. This was conducted using the aid of ISM software developed by Concept Star of Sorach Incorporation. Pairs of elements could be displayed by the software to allow the experts to decide through voting on the relationship before the next pair of elements was displayed. This process was repeated until all the elements were paired.

4. Generate the ISM model. This was done by the software after the pairings of elements were successfully conducted. The software generates the model based on the concept of pair wise comparison and transitive logic. Transitive Logic states that for any 3 elements (A, B, C) with a given relation when:

• A has the relation to B, (written A→ B),

• And B has the relation to C, (written B→C), • Then A has the relation to C, (written A→C or A→B→C).

5. The model was then being reviewed by the experts to check for conceptual inconsistency and making the necessary modifications if any. However, only minor amendments could be allowed since the structure was developed through a systematic process of discussion, and argument (Janes, 1988). Janes stated that the amendments

made are not a negation to the model structure. She added that ISM is learning process and participants perceptions towards a situation could change during the ISM session as new information emerged. However, amendments decided by the experts should be fed back into the computer software to generate the final model.

6. The final model was then presented after necessary amendments if any were made. The next steps 7 to 9 is the analysis of result (final model) from step 6.

7. Partitioning of the reachability matrix to classify the learning activities into different levels. This is essential to interpret the model at the end of the study (Janes, 1995). This was done based on the model generated in step (4). In general practice, the reachability matrix was achieved based on SSIM by substituting V, A, X and O by 1 and 0 as per given case. The substitution of 1s and 0s are as per the following rules:

I. If the (i, j) entry in the SSIM is V , the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0;
II. If the (i, j) entry in the SSIM is A, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1;
III. If the (i, j) entry in the SSIM is X, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry also becomes 1; and
IV. If the (i, j) entry in the SSIM is O, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

The symbols V, A, X, O actually denote the relationships between pairs of elements (learning activities) as indicated below:

V – Learning activity ‘i’ will help to achieve Learning activity ‘j’;

A - Learning activity ‘i’ will help to achieve Learning activity ‘j’

X - Learning activities ‘i’ and ‘j’ will help to achieve each other; and

O - Learning activities 'i' and 'j' are unrelated.

8. The learning activities were also classified according to clusters according to their driving powers and dependency. Steps (6) and (7) are essential in the analysis and interpretation of the model.

9. Based on the classification of learning activities, data could be analyzed and interpreted according to the importance and hierarchy of activities in relevance of mLearning implementation. Figure 3.8 shows a flowchart of the steps presented above to describe the methodology used for this study.

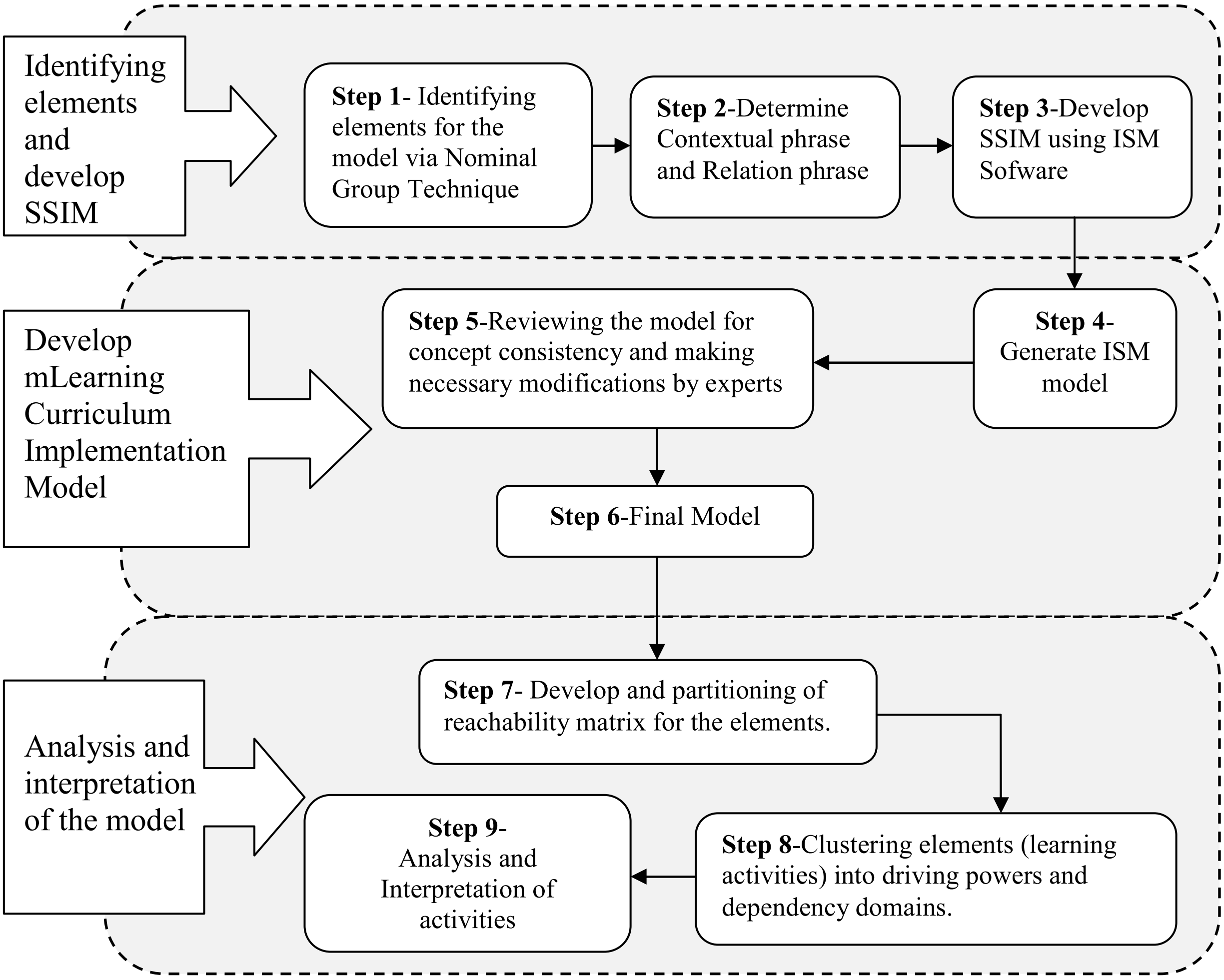


Figure 3.8. Flowchart of development of mLearning implementation model for undergraduate English Language learning for Professional and Communication Skills course

Phase 3: The Evaluation of mLearning Implementation Model for Professional Communication Skills Course for Undergraduates

Purpose. The purpose of the third phase of this study was the evaluation of the model. This was to validate whether the mLearning model of the study could be suitable as a guide in implementing mLearning as learning support for undergraduate students in formal language learning. The evaluation was conducted among experts to evaluate the model in terms of the use of language activities as element of the model, the relationships among the activities, and the suitability of the model in mLearning implementation based on the elements, and the relationships of the elements. To evaluate the model, the study adopted the fuzzy Delphi method to elicit experts' views in validating the model. Further elaboration on the use of the method, the selection of experts, the instrument used, the procedure of the evaluation, and analysis of data are presented in the following section.

Fuzzy Delphi method. Fuzzy Delphi was introduced by Kaufmann and Gupta (1988). It is a combination between fuzzy set theory and Delphi technique (Murray, Pipino, & Gigch, 1985). The fuzzy Delphi method is an analytical method for decision making which incorporates fuzzy theory in the traditional Delphi method.

The Delphi method (Linstone & Turoff, 2002) itself is a decision-making method which involves several rounds of questionnaire surveys to elicit experts' opinion on an issue being investigated. This method is also known as consensus approach or inner-opinions consensus (thoughts, intuitions, and feelings) of a group of selected experts or Delphi polls of experts. Adler and Ziglio (1996) stated that Delphi method is a structured process to collect and distill knowledge from a group of experts through series of questionnaires interspersed with controlled opinion feedback. This is consistent with Delbecq et al. (1975) who defined Delphi technique as a method for the systematic solicitation and collection of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier response (p. 10). Delphi method is also known as a prediction method that is based on experts' judgment. In this sense, Hill and Fowles (1975) illustrate that Delphi technique as a procedure of conducting polling of respondents' opinion on possibilities and probabilities of the future.

Cornish (1977) stated that the studies in technological forecasting led to the development of this method which was introduced by RAND Corporation in 1953 as a research technique by Olaf Helmer and Norman Dalkey in probing into solutions for military problems (Helmer, 1983). The RAND Corporation reported that this technique has expanded into various knowledge disciplines through articles and journals. Today, the method has been used in education (Baggio, 2008; Strickland, Moulton, Strickland & White, 2010), teacher training (Frazier & Sadera, 2011), management (Schmiedel, vom Brocke, & Recker, 2013), engineering (Putri & Yusof, 2009; Tohidi, 2011), health education (Bobonich & Cooper, 2012 ; Rigby, Schofield, Mann, & Benstead, 2012), public administration (Soares & Amaral, 2011), sports (Lindsey & Michelle, 2011); medical (Byrne, Wake, Blumberg, & Dibley, 2008; Herrmann, Kirchberger, Stucki & Cieza, 2010), career (Lambeth, 2012), tourism (Garrod, 2012; Lee & King, 2009), marketing (Story, Hurdley, Smith, & Saker, 2000), banking (Bradley & Steward, 2002), international business (MacCarthy & Atthirawong, 2003), nursing (Keeney, 2010) and industry (Jung-Erceg, Pandza, Armbruster & Dreher, 2007).

The premise, which justifies the development of this method, stemmed from the view that experts' opinion is permissible in new and undeveloped areas (Fowles, 1978). Among the characteristics of this method are the following:

1. Anonymity: Experts are chosen individually and each sample has no knowledge of the identity of the other or the numbers of the experts involved in the panel. Experts only know the responses of the others in the second round when the

researcher has conducted the data analysis. Armstrong (1985) explained that relationship among samples does not exist, their opinions are classified, but instead their ideas are integrated in the analysis of data. The advantage of this anonymity is that experts would not face any pressure, influence, or encouragement from any parties or other experts in responding to their questionnaires.

2. Feedback: Through subsequent rounds of questionnaires, experts could be given the main ideas constructed from the group that allows them to re-evaluate their judgment and submit their response again to the group.
3. Statistical: Feedback from the experts are analyzed statistically using frequencies arranged chronologically which result in a splinesgraph. The top part of the graph indicates the experts' consensus opinion (50% of experts) which represents the overall experts' consensus opinion. The first and the top quartile represent the deviation of experts' opinion. Each quartile represents 25% of the experts' contribution.
4. Convergence: The result or prediction will be determined as the results converge after multiple rounds of feedback from the experts.

Hence, the aim of Delphi method is to make decision based on achievement of consensus on a particular study. The method not only allows integration of opinions from various experts for prediction outcomes but it also meets the requirement of gaining the opinions independently from each expert through multiple cycles of questionnaires (Saedah, 2006, 2007). Ironically, this contributes to the weaknesses of the method as the following (Ho & Chen, 2007):

1. Repetition of the research cycle is time consuming.
2. The repetitive process could bore the experts and could compromise continuation of data collection. Their lack of commitment could suppress

coordination and communication. This could later affect the reach of consensus among them.

3. Gathering experts' opinions in multiple rounds and repetitive analysis of the data could also incur high cost.
4. Experts' opinion could be reached in certain stages of analysis process. However, the fuzziness in the stages is not considered. This could lead to misinterpretation of the expert's opinion. This means that the approximation of the expert's agreement on a certain element is not being considered. In other words, rather than relying on 'truth or false' value as practiced in the data analysis of the conventional Delphi method, the degree of truth or false need to be considered. This could help in a more accurate determination of the experts' opinion. To elaborate this on face value, take for example a question, which reads, "Do you agree that eLearning need to include cooperation from parents?" The experts need to respond whether they agree or not to this question based on a 5 point Likert scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree,

   5 = Strongly agree. If hypothetically the expert chooses 3 = Neutral, I indicate this response as neither agree nor disagree and this usually would not take any weightage in the accumulative responses whether the experts in consensus agree or disagree. However, if the fuzziness of the expert's opinion is considered based on 'triangular fuzzy number', the analysis of the accumulative responses from all experts may be more accurate in determining whether the experts in consensus agree or disagree with the question. This is further elaborated in the next section. The weaknesses in the analytical process could also cause some of the experts' opinion to be weakened or suppressed.

According to the literature, past researchers have proposed solutions to overcome the fuzziness in experts' opinion in the Delphi method. Murray, Pipino, and Gigch (1985) proposed the incorporation of fuzzy theory into the method using semantic variables. Klir and Folger (1988) suggested using mean normalization mode. There is also the initiative of applying maximum-minimum method with cumulative frequency distribution and fuzzy scoring to address experts' opinion in terms of fuzzy numbers that resulted in fuzzy Delphi method (Ishikawa et al., 1993). Instead, Hsu and Chen (1996) introduced the fuzzy similarity aggregation method. Through this method, similarities among experts were gathered and fuzzy numbers are assigned to each expert. This is used to identify the degree of agreement among them. Experts' fuzzy evaluation is then aggregated using consensus coefficient. If this resulted in low degree of agreement among experts, the survey needs to be distributed again. In order to elaborate, further the contribution of fuzzy theory in Delphi method, a brief introduction of the theory is discussed.

Fuzzy theory. Fuzzy theory actually applies fuzzy logic by using computers to make decision like human. Fuzzy logic was first proposed by Zadeh (1965). Fuzzy logic allows computers to make decision with imprecise quantities to make decision similar to the human brain. Real world decision involves high level of reasoning and uncertainties to take into account. For example, a grocer plans to order tomatoes to sell in a grocery. The grocer needs to make daily decision on how much he should order. If he orders too much, it would not be profitable for unsold tomatoes rot quickly. If he orders too little, he could risk losing customers, as their demands are not met. Thus, he has to make the right decision and to reach a correct decision, and to achieve this; he has to consider a few factors that are full of uncertainties such as season, weather, demand, inflation, and others. Fuzzy logic relies on two elements: fuzzy set and fuzzy rules to model the world in making decisions. Fuzzy sets allow us to make measurement in situations that are not precise. For example, in describing how hot the weather is without referring to temperature scales or telling how big a house is without using objective measurements.

A set is a collection of related items that belong to that set with different degrees. For instance, in a basketball team, a coach could decide the players by choosing them based on certain height to qualify. This is called the crisp boundary. Based on this boundary, whoever is taller than a certain height is considered tall and those who are below height is considered not tall (lower than crisp boundary) but this reference to 'tall" and 'not tall' does not give much information. We could consider all the players are tall at a certain degree. For this case, fuzzy logic gives more information. Instead of referring that a player is tall enough, fuzzy logic could refer that the player is tall to a degree of 0.65. This information could be included in fuzzy logic to categorize data in a set. The information from fuzzy sets could then be combined with fuzzy rules to make decision. Fuzzy rules on the other hand, use rules to model the world. For example, if a person were tall and agile, he may be advised to choose basketball. If a person is short and broad, he should consider wrestling. The rules take partially true facts (tall and agile), finds out to what degree they are true (how tall they are, how agile they are), and then takes another fact to make that true to a certain degree to determine how suitable a certain person is to sports. A number of rules can be combined and decision can be made- a process that is called inference. The rule applies human concept instead of strict measurement to make decision. Words are used instead of numbers to describe items. Fuzzy sets are terms to be used in fuzzy rules.

Based on the discussion above, the incorporation of fuzzy theory in fuzzy Delphi method could overcome the limitation of traditional Delphi method as shown in Table 3.3.

Table 3.3

Comparison of the Strengths and Weaknesses between the Fuzzy Delphi Method and the Delphi Method

	Method Description	
	Traditional Delphi Method	**Fuzzy Delphi Method**
	The aim is to achieve experts' consensus. A wide range of opinion could be elicited while maintaining quality of experts' independent opinion. Survey could be conducted in multiple rounds where experts need to revise their opinions in each round based on overall results of previous round until their opinions converge.	Since traditional Delphi method contains semantic fuzziness in the survey questions and answers, cumulative frequency distribution and fuzzy scoring is used to convert experts' opinions to fuzzy numbers. Similarity function is used to evaluate the degree of experts' agreement. The consensus coefficient for experts was then used to determine the fuzzy value of their opinions.
Strength and Weaknesses	More time is needed to collate the expert opinion.	Survey time is reduced significantly.
	Higher cost.	Lower cost.
	Survey questionnaire need to be administered repeatedly until consensus is reached. However, the survey recovery rate is low.	Reduces number of surveys, increases questionnaire recovery rate.
	In the process of reaching consensus, researcher could risk misinterpret expert opinion.	Experts can fully express their opinions, ensuring the completeness and consistency of the group opinion.
	Consensus of expert opinions only applies to a certain range. The fuzziness of that range is not taken into account.	Takes into account the fuzziness that cannot be avoided during the survey process. Does not misinterpret experts' original opinions and provides a true reflection of their response.

Note. Adapted from "Applying fuzzy Delphi method to select the variables of a sustainable urban system dynamics model," by Y. F. Ho and H.L. Wang, 2008, In *Proceeding of the 26th International Conference of the System Dynamics Society, Athens PATRAS University, Greece,* p. 8. Retrieved from http://www.systemdynamics.org/conferences/2008/proceed/papers/HO311.pdf.

Fuzzy Delphi method is adopted for the evaluation of the model in this study because it is an established decision-making tool. Since evaluation of the model involves decision-making, the method is adopted. Another reason was that the method relies on experts' opinion to make decision. Since the model was developed using experts' views, it could be compatible to use a panel of experts to evaluate the model too. Besides, fuzzy Delphi method has also been used for evaluation purposes in past research although it is widely used for planning, projections, decision-makings, and development. For example, the technique was used in evaluating hazardous waste transportation firms (Gumus, 2009), evaluating battle tanks (Cheng & Lin, 2002), evaluating software development projects (Buyukozkan & Ruan, 2008), evaluating public transport system (Hsu, 1999), and others.

In this study, I adopted a modified fuzzy Delphi method to conduct the evaluation of the mLearning implementation model. There were two main modifications made to the method:

1) In Delphi technique, experts are used for instance in decision making of product development using variables determined by them prior to the development. In this study, the evaluation does not require the participants to generate variables although the session involves decision-making. Although the evaluation output could be analyzed simply using descriptive statistics instead, the results of the testing could be solely based on a simple majority of the participants' view on certain evaluation criteria of the model. Fuzzy Delphi method goes beyond findings based on majority view; it takes into consideration collective views through consensus opinions of the participants involved. As a method more advanced than the traditional Delphi method, fuzzy Delphi method as mentioned in the earlier section takes into account the fuzziness that cannot be avoided during the survey process.

2) The second modification is in the use of defuzzification process and rankings in fuzzy Delphi method. In a conventional use of fuzzy Delphi method, the defuzzification process and rankings are used to determine the variables of the study. Instead, in the evaluation procedure of the present study, the defuzzification process and rankings are used to determine the consensual agreement among experts on items tested in the model based on predetermined range of defuzzification values. The procedure in conducting the modified fuzzy Delphi method is further elaborated in the next section. However, the following section discusses the sample of the study and instruments used prior to the discussion on the procedure.

Sample of the study. In this phase, as the study applies the modified fuzzy Delphi method, a panel of experts was chosen through purposive sampling to evaluate the model. Forty-eight respondents (48 experts) were selected to evaluate and validate the model. In Delphi method, the most important step is the selection of experts as it affects the quality of the result of the study (Jacobs, 1996; Taylor & Judd, 1989). However, there is no standard criterion in the technique in selection of experts (Kaplan, 1971, p. 24). In terms of setting the criteria to select the experts for a specific study, Pill (1971) and Oh (1974) stated that the experts should have some background or experience in the related field of study, be able to contribute their opinions to the needs of the study, and willing to revise their initial judgment to reach consensus among experts. Consistent with this, Delbecq, Van de Ven, and Gustafson (1975) proposed that qualified subjects for a Delphi study consists of three groups: 1) the top management who use the outcomes of the Delphi study; 2) professional individuals as staff members and supporting team; and 3) targeted individuals whose judgment are being elicited. In this study, based loosely on the above criteria, the evaluation was conducted on mainly language instructors such as teachers or lecturers who also have experience in using technology in education.

In terms of the numbers of experts for study, the literature has yet to reach a consensus (Hsu & Stanford, 2007). For instance, past researchers propose a number between 10- to 15 experts (Adler & Ziglio, 1996; Delbecq et al., 1975) is optimal in a Delphi study but some argue that 10 to 50 respondents are needed to facilitate the study (Witkin & Altschul, 1995). However, Ludwig (1994) explains that the number of experts used should represent a pooling of judgments and the capability of the research team in processing information (p. 52). In this study, I employed 48 respondents to form the panel to evaluate the model.

Instrument. The instrument used for this phase was a set of evaluation survey questionnaire (refer to Appendix B). The questionnaire consisted of 30 questions divided into two parts: 1) Experts' personal details; and 2) Experts' view of the model. The first part consists of two sections: 1) Section A to elicit participants' background information; and 2) Section B to elicit participants' use of mobile technologies. The second part served to elicit experts' view of the model. A pilot study was conducted on 12 lecturers from a tertiary level institution using the instrument to improve the questionnaire items. However, the 12 lecturers were not included in the actual needs analysis study. The instrument was further validated by six (6) curriculum and instruction technology experts. Reliability test was conducted on the survey questionnaire for all items that registers a Cronbach alpha coefficient of .874 that indicated high reliability for all items as shown in Table 3.4.

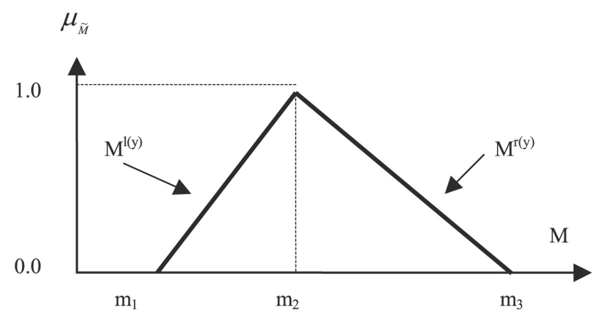
Table 3.4

Reliability Testing of Evaluation Questionnaire

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.874	.818	37

Procedure. The main aim of this phase was to evaluate the model developed in Phase 2 of this study. As the study employed fuzzy Delphi method to evaluate it, the procedure for this phase was as the following:

1. Selection of experts to evaluate the model. The process of selection of respondents to this study was elaborated in the previous section.
2. In order to address the issue of fuzziness among the experts' opinion, a linguistic scale is determined to frame the respondents' feedback. The linguistic scale is similar to a Likert scale with an additional of fuzzy numbers given to the scale of responses based on triangular fuzzy number (as shown in Figure 3.9). For every response, three fuzzy values were given to consider the fuzziness of the experts' opinions. The three values as shown in Figure 3.9 consist of three levels of fuzzy value: minimum value (m_1), most plausible value (m_2), and maximum value (m_3).



m1 = Minimum value; m2= most plausible value; m3= maximum value

Figure 3.9. Triangular Fuzzy number

In other words, the linguistic scale is used to convert the linguistic variable into fuzzy numbers. The level of agreement scale should be in odd numbers (3, 5, or 7 point linguistic scale). The higher the scale, the more accurate the response analysis could be. Table 3.5 shows an example of linguistic scale for a 5-point linguistic scale.

Table 3.5

Sample of Linguistic Scale

5 Point Linguistic Scale			
Strongly agree	0.60	0.80	1.00
Agree	0.40	0.60	0.80
Moderately agree/Neutral	0.20	0.40	0.60
Disagree	0.10	0.20	0.40
Strongly disagree	0.00	0.10	0.20

Based on Table 3.5, we could observe that the fuzzy numbers are in range of 0 to 1. In this study, a 7-point linguistic scale was used as shown in Table 3.6.

Table 3.6

Seven Point Linguistic Scale

7 Point Linguistic Scale			
Strongly agree	0.90	1.00	1.00
Agree	0.70	0.90	1.00
Moderately agree	0.50	0.70	0.90
Slightly agree	0.30	0.50	0.70
Slightly disagree	0.10	0.30	0.50
Disagree	0.00	0.10	0.30
Strongly disagree	0.00	0.00	0.10

3. The experts' responses with the correspondent fuzzy number scales for each questionnaire item on their view of the model were inserted in an excel spreadsheet. A sample is shown in Table 3.7. This is to obtain the average for m_1, m_2, and m_3.

Table 3.7

Sample of Fuzzy Delphi Expert Response Spreadsheet

Respondents	**Item 2.10**		
r1	0.10	0.30	0.50
r2	0.50	0.70	0.90
r3	0.90	1.00	1.00
r4	0.50	0.70	0.90
r5	0.50	0.70	0.90
r6	0.50	0.70	0.90
r7	0.90	1.00	1.00
r8	0.50	0.70	0.90
r9	0.90	1.00	1.00
r10	0.50	0.70	0.90
Average	0.62	0.78	0.90
	m_1	m_2	m_3

4. The next step was to calculate the difference between the experts' evaluation data and the average value for each item to identify the threshold value, 'd' using the formula as below:

$$d\left(\tilde{m},\tilde{n}\right) = \sqrt{\frac{1}{3}\left[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2\right]}.$$

Referring to the formula, m_1, m_2 and m_3 are average values for all the experts' opinion while 'n_1', 'n_2' and 'n_3' are fuzzy values for all three values for every user. A sample of the result is shown in Table 3.8.

Table 3.8

Sample of Calculation to Identify Threshold Value, d

RESPONDENTS	Unit 2.10	Unit 2.11
r1	**0.469326**	**0.421663**
r2	0.083267	0.042426
r3	**0.213542**	**0.261661**
r4	0.083267	**0.421663**
r5	0.083267	0.042426
r6	0.083267	0.042426
r7	**0.213542**	0.042426
r8	0.083267	0.042426
r9	**0.213542**	**0.261661**
r10	0.083267	0.042426
r11	**0.213542**	**0.261661**
r12	**0.469326**	**0.421663**
r13	0.083267	0.042426
r14	**0.213542**	**0.261661**
r15	0.083267	0.042426
r16	**0.213542**	0.042426
r17	0.083267	0.042426
r18	**0.213542**	**0.261661**
r19	**0.213542**	**0.261661**
r20	0.083267	0.042426

The threshold value is important to determine the consensus level among experts. According to Cheng and Lin (2002), if the threshold value is less than or equal with 0.2, then all the experts are considered to have achieved a consensus. The threshold values which are in **bold** in the sample calculation in Table 3.8 indicate the individual user's opinion that are not consensus with the other experts' view. However, what is more important to be considered is the overall consensus for all items. The overall group consensus should be more than 75%; otherwise a second round of fuzzy Delphi needs to be conducted.

5. Once the group consensus is achieved, the aggregate fuzzy evaluation is determined by adding all the fuzzy numbers for each item. A sample of this step is shown in Table 3.9. This step is essential for the final step of this phase.

Table 3.9

Sample of Fuzzy Evaluation

Respondents	Item 2.10			Item 2.11		
r1	0.10	0.30	0.50	0.10	0.30	0.50
r2	0.50	0.70	0.90	0.50	0.70	0.90
r3	0.90	1.00	1.00	0.90	1.00	1.00
r4	0.50	0.70	0.90	0.10	0.30	0.50
r5	0.50	0.70	0.90	0.50	0.70	0.90
r6	0.50	0.70	0.90	0.50	0.70	0.90
r7	0.90	1.00	1.00	0.50	0.70	0.90
r8	0.50	0.70	0.90	0.50	0.70	0.90
r9	0.90	1.00	1.00	0.90	1.00	1.00
r10	0.50	0.70	0.90	0.50	0.70	0.90
r11	0.90	1.00	1.00	0.90	1.00	1.00
r12	0.10	0.30	0.50	0.10	0.30	0.50
r13	0.50	0.70	0.90	0.50	0.70	0.90
r14	0.90	1.00	1.00	0.90	1.00	1.00
r15	0.50	0.70	0.90	0.50	0.70	0.90
r16	0.90	1.00	1.00	0.50	0.70	0.90
r17	0.50	0.70	0.90	0.50	0.70	0.90
r18	0.90	1.00	1.00	0.90	1.00	1.00
r19	0.90	1.00	1.00	0.90	1.00	1.00
r20	0.50	0.70	0.90	0.50	0.70	0.90
Average	0.62	0.78	0.90	0.56	0.73	0.87
Fuzzy Evaluation	**12.40**	**15.60**	**18.00**	**11.20**	**14.60**	**17.40**

6. The final step of the procedure of the evaluation phase is called the defuzzification process. The defuzzification value for each questionnaire item was calculated using the following formula :

$$A_{max} = 1/4 * (a_1 + 2a_m + a_2)$$

A sample of the defuzzification process is shown in Table 3.10.

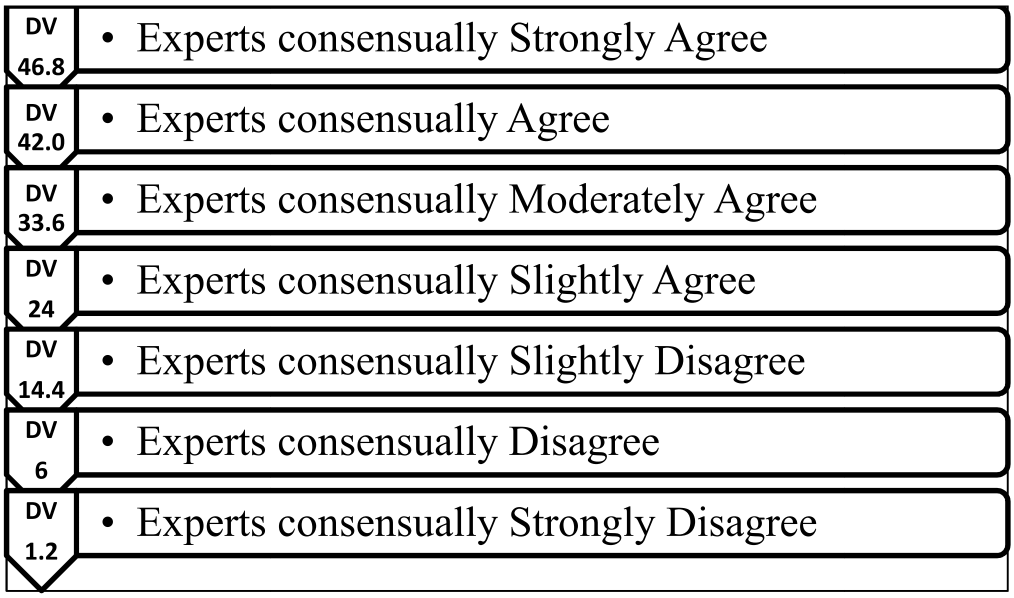
Table 3.10

Sample of Defuzzification Process

Respondents	Item 2.10			Item 2.11		
r1	0.10	0.30	0.50	0.10	0.30	0.50
r2	0.50	0.70	0.90	0.50	0.70	0.90
r3	0.90	1.00	1.00	0.90	1.00	1.00
r4	0.50	0.70	0.90	0.10	0.30	0.50
r5	0.50	0.70	0.90	0.50	0.70	0.90
r6	0.50	0.70	0.90	0.50	0.70	0.90
r7	0.90	1.00	1.00	0.50	0.70	0.90
r8	0.50	0.70	0.90	0.50	0.70	0.90
r9	0.90	1.00	1.00	0.90	1.00	1.00
r10	0.50	0.70	0.90	0.50	0.70	0.90
r11	0.90	1.00	1.00	0.90	1.00	1.00
r12	0.10	0.30	0.50	0.10	0.30	0.50
r13	0.50	0.70	0.90	0.50	0.70	0.90
r14	0.90	1.00	1.00	0.90	1.00	1.00
r15	0.50	0.70	0.90	0.50	0.70	0.90
r16	0.90	1.00	1.00	0.50	0.70	0.90
r17	0.50	0.70	0.90	0.50	0.70	0.90
r18	0.90	1.00	1.00	0.90	1.00	1.00
r19	0.90	1.00	1.00	0.90	1.00	1.00
r20	0.50	0.70	0.90	0.50	0.70	0.90
Average	0.62	0.78	0.90	0.56	0.73	0.87
Fuzzy Evaluation	12.40	15.60	18.00	11.20	14.60	17.40
Defuzzification	15.3			14.4		

In the general application of fuzzy Delphi, defuzzification is essential to classify the variables agreed by consensus of the experts through ranking of the variables. The variable that has the highest defuzzification value is ranked highest in priority to be considered as output variable. However, in this study, the ranking of items agreed by experts was used not to choose the variables for the study.

The calculation of defuzzification value and the rankings were used to identify which questionnaire items were agreed upon in evaluating the mLearning implementation model. The range of defuzzification value that is accepted as reaching the consensus among the experts is within the range of 33.6 to 46.8. Defuzzification value of 24 is the minimum value for experts' consensus under a hypothetical agreement of 'Moderately Agree' for all questionnaire items. The defuzzification value of 46.8 is the maximum value for indication of consensus experts' opinion under hypothetical agreement of 'Strongly Agree' for all questionnaire items. The following Figure 3.10 elaborates the range of agreement among the experts.



Note: DV- Defuzzification Value

Figure 3.10. Elaboration of experts' agreement based on defuzzification value.

Hence, a defuzzification value less than 24 indicates experts' consensus disagreement with the questionnaire item while a value ranging from 33.6 to 46.8 indicates consensus agreement to strong agreement among the experts. Thus, the method used to validate the model was a modified fuzzy Delphi method (with a different view of the use of defuzzification value and rankings for evaluation purposes as explained). The flow of the procedure for this evaluation phase is shown in Figure 3.11.

Analysis of Data. Data from part 1 of the survey questionnaire were analyzed using descriptive statistics via SPSS version 20 software. The study proposes the analysis of mode and means scores for this phase to chart the experts' background information of their expertise that were relevant to the study. Data from Part two of the survey questionnaire were analyzed using fuzzy Delphi method from step 2 to 6 as discussed in the 'Procedure' section for Phase III.

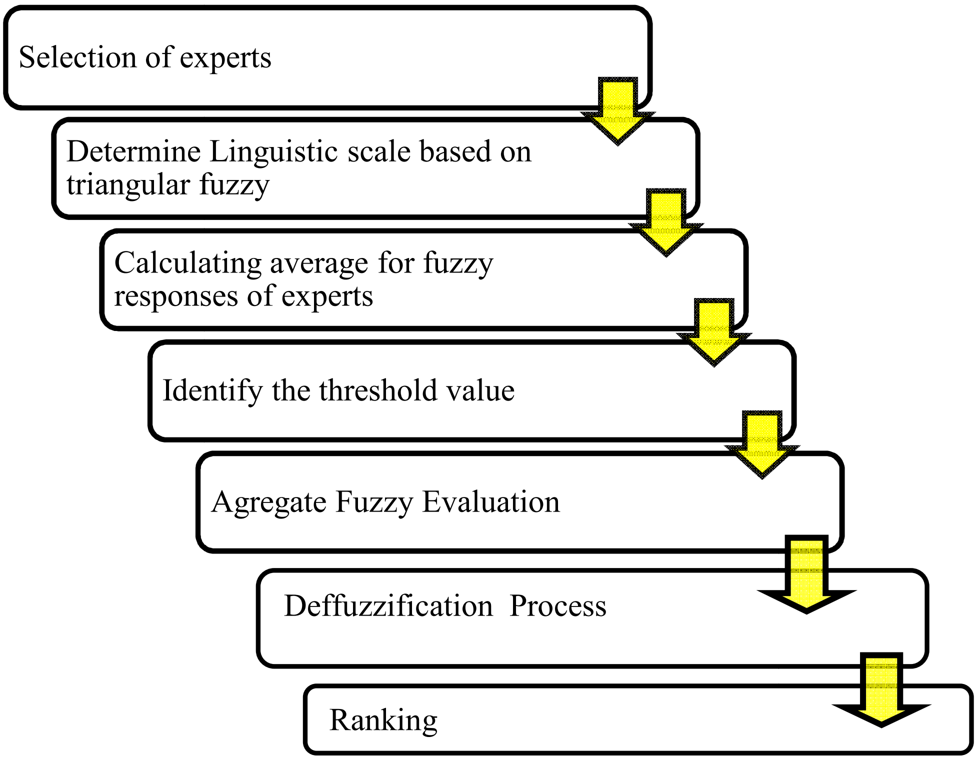


Figure 3.11. Flowchart of fuzzy Delphi method procedure.

Summary

The design and development research approach constituted the mainframe of the methodology in this study, which was adopted to develop the mLearning implementation model for the undergraduate English Language learning course. The approach divided the conduct of the study into three phases: 1) The needs analysis phase to seek the need to develop the mLearning implementation model; 2) The development of the mLearning implementation model; and 3) The evaluation of the model. The needs analysis phase was conducted using needs analysis survey questionnaire on undergraduates students as sample of the study to seek the needs of the development of the model in view of mLearning as a support to their language learning needs via its incorporation into their existing formal English Language communication skills course. In the instrument used, besides probing into the language learning needs of the students, their acceptance towards mLearning as a learning support was measured using survey questionnaires guided by unified theory of acceptance and use of technology (UTAUT) theory of technology acceptance. Analysis of data was conducted using descriptive statistics via SPSS software.

The second phase was the development of the mLearning implementation model. This phase itself was conducted in three phases: 1) identifying the elements for the model by experts' views using nominal group technique; 2) the development of the model by the panel of experts using interpretive structural modeling method and software; and 3) refining the model for analysis and interpretation of the model. The model was then evaluated by a panel of experts that consisted of mainly language instructors in the third phase of the study. This phase was conducted using a modified fuzzy Delphi technique, which is a powerful decision making tool. The instrument used was an evaluation survey questionnaire, which was based on a seven point linguistic scale. In the analysis of data for this phase, experts' background was processed using descriptive statistics while their views were analyzed via fuzzy Delphi technique.

CHAPTER 4

FINDINGS OF PHASE 1: NEEDS ANALYSIS

Introduction

The subsequent Chapters 4, 5, and 6 present the findings of the study. The results are presented in three chapters consistent with the three phases of the methodology of the study. The division of the presentation of the findings is also consistent with the research questions that elaborated the focus of the study. The result for each phase is also presented respectively to each research questions and aims of each phase. The format of the presentation is consistent with the design and development research method (Richey & Klein, 2007) to describe the findings for development of the mLearning implementation model, beginning with the need to develop the model, the development process, and ending with findings for the evaluation of the model.

Findings of the Needs Analysis

Background of Participants

The main aim of Phase 1 of the study was to identify the needs of mLearning implementation for the Professional Communication Skills course (PCS) among undergraduates based on students' views. This phase was conducted using needs analysis survey questionnaire distributed among undergraduate engineering students of a private higher institution. The needs analysis survey was distributed to 250 students and the survey received a high response rate of 220. The sample finally consisted of 146 male students and 74 female students where 194 were Malaysian students and the remaining 26 were international students as shown in Table 4.1 and Table 4.2 respectively.

Table 4.1

Participants' Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	146	66.5	66.5	66.5
	Female	74	33.6	33.6	100.0
	Total	220	100.0	100.0	

Table 4.2

Nationality of Participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malaysian	194	88.2	88.2	88.2
	International	26	11.8	11.8	100.0
	Total	220	100.0	100.0	

The following findings reported on the students' perception on their language competence, their perception of the traditional classroom PCS course, their mobile technology skills, and finally their level of acceptance and intention to use mLearning in its incorporation in the PCS course. These reports concluded into the need to incorporate mLearning as support for the learning of language communication skills course. In this report, the terms, respondents, and students are used interchangeably.

Students' Perception on Their Language Competence

The first part of the needs analysis aimed at assessing the students' language learning needs. Since the students' individual needs differ from one another, it was necessary to investigate them through their perception toward their own language competence. This answer the first research question:

1.1 What are the students' perceptions on their language competence as preparatory for PCS course?

To begin with, the investigation, the students' background academic achievement in English Language was required to form a better understanding for their perceptions later. Their academic English Language achievement was based on 'English 2' results, which is the private university's English Language preparatory examination. Table 4.3 shows the students' 'English 2' results.

Table 4.3

English 2 (Proficiency Course) Result of Participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.50-4.00 (A-to A)	50	22.7	22.8	22.8
	3.00-3.49 (B- to B+)	118	53.6	53.9	76.7
	2.50-2.99 (C- to C+)	41	18.6	18.7	95.4
	2.00-2.49 (D- to D+)	8	3.6	3.7	99.1
	Below 2.00 (F)	2	0.9	0.9	100.0
	Total	219	99.5	100.0	
Mean	2.06				
SD	.802				
Missing	System	1	0.5		
Total		220	100.0		

Note: A- to A= Good to Excellent; B- to B+ = Somewhat good to Fair;
C/C- = Highly Moderate to Low moderate; D- to D= Weak; F= Fail.

The majority of the respondents (53.9%, n = 118) who enrolled in the PCS course were categorized under B- to B grades that indicated their language competence level from good to fair. Only 22.8% (n = 50) respondents obtained A grades (A- to A) or excellent competence level. A total 22.4% (n = 49) respondents achieved only D- to C+ grades which indicated weak to highly moderate level of language competence among them. Two of them (0.9%) even failed the English Language preparatory course.

When probed further into their perception of language use, the majority (67.7%, n = 149) respondents agreed or strongly agreed that they used mostly grammatically incorrect spoken English Language especially in informal setting and among peers as indicated in Table 4.4. Only 11.8% (n = 26) of the respondents claimed that they use grammatically correct English all the time with their peers while 20.5% (n = 45) of them were not sure whether their English Language use was grammatically correct or otherwise.

Table 4.4

Speak Grammatically Incorrect English

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	5	2.3	2.3	2.3
Valid	Disagree	21	9.5	9.5	11.8
	Neutral	45	20.5	20.5	32.3
	Agree	81	36.8	36.8	69.1
	Strongly Agree	68	30.9	30.9	100.0
Mean	3.85				
SD	1.040				
	Total	220	100.0	100.0	

However, the majority of the respondents (65.9% , n = 145 students) either agreed or strongly agreed that other people could understand what they intend to say (as indicated in Table 4.5), but for future professional conduct, grammatically correct English is important in formal presentations as it may affect the reliability and credibility of their job presentations. Out of the remaining 34.1% (n = 75) respondents, 12.7% (n = 28) of them either disagree or strongly disagree that other people could understand their English Language and 21.4% (n = 47) of them were in fact not sure whether other people could understand them when they use English. In the use of language in formal settings, 66.7% (n = 146) respondents (as indicated in Table 4.6) would form sentences in their mind before uttering their message aloud as it could help them to construct formal and grammatically correct sentences. Only 16.4% (n = 36) of them could utter English words effortless and naturally while communicating with others orally in the language.

Table 4.5

English Understood by Others

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	4	1.8	1.8	1.8
Valid	Disagree	24	10.9	10.9	12.7
	Neutral	47	21.4	21.4	34.1
	Agree	80	36.4	36.4	70.5
	Strongly Agree	65	29.5	29.5	100.0
Mean	3.81				
SD	1.038				
	Total	220	100.0	100.0	

Table 4.6

Form Sentences in Mind before Saying Aloud

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	5	2.3	2.3	2.3
Valid	Disagree	31	14.1	14.2	16.4
	Neutral	37	16.8	16.9	33.3
	Agree	93	42.3	42.5	75.8
	Strongly Agree	53	24.1	24.2	100.0
Mean	3.72				
SD	1.054				
Missing	System	1			
	Total	220	100.0	100.0	

The majority of the respondents (65.9%, n = 145) also indicated that they tend to use short phrases and sentences when communicating in formal settings as shown in Table 4.7. Only 13.2% (n = 29) respondents either disagree or strongly disagree that they tend to use short sentences or phrases in formal communication.

Table 4.7

Tendency to use Phrases and Short Sentences

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	3	1.4	1.4	1.4
Valid	Disagree	26	11.8	11.8	13.2
	Neutral	46	20.9	20.9	34.1
	Agree	100	45.5	45.5	79.5
	Strongly Agree	45	20.5	20.5	100.0
Mean	3.72				
SD	.996				
	Total	220	100.0	100.0	

In compensating for their lack of competency, nearly half of the total respondents (45.9%, n = 101) may resort to memorized speech in oral presentations as indicated in Table 4.8. Only 35.5% (n = 78) of them disagreed that they use memorized speech when delivering their oral presentations.

Table 4.8

Prefer Memorized Speech

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	24	10.9	10.9	10.9
Valid	Disagree	54	24.5	24.5	35.5
	Neutral	41	18.6	18.6	54.1
	Agree	68	30.9	30.9	85.0
	Strongly Agree	33	15.0	15.0	100.0
Mean	3.15				
SD	1.256				
	Total	220	100.0	100.0	

Conclusion. The overall findings indicated that the majority of the students perceived lack of required competency to cope with the PCS undergraduate course. The lack of competency among the students needed to be addressed prior to or during their learning process in the PCS course as it could affect their success to meet the course outcomes. Thus, students' language needs to improve their language competence and fulfilling their target course outcomes have to be supported along their learning process. If their current formal PCS learning course could not accommodate these needs (students' language competence and target course outcomes), the need to support the learning course should be considered.

Students' Perception on the Traditional Professional Communication Skills Course

Therefore, before a learning support could be considered, there was a need into the investigation whether the PCS formal course was adequate to fulfill students' learning needs in attaining competency besides the fulfillment of the course outcomes. Thus, the study attempted to answer the next research question:

1.2 What are the students' perceptions on the traditional formal Professional and Communication Skills course?

In response to whether the PCS course could help the students to improve their language competence, Table 4.9 shows that the majority of the respondents (62.3%, n = 137) either disagreed or strongly disagreed that the course did help them to improve their language competence. This reflects that the course aimed more at equipping students with professional communication skills than assisting in improving students' basic language competence. This was expected as the students were assumed to possess a certain level of language competence before enrolling in the course.

Table 4.9

Course Improve Students' Language Competence

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	35	15.9	15.9	15.9
Valid	Disagree	102	46.4	46.4	62.3
	Neutral	40	18.2	18.2	80.5
	Agree	37	16.8	16.8	97.3
	Strongly Agree	6	2.7	2.7	100.0
Mean	2.44				
SD	1.034				
	Total	220	100.0	100.0	

Overall, the respondents agreed that the course did assume that they should be fluent in the language to follow the course as a majority of the respondents (88.65%, n = 195) either agreed or strongly agreed that they were expected to be competent enough to take the course as indicated in Table 4.10. Only 3.2% (n = 7) students disagreed that the course did not place language fluency as a condition to enroll in the course. Consequently, in terms of the duration of the course, a majority of 53.6% (n = 118) respondents indicated that they either disagree or strongly disagree that three hours per week allotted for the course was enough for them to acquire the targeted communicational skills as revealed in Table 4.11. Only 26.5% (n = 61) of the students agreed that the allocated hours per week for the course was sufficient.

Table 4.10

Course Assumed Students Fluent in English

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.5	.5	.5
	Disagree	6	2.7	2.7	3.2
	Neutral	18	8.2	8.2	11.4
	Agree	78	35.5	35.5	46.8
	Strongly Agree	117	53.2	53.2	100.0
Mean	4.38				
SD	.788				
	Total	220	100.0	100.0	

Table 4.11

Duration of Current PCS Hours Per Week Adequate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	28	12.7	12.8	12.8
	Disagree	90	40.9	41.1	53.9
	Neutral	40	18.2	18.3	72.1
	Agree	54	24.5	24.7	96.8
	Strongly Agree	7	3.2	3.2	100.0
	Total	219	99.5	100.0	
Mean	2.64				
SD	1.084				
Missing	System	1	.5		
Total		220	100.0		

Given the limited time allotted per week, a high percentage of 63.6% (n = 140) respondents as shown in Table 4.12 states that the knowledge inputs and comments on their oral presentations were not adequate for them to actually acquire the targeted professional communicational skills. A slight majority of 53.6 % (n = 118) respondents even felt that the PCS course classroom learning activities focused more on evaluation activities on oral presentations rather than developing skills as indicated in Table 4.13.

Overall respondents felt that the PCS course is an advantage to the more experienced students in oral presentations (for example, had experience involving in debate team or oratory competition in schools in the past) as Table 4.14 indicates a high percentage of 88.2% (n = 194) respondents either agreed or strongly agreed to this statement.

Table 4.12

Course Input Knowledge and Comments on Oral Presentation are Not Adequate

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	3	1.4	1.4	1.4
Valid	Disagree	41	18.6	18.6	20.0
	Neutral	36	16.4	16.4	36.4
	Agree	102	46.4	46.4	82.7
	Strongly Agree	38	17.3	17.3	100.0
Mean	3.60				
SD	1.023				
	Total	220	100.0	100.0	

Table 4.13

Course Focus More on Evaluation Rather Than Skills Development

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	31	14.1	14.2	14.2
	Disagree	31	14.1	14.2	28.3
Valid	Neutral	39	17.7	17.8	46.1
	Agree	77	35.0	35.2	81.3
	Strongly Agree	41	18.6	18.7	100.0
	Total	219	99.5	100.0	
Mean	3.30				
SD	1.313				
Missing	System	1	.5		
Total		220	100.0		

Table 4.14

Course Would Offer More Advantage for More Experienced Students

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	3	1.4	1.4	1.4
Valid	Disagree	4	1.8	1.8	3.2
	Neutral	19	8.6	8.6	11.8
	Agree	89	40.5	40.5	52.3
	Strongly Agree	105	47.7	47.7	100.0
Mean	4.31				
SD	.815				
	Total	220	100.0	100.0	

It was also obvious that most respondents (80%, n = 175) either agreed or strongly agreed that the higher language competent students could score better in the course as revealed in Table 4.15. As the course relied heavily on evaluations, students would tend to be more result competitive, resulting in the students targeting more on achieving good grade rather than focusing on developing language skills. This is evident as shown in Table 4.16 which reveals a high percentage of 78% (n = 172) respondents either agreed or strongly agreed that the course seems to place more importance on achieving good grades for the course.

Table 4.15

Course Would Offer More Advantage for Higher Competent Students

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	1	.5	.5	.5
	Disagree	14	6.4	6.4	6.8
	Neutral	29	13.2	13.2	20.1
Valid	Agree	72	32.7	32.9	53.0
	Strongly Agree	103	46.8	47.0	100.0
	Total	219	99.5	100.0	
Mean	4.20				
SD	.930				
Missing	System	1	.5		
Total		220	100.0		

Table 4.16

Course Seems to encourage More Importance in Grade Achievement

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	9	4.1	4.1	4.1
Valid	Disagree	27	12.3	12.3	16.4
	Neutral	12	5.5	5.5	21.8
	Agree	130	59.1	59.1	80.9
	Strongly Agree	42	19.1	19.1	100.0
Mean	3.77				
SD	1.027				
	Total	220	100.0	100.0	

Conclusion. In short, the overall findings of this section shows the students perceived that the PCS undergraduate course does not cater to their language learning needs in assisting them in improving their language competence while aiming to fulfill the course objectives. Due to the design of the course (refer to Appendix C), the course as perceived by the students focused more on aiding students to achieve the course objectives through mainly evaluation activities (on oral presentations) coupled with minimal course inputs. As such, students with experience in oral presentations and having higher language competence could have better advantage in achieving better grades in the course subject. This could be an issue to the lower achievers; thus, the mLearning intervention was proposed to aid more students to fulfill the course outcomes while assisting their language learning needs.

Students' Access to Mobile Devices and the Capability Levels of their Devices

Since the proposal applied mLearning as solution, the next step was to investigate the students' use of mobile technology as access to technology is an important criterion in technology based education (Jones, Valdez, Nowakowski, & Rasmussen, 1995; Quinn, 2011a). David (1994) argued further that technology should be accessible to students whenever needed. Accessibility here should not only mean access to technology devices but should also include uninterrupted data connectivity to ensure students' access to information and communication anytime anywhere and just in time. This is an important criterion for seamless learning through mLearning. Thus, the findings attempted to answer the research question:

1.3 What are the students' access to mobile devices and the capability level of the devices?

This is mainly to investigate whether the students have the appropriate devices for mLearning. In terms of technology accessibility, Table 4.17 shows that almost all respondents (98.6%, n = 217) owned at least one mobile technology device. This is not surprising considering the mobile phone penetration in this country is more than the country's population (Malaysian Communications and Multimedia Commission, 2012) as some of the mobile phone owners have more than one device.

Table 4.17

Owning a Mobile Device

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	217	98.6	98.6	98.6
	No	3	1.4	1.4	100.0
	Total	220	100.0	100.0	

Further investigation on types of mobile device revealed that mobile phones (69.5%, n = 153) and smart phones (51.8%, n = 114) were the types of mobile technology devices mostly owned by the respondents with PDA (2.3%, n = 5) as the least device owned by them as indicated in Table 4.18. In terms of mobile capabilities of their devices, a minimum Level 2 is suggested to incorporate mLearning in their formal learning course.

Table 4.19 shows that most of their devices (82.2%, n = 181) were at least Level 2. This means that most of the devices owned by the students have the functions of voice calls, Short Message Services (SMS), sending and receive emails, internet browsing, camera and video recording and streaming, MMS, video calls, and preloaded software that could readily accommodate incorporation of mLearning.

Table 4.18

Types of Mobile Devices Owned by Students

	Valid	Yes	No	Total
Mobile Phone	Frequency	153	67	220
	Percent	69.5	30.5	100
Smartphone	Frequency	114	106	220
	Percent	51.8	48.2	100
PDA	Frequency	5	215	220
	Percent	2.3	97.7	100
AV portable player	Frequency	70	150	220
	Percent	31.8	68.2	100
Tablet PC	Frequency	23	197	220
	Percent	10.5	89.5	100
Others	Frequency	24	196	220
	Percent	10.9	89.1	100

Table 4.19

Level of Capabilities of Mobile Devices

		Frequency	Percent	Valid Percent	Cumulative Percent
	Level 1	39	17.7	17.7	17.7
Valid	Level 2	65	29.5	29.5	47.3
	Level 3	116	52.7	52.7	100.0
Mean	2.35				
SD	.765				
	Total	220	100.0	100.0	

Note: Level 1- Basic services (such as voice calls & sms, with/without camera)
Level 2- Basic services + email, limited internet browsing, camera & video recording/streaming, MMS, video calls, and preloaded software.
Level 3- Level 2 capabilities + GPS+ mobile apps downloadable)

As added contribution to mLearning infrastructure, a high percentage of their mobile devices (71.6%, n = 156) could receive at least HSDPA or 3G data connection (refer to

Table 4.20) coupled with supplementary data connection capabilities such as WLAN WiFi (74.8%, n = 163), Bluetooth (76.6%, n = 167), and USB (68.8%, n = 150) which are indicated in Table 4.21. These connection capabilities are essential for uninterrupted data connection for seamless information searching and sharing, synchronous and asynchronous communication among learners, content, context and course instructors, and smooth data upload or transfer to facilitate students' learning via mLearning.

Table 4.20

Mobile Devices Data Connection Capabilities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GPRS	48	21.8	22.0	22.0
	EDGE	14	6.4	6.4	28.4
	HSDPA/3G	140	63.6	64.2	92.7
	4G and above	16	7.3	7.3	100.0
	Total	218	99.1	100.0	
Mean	2.57				
SD	.914				
Missing	System	2	.9		
Total		220	100.0		

Table 4.21

Supplementary Data Connection Capabilities

	Valid	Yes	No	Total
WLAN WiFi	Frequency	163	55	220
	Percent	74.8	25.2	100
Bluetooth	Frequency	167	51	220
	Percent	76.6	23.4	100
USB	Frequency	150	68	220
	Percent	68.8	31.2	100
Others	Frequency	21	197	220
	Percent	9.6	90.4	100

Conclusion. As a conclusion of the findings for this section, overall results from Table 4.17 to Table 4.21 conclusively indicate that access to mobile devices, mobile connectivity, and supportive mobile technology are readily available to students. In fact, a high majority of the mobile devices owned by the students have at least the minimum required mobile capabilities (refer to Table 4.19). The accessibility to the technology as mentioned here has readily solved the issue of feasibility of mLearning incorporation (David, 1994; Jones et al., 1995; Quinn, 2011a) in the students learning program as proposed solution to their learning needs.

However, as mentioned earlier, students' acceptance and intention to use the support need to be determined before it could be adopted as in the case of any study in technology based intervention. The following section is the report of the findings on the investigation into the acceptance and expectation of the students towards mLearning in its incorporation into the PCS course.

Students' Acceptance and Intention to Use mLearning

This section answers the final research question for the needs analysis phase:

1.4 What are the students' acceptance and intention to use mLearning in incorporation in their formal Professional and Communication Skills course?

As mentioned in the methodology Chapter 3, the investigation into students' acceptance and expectation of mLearning as a support to their language learning needs was based on the unified theory of acceptance and use of technology (UTAUT), a technology acceptance theory proposed by Venkatesh et al. (2003). The theory posits that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behavior (Venkatesh et al., 2003). Based on the key constructs, the items for the needs analysis questionnaire were divided into eight parts: 1) Performance expectancy; 2) Effort expectancy; 3) Attitude toward using technology; 4) Social influence; 5) Facilitating conditions; 6) Self-efficacy; 7) Anxiety; and 8) Behavioral intention to use mobile learning. The report of the findings reveal the students' acceptance, readiness, and intent to use mLearning as support to their language learning needs through the key constructs. Thus, the following section reported on the needs based on the eight parts of the UTAUT key constructs.

Performance expectation. Performance expectancy deals with students' perception on the effectiveness of mLearning as a support in accommodating students' language learning needs as well as the fulfilling the course outcomes (Venkatesh, 2003). In this aspect, Table 4.22 shows a high rate of performance expectation with 89.5% (n = 197) students agreed or strongly agreed that mLearning could be useful for their English Language communication course. A majority of the respondents (74.1%, n = 101) either agreed or strongly agreed that mLearning could increase learning productivity as revealed in Table 4.23.

Table 4.22

mLearning Useful for My Course(PCS)

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	1	.5	.5	.5
Valid	Disagree	6	2.7	2.7	3.2
	Neutral	16	7.3	7.3	10.5
	Agree	83	37.7	37.7	48.2
	Strongly Agree	114	51.8	51.8	100.0
Mean	4.38				
SD	.775				
	Total	220	100.0	100.0	

Table 4.23

mLearning Could Increase Students' Learning Productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	24	10.9	10.9	10.9
	Disagree	54	24.5	24.5	35.5
	Neutral	41	18.6	18.6	54.1
	Agree	68	30.9	30.9	85.0
	Strongly Agree	33	15.0	15.0	100.0
Mean	3.15				
SD	1.256				
	Total	220	100.0	100.0	

In terms of the performance expectancy aspect, Table 4.24 indicates a majority 79.5 % (n = 175) of the respondents agreed or strongly agreed that mLearning accomplishes their learning tasks more quickly as mobile tools and mobile environment offers a larger array of communication possibilities at greater speed and accessibility.

Table 4.24

mLearning Accomplish Students' Learning Tasks More Quickly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.5	.5	.5
	Disagree	14	6.4	6.4	6.8
	Neutral	29	13.2	13.2	20.1
	Agree	72	32.7	32.9	53.0
	Strongly Agree	103	46.8	47.0	100.0
	Total	219	99.5	100.0	
Mean	4.20				
SD	.930				
Missing	System	1	.5		
Total		220	100.0		

Furthermore, Table 4.25 shows another majority 78.2 % (n = 145) of the respondents either agreed or strongly agreed that mLearning increases their chances of obtaining better grades for their course as mobile learning offers more avenues for them to access assistance for learning. These findings revealed that the respondents perceived high expectation on the performance of mLearning in aiding them to meet their language learning needs if it is incorporated in the current PCS classroom learning.

Table 4.25

mLearning Increase Students' Chance of Obtaining Better Course Grades

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	3	1.4	1.4	1.4
Valid	Disagree	26	11.8	11.8	13.2
	Neutral	46	20.9	20.9	34.1
	Agree	100	45.5	45.5	79.5
	Strongly Agree	45	20.5	20.5	100.0
Mean	3.72				
SD	.966				
	Total	220	100.0	100.0	

Effort expectancy. Venkatesh (2003) defines 'Effort expectancy' as the degree of ease in using a proposed system; in this study, the system is mLearning. In this aspect, a majority of the respondents (71.8%, n = 158) agreed or strongly agreed that mLearning facilitates interaction with their peers, the lecturers, as well as content, as mobile technology offers multiple channels of interaction both synchronously and asynchronously (refer to Table 4.26). Only 10.9% (n = 24) of the respondents chose to disagree or strongly disagree with the interaction facilitation through mLearning while 17.3% (n = 38) of them were undecided.

Table 4.26

mLearning Could Facilitate Students' Interaction With Others

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	2	.9	.9	.9
Valid	Disagree	22	10.0	10.0	10.9
	Neutral	38	17.3	17.3	28.2
	Agree	105	47.7	47.7	75.9
	Strongly Agree	53	24.1	24.1	100.0
Mean	3.84				
SD	.935				
	Total	220	100.0	100.0	

However, although a slight majority of the respondents (53.6%, n = 118) agreed or strongly agreed that it is not be difficult to gain the skill to use mLearning as indicated in Table 4.27, only 45.9% (n = 101) of them were confident that mLearning would be easy to use as shown in Table 4.28. Some 35.4% (n = 78) of them perceive that mLearning could be difficult to use while 18.6 % (n = 41) could not decide whether mLearning could hinder their learning process or facilitate them better. Nevertheless, based on Table 4.27, a lower 25% (n = 55) of the respondents were not confident that they would find easy to be skillful in using mLearning later.

Table 4.27

Easy for The Students to Be Skillful in Using mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	11	5.0	5.0	5.0
Valid	Disagree	44	20.0	20.0	25.0
	Neutral	47	21.4	21.4	46.4
	Agree	74	33.6	33.6	80.0
	Strongly Agree	44	20.0	20.0	100.0
Mean	3.44				
SD	1.163				
	Total	220	100.0	100.0	

Table 4.28

Students Would NOT Find mLearning Easy to Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	24	10.9	10.9	10.9
	Disagree	54	24.5	24.5	35.5
	Neutral	41	18.6	18.6	54.1
	Agree	68	30.9	30.9	85.0
	Strongly Agree	33	15.0	15.0	100.0
Mean	3.15				
SD	1.256				
	Total	220	100.0	100.0	

Attitude expectancy. Attitude expectancy concerns the student's overall affective reaction to use mLearning (Venkatesh et al., 2003). In terms of this aspect, 61.8% (n = 136) of the respondents either disagree or strongly disagree (refer to Table 4.29) that they dislike to work with mLearning, 18.6% (n = 41) of them were neutral in their response while a low 19.5% (n = 43) of the respondents indicated that they disliked working with mLearning.

Table 4.29

Don't Like Working with mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	35	15.9	15.9	15.9
	Disagree	101	45.9	45.9	61.8
	Neutral	41	18.6	18.6	80.5
	Agree	37	16.8	16.8	97.3
	Strongly Agree	6	2.7	2.7	100.0
Mean	2.45				
SD	1.034				
	Total	220	100.0	100.0	

However, Table 4.30 indicates that a majority 70.4% (n = 155) of the respondents were confident that mLearning could make learning their PCS course more interesting. Consistent to this finding, 65.9% (n = 145) of them were in favor that working with mLearning could be more fun (refer to Table 4.31) in their learning process. The main aim of these questions was that if the use of mLearning would be more interesting compared to their conventional language learning process or bringing fun to learning, students would be more positive in their attitude towards the incorporation of mLearning in their formal learning course.

Table 4.30

mLearning Makes Learning the PCS Course More Interesting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	25	11.4	11.4	11.4
	Disagree	40	18.2	18.2	29.5
	Neutral	0	0	0	29.5
	Agree	96	43.6	43.6	73.2
	Strongly Agree	59	26.8	26.8	100.0
Mean	3.86				
SD	.943				
	Total	220	100.0	100.0	

Table 4.31

Working With mLearning Would Be More Fun

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.8	1.8	1.8
	Disagree	24	10.9	10.9	12.7
	Neutral	47	21.4	21.4	34.1
	Agree	80	36.4	36.4	70.5
	Strongly Agree	65	29.5	29.5	100.0
Mean	3.81				
SD	1.038				
	Total	220	100.0	100.0	

Overall, in terms of the aspect of the respondents' attitude expectancy, findings from Table 4.32 could conclude that the students hold positive attitude toward mLearning as a majority of the respondents (72.2%, n = 159) disagreed or strongly disagreed that mLearning is not a good idea as a learning aid.

Table 4.32

mLearning is Not a Good Idea as Learning Aid

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	41	18.6	18.6	18.6
Valid	Disagree	118	53.6	53.6	72.3
	Neutral	33	15.0	15.0	87.3
	Agree	24	10.9	10.9	98.2
	Strongly Agree	4	1.8	1.8	100.0
Mean	2.24				
SD	.940				
	Total	220	100.0	100.0	

Social influence. Social influence is defined as the degree to which an individual perceives that people who are important to them believe they should use mLearning (Venkatesh et al., 2003). In other words, the respondents' decision to use mLearning was being influenced by important parties. In this aspect, the overall findings showed that people who are important or having influence on the respondents' behavior did not have a significant effect on their motivation in deciding to use mLearning. For example, respectively, only 44.5% (n = 98) respondents (Table 4.34) and 48.6% respondents (n = 107) (Table 4.33) perceived that people who are important to them or people who have influence on their behavior thought that they should use mLearning. In fact, only 45.9 % (n = 101) of the respondents perceived that the university supported the use of mLearning (Table 4.36). However, Table 4.35 reveals that more of the respondents (67.7%, n = 149) perceived that their decision to use mLearning could be influenced more by the encouragement of their course lecturer. Thus, the role of the lecturer is a motivation factor in encouraging the students to use mLearning.

Table 4.33

People Who Influence My Behavior Think I Should Use mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	15	6.8	6.8	6.8
Valid	Disagree	42	19.1	19.1	25.9
	Neutral	56	25.5	25.5	51.4
	Agree	58	26.4	26.4	77.7
	Strongly Agree	49	22.3	22.3	100.0
Mean	3.38				
SD	1.216				
	Total	220	100.0	100.0	

Table 4.34

People Who are Important to Me Think I Should Use mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	36	16.4	16.4	16.4
Valid	Disagree	51	23.2	23.2	39.5
	Neutral	35	15.9	15.9	55.5
	Agree	59	26.8	26.8	82.3
	Strongly Agree	39	17.7	17.7	100.0
Mean	3.06				
SD	1.367				
	Total	220	100.0	100.0	

Table 4.35

My Lecturer Has Been Encouraging Me to Use mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	5	2.3	2.3	2.3
Valid	Disagree	21	9.5	9.5	11.8
	Neutral	45	20.5	20.5	32.3
	Agree	81	36.8	36.8	69.1
	Strongly Agree	68	30.9	30.9	100.0
Mean	3.85				
SD	1.040				
	Total	220	100.0	100.0	

Table 4.36

In General, My University Supports The Use of mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	24	10.9	10.9	10.9
	Disagree	54	24.5	24.5	35.5
	Neutral	41	18.6	18.6	54.1
	Agree	68	30.9	30.9	85.0
	Strongly Agree	33	15.0	15.0	100.0
	Total	24	10.9	10.9	10.9
Mean	3.15				
SD	1.256				
Missing	System	1	.5		
Total		220	100.0		

Facilitating condition. Facilitating conditions on the other hand are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of mLearning (Venkatesh et al., 2003). In this aspect, the overall findings indicated significant positive result on the students' perception on the organizational and technical support on their use of mLearning. For instance, Table 4.37 shows that the majority of the respondents (63.7%, n = 140) either agreed or strongly agreed that they have the resources to aid them in using mLearning but only 44.1% (n = 97) of them perceived that they have the necessary knowledge to use mLearning (refer to Table 4.38). Alternatively, the majority of the respondents (69.1%, n = 152) were confident that they have specific personnel to assist them in using mLearning later (refer to Table 4.39).

Table 4.37

I Have The Resources Necessary to Use mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	3	1.4	1.4	1.4
Valid	Disagree	41	18.6	18.6	20.0
	Neutral	36	16.4	16.4	36.4
	Agree	102	46.4	46.4	82.7
	Strongly Agree	38	17.3	17.3	100.0
Mean	3.60				
SD	1.023				
	Total	220	100.0	100.0	

Table 4.38

I Have The Knowledge to Use mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	13	5.9	5.9	5.9
Valid	Disagree	66	30.0	30.0	35.9
	Neutral	44	20.0	20.0	55.9
	Agree	73	33.2	33.2	89.1
	Strongly Agree	24	10.9	10.9	100.0
Mean	3.13				
SD	1.137				
	Total	220	100.0	100.0	

Table 4.39

I Have Specific Support Personnel to Assist Me in Using mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	3	1.4	1.4	1.4
Valid	Disagree	20	9.1	9.1	10.5
	Neutral	45	20.5	20.5	30.9
	Agree	116	52.7	52.7	83.6
	Strongly Agree	36	16.4	16.4	100.0
Mean	3.74				
SD	.888				
	Total	220	100.0	100.0	

Self-efficacy expectation. Self-efficacy deals with the student's individual perception of his or her own ability and skills to use mLearning. This aspect perhaps is one of the most important aspects in determining their readiness to use mLearning. When the respondents were probed into this aspect, Table 4.40 indicates that only 43.2% (n = 95) of them perceived that they could complete their mLearning task without any assistance. Thus, they need some kind of assistance to cope with mLearning. For example, in Table 4.41, 54.5% (n = 120) of the respondents perceived that they could complete the learning task when they were stuck provided they had some kind of assistance. The majority of them (66.4%, n = 146) further agreed that they could complete their learning tasks provided that they had enough resources as indicated in Table 4.42 or if there was a built in aid in the mLearning system (67.7%, n = 166) as indicated in Table 4.43 to facilitate their learning tasks.

Table 4.40

Could Complete Task Without Assistance

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	26	11.8	11.8	11.8
Valid	Disagree	64	29.1	29.1	40.9
	Neutral	35	15.9	15.9	56.8
	Agree	60	27.3	27.3	84.1
	Strongly Agree	35	15.9	15.9	100.0
Mean	3.06				
SD	1.295				
	Total	220	100.0	100.0	

Table 4.41

Could Complete Task With Help When Stuck

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	5	2.3	2.3	2.3
Valid	Disagree	45	20.5	20.5	22.7
	Neutral	50	22.7	22.7	45.5
	Agree	79	35.9	35.9	81.4
	Strongly Agree	41	18.6	18.6	100.0
Mean	3.48				
SD	1.083				
	Total	220	100.0	100.0	

Table 4.42

Could Complete Task If mLearning Resource Adequate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	2.3	2.3	2.3
	Disagree	31	14.1	14.2	16.4
	Neutral	37	16.8	16.9	33.3
	Agree	93	42.3	42.5	75.8
	Strongly Agree	53	24.1	24.2	100.0
	Total	219	99.5	100.0	
Mean	3.72				
SD	1.054				
Missing	System	1	.5		
Total		220	100.0		

Table 4.43

Could Complete Tasks with Built-In Aid

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	1	.5	.5	.5
`Valid	Disagree	15	6.8	6.8	7.3
	Neutral	38	17.3	17.3	24.5
	Agree	98	44.5	44.5	69.1
	Strongly Agree	68	30.9	30.9	100.0
Mean	3.99				
SD	.894				
	Total	220	100.0	100.0	

Anxiety. Anxiety deals with students' apprehensiveness to use mLearning, for example, due to their concern on the uncertainties of what are expected of them in using mLearning. The findings revealed that 61.8% of the respondents (n = 136) were not apprehensive about using mLearning (refer to Table 4.44) and a slight majority (53.9%, n = 118) are not afraid facing the risk when using mLearning such as the loss of information if they press the wrong key (refer to Table 4.45). Furthermore, only 19.5%

(n = 43) of them either agreed or strongly agreed that mLearning is intimidating to them as indicated in Table 4.46.

Table 4.44

Feel Apprehensive Using mLearning

		Frequency	Percent	Valid Percent	Cumulative Percent
`Valid	Strongly Disagree	35	15.9	15.9	15.9
	Disagree	101	45.9	45.9	61.8
	Neutral	40	18.2	18.2	80.0
	Agree	38	17.3	17.3	97.3
	Strongly Agree	6	2.7	2.7	100.0
Mean	2.45				
SD	1.039				
	Total	220	100.0	100.0	

Table 4.45

Afraid Could Lose mLearning Info by Pressing Wrong Key

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	28	12.7	12.8	12.8
	Disagree	90	40.9	41.1	53.9
	Neutral	40	18.2	18.3	72.1
	Agree	54	24.5	24.7	96.8
	Strongly Agree	7	3.2	3.2	100.0
	Total	219	99.5	100.0	
Mean	2.64				
SD	1.084				
Missing	System	1	.5		
Total		220	100.0		

Table 4.46

mLearning is Somewhat Intimidating to Me

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	35	15.9	15.9	15.9
Valid	Disagree	101	45.9	45.9	61.8
	Neutral	41	18.6	18.6	80.5
	Agree	37	16.8	16.8	97.3
	Strongly Agree	6	2.7	2.7	100.0
Mean	2.45				
SD	1.034				
	Total	220	100.0	100.0	

Behavioral expectancy. This aspect deals with students' eagerness and intention to use mLearning. Probing into this aspect, Table 4.47 indicates that a majority of the respondents (65.9%, n = 145) had the intention to use mLearning and a bigger majority of them (74.6%, n = 164) even planned to use mLearning the soonest possible (refer to Table 4.48). When asked whether they predicted that mLearning would be used in their PCS course, 67.7% (n = 149) of the respondents either agreed or strongly agreed to the motion (refer to Table 4.49). Thus, the findings for this aspect revealed that the students were significantly eager and intended to use mLearning in the near future.

Table 4.47

Do Intend to Use mLearning in PCS course

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	4	1.8	1.8	1.8
Valid	Disagree	24	10.9	10.9	12.7
	Neutral	47	21.4	21.4	34.1
	Agree	80	36.4	36.4	70.5
	Strongly Agree	65	29.5	29.5	100.0
Mean	3.81				
SD	1.038				
	Total	220	100.0	100.0	

Table 4.48

Plan To Use mLearning As Soon As Possible

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	17	7.7	7.7	7.7
Valid	Disagree	39	17.7	17.7	25.5
	Neutral	0	0	0	25.5
	Agree	98	44.5	44.5	70.0
	Strongly Agree	66	30.0	30.0	100.0
Mean	3.97				
SD	.888				
	Total	220	100.0	100.0	

Table 4.49

Predict That mLearning Would Be Use for My Course As Soon As Possible

		Frequency	Percent	Valid Percent	Cumulative Percent
	Strongly Disagree	5	2.3	2.3	2.3
Valid	Disagree	21	9.5	9.5	11.8
	Neutral	45	20.5	20.5	32.3
	Agree	81	36.8	36.8	69.1
	Strongly Agree	68	30.9	30.9	100.0
Mean	3.85				
SD	1.040				
	Total	220	100.0	100.0	

Conclusion. Based on UTAUT theory, Venkatesh et al (2003) posits four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) as direct determinants of usage intention and behavior of experts to accept and use technology. Added to these key constructs were attitude expectancy, self-efficacy expectation, anxiety, and behavioral expectancy (refer to Figure 3.1) used in this study to determine the students' acceptance and intention to use mLearning for their learning needs. Referring to the findings in this section, students placed high confidence in mLearning performance in aiding their learning tasks for performance expectation (refer to Tables 4.22 to 4.25). However, in effort expectancy, the majority of them did not perceive that mLearning would be easy to use (Table 4.28), but most of them were confident that it would not be difficult to gain skill in using it (Table 4.27) and a majority thought that mLearning could facilitate interaction among them (Figure 4.26). In response to attitude expectancy (Tables 4.29 to 4.32), most students felt that mLearning could be a good learning aid and could make learning more interesting for their course subject. As for social influence, the students did not perceive that people who have influence on them or are important to them including the university could influence them to use mLearning except the encouragement from their lecturers (Tables 4.33 to 4.36). Thus, the role of the lecturer or course instructor is important in motivating the students to use mLearning. In the facilitating condition aspect, the overall findings indicated significant positive result on the students' perception on the organizational and technical support on their use of mLearning (Tables 4.37 to 4.39). However, in self-efficacy expectation aspect, findings show that the students would need some kind of aid or assistance in using mLearning (Tables 4.40 to 4.43). When probed into the anxiety aspect, the majority of the students did not agree that they would be apprehensive in using mLearning as a tool for their learning (Tables 4.44 to 4.46). Finally, for behavioral expectancy, a higher majority of students was eager and intended to use mLearning to aid in their learning process (Tables 4.47 to 4.49). Thus, it can be concluded that from the findings, the students not only accept and intend to use mLearning but they are also eager to use it as soon as possible.

Summary of Findings of Phase 1

This chapter has presented the findings on the needs analysis, which was also the first of the three phases of the methodology of the study in the development of the mLearning implementation model. Based on the research questions of the study, the findings have revealed the students' perception on their actual language competence whether they had sufficient language competence to cope with their undergraduate Professional and Communication Skills course. This was to investigate the students' level of language competence to determine their language learning needs. If there was a need, then the situation necessitates a solution. The findings as presented had conclusively revealed that the students perceived lack of the required level of language competence to cope with the undergraduate Professional and Communication Skills course. Next, the chapter also presented the findings on their perception on the undergraduate language course on whether the PCS course could sufficiently accommodate their language learning needs in the process of fulfilling the course outcomes. This was important to seek whether the undergraduate course could sufficiently contribute as a support to the students' learning needs before a solution could be presented. The findings revealed that the current formal PCS course did not fully cater to most of the undergraduate students' language learning needs especially in improving their language competency to cope with the course and fulfilling the course outcomes. Hence, in this study, as the solution, mLearning was proposed as a learning support to the PCS classroom formal learning in aiding the students to cope with their language learning needs. The rationale of the proposal was elaborated in Chapter 1 (pp. 12).

Finally, this chapter had also reported on the students' access to mobile devices and capabilities of the devices. This was to investigate students' learning needs in terms of access to mobile technology infrastructure to facilitate the mobile learning environment. The findings revealed that mLearning is feasible to be incorporated in the students formal learning in terms of infrastructure as the mobile devices and technology are readily accessible to the students. However, before mLearning could be applied as the solution to students' language learning needs, an investigation into the acceptance and expectation of the students towards mLearning through its incorporation into the PCS course needed to be conducted. A positive response from the students would justify the need to develop the mLearning implementation model as suggested in this study. According to the findings on students' acceptance and intention to use mLearning, the overall result on all the key constructs (based on UTAUT model) concluded that the students highly accepted mLearning as intervention in facilitating their learning needs and they intended to use it.

Hence, the overall findings in Phase 1 justify the need to develop the interpretive mLearning implementation structural model for English Language learning among undergraduates. The following chapter discusses the findings for the development of the model.

CHAPTER 5

FINDINGS OF PHASE 2: DESIGN AND DEVELOPMENT OF THE MODEL

Introduction

The second phase of the study is the most important part of three phases where the mLearning implementation model was developed. The model was developed according to the findings of the needs analysis of phase one of this study. Since there was a need to support the undergraduate learning of their Professional Communication Skills course, mLearning was proposed as a solution. As a solution, the study focuses on developing an mLearning implementation model for learning support based on learning activities for the undergraduates' formal language learning. The findings of the study in this phase constitute the result of the experts' collective views on the learning activities and the relationships among the activities, which would be included in the model.

Findings of the Development Phase

Findings from Step 1: Results of Modified Nominal Group Technique

The results of the findings from the modified nominal group technique (NGT) determined the language activities that should be included in the model. At the end of the NGT session, the experts proposed and consensually agreed on the final list of learning activities to develop the implementation mLearning model. Table 5.1 shows the ranking and prioritization of the learning activities based on the experts' individual voting decision. The voting session was not to eliminate any learning activities at the final stage of NGT since all the experts had already decided on the final list. The purpose was to rank the degree of the experts' individual preference for each of the learning activity based on scale 1 to 7.

Table 5.1

Findings of NGT: Ranking and Prioritization of Learning Activities

	Learning Activities	EP 1	EP 2	EP 3	EP 4	EP 5	EP 6	EP 7	EP 8	Total	Priority
1	Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.	6	6	7	7	5	6	7	7	51	4
2	Online group discussions on task given by lecturer via mobile environment.	7	6	6	5	7	6	6	6	49	8
3	Develop 'mobile tags' for information and knowledge on communication, language competence, and technical use of mobile devices via QR code or social bookmarking.	5	7	7	7	6	6	6	6	50	5
4	Synchronous or asynchronous mLearning forum on specific communication or competence issues.	5	7	6	5	6	5	6	6	46	13
5	Collaborative redesign of in-class language activities to improve communicative or competence skills.	6	4	5	7	5	6	6	6	45	14
6	Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.	4	4	6	4	4	6	4	6	38	21
7	Asynchronous online evaluation on students' presentation through mobile devices by other students.	4	5	5	4	5	5	6	4	38	22
8	Attend in-class lectures on effective communication.	7	6	7	7	6	7	7	7	54	1
9	Collaborative redesign of method to improve specific communicative or competence skills.	5	5	6	6	7	4	6	6	45	15
10	In-class evaluation on students' presentation by the lecturer.	5	5	5	5	5	4	4	4	37	23
11	Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skills.	6	7	6	6	6	6	6	6	49	7

12	Search and browse for information on effective communication, competence, and technical use of devices through mobile devices.	7	6	7	7	7	6	5	7	52	3
13	Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.	4	5	4	5	4	4	6	4	36	24
14	Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication, or presentation.	5	6	6	5	7	6	6	6	47	11
15	Learning through modeling.	4	6	4	7	4	5	7	7	44	17
16	Synchronous online evaluation on students' presentation through mobile devices by other students.	5	6	4	5	4	5	5	4	38	20
17	Access and listen to lectures about effective communication on podcasts through mobile devices.	6	7	6	6	7	7	7	7	53	2
18	Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile.	5	5	5	6	6	7	6	7	47	10
19	Search and browse information for content to be used for presentation materials.	5	6	5	4	6	5	5	6	42	18
20	Playing mobile language games either individually or in groups.	6	5	6	5	5	7	6	5	45	16
21	Record and upload presentations to elicit comments from lecturers and peers via mobile devices.	7	7	6	6	6	6	6	6	50	6
22	Mentorship to help students or group of students by lecturer or by other more capable peers.	7	6	5	5	6	5	7	6	47	12
23	Synchronous online evaluation on students' presentation through mobile devices by the lecturer.	6	5	5	4	4	4	6	4	38	19
24	Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.	6	6	5	6	7	5	6	6	47	9

Note: EP = Expert

Referring to Table 5.1, the results of NGT indicates 24 learning activities that were agreed upon by the experts as the element for the construction of the mLearning implementation model. The table also shows the ranking numbers for each learning activity given by the experts. The lowest ranking number indicated by the experts is four (4), which indicates ‘favorable’ and the highest value given is seven (7), which indicates ‘most favorable’. The accumulated ranking numbers determine the priority value for the learning activities. Based on the priority values calculated as shown in Table 5.1, the learning activities could be arranged as the following:

1. Attend in-class lectures on effective communication.
2. Access and listen to lectures about effective communication on podcasts through mobile devices.
3. Search and browse for information on effective communication, competence, and technical use of devices through mobile devices.
4. Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.
5. Develop 'mobile tags' for information and knowledge on communication, language competence, and technical use of mobile devices via QR code or social bookmarking.
6. Record and upload presentations to elicit comments from lecturers and peers via mobile devices.
7. Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skills.
8. Online group discussions on task given by lecturer via mobile environment.
9. Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.
10. Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile.
11. Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication, or presentation.
12. Mentorship to help students or group of students by lecturer or by other more capable.

13. Synchronous or asynchronous mLearning forum on specific communication or competence issues.
14. Collaborative redesign of in-class language activities to improve communicative or competence skills.
15. Collaborative redesign of method to improve specific communicative or competence skills.
16. Playing mobile language games either individually or in groups.
17. Learning through modeling.
18. Search and browse information for content to be used for presentation materials.
19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer.
20. Synchronous online evaluation on students' presentation through mobile devices by other students.
21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.
22. Asynchronous online evaluation on students' presentation through mobile devices by other students.
23. In-class evaluation on students' presentation by the lecturer.
24. Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.

In the ISM session, the learning activities were inserted in the ISM computer software according to the above priority list. Based on the list, the learning activity 'Attend in-class lectures on effective communication' is in the top list. Janes (1988) stated that the most important element should lead the pairing with other elements during the ISM session. Hence, the priority list was generated in the NGT session.

The elaboration of each learning activities are as follows:

1. *Attend in-class lectures on effective communication.*

The experts consensually agreed that this item have to be included as physical face-to face guidance from the lecturer. It is still relevant and essential in guiding the learner through the course for the following reasons:

a) Certain forms of knowledge are not accessible to the students without a more formal pedagogic process where the role of the lecturer is important.

   For example in discussing presenter's use of non-verbal language, an in-class demonstration commented by the lecturer is more effective compare to lessons on non-verbal language through mobile video clips. The latter technique may lead to different interpretation among the students on best practice of non-verbal language in effective presentations. Although informal social networking develops certain skills, it cannot substitute for formal learning (Sharples, 2006)

b) The idea of eliminating in-class lectures totally may not be absorbed by the formal institution that is against the institution education policy. However, imposing minimum hours for students' class attendance is less drastic in the acceptance of mLearning incorporation in formal education.

c) In the effort of demonstrating the bridge between formal and informal learning via mLearning, in-class lecture could be the main point of reference to represent formal learning.

Notification of the in-class lecture could be through 'push' technology to students' mobile devices as reminders for attendance. Notification may include synopsis of class activity for the day besides time and venue.

2. *Access and listen to lectures about effective communication on podcasts through mobile devices.*

In this item, students are required to download in-class lectures on effective communication in the form of audio or audio-video formats to either listen or watch for information and reinforcement of learning. As the lectures are intended for learning access on the move, the contents should be short between 1-5 minutes, which could be fragments of a larger learning chapter. The short lecture series in the form of ‘podcasts’ or ‘vodcasts’ could be delivered to students either through push or pull technology.

3. *Search and browse for information on effective communication, language competence, and technical use of devices through mobile devices.*

This item involves students’ initiatives to obtain supportive content and information for self or collaborative learning process to gain communication skills, improve language competence or getting best practices in technical mobile device use.

4. *Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.*

This item serves to complement item 3. The difference between these items is that item 4 contains small learning content packages regulated by the lecturer or by assigned content provider to push these learning packages from time to time to students through their mobile devices. Access to these packages by students will be enrolled automatically by mLearning system for monitoring purposes. Monitoring could give insights into types of content most accessed by students to improve delivery of content suitable to their needs.

5. Develop 'mobile tags' for information and knowledge on communication, language competence, and technical use of mobile devices via QR code or social bookmarking.

This item is a collaborative effort among students to share information and knowledge through mobile tagging. QR (quick response) code or social bookmarking such as *Twitter* is a form of a mobile tag where students could develop and store information easily. The mobile tags could then be placed on physical objects such as shirts, books, or websites and social blogs (such as *Facebook*) where information stored could be retrieved using mobile devices. Learning could take place through the process of developing the tags and accessing information through them. This is not limited to developing ‘mobile tags ‘when the experts suggested the activity. Mobile tags are just examples of learning resources that the students could develop collaboratively. Other learning resources could also be included such as websites, social bookmarking, videos, or podcasts.

6. Record and upload presentations to elicit comments from lecturers and peers via mobile devices.

This item represents the main learning activity to aid students’ effective learning outputs for the language communication course. Students will be evaluated through their presentation outputs based on group poster presentations, individual informative presentation, business meetings, and individual persuasive presentation. For each of the outputs, students could record trial presentation to be shared among other students and the lecturer to elicit comments to improve their presentation skills before being evaluated.

7. Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skills.

This item involves scheduled video conferencing among students or between students and the lecturer. The sessions could be discussions on various topics whether course related or not but the aim of the conferencing is to improve students' communicative and competence skills. Usually conferencing could be conducted in small groups of maximum five members per session to optimize opportunities for student involvement.

8. Online group discussions on task given by lecturer via mobile environment. Eg. Group poster presentation, Business meetings etc.

Online group discussion adds avenues for students to engage themselves in discussion on tasks or assignments given by the lecturer through mobile devices. Since most students do not have the privilege to have group members of the same course discipline, the online group discussion facilitates discussions both synchronously and asynchronously regardless of the location and time available for students to meet.

9. Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.

Although mLearning idealizes learner-centered learning, a proper guide assisted by the course instructor or the lecturer is needed to regulate learners' learning process in the mobile context to achieve their targeted learning goals more effectively. Hence, learning contracts were proposed and agreed upon by the experts to be included in the model to aid in learners' self-directed learning. In self-directed learning, learning contracts are argued as an effective tool in delivering successful and positive independent study experiences for both students and advising faculty members (Anderson, Boud, & Sampson, 1998). Learning contracts could be developed and proposed by the students assisted by the lecturer. The lecturer could suggest necessary modification to the contract proposal. The contract should be agreed upon by the student and the lecturer before being finalized. The contract could then serve as an independent study guide for the student as well as tool for evaluation. The learning contract may flexibly be developed for the whole course or parts of the course for a more manageable learning process. The contracts may be modified further as the learner progresses.

10. Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile.

As mLearning thrives on social and collaborative learning, this item was proposed for students' collaborative knowledge construction through information sharing both in the physical and mobile environment. For this item, students shared and discussed knowledge in small groups on specific topics of mutual interests such as effective language style, essential grammar tips, and others through social blogs, SMS, emails, or through other medium including physical face-to-face contact where applicable.

11. Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication skills, or presentation.

This item is similar to item 10 above but areas of discussion stems on shared problems among students; for example, overcoming stage fright, avoiding grammar slips in conversation or presentations, expression of meanings, and others. The main difference with item 10 is this item aims to aid students with assistance to overcome problems in language, communication, or presentation with the help from the lecturer or students that are more capable.

12. Mentorship to help students or group of students by lecturer or by other more capable peers.

This item facilitates collaborative learning through scaffolding to assist students who could not achieve learning targets or overcome learning shortcomings on their own (Vygotsky, 1978, p. 86). Scaffolding through this item is provided through mentorship to help these students by their lecturer or other more capable peers.

This context of learning when complimented by mLearning could be further augmented and accelerated by mobile devices and technologies through new digital tools and media (Cook, 2010). This means continuous support for learning assistance across time and space.

13. Synchronous or asynchronous mLearning forum on specific communication or language competence issues.

This item also provides a kind of scaffolding to students but either for students in general or for a specific group of students in the form of forum. Synchronous forum session involves prescheduled slots where interested students could log in an online forum scheduled at a specific time to discuss a particular selected topic. The students may participate actively in contributing to the discussion or passively as listeners. Asynchronous forum is a continuous forum similar to a blog where students could log in at any time to participate in the discussions.

14. Collaborative redesign of in-class language activities to improve communicative or competence skills.

As mLearning promotes learner-centered learning, autonomy could be shared with the students in determining how to learn certain skills. This item allows students to collaborate and modify their in-class language activities using their mobile devices to improve their communicative or competence skills in a more motivating way. For example, the in-class lectures with the permission of the lecturer either could be recorded in mobile audio-video format and stored in students' mobile devices as replacement for note taking or shared with other students taking the same course. Points from the lectures could be further used for collaborative blog discussion in expanding knowledge. Another example is instead of the conventional face-to-face oral presentation of a product, students could collaborate in designing best practices in presenting the product through the mobile network and in the process may learn additional skills to persuade customers to purchase the product through online especially in coping with the rising acceptance of mobile commerce (m-commerce) globally.

15. Collaborative redesign of method to improve specific communicative or competence skills.

Similar to item 14, students collaboratively modify ways to improve their communicative or competence skills using their mobile devices. For example, in the conventional in-class mock trial presentation, the number of students having the opportunity to present is very limited due to time constraints and time allotted for lecturer's comment. Normally, students who volunteered to present in the mock trial are the ones who have the experience in doing so, in a way denying the inexperienced ones the chance to present. Through this item 15, students with the aid of mobile technology could record a short video presentation of their own topic of interest and upload it online to elicit comments from other students and the lecturer for comments via blogs or other social applications. Comments could be given asynchronously which allows responses received unconstrained by time and space. Thus, more students could have not one but more opportunities to obtain feedback on their presentations to aid in improving and developing their communicative and competence skills.

16. Playing mobile language games either individually or in groups. Eg. play mobile game apps to improve grammar, pronunciation, expressions etc.

Online gaming has been argued as a powerful tool in either enhancing or disrupting learning due to its powerful addictive effect on students depending on how it is conducted or exploited. However, the experts felt that this item need to be considered as part of students' learning experience provided careful selection of mobile games be in place. The lecturer may involve students in selection of games application to be downloaded on their mobile devices to aid their learning process.

17. Learning through modeling. Eg. watch and learn from effective speakers via YouTube or TED talk

Most of the experts viewed that this item is necessary to be considered as part of students' learning experience where students learn by good examples. For example, students while waiting for the bus may browse through their mobile devices for effective speeches via YouTube or TED talk. While YouTube contains general topics, TED talks are more geared to specific scientific or engineering topics. Students, for instance could learn quickly through short videos on the difference between conducting persuasive talks for general topics and technical ones. Selected speeches may be shared with other students via blog discussion or push technology by the mLearning course administrator.

18. Search and browse information for content to be used for presentation materials.

This item involves students searching and browsing the internet for inputs for their presentation either in the form of content or supporting effects to enhance the quality of their presentation slides such as background slides, slide transitions, latest statistical displays and others. Through online discussions in various media forms, students may share or exchange information to elicit comments from others in order to choose appropriate content for their presentation.

19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer.

This item involves evaluation of students' learning output (for example, poster presentation) by the lecturer based on students' live presentation through social networks such as Skype or face-time video calls. More students could be evaluated in a short time through this method as evaluation could be conducted at anytime mutually agreed by the students and the lecturer wherever they are.

20. Synchronous online evaluation on students' presentation through mobile devices by other students.

This item is similar to item 19 but the evaluation is conducted by the students. Students could be notified through 'push' technology to log into the specified time of presentation and evaluate the presentations. An example of evaluation process is simply by keying in a specific number for each criterion based on a scale given while or after watching the presentation. The mLearning management system could then collect all responses and finalize the marks. The lecturer could take the marks and average them as part of the total evaluation grade in addition to other forms of evaluation for the student or students being evaluated.

21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.

In this item, students learning output could be evaluated by the lecturer through mobile devices depending on the students’ video presentations. However, unlike items 19 and 20, responses from the lecturer are not immediate but asynchronous. The experts view that this type of evaluation provides a continuous assessment on the students’ work; thus provide a more thorough assessment as the lecturer could repeatedly refer to the videos for any strength or weaknesses of the presentations which may be overlooked before finalizing the evaluation marks.

22. Asynchronous online evaluation on students' presentation through mobile devices by other students.

Similar to item 21, in this item, students’ learning output could be evaluated through online either accessed in the classroom or through mobile devices but evaluated by the students. The lecturer may give prior guidelines or criteria for evaluation to guide students in evaluating their peers’ presentation. Through this effort, students not only aid in the evaluation process but it could also provide a learning experience to the students as evaluators where for example, they could learn from the criteria on best practice to present effectively.

23. In-class evaluation on students' presentation by the lecturer.

Similar to item ‘1’, the experts viewed that this item needs to be included as institutional validity for formal education. They also viewed that in-class evaluation should not be replaced as main form of the evaluation at least in the meantime before formal establishment of widespread mLearning in tertiary education.

24. Reflection on what students have learned and establish new learning target to develop new or higher language communication skills.

This item is where students reflect upon what they have already achieved in their learning goals at a certain stage or stages. This helps students to chart their learning achievement to improve on skills and develop new learning targets parallel to the course outcomes.

Findings from Step 2: Contextual Relationship Phrase and Relation Phrase

Referring to the PCS course outcomes and the learning activities agreed upon, the experts identified 'In order to enable more students especially the low achievers to be language competent and effective communicators, the learning activity 'i' MUST be conducted BEFORE learning activity 'j' to guide through the SSIM process. The phrase 'In order to enable more students especially the low achievers to be language competent and effective communicators, the learning activity, …' is the contextual phrase for the study while the phrase MUST be conducted BEFORE' is the relation phrase to relate the elements of the model.

Findings from Steps 3 and 4: Development of the Model

These steps aimed at developing the model through experts' decision on the relationships of the elements using pair wise technique with the aid of the ISM software as discussed earlier in the methodology section. The model serves as a guide to course instructors to implement mLearning for a language course at the undergraduate level. However, as discussed in the earlier section, the implementation is based on the concept of mobile learning as a tool to augment the formal classroom learning experience and not a model for a full-fledged mLearning (in which the students learn solely through mobile tools and network).

Although mLearning could be used to deliver full courses, the primary advantage of mLearning is about performance support and complementing learning (Quinn, 2011a, 2011b). In line with this concept, the model should be a guide on how formal classroom learning and informal mLearning could be bridged as a support to learners' learning needs in undergoing a language course. The model is structural in nature that was developed interpretively by experts constructed through a network of relationships of learning activities identified as elements of the model. The relationship among the activities was based on the 'contextual phrase' and the 'relation phrase' determined earlier in step 2 of the study. The learning activities, the contextual phrase, and the relation phrase were determined according to the course outcomes of PCS. As a reference, the course outcomes were:

At the end of this course, students should be able to:

1) apply the principles and practices of professional oral communication skills.
2) present information confidently, accurately and fluently in a variety of professional, business and social settings.
3) persuade effectively in a variety of professional, business and social settings.
4) communicate interpersonally, and work effectively individually and in teams.

In short, the course outcomes were aimed at producing students to communicate competently and effectively at the professional settings.

Based on the learning activities determined through nominal group technique in Step 1, and the 'relation phrase' and 'contextual phrase' from step 2, the ISM model for mLearning implementation model for undergraduate English Language learning was developed through experts' collective decision (aided by the ISM computer software) as shown in Figure 5.1. However, as mentioned in Chapter 3, the model may not be considered as final. The model was distributed among the experts to be reviewed and modified if necessary in Steps 5 and 6 of this phase.

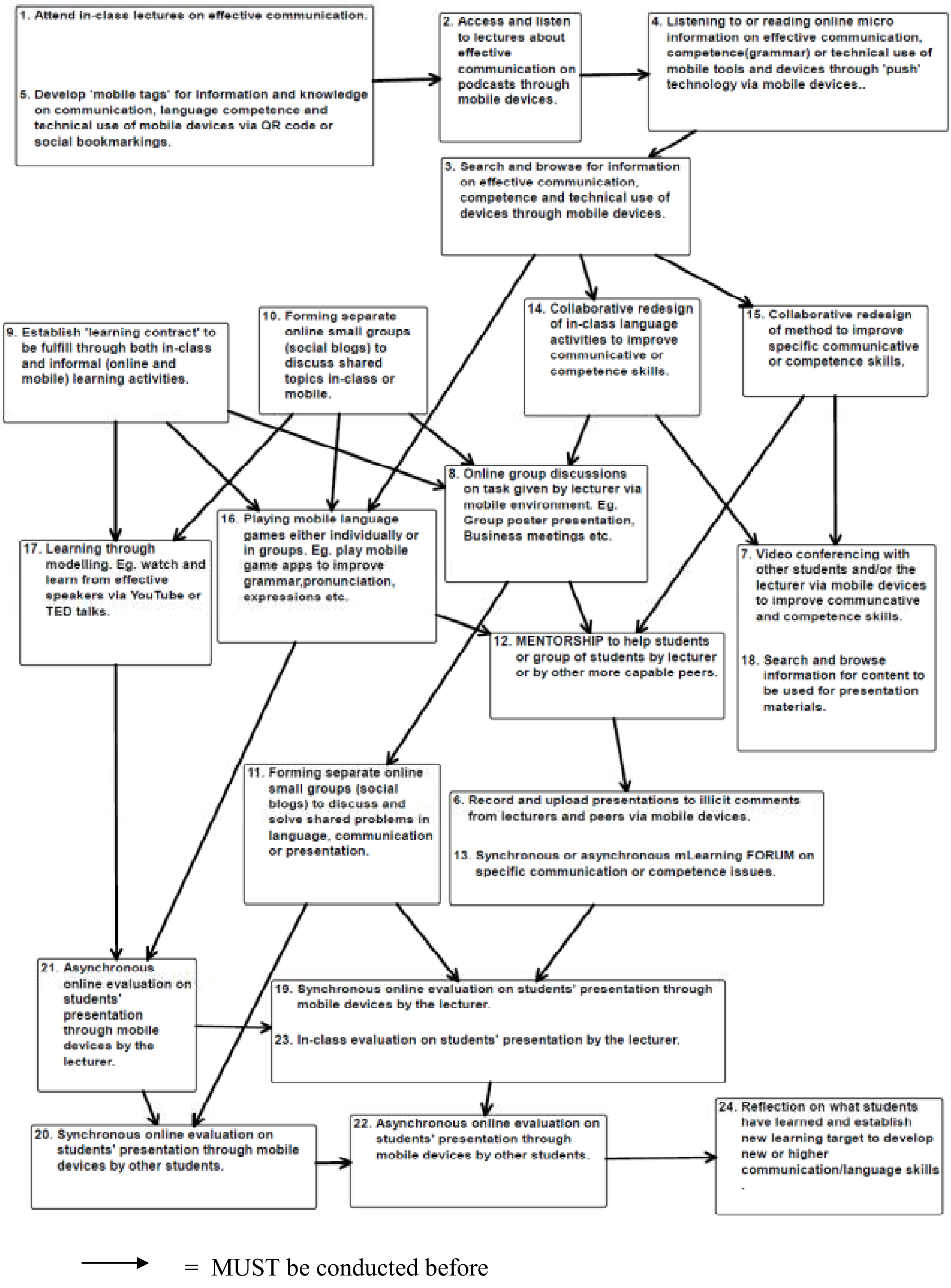


Figure 5.1. Interpretive structural modeling(ISM) based mLearning Implementation Model of Undergraduate English Language learning for Professional and Communication Skills course.

Findings from Steps 5 and 6: Presentation and Review of the Model

In the review process, the experts proposed a few minor amendments to the model. First, the experts proposed that the model could be divided into three domains, which are the Knowledge input activities, the Enabling skills activities, and the Evaluation and the reflection activities. Knowledge input activities that consist of learning activities 1 to 5 are activities that aid students to obtain the necessary background information and knowledge about effective communication skills. The Enabling skills activities (learning activities 6 to 20) are perhaps the most important activities that the students engaged on to develop their communication skills through formal learning and mLearning. The evaluation and the reflection skills activities (learning activities 19 to 24) are sets of activities to evaluate the students' language communication skills and for them to reflect upon their acquired skills either to improve their skills further or to develop new skills.

Referring to Figure 5.1, the experts also proposed and agreed that learning activity 17 (Learning through modeling such as through watching and learning from effective speakers via YouTube or TED talks) should be connected to learning activity 8 (Online group discussion on task given by the lecturer). The experts viewed that the lessons learnt from experienced speakers could aid students to use best practices in their oral presentation as well as to scaffold their development of communication skills. The experts also suggested activity 8 to be connected to learning activities 7 (Video conferencing among students) and 18 (Search and browse online information) as experts argued that students' 'online group discussion on tasks given by the lecturer' could lead to 'video conferencing and information search' as essential process to develop their communicative and language competence skill. Activities 7 and 18 could lead students to obtain comments from their lecturers and their peers to evaluate their presentations to improve further what they had worked on. Thus, the experts proposed activities 7 and

18 to be conducted before activities 6 (record and upload presentations to elicit comments via mobile phones) and 13 (Synchronous and asynchronous mLearning forum on communication and competence issues). The agreed amendments were fed back into the ISM computer software to regenerate the model. The final reviewed model as generated by the software is shown in Figure 5.2.

Based on the contextual and the relation phrase (as mentioned in findings of Step 2), the arrows in Figure 5.2 indicate the flow from one activity to another as groups of activities in sequence. The three domains interrelated with each other to form an overall structure of sequence activities for the whole mLearning implementation model. For example, activities 9 or 10 need to be conducted before activities 8, 16, and 17. The activities that share a single box such as learning activities 1 and 5, 7 and 18, 6 and 13, and 19 and 23 indicate that the activities could be conducted in any sequence or concurrently as the pairs of activities complement each other. To explain on how this model could be further interpreted and used as a guide, the reachability matrix of the learning activities need to be developed to classify the learning activities as presented in the following steps 7 and 8.

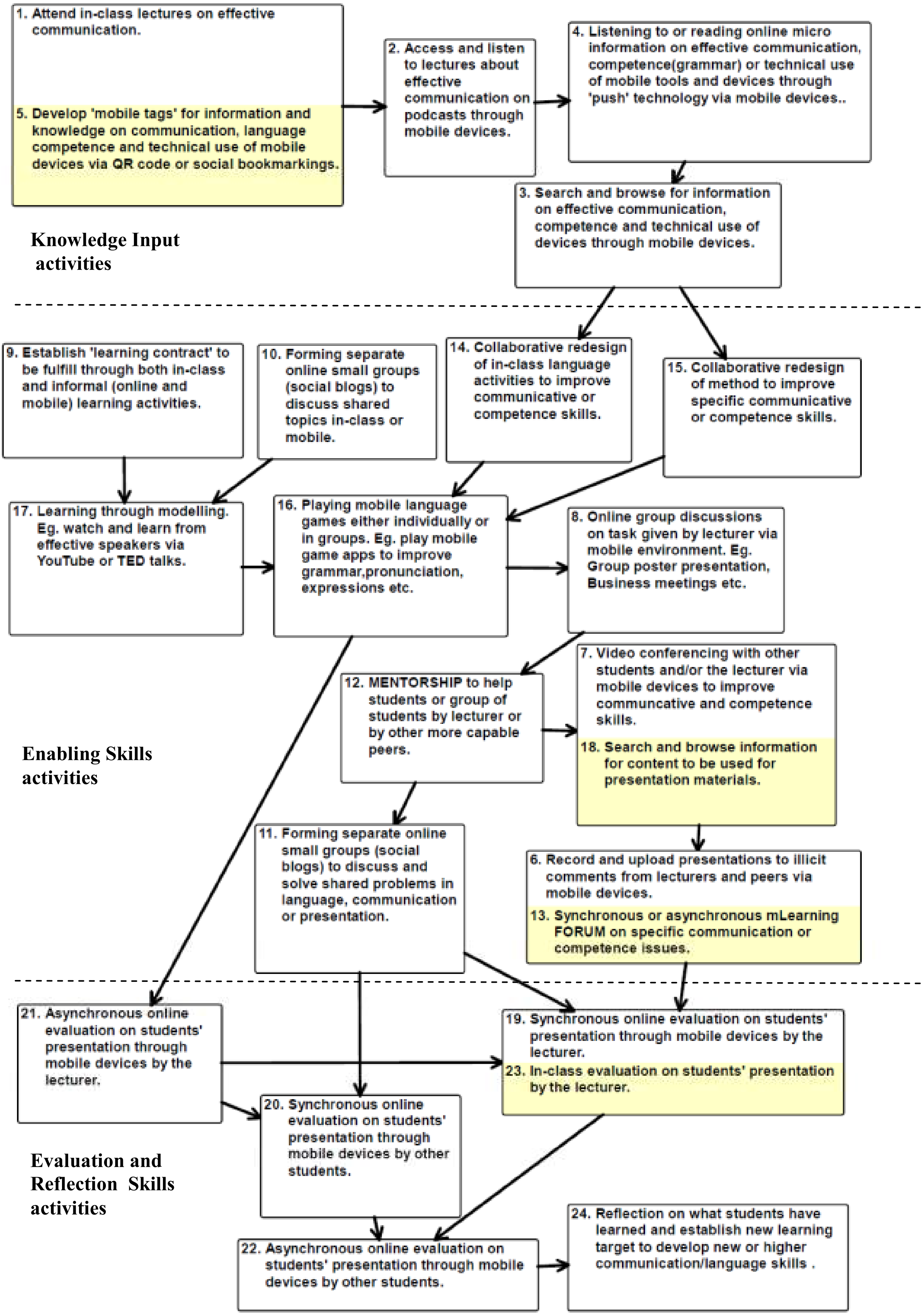


Figure 5.2. Reviewed interpretive structural modeling(ISM) based mLearning implementation model of undergraduate English Language learning for Professional and Communication Skills course.

Findings from Step 7: Classification of the Learning Activities Based on the Model

Based on the model in Figure 5.2, the reachability matrix for the learning activities was developed as shown in Table 5.2.

Table 5.2.

Final Reachability Matrix

LA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	DP
1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	21
2	0	1	1	1	0	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	19
3	0	0	1	0	0	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	17
4	0	0	1	1	0	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	18
5	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	21
6	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1	6
7	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	1	1	8
8	0	0	0	0	0	1	1	1	0	0	1	1	1	0	0	0	0	1	1	1	0	1	1	1	12
9	0	0	0	0	0	1	1	1	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	16
10	0	0	0	0	0	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	16
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	1	6
12	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	1	1	1	0	1	1	1	11
13	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1	6
14	0	0	0	0	0	1	1	1	0	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1	15
15	0	0	0	0	0	1	1	1	0	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	15
16	0	0	0	0	0	1	1	1	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	1	14
17	0	0	0	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	15
18	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	1	1	8
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	4
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	3
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	6
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	4
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
DEP	2	3	5	4	2	17	15	12	1	1	14	13	17	6	6	11	3	15	21	16	12	23	21	24	

Note: LA- Learning activities; DP-Driving Power, DEP- Dependence power

The reachability matrix as shown in Table 5.2 defines the driving power and the dependence power of each learning activity. Horizontally, the total numbers on the right hand side of the table indicates the driving power for each learning activity. It is the total number of all learning activities that the learning activity may help to achieve including it. Vertically, the dependence power of learning activities is the total number of learning activities (including itself), which may help achieve it. For example, for learning activity 1- Attend in-class lectures on effective communication, the driving power is 21, indicating that this learning activity must be conducted before the other activities except activity 9 and 10 which are not related to it. The dependence power of activity 1 is only '2'.

Based on the reachability matrix in Table 5.2, the learning activities are partitioned according to levels of influence. The partitioning is based on the reachability and antecedent set for each learning activity as shown in Table 5.3. The reachability set consists of the element itself and the other elements, which it may help achieve, whereas the antecedent set consists of the element itself and the other elements that may help in achieving it. When ISM is conducted manually without the software, the partitioning of reachability matrix is essential to develop the model by grouping the elements based on the levels. However, in the scope of this study, the partition levels of learning activities are developed to interpret the model further.

Table 5.3

Partitioning of Reachability Matrix

Learning Activity	Reachability Set	Antecedent Set	Inter-section	Level
1	1,2,3,4,5,6,7,8,11,12,13,14,15,16,18,19,20,21,22,23,24	1,5	1,5	15
2	2,3,4,6,7,8,11,12,13,14,15,16,18,19,20,21,22,23,24	1,2,5	2	14
3	3,6,7,8,11,12,13,14,15,16,18,19,20,21,22,23,24	1,2,3,4,5	3	12
4	3,4,6,7,8,11,12,13,14,15,16,18,19,20,21,22,23,24	1,2,4,5	4	13
5	1,2,3,4,5,6,7,8,11,12,13,14,15,16,18,19,20,21,22,23,24	1,5	1,5	15
6	6,13,19,22,23,24	1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,17,18	6,13	4
7	6,7,13,18,19,22,23,24	1,2,3,4,5,7,8,9,10,12,14,15,16,17,18	7,18	6
8	6,7,8,11,12,13,18,19,20,22,23,24	1,2,3,4,5,8,9,10,14,15,16,17,	8	9
9	6,7,8,9,11,12,13,16,17,18,19,20,21,22,23,24	9	9	16
10	6,7,8,10,11,12,13,16,17,18,19,20,21,22,23,24	10	10	16
11	11,19,20,22,23,24	1,2,3,4,5,8,9,10,11,12,14,15,16,17	11	7
12	6,7,11,12,13,18,19,20,22,23,24	1,2,3,4,5,8,9,10,12,14,15,16,17	12	8
13	6,13,19,22,23,24	1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,17,18	6,13	4
14	6,7,8,11,12,13,14,16,18,19,20,21,22,23,24	1,2,3,4,5,14	14	11
15	6,7,8,11,12,13,15,16,18,19,20,21,22,23,24	1,2,3,4,5,15	15	11
16	6,7,8,11,12,13,16,18,19,20,21,22,23,24	1,2,3,4,5,9,10,14,15,16,17	16	10
17	6,7,8,11,12,13,16,17,18,19,20,21,22,23,2	9,10,17	17	14
18	6,7,13,18,19,22,23,24	1,2,3,4,5,7,8,9,10,12,14,15,16,17,18	7,18	6
19	19,22,23,24	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,21,23	19,23	3
20	20,22,24	1,2,3,4,5,8,9,10,11,12,14,15,16,17,20,21	20	5
21	19,20,21,22,23,24	1,2,3,4,5,9,10,14,15,16,17,21	21	9
22	22,24	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23	22	2
23	19,22,23,24	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,21,23	19,23	3
24	24	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24	24	1

As indicated in Table 5.3, the influence level of each learning activity is determined based on its reachability set and antecedent set. There are 16 levels of learning activities with activity 24 at level 1 and at the other end are activities 9 and 10 at level 16. Level 1 is the lowest level and level 16 is the highest. Mapping against the model shown in Figure 5.2, the activities are arranged according to top down level with activities 1,2,3,9, and 10 at the top running down to activities 20, 22, 24 at the bottom of the model. In order to indicate the hierarchy of the learning activities clearly based on the level partitions, the learning activities are rearranged based on the level as shown in Table 5.4.

Table 5.4

Level Partition of Reachability Matrix

Act.	Learning Activities	Level
24	Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.	1
22	Asynchronous online evaluation on students' presentation through mobile devices by other students.	2
19	Synchronous online evaluation on students' presentation through mobile devices by the lecturer.	3
23	In-class evaluation on students' presentation by the lecturer.	3
6	Record and upload presentations to elicit comments from lecturers and peers via mobile devices.	4
13	Synchronous or asynchronous mLearning forum on specific communication or competence issues.	4
20	Synchronous online evaluation on students' presentation through mobile devices by other students.	5
7	Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skills.	6
18	Search and browse information for content to be used for presentation materials.	6
11	Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication or presentation.	7
12	MENTORSHIP to help students or group of students by lecturer or by other more capable peers.	8
8	Online group discussions on task given by lecturer via mobile environment. Eg. Group poster presentation, Business meetings etc.	9
21	Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.	9
16	Playing mobile language games either individually or in groups. Eg. play mobile game apps to improve grammar, pronunciation, expressions etc.	10

14	Collaborative redesign of in-class language activities to improve communicative or competence skills.	11
15	Collaborative redesign of method to improve specific communicative or competence skills.	11
3	Search and browse for information on effective communication, competence and technical use of devices through mobile devices.	12
4	Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.	13
2	Access and listen to lectures about effective communication on podcasts through mobile devices.	14
17	Learning through modeling. Eg. watch and learn from effective speakers via YouTube or TED talk	14
1	Attend in-class lectures on effective communication.	15
5	Develop 'mobile tags' for information and knowledge on communication, language competence and technical use of mobile devices via QR code or social bookmarking.	15
9	Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.	16
10	Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile.	16

Findings from Steps 8 and 9: Analysis and Interpretation of the model.

Finally based on the model in Figure 5.2, the reachability matrix and the level partition of reachability matrix as shown in Table 5.3, and Table 5.4 respectively, the learning activities are further classified according to clusters based on their driving power and dependence power. The classification is divided into four categories (Mandal & Deshmukh, 1994): a) Autonomous activities; b) Dependent activities; c) Linkage activities; and d) Independent activities as shown in Figure 5.3.

Based on Figure 5.3, it is observed that learning activities 9 and 10 share a driving power of 16 and dependence power of 1 and thus, they are positioned in the coordinate that corresponds to the driving power of 16 (Y-axis) and the dependence power of 1(X-axis). The aim of this classification is to analyze the driving power and dependence power of the activities. The first cluster, which is the Autonomous activities cluster, classifies activities that have both weak driving power and dependence power. This means that any activities classified under this cluster are relatively disconnected from the mLearning implementation. However, based on Figure 5.3, there is no activity under this cluster for the current study. The second cluster consists of Dependent activities that have weak driving power but strong dependence power. Learning activities 6, 7, 11, 13, 18, 19, 20, 21, 22, 23, and 24 are classified in this category. The third cluster or the Linkage activities consist of learning activities that have strong dependence and driving power. These activities are being labeled as important links between the Dependent activities and the Independent activities. The learning activities 8 and 12 fall into this category. Plotting against the model in Figure 5.2, these activities link the Dependent activities (Enabling Skills activities, and the Evaluation and Reflection skills activities) with Independent activities (which are mostly Knowledge Input skills activities and some Enabling Skills activities).

The final cluster consists of Independent activities. Learning activities which fall into this cluster have the highest driving power but with weaker dependence power. Nevertheless, activities under this cluster need to be conducted before other activities. As observed in Figure 5.3, learning activities 1, 2,3,4,5, 9, 10, 14, 15, 16, and 17 are classified under this category. The interpretations of these findings are elaborated in Chapter 7.

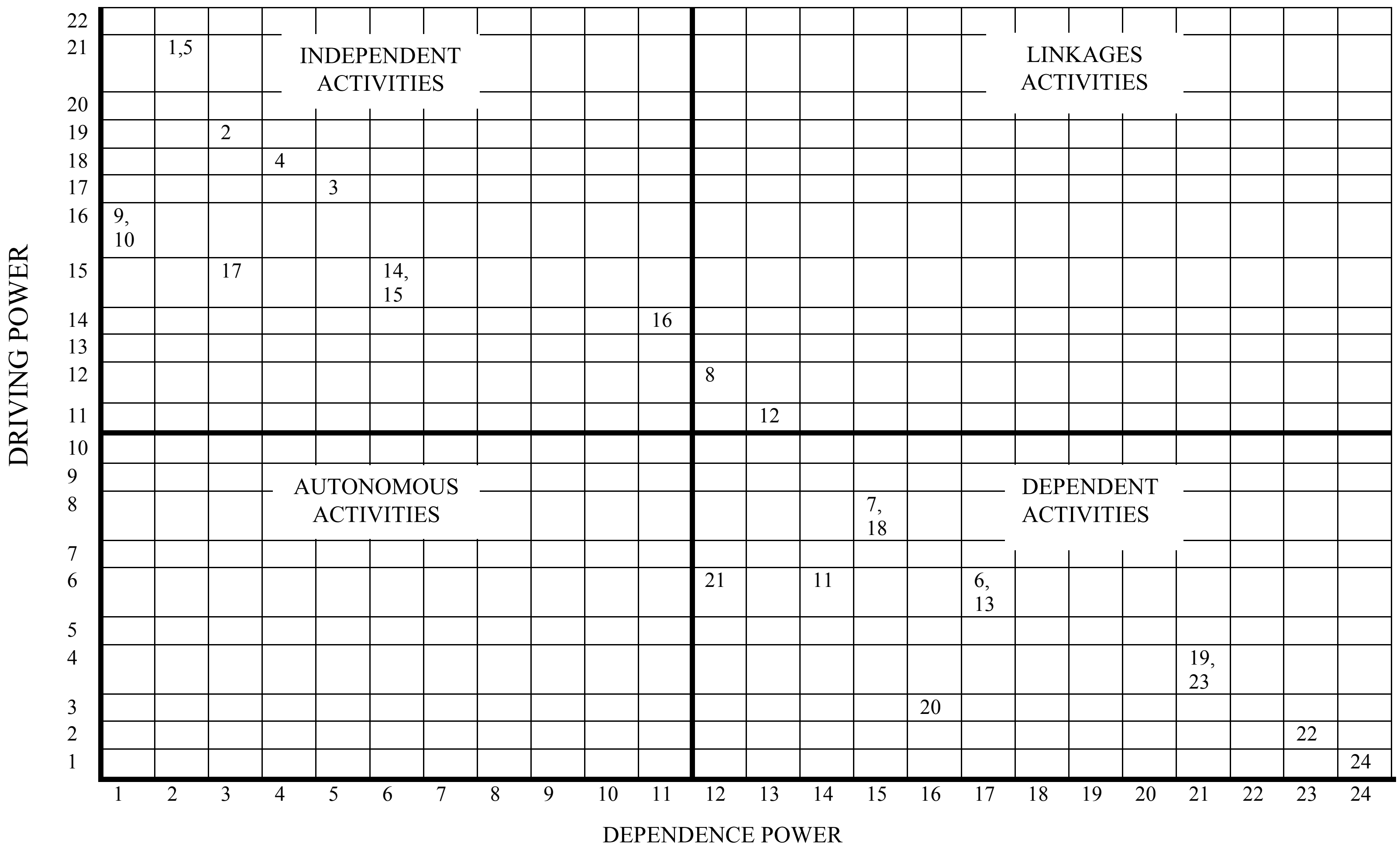


Figure 5.3. Driver- Dependence matrix for mLearning implementation model for undergraduate English learning for Professional and Communication Skills course

Summary of Findings of Phase 2

The result of this phase is the interpretive structural mLearning implementation model for undergraduate English Language learning as shown in Figure 5.2. The model was developed using experts' opinion using interpretive structural modeling technique, which is a powerful decision-making tool used initially in the economic and business sector (Warfield, 1973, 1974, 1976). As choice of focus of the study, the model was developed for the Professional Communication Skills course, which is compulsory undergraduate English for specific purpose course of an engineering private tertiary institution. The model consists of 24 learning activities, which is an integration of mostly informal mLearning activities and existing PCS formal learning activities. The learning activities are connected to each other in a hierarchical manner based on pair wise technique. The final model is divided into three sections or domains: Knowledge Input activities, Enabling Skills activities, and Evaluation and Reflection activities. The learning activities were further analyzed to form a Driver-dependence matrix to determine the clusters for each activity based on their respective driving power and dependent power. There are four categories of clusters: Independent cluster, Linkage cluster, Dependent cluster, and autonomous cluster (Figure 5.3). The clusters could determine activities that needed to be conducted prior to other activities as well as the combination of activities that could aid the students to fulfill their language learning needs. The output of the study is a proposal in modeling how mLearning could be incorporated through a series of integrated learning activities both formal and informal as a support to aid the undergraduate students to fulfill their learning needs as well as to achieve the learning course goals.

CHAPTER 6

FINDINGS OF PHASE 3: EVALUATION OF THE MODEL

Introduction

The main aim of the final phase of the study was to evaluate the mLearning implementation model developed in Phase 2. The evaluation phase is essential to determine the suitability of the model as a guide to mLearning implementation as learning support to undergraduate language learning. As mentioned in the methodology chapter (Chapter 3), the study employed the fuzzy Delphi method to evaluate the model using experts' opinion. The evaluation was conducted on 48 experts from the education field. The presentation of the findings for this phase is divided into two parts. The first part presents the background information of the experts to validate their expertise in evaluating the model. The second part reveals the experts' views on the suitability of the model as a guide to instructors in the implementation of mLearning in formal undergraduate language learning.

Findings of the Evaluation Phase

Background Information of the Experts

The evaluation phase was conducted on 48 experts. Table 6.1 shows 93.8% (n = 45) of the experts were from the education field while the rest 6.3% (n = 3) were from non-education fieldwork. From the education field, 64.6% (n = 31) of them either teach or work in the English Language field 29.2% (n = 14) were from non-English Language field.

Table 6.1

Experts' Field of Work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Education (TESL/TESOL/etc)	31	64.6	64.6	64.6
	Education (Non TESL)	14	29.2	29.2	93.8
	Non-Education	3	6.3	6.3	100.0
	Total	48	100.0	100.0	

Note : TESL- Teaching English as a Second Language ; TESOL- teaching English as Other Language

A majority of them (75%, n = 36) have more than 10 years of working experience with 27.1% (n = 13) of them were with above 20 years of experience (Table 6.2). In terms of their academic qualification, 22.9% (n = 11) possessed the highest qualification (PhD), 35.4% (n = 17) with Masters, and 41.7% (n = 20) with basic degree (refer to Table 6.3).

Table 6.2

Experts' Working Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 5 Years	2	4.2	4.2	4.2
	5-10 Years	10	20.8	20.8	25.0
	11-20 Years	23	47.9	47.9	72.9
	Above 20 years	13	27.1	27.1	100.0
	Total	48	100.0	100.0	

Table 6.3

Experts' Highest Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	11	22.9	22.9	22.9
	Master	17	35.4	35.4	58.3
	Degree	20	41.7	41.7	100.0
	Total	48	100.0	100.0	

In the aspect of experts' use of mobile technologies, Table 6.4 indicates that the majority of them (47.9%, n = 23) were moderate in computer or ICT related skills, while 27.1% (n = 13) of them were skilful but 25% (12) of them were either low skilled or having no skill. In terms of mobile technical skills, Table 6.5 reveals that most of them (45.8%, n = 22) claimed that they were highly skilled, while 39.6% (n = 19) indicated that they have average skills. Only 14.6% (n = 7) stated that they are low skilled in handling mobile devices.

Table 6.4

Experts' Computer or ICT Related Skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Skilful	13	27.1	27.1	27.1
	Moderate	23	47.9	47.9	75.0
	Low skilled	7	14.6	14.6	89.6
	None	5	10.4	10.4	100.0
	Total	48	100.0	100.0	

Note: Skillful (Develop and managing website or/and blogs) ;
Moderate (Able to communicate through social software like *Facebook*, *Twitter*, Likendl etc.);
Low skilled (use of office spreadsheets such as words, PowerPoint; receive and sending emails; browse and search for information on the internet)

Table 6.5

Experts' Mobile Technology Technical Skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	22	45.8	45.8	45.8
	Average	19	39.6	39.6	85.4
	Low	7	14.6	14.6	100.0
	Total	48	100.0	100.0	

Based on analysis shown in Tables 6.1 to 6.5, the participants fit the description to participate as experts in evaluating the model. In selecting experts for a specific Delphi study, Pill (1971) and Oh (1974) stated that the experts should have some background or experience in the related field of study, be able to contribute their opinions to the needs of the study, and willing to revise their initial judgment to reach consensus among experts. In terms of background experience and academic qualification in related field, as presented in the Tables 6.1 to 6.5, a majority of the participants were from the teaching of English Language field. Hence, they were suitable to evaluate the language-learning model of the study. The participants have some knowledge in using mobile technologies too. This is an added advantage in evaluating the mLearning implementation model. The following report is the experts' evaluation of the model.

Findings of the Evaluation of the mLearning Implementation Model for Undergraduate English Language Learning

Based on a seven-point linguistic scale, the responses of the participants (experts) to the evaluation survey questionnaires were obtained as shown in Appendix E. Based on the participants' feedback (refer to Appendix E), the threshold value, 'd' was calculated for all questionnaire items as shown in Table 6.6 to determine the consensus level among experts for each item. The threshold values in **bold** were the items that exceeded the threshold value 0.2. This indicated the individual participant's opinions that are not in consensus with the rest of the other participants' view for the particular questionnaire item (Cheng & Lin, 2002). For example, for questionnaire item 1.1, participants of number 12, 32, 33, 40, and 45 were not in consensus with the other participants in their agreement on the mLearning activities as proposed in the model. However, as mentioned in the methodology chapter, the calculation of the threshold value is to find the threshold values for the overall questionnaire items.

Table 6.6

Threshold Value, d, *for Survey Questionnaire Items*

Exp	1.1	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	5.4	5.5	5.6	5.7
1	0.1078	0.1107	0.1127	0.0622	0.0361	0.1085	0.1294	0.1067	0.107	0.0355	0.12421	0.1555	0.086	0.1614	0.1039	0.0388	0.1162	0.1122	0.0868	0.1376
2	0.1078	0.1107	0.1127	**0.413**	0.0361	0.1085	0.1294	0.1067	0.107	0.1871	0.12421	0.1555	0.086	0.1614	0.1039	0.1013	0.1162	0.1122	0.0868	0.1376
3	0.1078	0.1107	0.182	0.0715	0.0361	0.1085	0.0383	0.1067	0.107	0.1871	0.12421	0.139	0.086	0.1331	0.1039	0.1013	**0.3672**	0.1122	0.0868	0.1376
4	0.1078	0.1107	0.1127	**0.4313**	0.0361	0.1085	0.1294	0.1067	0.107	0.1074	0.035519	0.1555	0.086	**0.3248**	0.1039	0.1013	0.1162	0.1122	0.0868	0.1376
5	0.0384	0.1107	0.182	0.0715	0.1063	0.1085	0.1294	0.1067	0.107	0.1074	0.12421	0.1555	0.086	0.1614	0.1039	0.1013	0.1162	0.1122	0.0868	0.1569
6	0.0384	0.0295	0.182	0.0622	**0.2866**	0.0327	**0.3552**	0.1067	0.0341	0.0355	**0.360764**	0.139	0.086	**0.3248**	0.0367	**0.3842**	0.1162	0.1823	0.0433	0.1376
7	0.1078	0.0295	0.1127	0.0715	0.0361	0.0327	0.0383	**0.379**	0.0341	0.0355	0.12421	0.139	0.086	0.1614	0.0367	0.1013	0.1162	0.1823	0.0433	0.1569
8	0.0384	0.0295	0.064	0.0715	0.0361	0.0327	0.0383	0.0354	0.1876	0.1074	0.12421	0.139	0.086	0.1614	0.0367	0.1013	0.1794	0.1823	0.0433	**0.3482**
9	0.1078	0.1107	0.1127	0.0715	0.1063	0.1085	0.0383	0.0354	0.107	0.1074	0.12421	0.0428	0.086	0.1331	0.1907	0.1013	0.1162	0.1122	0.0868	0.0357
10	0.0384	0.1107	0.1127	0.0715	0.1883	0.1085	0.1294	0.0354	0.107	0.1074	0.170409	0.1555	0.086	0.0508	0.1039	0.1013	0.1162	0.1122	0.0868	0.1376
11	0.0384	0.1107	0.182	0.0715	0.0361	0.1085	0.1294	0.0354	0.107	0.0355	0.035519	**0.239**	0.086	0.0508	0.0367	**0.3842**	0.1162	0.1122	0.0433	0.0357
12	**0.2857**	0.1107	0.1127	0.0715	0.0361	0.0327	**0.3552**	0.0354	0.107	0.1074	0.035519	0.0428	0.0489	0.1331	0.1907	0.1013	0.1162	0.1823	0.0433	0.0357
13	0.1078	**0.3764**	**0.3067**	0.0715	**0.3792**	0.0327	0.1652	0.0354	0.1876	0.1074	0.035519	0.139	**0.2086**	0.1331	0.0367	0.1013	0.1162	0.1823	**0.2095**	0.1569
14	0.0384	0.1842	0.1127	0.0622	0.1883	0.0327	0.1294	0.1067	0.1876	0.1871	0.170409	0.1555	0.0489	0.1614	0.1907	0.1013	0.1162	0.1122	0.0433	0.1569
15	0.1078	0.1842	0.182	0.0715	0.1063	0.1085	0.1294	0.1067	0.107	0.1074	0.12421	0.1555	0.0489	**0.3248**	**0.3818**	0.1013	**0.3672**	0.1122	0.0433	**0.3482**
16	0.1869	0.0295	0.064	0.0715	0.1883	0.1085	0.1652	0.1067	**0.2861**	0.0355	0.12421	0.139	**0.2086**	0.1331	0.1039	0.0388	0.1794	0.1122	0.0433	0.0357
17	0.0384	0.0295	0.064	0.0715	**0.5763**	**0.3778**	**0.5523**	**0.379**	0.1876	**0.3782**	**0.360764**	**0.3319**	**0.2086**	0.0508	0.1039	0.0388	**0.3672**	**0.3723**	0.0433	0.0357
18	0.1078	0.1107	0.1127	0.0715	0.1063	0.0327	0.0383	0.0354	0.1876	0.1074	0.12421	0.139	0.086	0.1331	0.1039	0.0388	0.1794	0.1823	0.0868	0.1376
19	0.1078	0.0295	0.1127	0.0715	0.1063	0.0327	0.1294	0.0354	0.107	0.1074	0.12421	0.139	**0.2086**	0.1614	0.1039	0.1932	0.1162	0.1122	0.0868	0.1376
20	0.0384	0.0295	0.1127	0.0715	0.1063	0.1085	0.0383	0.0354	0.107	0.1871	0.12421	0.1555	0.086	0.1614	0.1039	0.1013	0.1162	0.1122	**0.2095**	0.1376
21	0.1078	0.0295	0.1127	**0.2229**	0.0361	0.1085	**0.3552**	0.0354	0.107	0.0355	0.12421	0.0428	0.086	0.0508	0.0367	0.1932	0.1162	0.1122	**0.2095**	0.1376
22	0.1078	0.0295	0.1127	**0.2229**	0.0361	0.1085	0.1652	0.0354	0.107	0.1074	0.035519	0.0428	0.0489	0.0508	0.0367	0.0388	0.1162	0.1122	0.0868	0.1376
23	0.1078	0.1842	0.064	**0.413**	0.1063	0.1862	0.1294	0.0354	0.107	0.1074	0.035519	0.139	0.0489	0.1331	0.1907	0.1932	0.1162	0.1122	0.0868	0.1376
24	0.0384	**0.3764**	0.1127	**0.2229**	0.0361	0.1862	0.0383	0.1878	0.107	0.0355	0.035519	0.139	**0.2086**	**0.3248**	0.0367	0.1013	0.1162	0.1122	0.0433	0.1376
25	0.0384	0.1842	0.182	0.0715	0.1063	0.1085	0.0383	0.0354	0.0341	0.0355	0.170409	0.0428	0.086	0.0508	**0.3818**	0.1013	0.1162	0.1122	**0.2095**	0.0357
26	0.1078	0.0295	**0.2133**	0.0622	0.1063	0.1085	0.1652	0.1067	0.0341	0.0355	0.170409	0.139	0.086	0.1331	0.1039	0.1013	0.1162	0.0398	**0.2095**	0.0357
27	0.1078	0.1842	0.064	0.0715	0.1063	0.1085	0.1294	0.0354	0.1876	0.1074	0.12421	0.0428	0.086	0.0508	0.1039	0.0388	0.0465	0.0398	0.0433	0.0357
28	0.0384	0.1842	0.064	0.0715	0.0361	0.1862	0.1294	0.1878	0.1876	0.1074	**0.270052**	0.0428	**0.2086**	0.1331	0.1039	0.1932	0.0465	0.1823	**0.2095**	0.1376

29	0.1078	0.1107	0.064	0.0715	0.1063	0.1085	0.1294	0.1067	0.107	0.1074	0.12421	0.139	0.0489	0.1614	0.1039	0.1013	0.0465	0.1122	**0.2095**	0.1376
30	0.1078	0.1842	0.182	0.0715	0.0361	0.1085	0.1294	0.1878	0.1876	0.1074	0.12421	0.139	0.0489	0.1331	0.0367	0.1013	0.1794	**0.3723**	**0.2095**	0.0357
31	0.1078	0.0295	0.1127	0.0715	0.1063	0.1085	0.1294	0.1878	0.1876	0.1074	0.12421	0.1555	**0.2086**	0.1331	0.0367	0.1013	**0.3672**	0.1823	0.0868	0.1569
32	**0.5739**	0.0295	0.182	**0.413**	0.1063	0.0327	0.1652	**0.379**	0.107	0.1074	**0.352435**	0.0428	**0.3995**	0.1614	0.1039	0.1013	**0.3672**	**0.3723**	**0.4023**	0.1569
33	**0.5739**	0.1842	**0.3067**	0.0622	0.1063	0.1862	0.1652	0.1067	0.1876	0.0355	**0.360764**	0.0428	**0.2086**	0.1614	0.1039	0.1013	0.1162	0.1122	0.0433	0.0357
34	0.1078	0.1107	0.1127	0.0622	0.1063	0.1085	0.1294	0.1067	0.107	0.1871	0.12421	**0.3319**	0.086	0.0508	0.1039	0.1932	0.0465	0.1823	0.0433	0.1376
35	0.1078	0.0295	0.064	0.0715	0.1063	**0.2842**	0.1294	0.1067	0.107	**0.3782**	0.12421	0.1555	0.086	0.0508	0.1907	0.0388	0.1162	0.1122	**0.2095**	0.1376
36	0.1869	0.1107	0.064	0.0715	**0.3792**	0.0327	0.1294	0.1067	0.107	0.0355	0.12421	0.1555	0.0489	0.1331	**0.3818**	0.0388	0.1794	0.1122	**0.2095**	0.1376
37	0.1078	0.1107	0.064	0.0622	0.0361	0.0327	0.1294	0.1067	0.107	0.1871	0.12421	0.1555	**0.2086**	0.1331	0.1039	0.1932	0.1162	0.0398	0.0433	0.1376
38	0.0384	0.1107	0.064	0.0715	0.1063	0.1862	0.1652	0.1067	0.1876	0.1074	**0.360764**	0.1555	0.086	0.0508	0.1039	**0.3842**	**0.3672**	0.1823	**0.4023**	0.1376
39	0.0384	0.0295	0.1127	0.0715	0.1063	0.1862	0.1294	**0.379**	0.107	0.1871	0.12421	0.139	0.086	0.1614	0.1039	0.0388	0.0465	0.1122	0.0433	0.1376
40	**0.3771**	0.0295	**0.3067**	0.0715	0.1063	**0.3778**	0.1294	0.1067	0.107	0.1074	0.12421	0.1555	0.086	0.1614	0.1039	0.0388	0.1162	0.1122	**0.2095**	0.1376
41	0.0384	0.1107	0.182	0.0715	0.1063	0.1085	0.1652	0.1067	0.107	0.1074	0.12421	0.139	0.086	0.1614	0.1039	0.0388	0.1162	0.1122	0.0868	0.1569
42	0.1078	0.1107	0.1127	0.0715	0.1063	0.1085	0.1294	0.1067	0.1876	0.1074	0.12421	0.1555	0.086	0.1614	0.1039	0.1013	0.1794	0.1122	0.0868	0.0357
43	0.1078	0.0295	0.182	0.0622	0.1063	0.1085	0.1652	0.1067	0.107	0.1074	**0.360764**	0.139	0.086	0.1614	0.1039	0.1013	0.1162	0.1122	0.0433	0.1376
44	0.1078	0.1107	0.182	0.0622	0.1063	0.0327	0.1294	0.1067	0.107	0.1074	0.170409	0.139	0.086	0.1614	0.1907	0.1013	0.1162	0.1122	0.0433	0.1376
45	**0.5739**	0.1107	0.182	0.0715	**0.3792**	0.0327	**0.3552**	0.1067	0.1876	0.1871	0.035519	0.1555	0.086	0.1614	0.0367	0.1013	0.1162	0.1122	0.0868	0.1376
46	0.1078	0.1107	0.182	0.0715	0.1063	**0.3778**	0.1294	0.1067	0.107	0.1074	0.035519	0.1555	0.086	0.1614	0.1039	0.1013	0.1162	0.0398	0.0868	0.0357
47	0.1078	0.1107	0.064	0.0715	0.1063	0.1085	0.1294	0.1878	0.0341	0.1074	**0.360764**	0.1555	0.086	0.1331	0.0367	0.1013	0.1794	0.1122	**0.2095**	0.0357
48	0.1078	0.1107	0.064	0.0715	0.1063	0.1085	0.1294	0.1067	0.1876	**0.3782**	0.12421	0.1555	0.086	**0.3248**	0.1907	0.1932	0.0465	0.1122	0.0868	0.1263

Based on Table 6.6, the overall threshold value,'d', was calculated as: [960 (total experts' responses) – 97(total responses more than 0.2) ÷ 960] x 100%= 89.9%. This means that the threshold value 'd' has exceeded 75% which indicates that the participants have reached the required consensus in their views for all questionnaire items of the evaluation survey questionnaire in evaluating the mLearning implementation model for the undergraduate English Language learning course of this study. As elaborated in Chapter 3, a threshold value of less than 75% requires a second round of Fuzzy Delphi where the participants need to respond to the evaluation survey questionnaire again to reevaluate their views. Subsequent rounds may be needed until consensus is achieved. Since a consensus among the participants had been achieved, the next step was to seek the findings for the participants' collective opinions on the evaluation of the model in terms of their agreement on the following aspects:

1) The suitability of the elements (learning activities);
2) The domain classification of the learning activities;
3) The cluster classification of the learning activities;
4) The relationships among the learning activities; and
5) The suitability of the model in teaching and learning activities in aiding the students to fulfill their language learning needs and course outcomes.

Aspects (1) to (4) were evaluated as these aspects represent the elements (learning activities) and the relationships among the elements, which constitute the main parts of the structure of the model. The suitability and clarity of the model in giving a clear and valid guide to mLearning implementation depend on the structure of the model. Aspect (5) was included to evaluate the purpose of the model.

The aspects above are consistent to the research question for this phase:

a. What is the experts' agreement on the suitability of the mLearning activities proposed in the mLearning implementation model for Professional and Communication Skills course? (Aspect 1)

b. What is the experts' agreement on the classification of the mLearning activities based on the three domains (Knowledge Input activities, Enabling Skills activities, and Evaluation and Reflection activities) as proposed in the mLearning implementation model for Professional and Communication Skills course? (Aspect 2)

c. What is the experts' agreement on the list of mLearning activities in the respective four clusters (Independent, Linkage, Dependent, and Autonomous) as proposed in the mLearning implementation model for Professional and Communication Skills course? (Aspect 3)

d. What the experts' agreement on the relationships among the mLearning activities is as proposed in the mLearning implementation model for Professional and Communication Skills course? (Aspect 4)

e. What is the experts' agreement on the suitability of the mLearning implementation model in the teaching and learning of Professional and Communication Skills course? (Aspect 5)

Thus, the report of the findings is as the following.

Aspect 1: Suitability of elements (Learning activities) of the mLearning implementation model. In response to this questionnaire item, the experts had to respond to the following question: 'Do you agree with the mLearning activities proposed in the model in connection to the learning outcome? (Item 1.1)". As elaborated in Chapter 3, the accepted defuzzification value for each questionnaire item should be between 24 (minimum value) to 46.8 (maximum value). For this item, Table 6.7 indicates a defuzzification value of 42.03 that was in the range of 33.6 to 46.8. This revealed that all experts consensually agreed with this questionnaire item. Based on Figure 3.10 (pp. 143) in Chapter 3, the experts' agreement was between consensually agreed to agree strongly to all the proposed learning activities in the model (Figure 5.2).

Table 6.7

Experts' view on mLearning activities proposed in the model

Item		1.1	
Average response	0.75	0.90	0.96
Fuzzy evaluation	36	43.1	45.9
Defuzzification value		42.03	

Aspect 2: Views on the domain classification of mobile learning activities of the mLearning implementation model. In order to elicit the participants' views whether they agreed with the domain classification of mobile learning in Figure 5.2, the participants were given the following questionnaire item to respond accordingly:

2.1 Grouping of mLearning activities into three domains as shown in the model: Knowledge Input Activities, Enabling Skills activities, and Evaluation and Reflection activities.

2.2 List of activities grouped under Knowledge Input Activities as shown in the model.

2.3. List of activities grouped under Enabling Skills Activities as shown in the model.

2.4 List of activities grouped under Evaluation and Reflection Activities as shown in the model.

Based on Table 6.8, the findings indicated participants' consensus agreement on the grouping of the mLearning activities to their respective domains (Item 2.1) with a defuzzification value of 42.05, and to all the list of activities under Knowledge Input activities, Enabling skills activities, and Evaluation and Reflection activities. For the list of activities, Enabling skills activities (Item 2.3) received the highest consensus agreement from the participants with a defuzzification value of 43.95 while Knowledge Input activities (Item 2.2) received the lowest count (defuzzification value= 38.8). The agreement among the participants for Enabling Skills activities (Item 2.3) and Evaluation and Reflection activities (Item 2.4) were in the range from consensually agreed to consensually strongly agree as the defuzzification values were above 42 (based on Figure 3.10, pp. 143). However, Knowledge Input Skills activities only received the range of moderately agreed to agree level. Nevertheless, the defuzzification values fell in the range of the participants' consensus agreement. Thus, conclusively, the participants consensually agreed with the proposed classification of mLearning activities in the mLearning implementation model according to the three domains: Knowledge Input Skills activities, Enabling Skills activities, and Evaluation and Reflection skills activities, as well as consensually agreed to the list of activities in each domain.

Table 6.8

Experts*' Views on the Domain Classification of Mobile Learning Activities*

Item		2.1			2.2			2.3			2.4	
Average response	0.74	0.90	0.97	0.65	0.82	0.94	0.80	0.93	0.98	0.75	0.90	0.96
Fuzzy evaluation	35.6	43	46.6	31	39.5	45.2	38.4	44.7	46.8	36	43.2	46.2
Defuzzification value		42.05			38.8			43.65			42.15	

Aspect 3: Views on the cluster classification of mobile learning activities of the mLearning implementation model. In terms of the participants' views on classification of mLearning activities based on the four clusters (Independent, Linkage, Dependent and Autonomous), the questionnaire items used were listed as the following:

3.1. Classification of mobile learning activities in the independent cluster.

3.2. Classification of mobile learning activities in the linkage cluster.

3.3. Classification of mobile learning activities in the dependent cluster.

3.4. Classification of mobile learning activities in the autonomous cluster.

Table 6.9 shows the findings of the participants' collective views on cluster classification of mLearning activities. The defuzzification values for all items indicate that the participants consensually agreed on the cluster classification and the list of activities under each cluster as proposed in the model.

Table 6.9

Experts' Views on the Cluster Classification of Mobile Learning Activities

Item		3.1			3.2			3.3			3.4	
Average response	0.75	0.90	0.97	0.73	0.87	0.95	0.75	0.90	0.96	0.75	0.90	0.97
Fuzzy evaluation	35.8	43.1	46.4	34.8	41.8	45.4	36	43.1	46.3	36	43	46.5
Defuzzification value		42.1			40.95			42.13			42.13	

Based on Table 6.9, the participants consensually agreed to agree strongly to the classification of mLearning activities for Independent cluster, Dependent cluster and Autonomous cluster with the defuzzification values of 42.1, 42.13 and 42.13 respectively as these values are above 42 (based on Figure 3.10, pp. 143). Only the mLearning activities for Linkage cluster (Item 3.2) receives less than 42 (which is 40.95) that indicates participants' consensual agreement from moderately agree to agree.

Aspect 4: Views on the relationships of mobile learning activities of the mLearning implementation model. The three important features of an interpretive structural model are the elements, the positioning of the elements, and the relationship among the elements in the development of the model. The findings, which have been presented up to this stage dealt with the elements and the positioning of the elements based on the first three aspects (Aspect 1 to 3). The fourth aspect describes the findings for the relationship among the elements or the learning activities. In evaluating the relationship of the learning activities in the model, the participants had given their views based on the following questionnaire items:

4.1. Relationships among the mobile learning activities in the Knowledge Input Activity domain as shown in the model in aiding the students to achieve their learning needs and course outcomes.

4.2. Relationships among the mobile learning activities in the Enabling Skills Activity domain as shown in the model in aiding the students to achieve their learning needs and course outcomes.

4.3. Relationships among the mobile learning activities in the Evaluation and Reflection Activity domain as shown in the model in aiding the students to achieve their learning needs and course outcomes.

4.4. Overall relationships among the mobile learning activities as shown in the model in aiding the students to achieve their learning needs and course outcomes.

Table 6.10 shows the findings of participants' views on the questionnaire items for this aspect. Similar to the other aspects, the defuzzification values for all items for this aspect are above the minimum value of 33.6 that indicates consensus agreement on the relationship of learning activities as proposed in the model (Figure 5.2). In detail, the relationship among learning activities in the Knowledge Input activities (Item 4.1) receives the highest value of agreement (42.08) compared to Enabling Skills activities (Defuzzification value - 41.25) and Evaluation and Reflection skills activities (Defuzzification value -39.95).

Table 6.10

Experts' Views on the Relationships among Mobile Learning Activities

Item		4.1			4.2			4.3			4.4	
Average response	0.75	0.90	0.96	0.73	0.88	0.95	0.68	0.85	0.95	0.78	0.92	0.98
Fuzzy evaluation	36	43	46.3	35	42.2	45.6	32.8	40.7	45.6	37.4	44	46.8
Defuzzi. value		42.08			41.25			39.95			43.05	

However, when probed on the overall relationship of the activities (Item 4.4), the defuzzification registered a high value of 43.05 that showed participants' consensual agreement to strong agreement on the relationship of the elements. The value was higher than the values in individual relationships in each domain (Knowledge Input Activities, Enabling Skills activities, and Evaluation and Reflection activities). It seemed that the participants valued the relationship among the learning activities more positively when the learning activities are connected as a whole system.

Aspect 5: Views on the overall suitability of the model as guide to mLearning teaching and learning context. The final aspect of the evaluation of the model was the participants' views on the suitability of the model in the context of teaching and learning in aiding the students to fulfill their language learning goals. Table 6.11 shows the result of this aspect accordingly to the elaborated questionnaire items for the aspect.

Table 6.11

Experts' Views on the Suitability of the Model in Teaching and Learning

Item		5.1			5.2			5.3			5.4	
Average response	0.68	0.84	0.94	0.75	0.90	0.97	0.76	0.90	0.97	0.75	0.88	0.94
Fuzzy evaluation	32.6	40.3	45.1	36.2	43.2	46.4	36.4	43.3	46.4	35.6	42.3	45.5
Defuzzi. value		39.58			42.25			42.35			41.43	

Item		5.5			5.6			5.7	
Average response	0.75	0.89	0.96	0.77	0.93	0.99	0.71	0.87	0.95
Fuzzy evaluation	36.6	43.1	46.1	33.8	41.7	46.2	36.2	43.5	46.7
Defuzzification value		42.23			40.85			42.48	

The items as indicated in the Table 6.11 are as the following:

5.1. The model shows a clear guide on how a language communication skills course could be conducted using mLearning in complementing the conventional classroom learning.

5.2. It is practical to use a network of interrelationship of learning activities in developing a model of mLearning implementation in guiding the curriculum implementers to conduct mLearning language lessons.

5.3. The model diagram shows clearly how formal classroom learning activities could merge with informal mLearning activities to form a holistic learning experience for the students.

5.4. The model diagram shows clearly how mLearning could promote and capitalize collaborative learning through formation of large and small 'learning society' among students through choice of collaborative online learning activities and the interrelationships among the activities.

5.5. The model diagram shows clearly how one activity connects to other activities in aiding the students through mLearning in achieving their learning outcomes.

5.6. The model could be used to guide the planning of course unit lessons in facilitating students' learning.

5.7. The model could be used as an example to develop other implementation models for other course subjects.

Referring to the result for item 5.1 in Table 6.11, the participants consensually agreed with a defuzzification value of 39.58 (above the minimum value of 33.6) that the model offers a clear guide on how a language communication skills course could be conducted using mLearning in complementing the conventional classroom learning. The overall range of agreement for this item was from consensually moderately agreed to agree consensually. Item 5.6 (defuzzification value- 40.85) also shared the same range of agreement. It shows that the participants also moderately agreed to agree on how the model could be used to guide in planning the course unit lesson in class.

However, higher agreement level (consensually agreed to strongly agree) among experts are indicated for items 5.2, 5.3, 5.4, 5.5, and 5.7 with their respective defuzzification value of 42.25, 42.35, 41.43, 42.23, and 42.48. The findings indicate that the participants consensually agreed that it is a practical approach in using the interrelationship of learning activities in developing the model to guide the course instructors in conducting mLearning language lessons in the classroom (Item 5.2). They also agreed that the relationship of learning activities in the model shows clearly how formal classroom learning could be interrelated with informal mLearning in aiding students' learning experience (Item 5.3). In this aspect, the participants were highly positive that the formal and informal learning experience could be further enhanced through collaborative online learning activities and social discourse (Item 5.4) via mLearning. The participants also consensually agreed that the model could serve as a clear guide on how learning activities connected to other activities in aiding the students via mLearning (Item 5.5). This result parallels to their agreement on the formal-informal learning experience and collaborative learning. Finally, the participants on high agreement noted that the model could also be used as a useful example to develop other implementation models for other course subjects (Item 5.7).

Conclusion

The overall mapping results for all five aspects above in evaluating the model could be concluded in Table 6.12. The table not only shows the defuzzification values for all questionnaire items but also includes the ranking of the items. The ranking of the items indicates how an item compares with other items in the degree of agreement among participants. Ranking number one (1) is taken as the highest rank consistent with the highest defuzzification value registered to the particular item. As described in the Methodology Chapter 3, in a conventional Fuzzy Delphi, the ranking of the items is to determine the variables for the scope of a case being studied. Items that received higher ranks could be considered as a variable or an element chosen as the result of the study. However, in this study, the ranking is used to compare the level of agreement of items among the participants. From Table 6.12, item 2.3 (List of activities grouped under Enabling Skills Activities as shown in the model) is ranked first in participants' preferences while item 2.2 (List of activities grouped under Knowledge Input Activities as shown in the model) received the lowest rank in the level of participants' agreement.

Table 6.12

Defuzzification Value and Ranking of Items

RESPONDENT	1.1			2.1			2.2			2.3			2.4			3.1			3.2		
Average	0.75	0.90	0.96	0.74	0.90	0.97	0.65	0.82	0.94	0.80	0.93	0.98	0.75	0.90	0.96	0.75	0.90	0.97	0.73	0.87	0.95
Fuzzy Evaluation	36	43.1	45.9	35.6	43	46.6	31	39.5	45.2	38.4	44.7	46.8	36	43.2	46.2	35.8	43.1	46.4	34.8	41.8	45.4
Defuzzy		42.03			42.05			38.8			43.65			42.15			42.1			40.95	
Ranking		12			11			19			1			7			9			15	

RESPONDEN T	3.3			3.4			4.1			4.2			4.3			4.4			5.1		
Average	0.75	0.90	0.96	0.75	0.90	0.97	0.75	0.90	0.96	0.73	0.88	0.95	0.68	0.85	0.95	0.78	0.92	0.98	0.68	0.84	0.94
Fuzzy Evaluation	36	43.1	46.3	36	43	46.5	36	43	46.3	35	42.2	45.6	32.8	40.7	45.6	37.4	44	46.8	32.6	40.3	45.1
Defuzzy		42.13			42.13			42.08			41.25			39.95			43.05			39.58	
Ranking		8			8			10			14			17			2			18	

RESPONDENT	5.2			5.3			5.4			5.5			5.6			5.7		
Average	0.75	0.90	0.97	0.76	0.90	0.97	0.75	0.88	0.94	0.75	0.89	0.96	0.77	0.93	0.99	0.71	0.87	0.95
Fuzzy Evaluation	36.2	43.2	46.4	36.4	43.3	46.4	35.6	42.3	45.5	36.6	43.1	46.1	33.8	41.7	46.2	36.2	43.5	46.7
Defuzzy		42.25			42.35			41.43			42.23			40.85			42.48	
Ranking		5			4			13			6			16			3	

However, the most important findings of Phase 3 of the study are the defuzzification values of the items in participants' evaluation of the interpretive mLearning implementation structural model for undergraduate English Language learning course. Overall, from the findings presented in this section, as the defuzzification values for all questionnaire items exceed the minimum value of 33.6 (refer to Table 6.12), the findings conclusively suggested that the participants have consensually agreed to all five aspects of the evaluation of the model. Thus, according to the participants or experts for the study, the model is suitable to serve as a guide in the implementation of mLearning as learning support for undergraduate formal English Language learning for Professional and Communication Skills course.

CHAPTER 7

DISCUSSION OF FINDINGS

Introduction

As recapitulation, Chapters 4, 5, and 6 presented the findings of the study in three phases (Phase 1- Needs analysis, Phase 2- Development of the mLearning implementation model for undergraduate English Language learning, and Phase 3- Evaluation of the model). Briefly, the needs analysis phase concluded the need to adopt a solution to students' learning needs in coping with their 'Professional Communication Skills' course subject. Responding to this need, the development phase focused on developing the mLearning implementation model for 'Professional Communication Skills' course based on language activities as learning support (solution) to help the students to improve their language competence and fulfill their course learning outcomes. Finally, the evaluation phase involved evaluation of the model to seek experts' opinion on the suitability of the model in guiding instructors and learners to use mLearning as learning support for the formal language course.

The following sections elaborate the findings for each phase followed by the discussion on the model that focuses on learning activities and the relationship among them in facilitating how undergraduate students could be aided through mLearning as support to their formal language learning process.

Discussion of Findings from Phase 1: The Needs Analysis Phase

Briefly, as discussed in Chapter 1, the mLearning implementation model was proposed as a support to the undergraduate language learning needs. The model aimed at serving as a guide to language instructors in implementing the mLearning based Professional Communication Skills (PCS) course to support students' formal classroom learning of the course subject. mLearning was proposed to aid students' learning process in improving their language competence as well as meeting the course outcomes. However, prior to the proposal, the need to have a learning support for the students has to be identified beforehand. The needs analysis was conducted using a set of needs analysis survey questionnaire, which was consisted of 48 questions probing into five aspects:

1) Students demographic details and their perceived level of language proficiency;
2) Students' perception on self-language competence;
3) Students' perception on the current Professional and Communication Skills course;
4) Students' use of mobile technology use; and
5) Students' acceptance and intention to use mLearning.

The questionnaires were posed to the students and mainly aimed to assess the students' need to have a learning support in their formal language learning process as well as to assess their level of acceptance on the incorporation of mLearning into their language communication course and the degree of their intention to use mLearning. The items for the survey questionnaire for the fifth aspect were constructed based on unified theory of acceptance and use of technology (UTAUT), a technology acceptance theory proposed by Venkatesh et al. (2003). The questionnaire was conducted on 250 undergraduate engineering students of a local private tertiary institution but 220 responded to the questionnaire. The students were selected purposively from those who enrolled for the course subject 'HAB 2033/HBB 2033- Professional and Communication Skills Course' an undergraduate English communication skills course offered by the institution. Data from this phase were analyzed using descriptive statistics via the Statistical Package for Social Science (SPSS). The analysis of mode and mean scores for this phase was proposed to determine the needs of mLearning at the undergraduate level based on students' views. In identifying the need for mLearning implementation of PCS course at the undergraduate level based on students' perceptions, the needs analysis phase aimed to answer the following research questions:

1.1 What are the students' perceptions on their language competence to cope with the Professional and Communication Skills course?

1.2 What are the students' perceptions on the traditional formal Professional and Communication Skills course in aiding them to fulfill their language learning needs?

1.3 What are the students' access to mobile devices and the capability level of the devices?

1.4 What are the students' level of acceptance and intention to use mLearning if incorporated into the formal Professional and Communication Skills course?

The findings for the research questions 1.1 and 1.2 justified the need to have a learning support to aid in the students learning needs since the majority of them perceived lack in language competence to cope with their undergraduate English Language communication skills course (refer to Tables 4.3 to 4.8, pp. 144 - 147). For example, the findings indicated that the majority of the students used grammatically incorrect English Language especially in informal settings (67.7%, n = 149) and this trend may persisted due because most of the students (65.9%, n = 145) believed that other people could still understand what they intended to say. However, the habit of using ungrammatical language could affect the students' language performance in formal setting. This was evident through the findings indicated in Table 4.6 (pp. 146) which shows that as high as 66.7% (n=146) of the students struggled to use formal language by forming sentences 'silently' before uttering them aloud. This shows that the respondents have problems in impromptu construction of grammatically correct sentences especially in formal settings. Furthermore, most of the students (65.9%, n = 145) also agreed that they tend to use short sentences and phrases in formal setting to compensate their lack in language competence and unsurprisingly some of them (45.9%, n = 101) prefer memorized speeches for oral presentations. The use of compensating strategies among the students as discussed here concluded their low language competence. This was further supported by their results in the university's English Language preparatory examination (English 2) which indicated that only 22.8% (n=50) of the undergraduate students obtained excellent competence level. The findings of the needs analysis also indicated that the students perceived that their PCS course itself could not cater for their language learning needs since learning priority of the course was aiming at fulfilling the course outcomes (refer to Tables 4.9 to 4.16, pp. 149 - 153). This may affect the less competent students to cope with the course outcomes. This justified the need to incorporate a solution to cater for the needs of these students to aid them in improving their language competence as well as fulfilling the course outcomes.

In terms of infrastructure, findings for research question 1.3 justified the feasibility of mLearning to be incorporated as the solution to the students learning problems since students have readily access to mobile technologies (as learning tools) (refer to Tables 4.17 to 4.21, pp. 154 - 156). The mobile technologies facilitated the mobile learning environment too. This criterion is vital since access to technology is an important condition in effective technology based education (Jones et al., 1995; Quinn, 2011a). David (1994) also argued that technology should be accessible to the students whenever needed. The findings of the study support this argument as almost all students surveyed have their own mobile devices especially mobile phones or smart phones for them to access personally whenever and wherever (as indicated in Table 4.17, pp. 154, and Table 4.18, pp. 155). Finally, findings for research question 1.4 justified the incorporation of mLearning as learning support to the students' language learning needs to improve their language competence as well as fulfilling the learning course outcomes. This supports Vifansi (2002) and Momtazur Rahman et al. (2009) who argued that a language course or program should accommodate not only the target needs but also the students' learning needs. The justification was also based on the students' acceptance and intention to use mLearning to aid their language learning process for PCS (as indicated in Tables 4.22 to 4.49, pp. 158 - 173). Venkatesh et. al (2003) argued that the learners should accept and intend to use a proposed solution before the solution could be implemented. In view of the incorporation of mLearning as a support here, the study focused on the development of the mLearning implementation model for English Language learning of PCS among undergraduates. The following section elaborates the discussion of the findings for the development of the model.

Discussion of Findings from Phase 2: Development Phase

In the development of the model for Professional and Communication Skills course, the development phase sought to answer the following research questions:

2.1 What are the experts' collective views on the learning activities which should be included in the development of the mLearning implementation model?

2.2 Based on the experts' collective views, what are the relationships among the learning activities in the development of the mLearning implementation model?

2.3 Based on the experts' collective views, how should the learning activities be classified in the interpretation of the mLearning implementation model?

In response to research question 2.1, the learning activities that constitute the elements of the intended model were identified and determined through experts' opinion via nominal group technique (NGT). As the focus of the study, the model was developed for the Professional Communication Skills course, an undergraduate level English for specific purpose course for an engineering private tertiary institution. The second procedure for this phase (in response to research question 2.2) was the development of the mLearning implementation model using experts' opinion with the aid of interpretive structural modeling technique. Interpretive structural modeling technique is a powerful decision-making tool used widely in the economic and business sector (Warfield, 1973, 1974, 1976). The result was the interpretive structural mLearning implementation model for undergraduate English Language communication skills as shown in Figure 5.2 (pp. 201). The elements for the model finally consisted of 24 learning activities, which was an integration of mostly informal mLearning activities, and existing PCS formal learning activities. The learning activities were connected to each other in a hierarchical manner determined by the experts based on pair wise technique. Based on the findings for this phase, research question 2.3 resulted in the classification of the learning activities into three sections or domains to facilitate interpretation of the model: knowledge input activities, enabling skills activities, and evaluation and reflection activities. The learning activities were then analyzed to form a driver-dependence matrix (Figure 5.3, pp. 208). Through the matrix, the activities were further categorized into four different clusters based on their respective driving power and dependent power. The four categories were independent cluster, linkage cluster, dependent cluster, and autonomous cluster. The clusters indicated how the activities were related among each other in terms of the flow and priority of activities in the implementation to aid in students learning process for mLearning as a support to aid the undergraduate students to fulfill their learning needs as well as to achieve the learning course goals. Further elaboration on how the model could be used to guide the mLearning implementation for PCS is presented in section 7.4. In the discussion, responding to the research questions, the findings were used to elaborate the model in terms of the learning activities and the relationships among them, and in relation to past studies and theories or models, which were adopted as both theoretical and conceptual framework of the study.

Discussion of Findings from Phase 3: Evaluation of the Model

The final phase of the study was the evaluation of the mLearning implementation model for Professional and Communication Skills course, which was developed in Phase 2. The evaluation phase aimed at answering the following research questions:

1. What is the experts' agreement on the suitability of the mLearning activities proposed in the mLearning implementation model for Professional and Communication Skills course?

2. What is the experts' agreement on the classification of the mLearning activities based on the three domains (Knowledge Input activities, Enabling skills activities, and Evaluation and Reflection activities) as proposed in the mLearning implementation model for Professional and Communication Skills course?

3. What is the experts' agreement on the list of mLearning activities in the respective four clusters (Independent, Linkage, Dependent, and Autonomous) as proposed in the mLearning implementation model for Professional and Communication Skills course?

4. What is the experts' agreement on the relationships among the mLearning activities of the mLearning implementation model for Professional and Communication Skills course?

5. What is the experts' agreement on the suitability of the mLearning implementation model in the teaching and learning of Professional and Communication Skills course?

Based on the research questions above, the model was evaluated according to five aspects:

1) The suitability of the mLearning activities;
2) The classification of the mLearning activities into three domains: knowledge Input activities, enabling skills activities, and evaluation and reflection activities;
3) The list of mLearning activities in the respective four clusters: independent, linkage, dependent, and autonomous;
4) The relationships among the mLearning activities; and
5) The suitability of the mLearning implementation model in the teaching and learning of Professional and Communication Skills course.

The evaluation was conducted on 48 experts using the modified fuzzy Delphi method. In this method, the experts had to respond to a set of survey questionnaire, which consisted of 30 questions divided into two parts. The first part was to sought the experts' background information and the second part was used to elicit their views on the model. Based on the threshold value, 'd' (Table 6.6, pp. 211 - 212), and the defuzzification values (Table 6.12, pp. 224), the findings conclusively suggested that the experts have consensually agreed to all five evaluation aspects of the model. This concluded that the experts consensually agreed that the model is suitable to be used as a guide to mLearning implementation as learning support to undergraduate language learning course for PCS subject. The following sections elaborate in detail how the learning activities of the model and the relationships among them could aid students' language learning process through mLearning in fulfilling both their language learning needs and the course outcomes.

Role of Learning Activities in the mLearning Implementation Model

As mentioned in the methodology Chapter 3, the learning activities were identified and determined by the panel of experts. In this study, transactional distance theory (Moore, 1972, 1997), Park's pedagogical framework for mobile learning (Park, 2011), Quinn's four' Cs mobile capabilities (Quinn, 2011a, p. 98 - 103), the Professional and Communication Skills learning course outcomes, and the SAMR model (Puentedura, 2006) (Figure 2.5, pp. 78) were adopted to guide in the selection of learning activities for mLearning.

As a result, the panel of experts had identified 24 learning activities to be included as elements for the model. According to Puentedura (2006), technology based learning activities should appear in all four stages of SAMR: 1) Substitution; 2) Augmentation; 3) Modification; and 4) Redefinition. As proposed in the SAMR model, the learning activities should allow function of technology use (mobile devices and technology) based on all four stages to optimize the full capabilities of technology in aiding the students to fulfill their learning goals as well as the course outcomes to help them to reach their highest potential. In support of the SAMR model and based on the findings of the study, the learning activities agreed by the experts could be categorized into all four levels as shown in Table 7.1.

Table 7.1

Distribution of Learning Activities Based on SAMR Stages

SAMR stages	Learning Activities of mLearning Implementation Model
Substitution (First level)	2. Access and listen to lectures about effective communication on podcasts through mobile devices. 3. Search and browse for information on effective communication, competence, and technical use of devices through mobile devices. 4. Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices. 18. Search and browse information for content to be used for presentation materials. 19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer. 20 Synchronous online evaluation on students' presentation through mobile devices by other students.
Augmentation (Second level)	7. Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skill. 8. Online group discussions on task given by lecturer via mobile environment. 10. Forming separate online small groups (social blogs) to discuss shared topics in- class or mobile. 11. Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication, or presentation. 21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer. 22 Asynchronous online evaluation on students' presentation through mobile devices by other students.
Modification (Third level)	6 Record and upload presentations to elicit comments from lecturers and peers via mobile devices. 9. Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities. 14. Collaborative redesign of in-class language activities to improve communicative or competence skills. 15 Collaborative redesign of method to improve specific communicative or competence skills. 16. Playing mobile language games either individually or in groups.
Redefinition (Fourth level)	5. Develop 'mobile tags' for information and knowledge on communication, language competence and technical use of mobile devices via QR code or social bookmarking. 12. Mentorship to help students or group of students by lecturer or by other more capable peers. 13. Synchronous or asynchronous mLearning forum on specific communication or competence issues. 17 Learning through modeling. 24 Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.

Based on Table 7.1, activities 2, 3, 4, 18, 19, and 20 could be categorized under substitution level of the SAMR model. As indicated in Figure 2.5, substitution is the lowest level of technology use as a direct tool substitute of conventional classroom method. For example, for activity 2, instead of listening to lectures on effective communication skills in class, students could opt to listen to the lectures in recorded form through mobile podcasts using their mobile devices anytime and anywhere especially when it is needed (Koller, Harvey, & Magnotta, 2008; Quinn, 2011a, 2011b). Students could also access other talks on effective communication skills or presentation techniques using similar mobile sources as supplementary to the lectures as substitute to searching information from library books. Similarly, for activity 4, without technology, students would search books on grammar to improve their language competence or seek help from their friends in class. However, with mobile technology, students could instead access the required information or online help through Short Message System (SMS), Blogs, emails, or even voice calls instantly and conveniently. For activities 19 and 20, in the traditional PCS classroom-learning, students' oral presentation assessments were conducted only during lecture hours in class for course grading purpose. However, through mobile technologies, students could be assessed beyond classroom walls synchronously where the lecturer and other students could access their webcams via mobile blogs to evaluate their presentations. The difference here is that through mobile technologies, the evaluation could be done on any mutual agreed time wherever the participants are located.

It is innovative to have the resources online and organized for the students or conducting assessments through live video streaming but according to Puentedura (2006), these activities are direct substitutions to what possibly could be done with library books, videos and reading lists to obtain information and knowledge or conducting the evaluations face-to-face in the classroom. Although the incorporation of mobile technology at this stage contributes to convenience in terms of time and place to learn, but based on SAMR model, it may not result in significance impact on students' engagement, performance, or achievement.

At the augmentation level, we have activities 7, 8, 10, 11, 21, and 22 as shown in Table 7.1. Based on the SAMR model, the augmentation level describes technology as a tool substitute but with some functional improvement. At a glance, activity 8 or 'Online group discussion on task given by lecturer via mobile environment' could be categorized under substitution level as it only replaces students' face-to-face discussion meeting on a given tasks similar to the synchronous online evaluation activities (activities 19 and 20), which replace face-to-face in-class evaluation. However, unlike evaluation activities, group discussions on tasks or assignments are usually more frequent which need more time and logistic commitment among the undergraduate students. Generally, students are engaged in other commitments for other subjects that make it difficult for them to commit extra time beyond PCS class to meet for discussion (Keeling & Dungy, 2004). They probably end up meeting a couple of times and result in unsatisfactory work done. However, mLearning could support face-to-face discussions through synchronous and asynchronous meetings using mobile social networking sites such as *Facebook* or social blogs (Park, 2011). Although activity 8 could serve as a substitute to face-to-face discussion, the functional improvement of this activity allows students to respond continuously to each other in their discussions anytime and anywhere. Lengthy discussion could be carried out and uninterrupted, which enable students to complete the language tasks given by their lecturer quickly and efficiently.

Through mLearning, they could even post videos, podcasts, or other online sources that are relevant to their tasks and enrich their discussions. With these capabilities, students could even form small group online forums or social blogs such as a specific *Facebook* account to discuss with their peers on a mutual interest topic to discuss through mobile devices (activity 10). The discussion could even be continued in-class or when they meet face-to-face as suggested in the activity. This is an example on how formal learning (classroom learning) and informal learning (mLearning) could be integrated. Although activity 10 is a substitute to classroom group discussion, one of the functional improvements for the activity is to allow more students to participate in the discussion without peer pressure especially the low achievers. In the face-to-face discussion, students who are more competent tend to dominate the discussion. However, the use of social networking sites such as *Facebook* allows more opportunities for the low achievers' opinions to be heard and taken into consideration. The use of technology to integrate formal and informal learning as suggested by activity 10 supports recent successful studies on the initiative. For example, Dettori and Torsani (2013) described a study exploiting social bookmarking to support seamless integration of formal and informal English Language learning among working adult students. The study explored individual web exploration using links to social bookmarking resources (informal learning) relevant to formal learning content and learner's interest. Their findings reported that the students appreciated the social bookmarking links provided as the links consolidated their formal language learning. However, the students were very selective and limited themselves to a few interesting links as exploring websites were time-consuming.

Students could also use social blogs to discuss and solve shared problems that they face in the PCS course or in improving language competence (Activity 11). Low achievers could have more opportunities to address their language learning problems without peer pressure through this activity compared to the conventional face-to-face consultation.

Another unique feature of the capability of mLearning is exemplified through activities 21 (Asynchronous online evaluation on students' presentation through mobile devices by the Lecturer) and 22 (Asynchronous online evaluation on students' presentation through mobile devices by other students) where students’ work or learning progress could be evaluated continuously by the lecturer and other students at anytime anywhere. Through this type of evaluation, students’ work progress could be commented and evaluated for further improvement before the final assessment. These activities (activities 21 and 22) could be regarded as substitute to the face-to-face mock trial presentations in the classroom but their functional improvement allow more students to have the opportunity to have pre-evaluation of their presentations anytime and anywhere. Students could also be selective to whom they chose to evaluate them by uploading their presentations to a certain blog group. In giving feedbacks to their presentation, the lecturer or other students could opt to give short comments or upload relevant hyperlinks leading to podcasts or video samples to improve the students’ presentations. This is limited and not practical in the conventional classroom learning. McCarthy (2012) reported that students were positive towards the integration of evaluation in the mobile learning environment using *Facebook* as the host. The inclusion of asynchronous evaluation activities in the model as discussed here further elaborates McCarthy’s study in terms of type of evaluation, which could be incorporated. Furthermore, the inclusion of the activities also support past studies on mLearning on the use of mobile devices in assessing students’ language learning that could increase their language competence and motivates them to learn (Cooney & Keogh, 2007) as well as reducing assessment workloads of teachers and improving students’ learning efficiency through instant feedback (Wong, Sellan, & Lee, 2006).

Referring back to the SAMR model, the substitution level and augmentation level are also categorized by Puentedura (2006) as ‘Enhancement’ level where use of technology at these levels could enhance learners’ learning process. At the ‘Transformation’ level that consists of ‘Modification and Redefinition’ levels, learners’ autonomy has reached to another stage. Activities 6, 9, 14, 15, and 16 were categorized under the modification level. At this level, the capabilities of technology allow students to modify their learning tasks or process, which suits best to their interest. Examples of activities under modification level are through activity 14 and activity 15 where students could redesign in-class activities or method to improve their language competence. For instance, rather than attempting conventional online quiz on grammar, students could conduct small video conferencing with each other where they could hold a conversation game such as when one student speaks, the others count his or her grammar ‘slips’ (errors) occurred within a minute. Students could then compare grammar slip counts with each other. The one with the least grammar slips wins the first round. These types of technology-based activities would not be possible if they were conducted without technology but the use of technology could bring significant change in the ways students learn. Other examples could also take advantage of the current mobile technology such as the Global Positioning System (GPS) that is readily equipped in most present smartphones. An mLearning study on Dutch teachers highlighted the potential of GPS in creating playful and creative language games to engage students highly in learning (Smidts, Hordijk, & Huizenga, 2008). The authors argued that the use of GPS could create a new dimension of mLearning where students could access to layers of information formed through connection between the physical and the virtual learning environment via location-aware mobile devices (p. 4).

At the redefinition level (highest level), learner-centered learning reached yet another level. According to Puentedura (2006), at the redefinition level, students could experience how technology use allows for the creation of new learning tasks that were previously inconceivable without technology. According to Table 7.1, activities 5, 12, 13, 17, and 24 were categorized under this level. For example, through activity 5, students could individually or collaboratively develop own ‘mobile tags’ (such as Quick Respond code) for tagging information over social sites or blogs to be shared and discussed. The ‘mobile tags’ (or other learning resources such as podcasts) is a small learning platform which could be updated from time to time for students or other audience to refer and improve either their communication skills or language competence. This type of activity is considered a new learning task that is not conceivable without the use of technology. Without the use of technology, collaborative development of learning materials among students could be too time consuming and impractical for large groups to meet and work on the task. Students would tend to be put off on involving in such task due to high commitment to find the time and space required to develop the learning materials and share them with others. However, with mobile technology, through mLearning, students could effortlessly develop and contribute the learning materials anytime and anywhere. Through social networking, the materials could be robustly shared among themselves and even to a wider group of audience. To elaborate further, a study conducted by Stanley (2006) on the use of podcasts to support classroom-based learning could serve as an example on how students could collaborate to provide their own learning podcasts materials to upload and share with others. He found out that through the activity, the students were more motivated to learn from the materials as they appreciate the value of publishing their own podcast.

Through mLearning, 'Mentoring' could be redefined through Activity 12 as it is more robust and practical as students who have language learning problems could seek continuous assistance from their lecturers or more capable peers through various channel options (such as SMS, social blogs, voice calls, and others) both synchronously and asynchronously. The inclusion of this activity (Activity 12) in the model by experts supports a recent study conducted by McCarthy (2012) who investigated the use of *Facebook* as an alternative approach to the traditional face-to-face mentoring for undergraduate and postgraduate students across universities. His findings indicated that overall, the students from different universities reported positive experience in using the mentoring scheme and succeeded in establishing academic and professional connections among staffs and students. This study exemplified how mentoring could be redefined where students could seek assistance beyond their learning institution and this type of activity was made possible using mobile technology. Schwartz (2009) also supported the use of social media like *Facebook* where teachers could benefit it to conduct mentorship with students.

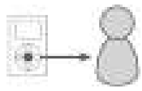
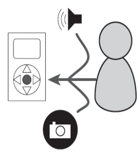
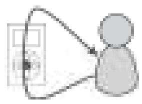
Referring to the social constructivist theory, the mentorship activity (Activity 12) and other activities 8, 10, and 11 from the modification level could serve as examples on how low achievers could be assisted by their more capable peers or the lecturer to solve their learning needs as described by Vygotsky's (1978) zone of proximal development (ZPD) theory. Based on Bruner's (1970) scaffolding theory, the interaction between the learner and other more skilful peers could be augmented through mLearning and effectively develop learner's skills and learning strategies. In the context of this study, lecturers may include cooperative language activities where skilful peers could help lower competent language learners within the learners' ZPD through scaffolding.

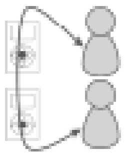
In terms of scaffolding, Activity 17 (Learning through modeling) is unique as redefinition level activity as it served as an example where mobile technology could become a scaffolding support instead of lecturers or other students. As suggested by the activity, students for example could learn how to present effective communication through watching and learning from effective speakers via YouTube (video-sharing website) or TED (website of conferences) talks using their mobile phones. This type of scaffolding through activity 17 is also known as technical scaffolding (Yelland & Masters, 2007) as described in Chapter 2, p. 66.

Another observation that we could deduce is that the language activities in the model of the study involve optimum use of the mobile capabilities in support of Quinn's four Cs of mobile capabilities (Table 2.3, pp. 84). As mentioned earlier in Chapter 2 (pp. 82), the mLearning implementation model should indicate that the capabilities of mobile technology are being optimally utilized (Goth, Frohberg and Schwabe, 2006; Quinn, 2011a; Quinn, 2011b) in the incorporation of mLearning in formal education. At the same time, a balance between the amount of learners' focus on technology and their focus on learning need to be achieved (Goth, Frohberg and Schwabe, 2006). Hence, the study adopted Quinn's four Cs of mobile capabilities. Table 7.2 proposes the list of mLearning language activities from the model that could be categorized according to Quinn's four C's of mobile capabilities: content, capture, compute, and communicate.

Table 7.2

mLearning Language Activities Based on Quinn's Four C's of Mobile Capabilities

Mobile Capability	**Learning Activities of mLearning Implementation Model**
Content 	2. Access and listen to lectures about effective communication on podcasts through mobile devices. 3. Search and browse for information on effective communication, competence and technical use of devices through mobile devices. 4. Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' 16. technology via mobile devices. 17. Playing mobile language games either individually or in groups. 18. Learning through modeling(e.g. Watch and listen to effective speakers on YouTube) Search and browse information for content to be used for presentation materials.
Capture 	5. Develop 'mobile tags' for information and knowledge on communication, language competence and technical use of mobile devices via QR code or social bookmarking. 6. Record and upload presentations to elicit comments from lecturers and peers via mobile devices. 7. Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skill. 8. Online group discussions on task given by lecturer via mobile environment 9. Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities 10. Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile 11. Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication or presentation 12. Mentorship to help students or group of students by lecturer or by other more capable peers. 14. Collaborative redesign of in-class language activities to improve communicative or competence skills 15. Collaborative redesign of method to improve specific communicative or competence skills 19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer. 20. Synchronous online evaluation on students' presentation through mobile devices by other students 21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer. 22. Asynchronous online evaluation on students' presentation through mobile devices by other students.
Compute 	5. Develop 'mobile tags' for information and knowledge on communication, language competence and technical use of mobile devices via QR code or social bookmarking. 6. Record and upload presentations to elicit comments from lecturers and peers via mobile devices. 14. Collaborative redesign of in-class language activities to improve communicative or competence skills 15. Collaborative redesign of method to improve specific communicative or competence skills 16. Playing mobile language games either individually or in groups.

	19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer. 20. Synchronous online evaluation on students' presentation through mobile devices by other students 21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer. 22. Asynchronous online evaluation on students' presentation through mobile devices by other students. 24. Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.
Communicate 	6. Record and upload presentations to elicit comments from lecturers and peers via mobile devices 7. Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skill. 8. Online group discussions on task given by lecturer via mobile environment 9. Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities 10. Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile 11. Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication or presentation 12. Mentorship to help students or group of students by lecturer or by other more capable peers. 13. Synchronous or asynchronous mLearning forum on specific communication or competence issues 14. Collaborative redesign of in-class language activities to improve communicative or competence skills 15. Collaborative redesign of method to improve specific communicative or competence skills 16. Playing mobile language games either individually or in groups. 17. Learning through modeling (e.g. learn from effective speakers via YouTube) 19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer. 20. Synchronous online evaluation on students' presentation through mobile devices by other students 21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer. 22. Asynchronous online evaluation on students' presentation through mobile devices by other students. 24. Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.

Based on Table 7.2, we could conclude that there are two main types of category of activities in terms of the use of mobile capability: 1) activities that could be categorized under a single capability; and 2) activities that could be categorized into more than one capability. Activities 2, 3, 4, and 18 were categorized under the single content capability. These activities involved students in retrieving information for learning content for both improving their language competence and fulfilling their language course subject. The activities could serve as a guide to mobile course developer on what type of content and the form of content needed to be included in a mobile language-learning website or software program in the incorporation of mLearning in formal classroom learning. For example, based on the activities in content capability, the mLearning website or learning software for PCS course may need to include information sources on effective communication skills, grammar and language structures, mobile language games and applications, and technical information on accessing and using mLearning program and devices. The content could be in the form of text, hyperlinks, audio links, or video podcasts.

We could also observe that a number of the activities could be categorized into more than one capability. For example, activities 6, 19, 20, 21, and 22 (evaluation activities) involved capture, compute, and communicate capabilities of mobile devices and technology. The activities for instance required the students to record their oral presentation using a video camera (capture), and post it on a social network to elicit comments or assessments from their lecturer or peers (communicate). The lecturer or their peers could give comments or grade their work (Compute and Communicate). The students could then retrieve the comments or evaluation (Compute) and respond to them (Communicate). This set of activities could guide instructors in selection of mobile devices and technology in suiting the needs of language learners in their learning process. For instance, in the example above, for evaluation of their oral presentation, students need to record their presentation and then upload the recordings onto a social network to elicit comments. Thus, in ensuring uninterrupted learning process, the students need to have access to mobile devices such as PDAs or smartphones which have audio-video recording function, video converter function, social network software, and high bandwidth wireless internet connection.

In another example, through activity 17, when students access YouTube to watch and listen to effective speakers, they are actually accessing content. Therefore, the activity was listed under content capability. However, activity 17 could also be categorized further under communicate capability as the students could send and respond to comments about an effective speaker's presentation on 'YouTube' to gain further knowledge on communication skills. Thus, from the examples above, we could observe that based on Quinn's four Cs capabilities, mLearning is not solely about content. Beyond content, if the capabilities of mobile were fully utilized, the learning experience of students would be enriched beyond what is not possible with traditional classroom learning.

Relationship of mLearning activities to transactional distance theory and Park's pedagogical framework for mobile learning. Tying to Moore's transactional distance theory (Moore, 1972, 1997), the language activities from the model (Figure 5.2, pp. 201) support the description of the pedagogical distance concept as proposed in the theory. For example, the mentorship activity (activity 12) through mLearning exemplified a type of learning activity, which has low structure and allows high dialog between the instructor and learners yet promotes high learner's autonomy as part of their language learning process. The activity has low structure as it focuses more on learners' input (questions, comments, evaluation, and reflections) which requires more dialogs in fulfilling learners' language learning needs. This is consistent to Moore's argument that low structured educational activities could promote high dialog, which offer more dynamic learning experiences for the learners (Moore, 1993, p. 27). However, Moore added that the amount of dialog for a loose structure learning activity could depend largely on the use of communication media (p. 26). In the case of this study, the use of wireless mobile devices serves as a media in facilitating robust interactions (high dialog) between the learners and their instructor.

This type of activity (activity 12) also supports type 3 mLearning activity (Low Transactional Distance Socialized mLearning) of Park's pedagogical framework (2011) where the activity has loose structure but involves frequent interaction among learners (refer to Table 2.1, pp. 80). However, activity 17 (learning through modeling) has high structure as it is in the form of recorded presentations where learners as individuals or in groups could learn through examples. This type of activity supports type 1 mLearning activity (High Transactional Distance Socialized mLearning) or type 2 mLearning activity (High Transactional Distance and Individualized Mobile Learning Activity) of Park's pedagogical framework as learners have more psychological and communication space with the instructor due to the structure of the learning content. High interactions could mainly occur among learners when they discuss among themselves about the quality of a speaker's recorded presentations (Type 1 mLearning) or the learners as individuals could interact only with the recorded presentation (Type 2 mLearning) to learn best presentation practice on their own. Thus, learners could have more options on the types of learning which suit their preferences.

Similar to these activities (Activities 12 and 17), the other mLearning activities from the model (Figure 5.2) also support transactional distance theory and Park's pedagogical framework. As a summary in relating the language activities to transactional distance theory, Table 7.3 aimed at proposing how the activities could be categorized according to Moore's types of educational activities (refer to Figure 2.3, pp. 72) that are based on the presence or absence of dialog (D) and structure (S). In comparison, Table 7.4 shows the summary on how the language activities could be categorized based on Park's mLearning types of activities.

Table 7.3

Category of mLearning Language Activities Based on Moore's Types of Educational Activities (based on presence/absence of dialog (D) and structure (S))

Moore's Types of Educational activities		**Learning Activities of mLearning Implementation Model**
–D–S (Low dialog and low structure) *Note: High transactional distance between the instructor and learners.*	5.	Develop 'mobile tags' for information and knowledge on communication, language competence and technical use of mobile devices via QR code or social bookmarking.
	10.	Forming separate online small groups (social blogs) to discuss shared topics in- class or mobile.
	11.	Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication or presentation.
	14.	Collaborative redesign of in-class language activities to improve communicative or competence skills.
	15	Collaborative redesign of method to improve specific communicative or competence skills.
	18.	Search and browse information for content to be used for presentation materials.
	24	Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.
–D+S (Low dialog and high structure) *Note : High transactional distance between the instructor and learners.*	2.	Access and listen to lectures about effective communication on podcasts through mobile devices.
	3.	Search and browse for information on effective communication, competence and technical use of devices through mobile devices.
	4.	Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.
	8.	Online group discussions on task given by lecturer via mobile environment.
	16.	Playing mobile language games either individually or in groups.
	17	Learning through modeling.
	20.	Synchronous online evaluation on students' presentation through mobile devices by other students.
	22	Asynchronous online evaluation on students' presentation through mobile devices by other students.
+D+S (high dialog and high structure) *Note: low transactional distance between the instructor and learners.*	9.	Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.
	19.	Synchronous online evaluation on students' presentation through mobile devices by the lecturer.
	21.	Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.
+D–S (High dialog and low structure) *Note: low transactional distance between the instructor and learners.*	6	Record and upload presentations to elicit comments from lecturers and peers via mobile devices
	7.	Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skill.
	12.	Mentorship to help students or group of students by lecturer or by other more capable peers.
	13.	Synchronous or asynchronous mLearning forum on specific communication or competence issues.

Table 7.4

Category of mLearning Language Activities based on Park's Pedagogical Framework for mLearning

Types of mLearning activity	Learning Activities of mLearning Implementation Model	
Type 1: High Transactional Distance and Socialized Mobile Learning Activity (HS)	5.	Develop 'mobile tags' for information and knowledge on communication, language competence and technical use of mobile devices via QR code or social bookmarking.
	14.	Collaborative redesign of in-class language activities to improve communicative or competence skills.
	15	Collaborative redesign of method to improve specific communicative or competence skills.
	16.	Playing mobile language games either individually or in groups.
	17	Learning through modeling.
	18.	Search and browse information for content to be used for presentation materials.
Type 2: High Transactional Distance and Individualized Mobile Learning Activity (HI)	2.	Access and listen to lectures about effective communication on podcasts through mobile devices.
	3.	Search and browse for information on effective communication, competence and technical use of devices through mobile devices.
	4.	Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.
	8.	Online group discussions on task given by lecturer via mobile environment.
	16.	Playing mobile language games either individually or in groups.
	17	Learning through modeling.
	20.	Synchronous online evaluation on students' presentation through mobile devices by other students.
	22	Asynchronous online evaluations on students' presentation through mobile devices by other students.
Type 3: Low Transactional Distance and Socialized Mobile Learning Activity (LS)	9.	Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.
	10.	Forming separate online small groups (social blogs) to discuss shared topics in- class or mobile.
	11.	Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication or presentation.
	14.	Collaborative redesign of in-class language activities to improve communicative or competence skills.
	15	Collaborative redesign of method to improve specific communicative or competence skills.
	19.	Synchronous online evaluation on students' presentation through mobile devices by the lecturer.
	21.	Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.
Type 4: Low Transactional Distance and Individualized Mobile Learning Activity (LI)	6.	Record and upload presentations to elicit comments from lecturers and peers via mobile devices.
	7.	Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skill.
	12.	Mentorship to help students or group of students by lecturer or by other more capable peers.
	13.	Synchronous or asynchronous mLearning forum on specific communication or competence issues.
	24	Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.

According to Moore (1997) in his theory, the aim of an effective distance education is to minimize the transactional distance between the instructor and the learners. However, aligned with Park' pedagogical framework for mLearning, both Tables 7.2 and 7.3 show the types of activities which could demonstrate how low or high transactional distance could be exploited or integrated to support learners to achieve their learning targets. In short, the findings here could implicate Moore's theory of transactional distance. For example, the activities 12 and 17 as discussed earlier could serve as examples on how the different gaps in transactional distance between the instructor and the learners for each activity could be exploited based on the structure of the learning activity and learners' autonomy in aiding students' learning process. In both activities, the absence of the instructor could be compensated with more capable peers or as Vygotsky (1978) terms it as more knowledge others (MKO) to aid the learners through scaffolding. In other words, whenever the instructor is not available, students could take charge of their learning by referring help from other students who are more capable than they are. Alternatively, learners could solve their learning problems sufficiently through technical Scaffolding (Yelland & Masters, 2007) by referring to electronic sources instantly using their mobile devices. However, in this study, it is the integration among language activities instead of the application of language activities in isolation, which support the learner's language needs. Further discussion on the integration of these activities focusing on how mLearning could support learners' language learning is presented in the following section.

Role of Relationships among Learning Activities

The levels of the learning activities as presented in the findings of Step 7 (Table 5.4, pp. 201) and the cluster classifications of Step 8 and 9 (Figure 5.3, pp. 208) are the most important sections in understanding the role of relationships among learning activities for the implementation of mLearning. The driving power and the dependence power as presented in the driver-dependence matrix diagram in Figure 5.3 gives valuable insights into the importance and the interrelationship among activities. For example, without the matrix diagram and refer solely on the model in Figure 5.2, we may assume that to implement mLearning, we should begin with the knowledge input activities (activities 1 and 5) followed by subsequent activities below them. However, based on Table 5.4 (pp. 201), the activities 'Establishing learning contract' (activity 9) and 'Forming separate online small groups (social blogs)' (activity 10) were positioned at the highest level 16. This indicated that these activities were the most important activities due to their high driving power and low dependence power among all identified learning activities in the implementation of mLearning for PCS. These activities were identified as the main driving factors in the initiation of the rest of other mLearning activities and interestingly they fall under the 'Enabling skills activities' domain in the model (refer to Figure 5.2, pp. 201). In other words, in terms of importance, activities 1(Attend in-class lectures on effective communication) and 5 (Develop 'mobile tags' for information and knowledge) of knowledge input domain came only second at level 15. Knowledge input is about delivering content. Though mLearning could be about content delivery, it is not everything about content (Kukulska-Hulme & Shield, 2008; Quinn, 2011a). According to Quinn (2011a), as it is interactive, mLearning should be more on communication, connecting learners with the right people and resources when and where they are most needed. In learning instruction, it is critical in giving help to learners when and where it is needed and this is the main advantage of mLearning over other technology-based learning. Coincidently, parallel to this concept of mLearning, activities 10 and 9 are more on establishment of communication ground among learners through forming online social blogs and self-management of learning process via learning contracts. These were the activities proposed to be conducted at the beginning of the mLearning implementation before other activities.

Another point that we could observe is that learning activities 1 to 5 and 9 to 10 as discussed above are integration of formal and informal learning. This is important because mLearning is also about creating a seamless flow in bridging formal and informal learning (So, Kim, & Looi, 2008). For example, activity 1 is an in-class formal learning activity but pairing with it is activity 5, an informal learning activity where students collaborate to develop knowledge inputs in the form of mobile tags. This in a way complements the formal learning activity 1, where students assist the lecturer in augmentation of input through mobile context. Although the content in activity 5 could be accessed informally, the activities to develop the tags could be done as formal learning if conducted in-class. However, as discussed earlier, what is more important than content delivery are the learner centeredness and communication aspects of the learning activities in augmenting the formal learning experience as proposed through learning activities 9 and 10. While activity 9 allows learners' autonomy to manage own learning experience through learning contracts, activity 10 establishes online communication ground. For example through social blogs, learners could extend their in-class discussion anytime and anywhere, not only to obtain information but also in collaborative negotiation of knowledge. Coincidentally, collaborative negotiation of knowledge strives in continuous communication and here mLearning could serve as an ideal medium (Gong & Wallace, 2012). In terms of connection with subsequent activities in the model, these activities (activities 9 and 10) are seen as a vital precedent for overall successful implementation of mLearning. For example, the establishment of social communication environment in activity 10 is important as grounding for the implementation of activities 8 (Online discussions on task given), 16 (collaborative online language games), 12 (Mentorship), 7 (Video conferencing among learners), 6 (Record and upload presentations to elicit comments), and evaluation activities (activities 19 to 24). The interconnection of these language activities (activities 10, 8, 16, 12, 7, 6, and 19 to 24) supports Belanger's (2005) findings from his study on the use of IPod among undergraduate language learners. He reported that his students were able to use their mobile devices in establishing communication networks among themselves and their tutors to aid in their language learning collaboration. Through the networks, the students recorded their oral assessments and uploaded them to a virtual learning environment (VLE) to allow tutors' feedback. In short, learning activities in the independent cluster (Figure 5.3, pp. 208) are the most important activities as they have great influence on other learning activities. These activities are situated at the top part of the model (Figure 5.2, pp. 201) either as knowledge input activities or as enabling skills activities.

Relating to the theories adopted in this study, the relationship of the activities as described above conforms to the social constructivist learning theory, which capitalizes in supporting learners' language learning through interaction and collaboration. According to the theory, the notion where knowledge is best negotiated and acquired through interaction and collaboration with each other, aligned with beliefs of social constructionists (Kurt & Atay, 2007; Powell & Kalina, 2009).

Referring back to the driving power-dependence matrix diagram in Figure 5.3, the linkages cluster includes activities 8 (Online group discussions on task given) and 12 (Mentorship). Activities in this cluster have both high driving power and dependence power. The conducts of these activities while depending on the upper activities (Independent activities) influence the lower subsequent activities of the model. In other words, linkages activities play an important role in connecting the precedent activities and the subsequent activities together. For example, before online group discussions on task given by lecturer (activity 8), online social groups (activity 10) should be formed first. Based on the model too (Figure 5.2), the conduct of online group discussion also depends on the competence and communication skills among students which could be developed through collaborative redesign of language activities (activity 14) and collaborative redesign on method (activity 15) as proposed in the model. Activity 8 could lead to proper mentorship (activity 12) for low achievers, video conferencing (activity 7) for further discussion on tasks, or lead to collecting further content materials for presentations (activity 18) based on what transpired in the online discussions. Furthermore, along the learning process, students who need further assistance during the online discussion could be led to form separate online groups to solved shared learning problems (activity 11).

Learning activities, which are in the independent activities and linkages activities cluster are also known as strategic activities. These activities play a key role in the implementation of mLearning in augmenting the conventional classroom learning experience. Hence, activities in these clusters require greater attention by the course instructors. The next cluster in the driving power-dependence diagram (Figure 5.2) is the dependence cluster. Learning activities classified in this cluster have weak driving power but strong dependence power. In this study, activities 6,7,11,13,18,19, and 20 to 24 fall under this cluster. The final cluster as shown in the driving power-dependence matrix diagram (Figure 5.3) is the autonomous activities cluster. Activities classified under this cluster have both weaker driving power and dependence power relatively to activities in other clusters. Autonomous activities do not have any influence in the implementation of mLearning curriculum or somewhat detached from the whole system. However, in this study, there is no activity under autonomous cluster.

In short, referring to the role of the activities in the respective clusters, the course instructors need to pay attention to all 24 activities as they individually and connectedly have influence to the implementation of the mLearning for the English Language learning course.

In terms of attaining the PCS course outcomes, the classified activities as discussed above were based on experts' collective decision with reference to the course objectives as mentioned in the findings section. The model could also guide how the learning activities individually and in connection help in aiding the learners to achieve the outcomes. However, the activities are not exclusively implemented to serve a particular course outcome. An activity or a set of activities could help fulfill multiple course outcomes during the learners' learning process. For example, learning activities 1 and 5 or 2 to 4 are essential as input knowledge for the first course outcome 'apply the principles and practices of professional oral communication skills'. Activities 8, 9, 10, 11, 12, 14, 15, 16, 17, and 18 could help develop students' skills further in applying the PCS principles and practices, while activities 6, 13, 19, 22, 23, and 24 could gauge to what extent students could apply the communication skills. However, these sets of activities apply too to fulfill the other course outcomes.

Conclusion

This chapter begins with the discussion of the findings in three phases: Phase one- Needs analysis, Phase two- Development of the mLearning implementation model for undergraduate English Language learning, and Phase three- Evaluation of the model. Briefly, the needs analysis phase indicates that the majority of the students perceived that they have inadequate level of language competence, which could affect their performance in fulfilling their professional language course outcomes. Thus, becoming a language-learning problem and this needed a solution. However, their current PCS course could not cater to improve the students' language competence as the course focused more on fulfilling course outcomes. mLearning was then proposed to aid the students' language learning process to cope with their formal professional language course. Through the UTAUT analysis, students perceived high level of acceptance and readiness to accept mLearning as support to their language learning needs.

In adopting mLearning in formal classroom learning, proposals could be in the form of developing mLearning courseware or learning support system, mLearning infrastructure system, mLearning policy, a language teaching module for mLearning, mLearning curriculum design, or others. However, I chose to focus on the development of the mLearning implementation model for undergraduate English Language learning. The findings of phase two constitute the main findings of this study with the result of the model. The model, which was based on learning activities, was generated using ISM software via experts' views. Findings of the third phase involved the evaluation of the model using experts' opinion. The evaluation was conducted using fuzzy Delphi technique. The findings revealed that the model received high level of consensual agreement on all five aspects being used as instrument to evaluate the model. This concludes that the mLearning implementation model is suitable to serve as a guide in incorporating mLearning as learning support to undergraduate language learners to cope with their formal language professional course through integration of formal, informal, and social learning activities.

The language activities and the relationships among them support the social constructivist learning theory especially Vygotsky's notion of ZPD (Vygotsky, 1978), and the scaffolding language theory (Bruner, 1970) in describing how undergraduate language learners learn through interactions and collaboration (Tu & Hsiang, 2000

Navarro & Shoemaker, 2000; Vrasdisas & McIsaac, 1999) to meet their language learning needs and targeted course outcomes via mLearning. The model also supports these theories though the integration of formal, informal, and social learning activities as discussed earlier in this chapter. In the implementation of mLearning as learning support, the discussion of the model also demonstrated how transactional distance theory (Moore, 1972, 1993, 1997) and Park's pedagogical framework for mLearning (Park, 2011) described the mLearning concept and practice as learning support in formal learning which capitalized on the interactions among students, course instructors, learning content, mobile devices, and learning course outcomes. Through the theory and framework, the model showed that several types of mLearning could be necessarily involved in stages of the learning process based on the interactions and students' autonomy.

Besides this, the discussion of the model also showed how mLearning capabilities and mobile device capabilities could be optimally exploited in aiding the learners' language learning process using SAMR model (Puentedura, 2006) and Quinn's four Cs of mobile capabilities (Quinn, 2011a) in framing the selection of language activities and the relationships among them. The employment of the models here are also essential in creating a balance between the amount of learners' focus on technology and their focus on learning environment (Goth, Frohberg and Schwabe, 2006) towards sustainable incorporation of technology in education. Through the adoption of the theories, framework and the models discussed here, the model aimed at proposing how mLearning could be implemented through a network of language activities in supporting undergraduate language learners' learning needs to cope better with their formal learning course.

CHAPTER 8

IMPLICATION AND RECOMMENDATION

This chapter presents the implication and recommendation of the study. It begins with a brief summary of the study before advancing to the implication of the study. In the implication section, I will present the practical implications, theoretical implications, and the methodology implications. The chapter ends with suggestions for future possible directions of the study.

Summary of the Study

The aim of the study was to develop an implementation model of mLearning for English language learning among undergraduates. The model aimed at guiding how mLearning could be implemented as learning support for formal language course learning. This was to aid students to gain assistance in overcoming their lack of language competence to cope with their professional communication skills course and to achieve their course outcomes. The model (Figure 5.2) was developed based on the need of the students to have a language learning support as revealed in the findings of phase one. The model was then developed in the second phase of the study based on experts' opinion facilitated through interpretive structural modeling technique (ISM) session. The elements of the model consist of language activities that were determined via nominal group technique prior to the ISM session. The experts suggested that the model could be divided into sections to facilitate understanding of activities that contribute to students' language inputs and development of language skills. Based on the ISM technique, a driver-dependence matrix (Figure 5.3) was developed for the model to analyze the role and the importance of the activities in supporting the students' language learning. In the final phase of the study, the model was evaluated for suitability to be used as a guide for instructors in implementing mLearning. The evaluation was conducted using a panel of experts via fuzzy Delphi technique. The result of the evaluation showed experts' consensual agreement on all suitability criteria. This indicated that the model is suitable to be used as mLearning implementation model for undergraduate language learning. However, the findings of the study do have implications to instructional practices in teaching and learning language, which are discussed in the following section. The subsequent sections discuss the theoretical implication of the study and the implication to research methodology.

Practical Implications of the Study

It is apparent that mLearning is gaining acceptance as future learning owing to research findings that have proven the advantage of mLearning in motivating students in taking more self-participation and responsibilities in their own learning process. Students were able to collaborate more meaningfully, explore, and even construct new knowledge through interactive mobile technology mediated learning. The result of this study contributes to the body of knowledge in the implementation of technology-mediated learning in mainstream education specifically in the field of mLearning. This is exemplified through the development of the mLearning implementation model for undergraduate English Language learning. In facilitating development of the model, the study was further narrowed down to develop a model specifically designed for Professional and Communication Skills course, an English Language for specific purposes course among engineering undergraduate students of a private higher institution in Malaysia. The study through the development of the model could pave the direction to education stakeholders in designing meaningful and sustainable learning experiences mediated through mobile technology to cater the new mobile generation of learners without forsaking the long institutionalized traditional formal classroom learning.

Another contribution of the study in the body of knowledge is in English Language learning. As mentioned in the problem statement section, there is a large gap in mLearning studies in the use of mobile tools and devices as support for language learning process through learners' interaction (Petersen & Divitini, 2004). Thus, the study proposes the mLearning implementation model for language learning to serve as a proposal on how mLearning could be systematically conducted to support learners' learning needs. The model could be adopted or adapted to implement mLearning in a formal classroom at tertiary level. According to the activities and the relationships among them, course instructors could plan appropriate mLearning lesson plans and select suitable mobile devices to facilitate learners' language learning needs and fulfill course objectives. For example, based on the findings of the model (Figure 5.2) and the driver-dependence matrix (Figure 5.3), the lecturer may begin the language course by establishing learning contract (activity 9) with the students and encouraging them to form social blog groups (activity 10) before proceeding on giving lectures on communication (activity 1) or encouraging the students to get and share information about the course content (activity 5). Activities 9 and 10 that had been conducted earlier could facilitate activities 1 and 5, for example to allow students to share and understand the principles of communication through interaction in classroom and via mobile devices. Probably as the course progresses in the lecturer's lesson plan, the low achieve students could be assisted through mentorship (activity 12) and subsequently through mobile video conferencing (activity 7), mLearning forums (activity 13) and small group discussion through social blogs (activity 11). At the same time, referring to the model, students who wanted to present a mock-trial presentation could do so through activity 18 (search for presentation materials) and then record their oral presentations to be upload on social blogs to be commented by others (activity 6). Further discussion on the students' improvement could be conducted through the same activities 7, 11, 12, and 13 as mentioned here. In terms of mobile devices, since the activities involve synchronous and asynchronous interaction and collaboration, students need to be equipped with smartphones with audio-video streaming capabilities.

The Ministry of Higher Education and higher institutions may refer to the findings of this study in adding value to available infrastructure in universities in terms of technology equipment and devices suitable for social learning in a formal classroom setting. Probably, referring to the model, the higher education stakeholders may need to collaborate with mobile technology providers in equipping higher institutions with relevant mobile learning infrastructure and mass production of high-end mobile devices for course instructors and students such as mobile phones, smart phones, PDAs, iPod, and iPad. The nationwide collaboration and mass production of mobile devices will bring down the cost of the devices without compromising high end user technology. The findings of the study will also help the ministry and higher institutions in identifying new teaching and learning skills needed by both course instructors and students in managing teaching and learning activities via mobile technologies. Appropriate policies could then be drafted aligned with technology incorporation in formal education; for instance on how the mobile devices should be selected, employed and deployed in the classroom. Critical learning skills could be identified from the model to develop further cognitive skills or higher order thinking skills appropriated to the mLearning. New social skills such as online collaborative skills, podcasting and moblogging, and metacognitive skills such as self assess skills could be among the relevant new skills that need to be acquired by students to engage in learning and at work in the future.

Theoretical Implications of the Study

The model as discussed in this study not only shows how mLearning could be implemented but further described how formal, informal learning, and social learning could be bridged as a solution to cater the students' learning needs. In the process, the model redefined what mLearning is, both as a tool to augment learning and as performance support (Quinn, 2011; Terras & Ramsay, 2012) instead of narrowly defined it as a system to deliver content or courses. In directing the development of the model, the theoretical framework of the study consists of two parts. The first part adopted the social constructivist learning theory specifically Vygotsky's (1978) ZPD coupled with Bruner's (1970) scaffolding theory to describe how language learners could be assisted through interaction and collaboration with the course instructor, their peers, devices, and learning environment mediated through mobile devices. The other part of the theoretical framework involved the adoption of Moore's transactional distance theory and Park's pedagogical framework for mLearning in framing the selection of language activities for the model in implementing mLearning as learning support for the learners to fulfill their language needs and cope with their language course subject through interaction and collaboration. Based on the framework, the selected learning activities described how students could interact and collaborate with each other to learn and how they could be aided to achieve their learning goals with the help of others via mLearning. Besides this, the learning activities were targeted to manipulate the full capabilities of mobile technology and devices. Thus, the SAMR model (Puentedura, 2006) and Quinn's (2011a) four Cs of mobile capabilities were employed to guide the experts in selection of relevant learning activities. As discussed earlier, learning activities beyond substitution level of the SAMR model could significantly justify the incorporation of technology because activities in subsequent stages (Augmentation, Modification and Redefinition) represent activities which could not be accomplished previously (without technology) but very relevant in aiding the students to reach their highest potential. For example, to achieve sustainability of technology incorporation in formal learning, the study through the development process of the model proposed the integration of formal, informal, and social learning which conforms to natural human learning (Quinn, 2011a, 2011b) facilitated by mLearning using mobile technology. To strengthen the sustainable value here, the development of the model was driven by appropriate learning theories and technology-based models. For example, in determining the learning activities to be included in the implementation model, the study employs Quinn's four Cs of mobile capabilities and the SAMR model to force the experts to identify not only the activities which enhance learning that are unique to mobile capabilities but also ones that transform learning. The employment of these models aim to characterize learning experiences uniquely to mLearning especially in overcoming learning problems which are not possible with traditional formal learning. The differences accomplished through the incorporation of mLearning in students' learning could be the key to sustainable technology use.

Based on the discussion in this section, the mLearning implementation model implicates both Vygotsky's ZPD and the scaffolding theory where the model via a network of language activities guides how learners' ZPD could be overcome through their interaction with the more knowledge others (MKO) scaffold by their instructors, peers, and mobile devices. The ZPD need to be solved in order for the learners to achieve their next potential or specifically fulfill their language learning needs. The study also implicates theoretically by demonstrating how multiple learning theories, frameworks, and models could be combined to develop an educational strategy. The study also showed that past learning theory such as Vygotsky's zone of proximal development could still be relevant to describe the present learning application (e.g., Cook, 2010).

Methodology Implications of the Study

The study also contributes to the body of knowledge in the research methodology for curriculum instruction and technology field. To elaborate, the study proposed the use of interpretive structural modeling (ISM) which is a powerful decision making tool in the development of the mLearning implementation model for this study. ISM is a management decision-making tool popularly used in the sales and marketing sector, finance, manufacturing, consultation, product development or other business and organization related field for over 25 years. However, the use of ISM in education field is scarce though it is a valuable tool in education policy making, training, educational institution management, resource management, and others. Very few studies have been conducted on using ISM especially in solving specific teaching and learning problems. The number of studies is further limited in education field in terms of studies that integrates ISM with nominal group technique (NGT), a comparable technique used to generate the elements for ISM as presented in this study. The use of fuzzy Delphi technique proved a valuable strategy as demonstrated in evaluating the output of ISM in this study but scarcely used in educational research. One of the main similarity that suggest compatibility among these research methods was that they all capitalize on experts' decisions in the design and development of the model. The use of experts' opinion has a long established record of use in research methodology especially in new and undeveloped areas (Fowles, 1978). Since specific study in development of mLearning implementation model for English language learning is scarce, the use of experts' opinion is employed in this study.

However, although the research methodologies used in this study are not new, the way these methods were integrated had not been accomplished previously especially in the design and development of technology-based instructional or learning models. Thus, the employment of ISM combined with NGT and fuzzy Delphi technique in the development of mLearning implementation model here could serve as an example in using these methods for education strategies. The methodology used here in developing the model could be replicated or adapted to develop mLearning models not only for other language-learning course but for other learning courses as well. The methodology could also be useful to develop other educational related model such as curriculum, policies, resource management, institutional management, and others.

Recommendation

Based on the outcome of the study, a few recommendations could be made. Firstly, in terms of the incorporation of new technology in formal learning, the application of new technology or concept (e.g., mLearning) should also focus on its role as a solution besides employing it as a novelty or replacement of current practices. The key significance of employment of technology in education should not about how exciting it is in doing things differently compared to conventional practice. It should be about continuity of technology use although we appreciate the convenience value of technology.

To illustrate, take for example the long institutional formal learning. Formal classroom learning has a long history since its introduction as new learning technology replacing informal education. In the past, learners have to travel far to meet teachers to acquire knowledge (Tokoro & Steels, 2003). When formal schooling was introduced, it gave immense positive impact and revolutionized learning and reshape communities and societies globally ever since. Formal schooling sustains until today not primarily due to its convenience value but because it became a solution to the learning needs at large. It solves learners' global problems in attaining knowledge where they do not have to travel far and frequently to meet their mentors any longer. Schools were formed as an institution to gather learners and teachers at one place and this act as a solution. The same notion should apply too in the incorporation of technology in mainstream education. One way is that it should be incorporated as a solution especially when the needs arise as demonstrated in this study.

However, whether technology could be a viable solution, it depends on how it is implemented. This leads to the second recommendation of the study, which proposes the implementation of mLearning as learning support via integration of formal, informal, and social learning instead of mLearning solely as content delivery system. As an example, this study was conducted to describe how mLearning could be used as a learning support in aiding learners to achieve their learning goals. This was proposed through developing an interpretive structural implementation model to guide how mLearning could augment formal classroom learning in catering the learning needs of undergraduate students especially the low to intermediate level achievers. Although the model guides how mLearning could be implemented specifically for language learning among undergraduates, the methodology could be adapted to develop models for other areas of learning disciplines catering other types of learners' learning needs using mobile technology. The third recommendation is on further research that could be conducted based on the outcomes of the study. This is discussed in the following section.

Further Research of the Study

The final product of the study is the interpretive structural mLearning implementation model for undergraduate English Language learning based on learning activities as element for the model. Based on the model, it is recommended to develop language learning modules and conducted on undergraduate students. This would further evaluate the effectiveness of the model in supporting the learners' learning process based on students' view. Software technologist could also be employed to develop mobile language software, applications, or learning management system based on the model of the study to facilitate the conduct of the learning modules. The model could be possibly further refined based on the findings of the evaluation through the modules.

Further research is also suggested in developing more models for other English Language course subjects. From the models, standardized language learning activities could be generated to develop criteria for mLearning language activities in general. For example, from the comparison of the selected mLearning language activities between General English and English for specific purposes models, similar or different types of mLearning activities could be determined and listed. The list would be valuable in selection of appropriate learning activities to support learners' language learning needs effectively across language disciplines and levels. In another example, mLearning implementation models developed for language learning at primary, secondary, and tertiary levels could be useful in mapping language activities that could develop learners' language skills in stages using mobile technology. New sets of language learning skills for the mobile era perhaps could be derived from the mapping and subsequently be introduced in the formal language curriculum and developed along the education levels.

Other mLearning implementation models could also be developed for specific needs of learners. For example, mLearning implementation model could be developed for posttraumatic disorder learners, physical disabled learners, post natural disaster learners, teacher training, and others. Based on the model, appropriate policies, curriculum, course syllabus, or teaching modules could be developed to aid the learners of special or specific needs. The methodology used in the study could serve as valuable guide in developing the models.

Comparison studies in mLearning implementation models across countries could also be recommended as extension of this study. Based on the results of the studies, we could determine the similarities and differences among the implementation models. From this, factors which contribute to similarities or differences could be identified. For example, answers to whether different culture, ethnicity, social and education background could have implication to the implementation of mLearning in specific region. This would answer for instance why mLearning is more successful in its implementation in certain countries. Specific theories or models could be selected based on the factors identified to develop mLearning curriculum, models, or modules in a particular knowledge field or geographical area. Perhaps, new theories or models could also be developed to define implementation of mLearning in general.

Closing Statement

Past researches have abundantly reported on successful initiatives of mLearning and claimed various learning achievements and motivation increase among learners. Positive learning outcomes resulted from mLearning have emerged not only in education field but encouraging outcomes were reported too from mLearning applications in business, management, nursing, tourism, landmark visits, and other sectors. Even UNESCO, a world organization has approved mLearning and drafted a policy for mLearning. However, despite of these positive effects and great potential of mLearning, there is no sign that the traditional formal classroom learning would be replaced in the immediate future. Sharples (2006) argued that formal learning has a long history and it is here to stay. While informal social networking develops certain skills, it cannot substitute for formal learning.

However, instead of adopting mLearning as full learning delivery system, a different path was chosen for this study by exploring the adoption of mLearning as potential learning support tool for formal learning. In the context of the study, mLearning was proposed to help the undergraduate students who lacked in language competence to cope with their formal language course. In support of Quinn's (2011a) definition, the study adopts mLearning as a tool to support not only the formal classroom learning, but also informal and social learning augmented through mobile devices. Through the mLearning implementation model, mLearning was proposed as learning support to augment learners' language learning process to overcome their shortcomings in language competence and cope with their language course outcomes.

In short, the study explored the use of technology as a solution to a specific learning issue, which could not be solved through traditional learning mode. While the use of technology in education could redefine learning experiences and enrich learning delivery tools, the application of technology as a solution to unsettled learning problems could be more impactful and meaningful. Only then, technology use could be more sustainable. However, the adoption of technology in education should cater not only learners' needs but also their preferences and intention to use it although the technology is closely associated with them. For example, certain group of learners may resent the use of mobile phones in formal learning as they have already regarded the devices as personal use for communication and entertainment. This is the reason for a needs analysis to be conducted before introducing a particular technology in their learning course. Nevertheless, technology-based education has proven from time to time in engaging new and meaningful learning experiences especially in catering for the preferences and needs of the new generation of learners. Thus, research in technology-based intervention such as mLearning needs to be continued. Moreover, as stated in the opening sentence of Chapter 1, learners of today have evolved in the way they learn compared to their teachers, professors, or their course instructors learned when they were students (Prensky, 2001).

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APPENDIX A

SURVEY QUESTIONNAIRE
NEEDS ANALYSIS ON mLEARNING FOR PROFESSIONAL & COMMUNICATION SKILLS COURSE

Thank you for taking the time to fill in this questionnaire. This questionnaire is being used to investigate your experience with technology and the use of technology within an educational environment. Your responses will be used as part of a needs assessment for Professional and Communication course mobile learning design. Responses to this questionnaire will be absolutely confidential and no other participants will be able to see your data. The answers to this questionnaire will go only to the project researcher (Muhammad Ridhuan Tony Lim) and any information which could potentially identify participants will not be disclosed.

SECTION A- YOUR DETAILS.
Instruction: Answer each question by placing a √ or an X in the box provided.

1	Gender	1	Male	2	Female
2	Nationality	1	Malaysian	2	International (Please specify: ______________)
3	ENGLISH 2 RESULT	1	3.70-4.00 (A- to A)	3	2.0-2.3(C to C+)
		2	2.70-3.30(B to B+)	4	2.00-2.49(D- to D+)
				5	Below 2.00 (F)

SECTION B- YOUR PERCEPTION TOWARDS YOUR LANGUAGE COMPETENCE.
Instruction:For each statement below, choose your response from the answer key and place the corresponding number of your answer on the line beside each statement.

Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	

4 [ ] I am confident that listeners will not have any problem to understand what I say.
5 [ ] I tend to arrange the words in my mind before expressing what I wanted to say aloud especially in formal conversation.
6 [ ] I tend to speak 'broken English' especially during informal conversation.
7 [ ] I tend to speak more in phrases or short sentences.
8 [ ] I prefer to memorize scripts before delivering a speech or talk in front of an audience.

SECTION C- YOUR OPINION ON THE CURRENT PCS COURSE
Instruction: For each statement below, choose your response from the answer key and place the corresponding number of your answer on the line beside each statement.

Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	

9 [ ] The course assumes that the students are fluent in English before signing for the course.
10 [ ] The course focus more heavily on evaluation activities than learning of presentation skills.
11 [ ] Three hours per week in one semester is ENOUGH for me to acquire professional communication skil
12 [ ] The comments given on presentations by the lecturer and students are **NOT** enough for me to deliver an effective presentation.
13 [ ] Students who have the experience in delivering oral presentations before would perform better.
14 [ ] Students who have better command of English will perform better in this course.
15 [ ] At the end of the course, I end up placing more importance in grades obtain rather than communicatioi skills acquired.

APPENDIX A

SECTION D : YOUR MOBILE DEVICE CAPABILITIES.

Instruction:For each statement below, choose your response from the answer key and place the corresponding number of your answer on the line beside each statement.

16 Do you own a mobile devices (Ex: mobile phone) ?

- [ ] Yes
- [ ] No

17 What type of mobile communication devices do you own ? (May select **MORE** than **ONE**)

1	Mobile Phone/Cell Phone
2	Smart phone (such as Iphone or Android phone)
3	Personal Device Assistance (PDA)
4	Audio/Video Portable Player (Examples: IPOD, MP3, MP4 or MP5 Player)
5	Tablet PC (Example: IPAD, Galaxy TAB, etc)
6	Other(Specify): ______________________

18 What is the level of your mobile phone/device capabilities ? (Select the **HIGHEST**)

1	Level 1 (Basic services- voice calls & sms, with/without camera)
2	Level 2 (Level 1 + email, limited internet browsing, camera & video recording, MMS, video calls, and preloaded softwares)
3	Level 3 (Level 2 + GPS+ mobile apps downloadable)

19 What is your mobile phone/devices data connection capabilities ? (**HIGHEST**)

1	GPRS (Basic bandwidth)	3	HSDPA/3G
2	EDGE	4	4G or above

20 What is your supplementary data connection capabilities ? (May select **MORE** than **ONE**)

1	WLAN WiFi	3	USB
2	Bluetooth	4	Others ______________________

SECTION E : ACCEPTANCE AND USE OF mLEARNING.

Instruction:For each statement below, choose your response from the answer key and place the corresponding number of your answer on the line beside each statement.

Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	

PERFORMANCE EXPECTANCY

21 [ ] I would find that mLearning is useful for my English Professional and Communication course
22 [ ] Using mlearning would help me to accomplish my learning tasks more quickly.
23 [ ] Using mLearning would increase my productivity.
24 [ ] Mlearning would increase my chance to get better grades for my course.

EFFORT EXPECTANCY

25 [ ] My interaction through mLearning would be clear and understandable.
26 [ ] It would be easy for me to become skillful at using mLearning.
27 [ ] I would find mLearning easy to use.

ATTITUDE TOWARDS USING TECHNOLOGY FOR LEARNING

28 [ ] I don't like learning with mLearning.
29 [ ] MLearning would make learning more interesting.
30 [ ] It would be fun learning with mLearning.
31 [ ] Using mLearning would be a very good idea.

SOCIAL INFLUENCE

32 ☐ People who influence my behaviour think that I should use mLearning.
33 ☐ People who are important to me think that I should use mLearning
34 ☐ My lecturer has encouraged and convinced me to use mLearning.
35 ☐ In general, my university has supported the use of mLearning.

FACILITATING CONDITIONS

36 ☐ I have the necessary tools and resources to use mLearning.
37 ☐ I have the knowledge necessary to use mLearning.
38 ☐ I have specific person to refer to assist me with mLearning difficulties.

SELF-EFFICACY

I would complete a learning or communciation task using mLearning…

39 ☐ If there is NOBODY around telling me what to do as I go.
40 ☐ If there is someone I could call to help me when I got stuck.
41 ☐ If I have a lot of time and mLearning resources provided.
42 ☐ If there is a built-in help facility for assistance in mLearning system.

BEHAVIOURAL INTENTION TO USE MOBILE LEARNING

43 ☐ I intend to use mLearning for this course as soon as possible.
44 ☐ I plan to use mLearning for this course in the next 2 months.
45 ☐ I predict I would use mLearning for this course in the next two months.

ANXIETY

46 ☐ I feel apprehensive using mLearning for this course.
47 ☐ I am afraid I could lose a lot of mLearning information by hitting a wrong key.
48 ☐ Using mLearning is somewhat intimidating to me.

THANK YOU

APPENDIX B

UNIVERSITY OF MALAYA

EVALUATION OF mLEARNING CURRICULUM IMPLEMENTATION MODEL FOR UNDERGRADUATE ENGLISH COMMUNICATION SKILLS COURSE

(SURVEY QUESTIONNAIRE)

Invitation to participate in the usability testing of interpretive structural modelling of mlearning implementation model for english language communication course among undergraduates.

To all respected respondents, I am Muhammad Ridhuan Tony Lim Abdullah, a doctoral candidate from the Faculty of Education at University of Malaya, Kuala Lumpur. I am conducting a research study titled, "Development of Activity-Based mlearning Implementation Model for Undergraduate English Language Learning" as fulfilment of the requirements for the degree doctor of philosophy. This questionnaire aims to obtain your expertise in the suitability of the mLearning implementation model to serve as a guide in implementing mLearning as support to formal language course learning.

Responses to this questionnaire will be confidential and no other participants will be able to see your data. The answers to this questionnaire will go only to the project researcher (Muhammad Ridhuan Tony Lim) and any information, which could potentially identify the participants, will not be disclosed.

INSTRUCTIONS

Attached to these questionnaires is the mLearning implementation model (Attachment A) which proposes a network of learning activities mapping how a language communication skills course could be implemented via mobile learning (mLearning) both in and beyond classroom borders. Here mLearning could serve as a complement but more so to augment classroom teaching and learning as a pragmatic solution to aid more undergraduates (especially the beginner to intermediate proficiency level students) to better meet their individual learning needs based on the course learning outcomes. Thus, the course learning objectives which are listed in the Professional & Communication Skills course syllabus (Attachment C) is also attached to these questionnaires. Attachment B illustrates the clusters of mLearning activities that were classified according to their dependence and driving powers. Further information on the classifications are elaborated in the questionnaire to further probe the suitability of the model.

APPENDIX B

PART 1: PARTICIPANT'S PERSONAL INFORMATION

SECTION A – BACKGROUND OF PARTICIPANTS

1. Gender

- ☐ Male
- ☐ Female

2. Teaching/Working Experience

- ☐ Below 5 Years
- ☐ 5-10 Years
- ☐ 11-20 Years
- ☐ Above 20 Years

3. Highest Qualification

- ☐ PhD
- ☐ Master
- ☐ Degree
- ☐ Diploma/Certificate

4. Field of work/expertise

- ☐ Education (TESL/TESOL/etc)
- ☐ Education (Non TESL)
- ☐ Non-Education: ____

SECTION B : USE OF MOBILE TECHNOLOGIES

1. How do you rate your computer or ICT related skills ?
   (Skills involve browsing the internet and search for information, communication using email or instant messaging, blogs, facebook, twitters, developing web page etc.)

- ☒ Skillful (Develop and managing website or/and blogs)
- ☐ Moderate (Able to communicate through social softwares like Facebook, Twitters, Likendl etc.)
- ☐ Low skilled (use of office spreadsheets such as words, powerpoint; receive and sending emails; browse and search for information on the internet)
- ☐ None

2. What mobile device or mobile devices do you own? (Mobile device - Mobile phone, PDA, Ipod, Ipad, and others.)

- ☐ Mobile Phone/Cell Phone
- ☐ Smart phone (such as Iphone or Android phone)
- ☐ Personal Device Assistance (PDA)
- ☐ Audio/Video Portable Player (Examples: IPOD, MP3, MP4 or MP5 Player)

APPENDIX B

- ☐ Tablet PC (Example: IPAD, Galaxy TAB, etc)
- ☐ Mobile Handheld Gaming (Such as PSP, N-Gage, Nintendo, etc)
- ☐ Laptops/Notebook
- ☐ Other: ______

3. What do you mainly use the device/devices for?

- ☐ Learning (Accessing knowledge and information)
- ☐ Entertainment
- ☐ Work
- ☐ Communication
- ☐ Other: ______

4. What is your level of technical skill with mobile communication devices?

- ○ High
- ○ Average
- ○ Low

5. What social networking tools are you familiar with?

- ☐ Email
- ☐ Blogs/Facebooks/Twitters
- ☐ Wiki
- ☐ Texting (SMS, MMS)
- ☐ MySpace
- ☐ Instant Messaging (IM)
- ☐ None
- ☐ Other: ______

APPENDIX B

PART 2: EXPERT'S VIEW ON THE USABILITY OF THE MODEL

INSTRUCTION For each statement below, please refer to ATTACHMENT A and B. Choose your response from the answer key corresponding to each item.

IMPORTANT NOTE :

1= STRONGLY DISAGREE
2= DISAGREE
3=MODERATE AGREE
4=AGREE
5=STRONGLY AGREE

1. ***Suitability of elements(Learning activities) of the Mlearning Implementation Model for Language Communication Course.***

1.1 Do you agree with the mobile learning activities proposed in the model in connection to the learning outcomes? (The numbers in the boxes are the total activities)

	1-3	4-6	7-9	10-12	13-15	16-18	19-24	
	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☒	☐	☐	STRONGLY AGREE

Please indicate which Learning activity/activities that you fell inappropriate:

____

2. ***Views on the domain classification of mobile learning activities of the mlearning curriculum implementation model for language communication course***

INSTRUCTION For each statement below, please refer to ATTACHMENT A and ATTACHMENT B. Choose your response from the answer key below each item.

2.1 Do you agree with the grouping of mobile learning activities into 3 domains as shown in the model (ATTACHMENT A) : Knowledge Input Activities, Enabling Skills activities, and Evaluation and Reflection activities ?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY DISAGREE

2.2 Do you agree with the list of activities grouped under Knowledge Input Activities as shown in the model (ATTACHMENT A) ?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☒	☐	☐	☐	☐	STRONGLY AGREE

2.3. Do you agree with the list of activities grouped under Enabling Skills Activities as shown in the model (ATTACHMENT A) ?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

2.4. Do you agree with the list of activities grouped under Evaluation and Reflection Activities as shown in the model (ATTACHMENT A) ?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

Comments on the classification of mobile learning activities according to the domain above if any.

APPENDIX B

3.0. Views on the cluster classification of mobile learning activities of the mlearning curriculum implementation model for language communication course (please refer to Attachment b)

INSTRUCTION For each statement below, please refer to Attachment A and Attachment B. Choose your response from the answer key below each item.

3.1. Do you agree with the classification of mobile learning activities in the INDEPENDENT cluster? (Independent activities have strong driving power and weak dependence power. These activities would have to be conducted first to have effect on other activities that depend on them).

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

3.2. Do you agree with the classification of mobile learning activities in the LINKAGE cluster? (Linkage activities have strong driving and strong dependence power. Any action on these activities will have an effect on the other activities).

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

3.3. Do you agree with the classification of mobile learning activities in the DEPENDENT cluster? (Dependent activities have weak driving power but strong dependence power. In order for these activities to be involved in aiding the learners achieve their learning outcomes, these activities depend on other activities connected to them).

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

3.4. Do you agree with the classification of mobile learning activities in the AUTONOMOUS cluster ? (Autonomous activities have weak driving power and weak dependence power. As such they are relatively disconnected from the system. The model can be applied with or without the variables).

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

Comments on the classification of mobile learning activities according to the CLUSTERS if any.

APPENDIX B

4.0. Views on the relationships of mobile learning activities of the mlearning curriculum implementation model for language communication course

INSTRUCTION For each statement below, please refer to ATTACHMENT A , ATTACHMENT B and ATTACHMENT C. Choose your response from the answer key below each item.

4.1. Do you agree with the relationships among the mobile learning activities in the Knowledge Input Activity domain as shown in the model (ATTACHMENT A) in aiding the students to achieve their learning needs and course outcomes (ATTACHMENT C)?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

4.2. Do you agree with the relationships among the mobile learning activities in the Enabling Skills Activity domain as shown in the model (ATTACHMENT A) in aiding the students to achieve their learning needs and course outcomes (ATTACHMENT C)?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

4.3. Do you agree with the relationships among the mobile learning activities in the Evaluation and Reflection Activity domain as shown in the model (ATTACHMENT A) in aiding the students to achieve their learning needs and course outcomes (ATTACHMENT C)?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

4.4. Do you agree with the OVERALL relationships among the mobile learning activities as shown in the model (ATTACHMENT A) in aiding the students to achieve their learning needs and course outcomes (ATTACHMENT C)?

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

Comments on the relationship of mobile learning activities if any.

APPENDIX B

5.0. Views on the overall usability of the model

5.1. The model shows a clear guide on how a language communication skills course could be conducted using mLearning in complementing the conventional classroom learning.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

5.2. It is practical to use a network of interrelationship of learning activities in developing a model of curriculum implementation in guiding the curriculum implementers to conduct mLearning language lessons as shown in this model.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

5.3. The model Attachment shows clearly how formal classroom learning activities could merge with informal mLearning activities to form a holistic learning experience for the students.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

5.4. The model Attachment shows clearly how mLearning could promote and capitalize collaborative learning through formation of large and small 'learning society' among students through choice of collaborative online learning activities and the interrelationships among the activities.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

5.5. The model Attachment shows clearly how one activity connects to other activities in aiding the students through mLearning in achieving their learning outcomes.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

5.6. The model could be used to guide planning of course unit lessons by the lecturer in facilitating students' learning.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

5.7. The model could be used as an example to develop other curriculum implementation models for other course subjects.

	1	2	3	4	5	6	7	
STRONGLY DISAGREE	☐	☐	☐	☐	☐	☐	☐	STRONGLY AGREE

APPENDIX B

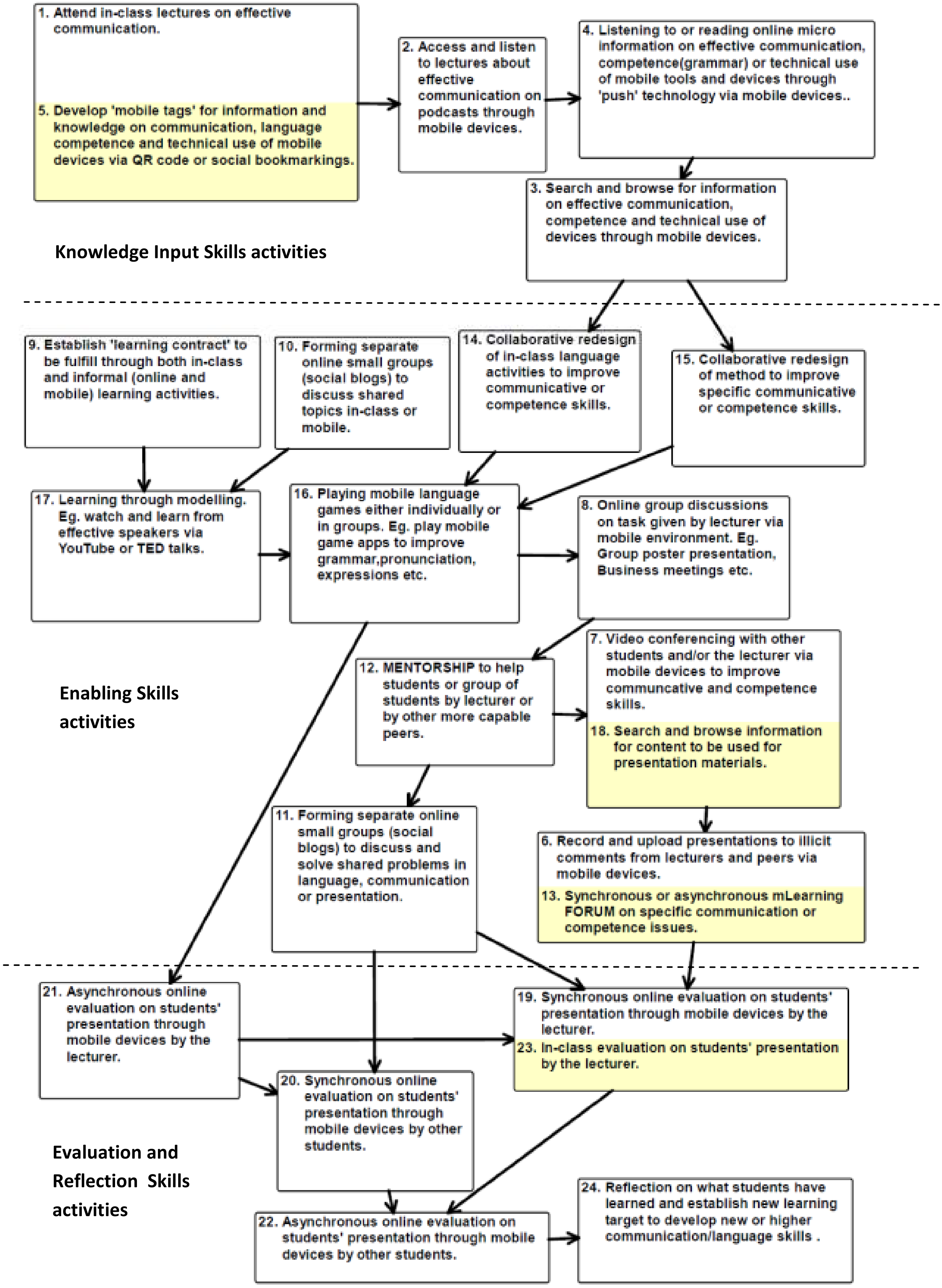
Comments on the overall usability of the model if any

END OF QUESTIONNAIRES

THANK YOU VERY MUCH FOR YOUR PARTICIPATION.

APPENDIX B

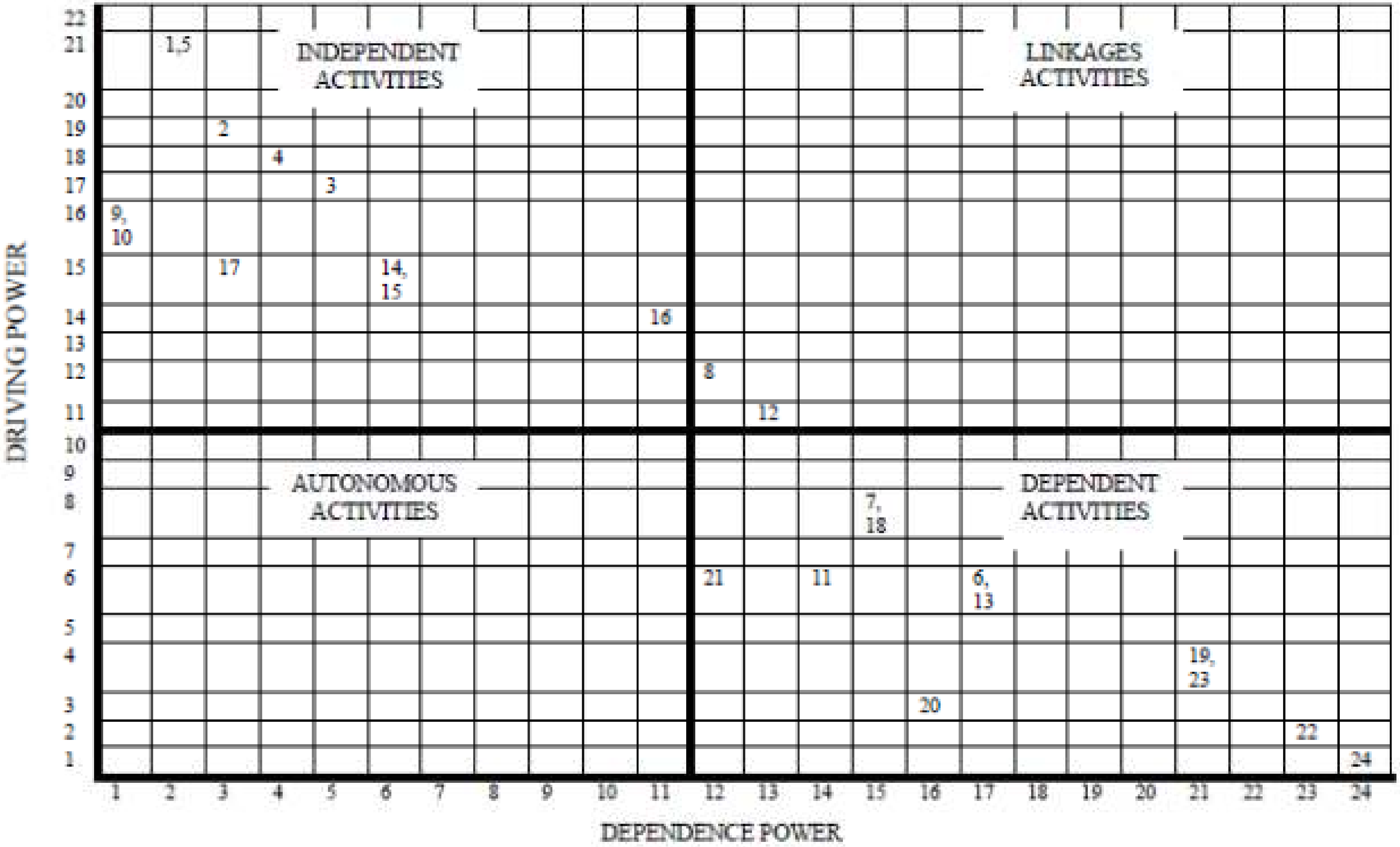
ATTACHMENT A



mLearning implementation model of undergraduate English Language learning for Professional and Communication Skills course.

APPENDIX B

ATTACHMENT B



Driver- Dependence matrix for mLearning implementation model for undergraduate English learning for Professional and Communication Skills course

APPENDIX B

ATTACHMENT B (CONTINUATION)

List of Activities

1. Attend in-class lectures on effective communication.
2. Access and listen to lectures about effective communication on podcasts through mobile devices.
3. Search and browse for information on effective communication, competence, and technical use of devices through mobile devices.
4. Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.
5. Develop 'mobile tags' for information and knowledge on communication, language competence, and technical use of mobile devices via QR code or social bookmarking.
6. Record and upload presentations to elicit comments from lecturers and peers via mobile devices.
7. Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skills.
8. Online group discussions on task given by lecturer via mobile environment.
9. Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.
10. Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile.
11. Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication, or presentation.
12. Mentorship to help students or group of students by lecturer or by other more capable.
13. Synchronous or asynchronous mLearning forum on specific communication or competence issues.
14. Collaborative redesign of in-class language activities to improve communicative or competence skills.
15. Collaborative redesign of method to improve specific communicative or competence skills.
16. Playing mobile language games either individually or in groups.
17. Learning through modeling.
18. Search and browse information for content to be used for presentation materials.
19. Synchronous online evaluation on students' presentation through mobile devices by the lecturer.
20. Synchronous online evaluation on students' presentation through mobile devices by other students.
21. Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.
22. Asynchronous online evaluation on students' presentation through mobile devices by other students.
23. In-class evaluation on students' presentation by the lecturer.
24. Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.

APPENDIX B

ATTACHMENT C

Professional Communication Skills Course Syllabus

1	Name of Course/ Module	**Kemahiran Berkomunikasi Profesional / Professional Communication Skills**				
2	Course Code	HCB 2033				
3	Name of Academic Staff	Dr. Zulqarnain Abu Bakar, Dr. Sumathi Renganathan, Chong Su Li, M Noor Rosli Baharom, Muhammad Ridhuan Abdullah, Razol Mahari Mohd Ali, Azelin M Noor				
4	Rationale for the inclusion of course in the program	Emerging trends in technical and professional education call for value addition i.e. students must acquire something more than what is provided in the curriculum. There is need to enhance their communication skills, to develop professional ethics in them and to help them learn and develop human values and concern for humanity.				
5	Semester and year offered	2 / 1				
6	Total Student Learning Time (SLT)	Face To Face				Total Guided and Independent Learning
	L = Lecture T = Tutorial P = Practical O = Others	L 28	T 6	P 8	O	42
7	Credit Value	3				
8	Prerequisite (if any)	**Academic writing**				
9	Objectives	To be able to conduct effective and professional oral presentation/meetings.				
10	Learning Outcomes	**At the end of this course, students should be able to:** **1) apply the principles and practices of professional oral communication skills.** **2) present information confidently, accurately and fluently in a variety of professional, business and social settings.** **3) persuade effectively in a variety of professional, business and social settings.** **4) communicate interpersonally, and work effectively individually and in teams.**				
11	Transferable Skills: Skills and how they are developed and assessed, Project and practical experience and Internship	Ongoing assessment of transferable skills stated below : Group Technical poster presentation; individual informative technical presentation; group business meeting; and individual persuasive presentation.				
12	Teaching-learning and assessment strategy	Ongoing oral assessment of listed transferable skills incorporating regular tutorials and consultations with the lecturer				
13	Synopsis	This course emphasizes the theory and practice of professional communication at interpersonal level, in teams and to a large group. The course serves to build upon the students' academic and professional knowledge acquired through other core courses and will enable them to be highly effective in expressing themselves and in imparting their professional and technological expertise in a variety of jobs, business, professional and social settings. This course will be delivered through a series of simulated and activity-based situations.				

<table>
<tr><td>14</td><td>Mode of Delivery (Lecture, Tutorial, Workshop, Seminar, etc)</td><td colspan="4">Lecture, Tutorial</td></tr>
<tr><td>15</td><td>Assessment Methods and Types</td><td colspan="4">Coursework (Presentations, Assignments) – 100%</td></tr>
<tr><td>16</td><td>Mapping of the course/module to the Programme Aims</td><td colspan="4">-</td></tr>
<tr><td>17</td><td>Mapping of the course/module to the Programme Learning Outcomes</td><td colspan="4">
<table>
<tr><td colspan="2" rowspan="2">Course Learning Outcome</td><td colspan="5">Programme Outcome</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td></tr>
<tr><td>CLO1</td><td>apply the principles and practices of professional oral communication skills</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>CLO2</td><td>present information confidently, accurately and fluently in a variety of professional, business and social settings</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>CLO3</td><td>persuade effectively in a variety of professional, business and social settings</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>CLO4</td><td>communicate interpersonally, and work effectively individually and in teams.</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
<tr><td rowspan="6">18</td><td rowspan="6">Content Outline of the Course/Module and the SLT per topic</td><td></td><td>Lect.</td><td>Tut.</td><td>Lab</td></tr>
<tr><td>Principles and Practices of Communication

Formal Oral Communication</td><td>3</td><td></td><td></td></tr>
<tr><td>Informative Oral Presentation
i. Process Description
ii. Technical Oral Presentation</td><td>2
7
12</td><td></td><td></td></tr>
<tr><td>Persuasive Presentation</td><td>12</td><td></td><td></td></tr>
<tr><td>Business Meeting</td><td>6</td><td></td><td></td></tr>
<tr><td>**Total Hours**</td><td>42</td><td></td><td></td></tr>
<tr><td rowspan="2">19</td><td rowspan="2">References</td><td>1. *Communicating at Work*. Adler, Ronald B. and Jeanne Marquardt Elmhorst. New York: McGraw Hill 2008</td><td colspan="3">Main Reference</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td>20</td><td>Other additional information</td><td></td><td colspan="3"></td></tr>
</table>

APPENDIX C

Professional Communication Skills Course Proforma

<table>
<tr><td>1</td><td>Name of Course/ Module</td><td colspan="5">Kemahiran Berkomunikasi Profesional /
Professional Communication Skills</td></tr>
<tr><td>2</td><td>Course Code</td><td colspan="5">HCB 2033</td></tr>
<tr><td>3</td><td>Name of Academic Staff</td><td colspan="5">Dr. Zulqarnain Abu Bakar, Dr. Sumathi Renganathan, Chong Su Li, M Noor Rosli Baharom, Muhammad Ridhuan Abdullah, Razol Mahari Mohd Ali, Azelin M Noor</td></tr>
<tr><td>4</td><td>Rationale for the inclusion of course in the program</td><td colspan="5">Emerging trends in technical and professional education call for value addition i.e. students must acquire something more than what is provided in the curriculum. There is need to enhance their communication skills, to develop professional ethics in them and to help them learn and develop human values and concern for humanity.</td></tr>
<tr><td>5</td><td>Semester and year offered</td><td colspan="5">2 / 1</td></tr>
<tr><td rowspan="2">6</td><td>Total Student Learning Time (SLT)</td><td colspan="4">Face To Face</td><td>Total Guided and Independent Learning</td></tr>
<tr><td>L = Lecture
T = Tutorial
P = Practical
O = Others</td><td>L

28</td><td>T

6</td><td>P

8</td><td>O</td><td>42</td></tr>
<tr><td>7</td><td>Credit Value</td><td colspan="5">3</td></tr>
<tr><td>8</td><td>Prerequisite (if any)</td><td colspan="5">Academic writing</td></tr>
<tr><td>9</td><td>Objectives</td><td colspan="5">To be able to conduct effective and professional oral presentation/meetings.</td></tr>
<tr><td>10</td><td>Learning Outcomes</td><td colspan="5">At the end of this course, students should be able to:
1) apply the principles and practices of professional oral communication skills.
2) present information confidently, accurately and fluently in a variety of professional, business and social settings.
3) persuade effectively in a variety of professional, business and social settings.
4) communicate interpersonally, and work effectively individually and in teams.</td></tr>
<tr><td>11</td><td>Transferable Skills: Skills and how they are developed and assessed, Project and practical experience and Internship</td><td colspan="5">Ongoing assessment of transferable skills stated below :
Group Technical poster presentation; individual informative technical presentation; group business meeting; and individual persuasive presentation.</td></tr>
<tr><td>12</td><td>Teaching-learning and assessment strategy</td><td colspan="5">Ongoing oral assessment of listed transferable skills incorporating regular tutorials and consultations with the lecturer</td></tr>
<tr><td>13</td><td>Synopsis</td><td colspan="5">This course emphasizes the theory and practice of professional communication at interpersonal level, in teams and to a large group. The course serves to build upon the students' academic and professional knowledge acquired through other core courses and will enable them to be highly effective in expressing themselves and in imparting their professional and technological expertise in a variety of jobs, business, professional and social settings. This course will be delivered through a series of simulated and activity-based situations.</td></tr>
<tr><td>14</td><td>Mode of Delivery (Lecture, Tutorial, Workshop, Seminar, etc)</td><td colspan="5">Lecture, Tutorial</td></tr>
<tr><td>15</td><td>Assessment Methods and Types</td><td colspan="5">Coursework (Presentations, Assignments) – 100%</td></tr>
</table>

APPENDIX C

<table>
<tr><td>16</td><td>Mapping of the course/module to the Programme Aims</td><td>-</td></tr>
<tr><td>17</td><td>Mapping of the course/module to the Programme Learning Outcomes</td><td>
<table>
<tr><td colspan="2" rowspan="2">Course Learning Outcome</td><td colspan="5">Programme Outcome</td></tr>
<tr><td>PO1</td><td>PO2</td><td>PO3</td><td>PO4</td><td>PO5</td></tr>
<tr><td>CLO1</td><td>apply the principles and practices of professional oral communication skills</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>CLO2</td><td>present information confidently, accurately and fluently in a variety of professional, business and social settings</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>CLO3</td><td>persuade effectively in a variety of professional, business and social settings</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>CLO4</td><td>communicate interpersonally, and work effectively individually and in teams.</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
<tr><td>18</td><td>Content Outline of the Course/Module and the SLT per topic</td><td>
<table>
<tr><td></td><td>Lect.</td><td>Tut.</td><td>Lab</td></tr>
<tr><td>Principles and Practices of Communication
Formal Oral Communication</td><td>3</td><td></td><td></td></tr>
<tr><td>Informative Oral Presentation
i. Process Description
ii. Technical Oral Presentation</td><td>2
7
12</td><td></td><td></td></tr>
<tr><td>Persuasive Presentation</td><td>12</td><td></td><td></td></tr>
<tr><td>Business Meeting</td><td>6</td><td></td><td></td></tr>
<tr><td>Total Hours</td><td>42</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>19</td><td>References</td><td>
<table>
<tr><td>1. Communicating at Work. Adler, Ronald B. and Jeanne Marquardt Elmhorst. New York: McGraw Hill 2008</td><td>Main Reference</td></tr>
<tr><td>1. Business Communication: A Cultural and Strategic Approach.
Rouse and Rouse Cornwall:
Thomson Learning, 2002.

2. Mastering Public Speaking 3rd ed
Grice, George L and John F Skinner
Boston: Allyn and Bacon, 1998

3. Communicating in Business and Professional Settings. 4th ed.Hanna, Micheal S and Gerald L Wilson. 1998. New York: McGraw-Hill International Edition, 1998</td><td>Optional Reference</td></tr>
</table>
</td></tr>
<tr><td>20</td><td>Other additional information</td><td></td></tr>
</table>

APPENDIX D

INTERPRETIVE STRUCTURAL MODELLING(ISM) SESSIONS TO DEVELOP MLEARNING IMPLEMENTATION MODEL FOR PROFESSIONAL COMMUNICATION SKILLS COURSE FOR UNDERGRADUATES

BACKGROUND

Interpretive Structural Modelling (ISM) is a powerful tool for analyzing complex situations and solving problems. This ISM session is a based group decision-making session which is especially designed to consult the view of a group of selected experts in developing an mLearning implementation model for Professional Communication Skills (PCS) course for undergraduates. This session is aided with a computer ISM software developed by Sorach Inc. through their Concept Star product. PCS like any other English for Specific Purpose (ESP) course at the undergraduate level relatively favours students who have exceptional higher language competence in English and those who have experience in conducting oral presentations. The assumption that students who registered for the course are already fluent in English coupled with the factors of large class size and limited classroom contact hours continuously pose pedagogical problems in fulfilling the course objectives. Thus, mobile learning (mLearning) is adopted to be incorporated in the classroom learning as a solution to effectively aid more students in achieving their learning goals as targeted in the course outcomes. However, to address the pedagogical issues in the incorporation of mLearning, a curriculum implementation model need to be developed to guide how mLearning could be effectively incorporated and implemented in the course. Thus the ISM session is conducted. In order to meet the objectives of the session, the development of the model via ISM software tool require experts' continuous commitment till the completion of the model. A lengthy pause in between sessions would compromise the result of the model. This justifies why the experts need to be gathered in a specific time and place to effectively develop the model. The proposed plan of the session and schedule are given as below.

OBJECTIVES:

1. TO IDENTIFY LEARNING LANGUAGE ACTIVITIES FOR MLEARNING PCS
2. TO DETERMINE RELATIONSHIPS AMONG LANGUAGE LEARNING ACTIVITIES
3. TO DEVELOP MLEARNING CURRICULUM IMPLEMENTATION MODEL FOR PCS COURSE
4. TO EVALUATE MLEARNING CURRICULUM IMPLEMENTATION MODEL FOR PCS COURSE

EXPERT PANELS

A. Five(4) Content Experts
B. Two(2) IT/Mlearning Experts
C. One (1) Organizational Communication Expert
D. One (1) Curriculum Expert

PROPOSED VENUE : TELUK DALAM RESORT, PULAU PANGKOR
PROPOSED DATES : 15/9/2012 (SAT) - 17-9/2012 (MON)

APPENDIX D

TENTATIVE SCHEDULE

SESSION 1: IDENTIFYING AND FINALIZATION OF MLEARNING ACTIVITIES FOR PCS

Saturday – 15/9/2012

TIME	ACTIVITY
3.00 PM	Check in at Telok Dalam Resort, Pulau Pangkor
4.30 PM	Coffee break, solat, briefing of session and ISM schedule
5.30 PM	End of briefing, free and easy
7.30 PM	Dinner, Solat
8.30 PM	Welcoming speech for PRE- ISM session at meeting room
8.40 PM	Introduction
8.50 PM	Process description 1. Create 'context statement' to aid focus of discussion. 2. Idea generation - Identifying appropriate learning activities for PCS mLearning from list given. - Review of learning activities - Deletion or addition of learning activities - Justification of deletion or addition of learning activities - Finalizing list of learning activities 3. Identifying 'relation statement' to relate the activities. 4. Review process and feedback
11.00 PM	End of session

SESSION 2: CONSTRUCTION OF ISM FOR MLEARNING ACTIVITIES FOR PCS-CRITICAL ANALYSIS

SUNDAY-16/9/2012

TIME	ACTIVITY
7.30 AM	Breakfast
8.00 AM	Welcoming to ISM Session 2
8.10 AM	Review of activities discussed in ISM session 1.
8.20 AM	Question & answer session
8.30 AM	Construction of ISM
10.30 AM	Coffee break
10.45 AM	Construction of ISM
12.30 PM	Lunch break & solat
2.00 PM	Construction of ISM
3.45 PM	Coffee break
4.00 PM	Construction of ISM
5.30 PM	Mid-break , leisure and dinner
8.00 PM	Construction of ISM (coffee at 9.30 PM while ISM is in the process)
11.00 PM	Completion of ISM and end of session 2

APPENDIX D

SESSION 3: DISCUSSION OF ISM MODEL FOR MLEARNING ACTIVITIES FOR PCS-CRITICAL ANALYSIS

MONDAY-17/9/2012

TIME	ACTIVITY
7.30 AM	Breakfast
8.00 AM	Discussion of model - Evaluating the model constructed through ISM in terms of the relationships of learning activities - Review model in relation to course objectives, mobile capabilities, and SAMR model
9.45 AM	Coffee break
10.00 AM	Discussion of model
11.30 AM	End of session
12.30 PM	Check out from hotel

APPENDIX E

Phase 3: Fuzzy Delphi Technique- Experts' response to evaluation survey of mLearning implementation model

RESPONDENT	ITEM 1.1			ITEM 2.1			ITEM 2.2			ITEM 2.3			ITEM 2.4			ITEM 3.1			ITEM 3.2			ITEM 3.3			ITEM 3.4			ITEM 4.1		
r1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.5	0.7	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1
r2	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.5	0.7	0.5	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9
r3	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r4	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1
r5	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1
r6	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.3	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1
r7	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.3	0.5	0.7	0.7	0.9	1	0.7	0.9	1
r8	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1
r9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1
r10	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1
r11	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1
r12	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.3	0.5	0.7	0.7	0.9	1	0.9	1	1	0.7	0.9	1
r13	0.9	1	1	0.3	0.5	0.7	0.7	0.9	1	0.7	0.9	1	0.3	0.5	0.7	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9
r14	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9
r15	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1
r16	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.5	0.7	0.9	0.7	0.9	1
r17	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1
r18	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1
r19	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1
r20	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9
r21	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.3	0.5	0.7	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1
r22	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1
r23	0.9	1	1	0.9	1	1	0.7	0.9	1	0.3	0.5	0.7	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1
r24	0.7	0.9	1	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1

APPENDIX E

r25	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1
r26	0.9	1	1	0.7	0.9	1	0.3	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1
r27	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9
r28	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r29	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1
r30	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r31	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r32	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.3	0.5	0.7	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.3	0.5	0.7	0.9	1	1	0.7	0.9	1
r33	0.9	1	1	0.5	0.7	0.9	0.3	0.5	0.7	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1
r34	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9
r35	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.3	0.7	0.9	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9
r36	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.7	0.9	1	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1
r37	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9
r38	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1
r39	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.3	0.5	0.7	0.9	1	1	0.5	0.7	0.9
r40	0.9	1	1	0.7	0.9	1	0.3	0.5	0.7	0.7	0.9	1	0.5	0.7	0.9	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1
r41	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9
r42	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1
r43	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.7	0.9	1
r44	0.9	1	1	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1
r45	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.7	0.9	1	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r46	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.9	1	1	0.5	0.7	0.9	0.3	0.5	0.7	0.9	1	1
r47	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9
r48	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.3	0.5	0.7

APPENDIX E

RESPONDENT	ITEM 4.2			ITEM 4.3			ITEM 4.4			ITEM 5.1			ITEM 5.2			ITEM 5.3			ITEM 5.4			ITEM 5.5			ITEM 5.6			ITEM 5.7		
r1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1
r2	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r3	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1
r4	0.7	0.9	1	0.9	1	1	0.9	1	1	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1
r5	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9
r6	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1
r7	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r8	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1
r10	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.3	0.5	0.7	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1
r11	0.7	0.9	1	0.3	0.7	0.9	0.9	1	1	0.3	0.5	0.7	0.3	0.5	0.7	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1	0.3	0.5	0.7
r12	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1
r13	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r14	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9
r15	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.7	0.9	1	0.7	0.3	0.5	0.7	1	1	0.3	0.5	0.7	0.5	0.7	0.9
r16	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1
r17	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1
r18	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1
r19	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1
r20	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1
r21	0.9	1	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1
r22	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1
r23	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1
r24	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.9	1	1
r25	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1
r26	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.3	0.5	0.7
r27	0.9	1	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9

APPENDIX E

r28	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1
r29	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1
r30	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.3	0.5	0.7	0.9	1	1	0.5	0.7	0.9	0.3	0.5	0.7	0.5	0.7	0.9	0.3	0.5	0.7
r31	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.3	0.5	0.7	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9
r32	0.9	1	1	0.5	0.7	0.9	0.3	0.5	0.7	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.9	1	1	0.9	1	1
r33	0.3	0.5	0.7	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.3	0.5	0.7	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1
r34	0.9	1	1	0.3	0.5	0.7	0.9	1	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1
r35	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9
r36	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1
r37	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.5	0.7	0.9
r38	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9
r39	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9
r40	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.7	0.9	1
r41	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.9	1	1	0.5	0.7	0.9
r42	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1
r43	0.3	0.5	0.7	0.3	0.5	0.7	0.9	1	1	0.7	0.9	1	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.5	0.7	0.9
r44	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.9	1	1	0.7	0.9	1	0.5	0.7	0.9
r45	0.7	0.9	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1	0.7	0.9	1	0.9	1	1	0.9	1	1
r46	0.7	0.9	1	0.9	1	1	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.7	0.9	1	0.9	1	1	0.7	0.9	1
r47	0.5	0.7	0.9	0.9	1	1	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.7	0.9	1
r48	0.5	0.7	0.9	0.5	0.7	0.9	0.5	0.7	0.9	0.9	1	1	0.5	0.7	0.9	0.5	0.7	0.9	0.7	0.9	1	0.9	1	1	0.9	1	1	0.7	0.9	1

APPENDIX F

Phase 3 : Fuzzy Delphi technique- Calculation of threshold value, d, for all item questionnaires

RESPONDEN		1.1			2.1			2.2			2.3			2.4			3.1	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	0.1	0.03125	-0.03	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00098	6E-04	0.002	0	0.001	0.024	0.01	0.001
r1		0.035			0.037			0.038			0.0116			0.004			0.035	
		0.012			0.012			0.013			0.00387			0.001			0.012	
		0.108			0.111			0.113			0.06219			0.036			0.108	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	0.5	0.43125	0.275	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.25	0.18598	0.076	0.002	0	0.001	0.024	0.01	0.001
r2		0.035			0.037			0.038			0.5116			0.004			0.035	
		0.012			0.012			0.013			0.17053			0.001			0.012	
		0.108			0.111			0.113			0.41296			0.036			0.108	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00473	6E-04	0.002	0	0.001	0.024	0.01	0.001
r3		0.035			0.037			0.099			0.01535			0.004			0.035	
		0.012			0.012			0.033			0.00512			0.001			0.012	
		0.108			0.111			0.182			0.07153			0.036			0.108	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.002	0	0.001	0.024	0.01	0.001
r4		0.035			0.037			0.038			0.01535			0.004			0.035	
		0.012			0.012			0.013			0.00512			0.001			0.012	
		0.108			0.111			0.113			0.07153			0.036			0.108	
	0.05	-0	-0.04	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.002	4E-06	0.002	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001

APPENDIX F

r5		0.004			0.037			0.099			0.01535			0.034			0.035	
		0.001			0.012			0.033			0.00512			0.011			0.012	
		0.038			0.111			0.182			0.07153			0.106			0.108	
	0.05	-0	-0.04	0.042	-0	-0.03	-0.25	-0.18	-0.06	0.1	0.03125	-0.03	0.45	0.2	0.063	0.046	-0	-0.03
	0.002	4E-06	0.002	0.002	2E-05	9E-04	0.065	0.031	0.003	0.01	0.00098	6E-04	0.203	0.04	0.004	0.002	4E-06	0.001
r6		0.004			0.003			0.099			0.0116			0.246			0.003	
		0.001			9E-04			0.033			0.00387			0.082			0.001	
		0.038			0.029			0.182			0.06219			0.287			0.033	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	0.05	0	-0.04	0.046	-0	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.002	0	0.001	0.002	4E-06	0.001
		0.035			0.003			0.038			0.01535			0.004			0.003	
r7		0.012			9E-04			0.013			0.00512			0.001			0.001	
		0.108			0.029			0.113			0.07153			0.036			0.033	
	0.05	-0	-0.04	0.042	-0	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	0.05	0	-0.04	0.046	-0	-0.03
	0.002	4E-06	0.002	0.002	2E-05	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.002	0	0.001	0.002	4E-06	0.001
r8		0.004			0.003			0.012			0.01535			0.004			0.003	
		0.001			9E-04			0.004			0.00512			0.001			0.001	
		0.038			0.029			0.064			0.07153			0.036			0.033	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r9		0.035			0.037			0.038			0.01535			0.034			0.035	
		0.012			0.012			0.013			0.00512			0.011			0.012	
		0.108			0.111			0.113			0.07153			0.106			0.108	
	0.05	-0	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	0.25	0.2	0.063	-0.15	-0.1	-0.03
	0.002	4E-	0.002	0.025	0.011	9E-	0.021	0.015	0.002	0.01	0.00473	6E-	0.062	0.04	0.004	0.024	0.01	0.001

APPENDIX F

		06				04						04						
r10		0.004			0.037			0.038			0.01535			0.106			0.035	
		0.001			0.012			0.013			0.00512			0.035			0.012	
		0.038			0.111			0.113			0.07153			0.188			0.108	
	0.05	-0	-0.04	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.002	4E-06	0.002	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00473	6E-04	0.002	0	0.001	0.024	0.01	0.001
r11		0.004			0.037			0.099			0.01535			0.004			0.035	
		0.001			0.012			0.033			0.00512			0.001			0.012	
		0.038			0.111			0.182			0.07153			0.036			0.108	
	0.45	0.198	0.056	-0.16	-0.1	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	0.05	0	-0.04	0.046	-0	-0.03
	0.203	0.039	0.003	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.002	0	0.001	0.002	4E-06	0.001
r12		0.245			0.037			0.038			0.01535			0.004			0.003	
		0.082			0.012			0.013			0.00512			0.001			0.001	
		0.286			0.111			0.113			0.07153			0.036			0.033	
	-0.15	-0.1	-0.04	0.442	0.396	0.271	0.346	0.323	0.242	-0.1	-0.0688	-0.03	0.45	0.4	0.263	0.046	-0	-0.03
	0.023	0.01	0.002	0.195	0.157	0.073	0.12	0.104	0.058	0.01	0.00473	6E-04	0.203	0.16	0.069	0.002	4E-06	0.001
r13		0.035			0.425			0.282			0.01535			0.431			0.003	
		0.012			0.142			0.094			0.00512			0.144			0.001	
		0.108			0.376			0.307			0.07153			0.379			0.033	
	0.05	-0	-0.04	0.242	0.196	0.071	0.146	0.123	0.042	0.1	0.03125	-0.03	0.25	0.2	0.063	0.046	-0	-0.03
	0.002	4E-06	0.002	0.058	0.038	0.005	0.021	0.015	0.002	0.01	0.00098	6E-04	0.062	0.04	0.004	0.002	4E-06	0.001
r14		0.004			0.102			0.038			0.0116			0.106			0.003	
		0.001			0.034			0.013			0.00387			0.035			0.001	
		0.038			0.184			0.113			0.06219			0.188			0.033	
	-0.15	-0.1	-0.04	0.242	0.196	0.071	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.058	0.038	0.005	0.065	0.031	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001

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r15		0.035			0.102			0.099			0.01535			0.034			0.035	
		0.012			0.034			0.033			0.00512			0.011			0.012	
		0.108			0.184			0.182			0.07153			0.106			0.108	
	0.25	0.198	0.056	0.042	-0	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	0.25	0.2	0.063	-0.15	-0.1	-0.03
	0.062	0.039	0.003	0.002	2E-05	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.062	0.04	0.004	0.024	0.01	0.001
r16		0.105			0.003			0.012			0.01535			0.106			0.035	
		0.035			9E-04			0.004			0.00512			0.035			0.012	
		0.187			0.029			0.064			0.07153			0.188			0.108	
	0.05	-0	-0.04	0.042	-0	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	0.65	0.6	0.463	0.446	0.398	0.267
	0.002	4E-06	0.002	0.002	2E-05	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.422	0.36	0.214	0.199	0.158	0.071
r17		0.004			0.003			0.012			0.01535			0.996			0.428	
		0.001			9E-04			0.004			0.00512			0.332			0.143	
		0.038			0.029			0.064			0.07153			0.576			0.378	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.046	-0	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.023	0.01	0.001	0.002	4E-06	0.001
r18		0.035			0.037			0.038			0.01535			0.034			0.003	
		0.012			0.012			0.013			0.00512			0.011			0.001	
		0.108			0.111			0.113			0.07153			0.106			0.033	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.046	-0	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.023	0.01	0.001	0.002	4E-06	0.001
r19		0.035			0.003			0.038			0.01535			0.034			0.003	
		0.012			9E-04			0.013			0.00512			0.011			0.001	
		0.108			0.029			0.113			0.07153			0.106			0.033	
	0.05	-0	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.002	4E-	0.002	0.002	2E-	9E-	0.021	0.015	0.002	0.01	0.00473	6E-	0.023	0.01	0.001	0.024	0.01	0.001

APPENDIX F

		06			05	04						04						
r20		0.004			0.003			0.038			0.01535			0.034			0.035	
		0.001			9E-04			0.013			0.00512			0.011			0.012	
		0.038			0.029			0.113			0.07153			0.106			0.108	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	0.3	0.23125	0.075	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.021	0.015	0.002	0.09	0.05348	0.006	0.002	0	0.001	0.024	0.01	0.001
r21		0.035			0.003			0.038			0.1491			0.004			0.035	
		0.012			9E-04			0.013			0.0497			0.001			0.012	
		0.108			0.029			0.113			0.22294			0.036			0.108	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	0.3	0.23125	0.075	0.05	0	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.021	0.015	0.002	0.09	0.05348	0.006	0.002	0	0.001	0.024	0.01	0.001
r22		0.035			0.003			0.038			0.1491			0.004			0.035	
		0.012			9E-04			0.013			0.0497			0.001			0.012	
		0.108			0.029			0.113			0.22294			0.036			0.108	
	-0.15	-0.1	-0.04	0.242	0.196	0.071	-0.05	-0.08	-0.06	0.5	0.43125	0.275	-0.15	-0.1	-0.04	0.246	0.198	0.067
	0.023	0.01	0.002	0.058	0.038	0.005	0.003	0.006	0.003	0.25	0.18598	0.076	0.023	0.01	0.001	0.06	0.039	0.004
r23		0.035			0.102			0.012			0.5116			0.034			0.104	
		0.012			0.034			0.004			0.17053			0.011			0.035	
		0.108			0.184			0.064			0.41296			0.106			0.186	
	0.05	-0	-0.04	0.442	0.396	0.271	0.146	0.123	0.042	0.3	0.23125	0.075	0.05	0	-0.04	0.246	0.198	0.067
	0.002	4E-06	0.002	0.195	0.157	0.073	0.021	0.015	0.002	0.09	0.05348	0.006	0.002	0	0.001	0.06	0.039	0.004
r24		0.004			0.425			0.038			0.1491			0.004			0.104	
		0.001			0.142			0.013			0.0497			0.001			0.035	
		0.038			0.376			0.113			0.22294			0.036			0.186	
	0.05	-0	-0.04	0.242	0.196	0.071	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03

APPENDIX F

	0.002	4E-06	0.002	0.058	0.038	0.005	0.065	0.031	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r25		0.004			0.102			0.099			0.01535			0.034			0.035	
		0.001			0.034			0.033			0.00512			0.011			0.012	
		0.038			0.184			0.182			0.07153			0.106			0.108	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	0.346	0.123	0.042	0.1	0.03125	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.12	0.015	0.002	0.01	0.00098	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r26		0.035			0.003			0.136			0.0116			0.034			0.035	
		0.012			9E-04			0.045			0.00387			0.011			0.012	
		0.108			0.029			0.213			0.06219			0.106			0.108	
	-0.15	-0.1	-0.04	0.242	0.196	0.071	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.058	0.038	0.005	0.003	0.006	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r27		0.035			0.102			0.012			0.01535			0.034			0.035	
		0.012			0.034			0.004			0.00512			0.011			0.012	
		0.108			0.184			0.064			0.07153			0.106			0.108	
	0.05	-0	-0.04	0.242	0.196	0.071	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	0.05	0	-0.04	0.246	0.198	0.067
	0.002	4E-06	0.002	0.058	0.038	0.005	0.003	0.006	0.003	0.01	0.00473	6E-04	0.002	0	0.001	0.06	0.039	0.004
r28		0.004			0.102			0.012			0.01535			0.004			0.104	
		0.001			0.034			0.004			0.00512			0.001			0.035	
		0.038			0.184			0.064			0.07153			0.036			0.186	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r29		0.035			0.037			0.012			0.01535			0.034			0.035	
		0.012			0.012			0.004			0.00512			0.011			0.012	
		0.108			0.111			0.064			0.07153			0.106			0.108	
	-0.15	-0.1	-0.04	0.242	0.196	0.071	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	0.05	0	-0.04	-0.15	-0.1	-0.03

APPENDIX F

	0.023	0.01	0.002	0.058	0.038	0.005	0.065	0.031	0.003	0.01	0.00473	6E-04	0.002	0	0.001	0.024	0.01	0.001
r30		0.035			0.102			0.099			0.01535			0.004			0.035	
		0.012			0.034			0.033			0.00512			0.001			0.012	
		0.108			0.184			0.182			0.07153			0.036			0.108	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r31		0.035			0.003			0.038			0.01535			0.034			0.035	
		0.012			9E-04			0.013			0.00512			0.011			0.012	
		0.108			0.029			0.113			0.07153			0.106			0.108	
	0.65	0.598	0.456	0.042	-0	-0.03	-0.25	-0.18	-0.06	0.5	0.43125	0.275	-0.15	-0.1	-0.04	0.046	-0	-0.03
	0.422	0.358	0.208	0.002	2E-05	9E-04	0.065	0.031	0.003	0.25	0.18598	0.076	0.023	0.01	0.001	0.002	4E-06	0.001
r32		0.988			0.003			0.099			0.5116			0.034			0.003	
		0.329			9E-04			0.033			0.17053			0.011			0.001	
		0.574			0.029			0.182			0.41296			0.106			0.033	
	0.65	0.598	0.456	0.242	0.196	0.071	0.346	0.323	0.242	0.1	0.03125	-0.03	-0.15	-0.1	-0.04	0.246	0.198	0.067
	0.422	0.358	0.208	0.058	0.038	0.005	0.12	0.104	0.058	0.01	0.00098	6E-04	0.023	0.01	0.001	0.06	0.039	0.004
r33		0.988			0.102			0.282			0.0116			0.034			0.104	
		0.329			0.034			0.094			0.00387			0.011			0.035	
		0.574			0.184			0.307			0.06219			0.106			0.186	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	0.1	0.03125	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00098	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r34		0.035			0.037			0.038			0.0116			0.034			0.035	
		0.012			0.012			0.013			0.00387			0.011			0.012	
		0.108			0.111			0.113			0.06219			0.106			0.108	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.446	0.198	0.067

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	0.023	0.01	0.002	0.002	2E-05	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.199	0.039	0.004
r35		0.035			0.003			0.012			0.01535			0.034			0.242	
		0.012			9E-04			0.004			0.00512			0.011			0.081	
		0.108			0.029			0.064			0.07153			0.106			0.284	
	0.25	0.198	0.056	-0.16	-0.1	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	0.45	0.4	0.263	0.046	-0	-0.03
	0.062	0.039	0.003	0.025	0.011	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.203	0.16	0.069	0.002	4E-06	0.001
r36		0.105			0.037			0.012			0.01535			0.431			0.003	
		0.035			0.012			0.004			0.00512			0.144			0.001	
		0.187			0.111			0.064			0.07153			0.379			0.033	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.05	-0.08	-0.06	0.1	0.03125	-0.03	0.05	0	-0.04	0.046	-0	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.003	0.006	0.003	0.01	0.00098	6E-04	0.002	0	0.001	0.002	4E-06	0.001
r37		0.035			0.037			0.012			0.0116			0.004			0.003	
		0.012			0.012			0.004			0.00387			0.001			0.001	
		0.108			0.111			0.064			0.06219			0.036			0.033	
	0.05	-0	-0.04	-0.16	-0.1	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.246	0.198	0.067
	0.002	4E-06	0.002	0.025	0.011	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.06	0.039	0.004
r38		0.004			0.037			0.012			0.01535			0.034			0.104	
		0.001			0.012			0.004			0.00512			0.011			0.035	
		0.038			0.111			0.064			0.07153			0.106			0.186	
	0.05	-0	-0.04	0.042	-0	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.246	0.198	0.067
	0.002	4E-06	0.002	0.002	2E-05	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.023	0.01	0.001	0.06	0.039	0.004
r39		0.004			0.003			0.038			0.01535			0.034			0.104	
		0.001			9E-04			0.013			0.00512			0.011			0.035	
		0.038			0.029			0.113			0.07153			0.106			0.186	
	0.45	0.398	0.256	0.042	-0	-0.03	0.346	0.323	0.242	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.446	0.398	0.267

APPENDIX F

	0.203	0.158	0.066	0.002	2E-05	9E-04	0.12	0.104	0.058	0.01	0.00473	6E-04	0.023	0.01	0.001	0.199	0.158	0.071
r40		0.427			0.003			0.282			0.01535			0.034			0.428	
		0.142			9E-04			0.094			0.00512			0.011			0.143	
		0.377			0.029			0.307			0.07153			0.106			0.378	
	0.05	-0	-0.04	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.002	4E-06	0.002	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r41		0.004			0.037			0.099			0.01535			0.034			0.035	
		0.001			0.012			0.033			0.00512			0.011			0.012	
		0.038			0.111			0.182			0.07153			0.106			0.108	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	0.146	0.123	0.042	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.021	0.015	0.002	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r42		0.035			0.037			0.038			0.01535			0.034			0.035	
		0.012			0.012			0.013			0.00512			0.011			0.012	
		0.108			0.111			0.113			0.07153			0.106			0.108	
	-0.15	-0.1	-0.04	0.042	-0	-0.03	-0.25	-0.18	-0.06	0.1	0.03125	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.002	2E-05	9E-04	0.065	0.031	0.003	0.01	0.00098	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r43		0.035			0.003			0.099			0.0116			0.034			0.035	
		0.012			9E-04			0.033			0.00387			0.011			0.012	
		0.108			0.029			0.182			0.06219			0.106			0.108	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	0.1	0.03125	-0.03	-0.15	-0.1	-0.04	0.046	-0	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00098	6E-04	0.023	0.01	0.001	0.002	4E-06	0.001
r44		0.035			0.037			0.099			0.0116			0.034			0.003	
		0.012			0.012			0.033			0.00387			0.011			0.001	
		0.108			0.111			0.182			0.06219			0.106			0.033	
	0.65	0.598	0.456	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	0.45	0.4	0.263	0.046	-0	-0.03

APPENDIX F

	0.422	0.358	0.208	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00473	6E-04	0.203	0.16	0.069	0.002	4E-06	0.001
r45		0.988			0.037			0.099			0.01535			0.431			0.003	
		0.329			0.012			0.033			0.00512			0.144			0.001	
		0.574			0.111			0.182			0.07153			0.379			0.033	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.25	-0.18	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	0.446	0.398	0.267
	0.023	0.01	0.002	0.025	0.011	9E-04	0.065	0.031	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.199	0.158	0.071
r46		0.035			0.037			0.099			0.01535			0.034			0.428	
		0.012			0.012			0.033			0.00512			0.011			0.143	
		0.108			0.111			0.182			0.07153			0.106			0.378	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r47		0.035			0.037			0.012			0.01535			0.034			0.035	
		0.012			0.012			0.004			0.00512			0.011			0.012	
		0.108			0.111			0.064			0.07153			0.106			0.108	
	-0.15	-0.1	-0.04	-0.16	-0.1	-0.03	-0.05	-0.08	-0.06	-0.1	-0.0688	-0.03	-0.15	-0.1	-0.04	-0.15	-0.1	-0.03
	0.023	0.01	0.002	0.025	0.011	9E-04	0.003	0.006	0.003	0.01	0.00473	6E-04	0.023	0.01	0.001	0.024	0.01	0.001
r48		0.035			0.037			0.012			0.01535			0.034			0.035	
		0.012			0.012			0.004			0.00512			0.011			0.012	
		0.108			0.111			0.064			0.07153			0.106			0.108	

APPENDIX F

RESPONDEN	3.2			3.3			3.4			4.1			4.2			4.3		
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.05	-0.004	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0025	2E-05	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r1		0.05			0.0342			0.0343			0.0038			0.0463			0.0726	
		0.017			0.0114			0.0114			0.0013			0.0154			0.0242	
		0.129			0.1067			0.107			0.0355			0.1242			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.25	0.1958	0.0646	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0625	0.0384	0.0042	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r2		0.05			0.0342			0.0343			0.105			0.0463			0.0726	
		0.017			0.0114			0.0114			0.035			0.0154			0.0242	
		0.129			0.1067			0.107			0.1871			0.1242			0.1555	
	0.025	-0.03	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.25	0.1958	0.0646	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	6E-04	9E-04	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0625	0.0384	0.0042	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r3		0.004			0.0342			0.0343			0.105			0.0463			0.058	
		0.001			0.0114			0.0114			0.035			0.0154			0.0193	
		0.038			0.1067			0.107			0.1871			0.1242			0.139	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0469	0.0231	0.0025
r4		0.05			0.0342			0.0343			0.0346			0.0038			0.0726	
		0.017			0.0114			0.0114			0.0115			0.0013			0.0242	
		0.129			0.1067			0.107			0.1074			0.0355			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r5		0.05			0.0342			0.0343			0.0346			0.0463			0.0726	
		0.017			0.0114			0.0114			0.0115			0.0154			0.0242	
		0.129			0.1067			0.107			0.1074			0.1242			0.1555	

APPENDIX F

	0.425	0.371	0.2458	-0.15	-0.102	-0.035	0.05	-0.004	-0.031	0.05	-0.004	-0.035	0.4292	0.3792	0.25	0.1833	0.1479	0.05
	0.181	0.138	0.0604	0.0225	0.0104	0.0013	0.0025	2E-05	0.001	0.0025	2E-05	0.0013	0.1842	0.1438	0.0625	0.0336	0.0219	0.0025
r6		0.379			0.0342			0.0035			0.0038			0.3905			0.058	
		0.126			0.0114			0.0012			0.0013			0.1302			0.0193	
		0.355			0.1067			0.0341			0.0355			0.3608			0.139	
	0.025	-0.03	-0.054	0.45	0.3979	0.2646	0.05	-0.004	-0.031	0.05	-0.004	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	6E-04	9E-04	0.0029	0.2025	0.1583	0.07	0.0025	2E-05	0.001	0.0025	2E-05	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
		0.004			0.4308			0.0035			0.0038			0.0463			0.058	
r7		0.001			0.1436			0.0012			0.0013			0.0154			0.0193	
		0.038			0.379			0.0341			0.0355			0.1242			0.139	
	0.025	-0.03	-0.054	0.05	-0.002	-0.035	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	6E-04	9E-04	0.0029	0.0025	4E-06	0.0013	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r8		0.004			0.0038			0.1056			0.0346			0.0463			0.058	
		0.001			0.0013			0.0352			0.0115			0.0154			0.0193	
		0.038			0.0354			0.1876			0.1074			0.1242			0.139	
	0.025	-0.03	-0.054	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.017	-0.052	-0.05
	6E-04	9E-04	0.0029	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0003	0.0027	0.0025
r9		0.004			0.0038			0.0343			0.0346			0.0463			0.0055	
		0.001			0.0013			0.0114			0.0115			0.0154			0.0018	
		0.038			0.0354			0.107			0.1074			0.1242			0.0428	
	-0.18	-0.13	-0.054	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.2292	0.1792	0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0525	0.0321	0.0025	0.0469	0.0231	0.0025
r10		0.05			0.0038			0.0343			0.0346			0.0871			0.0726	
		0.017			0.0013			0.0114			0.0115			0.029			0.0242	
		0.129			0.0354			0.107			0.1074			0.1704			0.1555	
	-0.18	-0.13	-0.054	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	0.05	-0.004	-0.035	0.0292	-0.021	-0.05	0.3833	0.1479	0.05
	0.031	0.017	0.0029	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0025	2E-05	0.0013	0.0009	0.0004	0.0025	0.1469	0.0219	0.0025

APPENDIX F

r11		0.05			0.0038			0.0343			0.0038			0.0038			0.1713	
		0.017			0.0013			0.0114			0.0013			0.0013			0.0571	
		0.129			0.0354			0.107			0.0355			0.0355			0.239	
	0.425	0.371	0.2458	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	-0.017	-0.052	-0.05
	0.181	0.138	0.0604	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0003	0.0027	0.0025
r12		0.379			0.0038			0.0343			0.0346			0.0038			0.0055	
		0.126			0.0013			0.0114			0.0115			0.0013			0.0018	
		0.355			0.0354			0.107			0.1074			0.0355			0.0428	
	0.225	0.171	0.0458	0.05	-0.002	-0.035	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	0.1833	0.1479	0.05
	0.051	0.029	0.0021	0.0025	4E-06	0.0013	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0336	0.0219	0.0025
r13		0.082			0.0038			0.1056			0.0346			0.0038			0.058	
		0.027			0.0013			0.0352			0.0115			0.0013			0.0193	
		0.165			0.0354			0.1876			0.1074			0.0355			0.139	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	0.25	0.1958	0.0687	0.25	0.1958	0.0646	0.2292	0.1792	0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0625	0.0384	0.0047	0.0625	0.0384	0.0042	0.0525	0.0321	0.0025	0.0469	0.0231	0.0025
r14		0.05			0.0342			0.1056			0.105			0.0871			0.0726	
		0.017			0.0114			0.0352			0.035			0.029			0.0242	
		0.129			0.1067			0.1876			0.1871			0.1704			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r15		0.05			0.0342			0.0343			0.0346			0.0463			0.0726	
		0.017			0.0114			0.0114			0.0115			0.0154			0.0242	
		0.129			0.1067			0.107			0.1074			0.1242			0.1555	
	0.225	0.171	0.0458	-0.15	-0.102	-0.035	0.45	0.1958	0.0687	0.05	-0.004	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	0.051	0.029	0.0021	0.0225	0.0104	0.0013	0.2025	0.0384	0.0047	0.0025	2E-05	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r16		0.082			0.0342			0.2456			0.0038			0.0463			0.058	
		0.027			0.0114			0.0819			0.0013			0.0154			0.0193	

APPENDIX F

		0.165			0.1067			0.2861			0.0355			0.1242			0.139	
	0.625	0.571	0.4458	0.45	0.3979	0.2646	0.25	0.1958	0.0687	0.45	0.3958	0.2646	0.4292	0.3792	0.25	0.3833	0.3479	0.25
	0.391	0.326	0.1988	0.2025	0.1583	0.07	0.0625	0.0384	0.0047	0.2025	0.1567	0.07	0.1842	0.1438	0.0625	0.1469	0.121	0.0625
r17		0.915			0.4308			0.1056			0.4292			0.3905			0.3305	
		0.305			0.1436			0.0352			0.1431			0.1302			0.1102	
		0.552			0.379			0.1876			0.3782			0.3608			0.3319	
	0.025	-0.03	-0.054	0.05	-0.002	-0.035	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	6E-04	9E-04	0.0029	0.0025	4E-06	0.0013	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r18		0.004			0.0038			0.1056			0.0346			0.0463			0.058	
		0.001			0.0013			0.0352			0.0115			0.0154			0.0193	
		0.038			0.0354			0.1876			0.1074			0.1242			0.139	
	-0.18	-0.13	-0.054	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	0.031	0.017	0.0029	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r19		0.05			0.0038			0.0343			0.0346			0.0463			0.058	
		0.017			0.0013			0.0114			0.0115			0.0154			0.0193	
		0.129			0.0354			0.107			0.1074			0.1242			0.139	
	0.025	-0.03	-0.054	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	0.25	0.1958	0.0646	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	6E-04	9E-04	0.0029	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0625	0.0384	0.0042	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r20		0.004			0.0038			0.0343			0.105			0.0463			0.0726	
		0.001			0.0013			0.0114			0.035			0.0154			0.0242	
		0.038			0.0354			0.107			0.1871			0.1242			0.1555	
	0.425	0.371	0.2458	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	0.05	-0.004	-0.035	-0.171	-0.121	-0.05	-0.017	-0.052	-0.05
	0.181	0.138	0.0604	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0025	2E-05	0.0013	0.0292	0.0146	0.0025	0.0003	0.0027	0.0025
r21		0.379			0.0038			0.0343			0.0038			0.0463			0.0055	
		0.126			0.0013			0.0114			0.0013			0.0154			0.0018	
		0.355			0.0354			0.107			0.0355			0.1242			0.0428	
	0.225	0.171	0.0458	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	-0.017	-0.052	-0.05

APPENDIX F

	0.051	0.029	0.0021	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0003	0.0027	0.0025
r22		0.082			0.0038			0.0343			0.0346			0.0038			0.0055	
		0.027			0.0013			0.0114			0.0115			0.0013			0.0018	
		0.165			0.0354			0.107			0.1074			0.0355			0.0428	
	-0.18	-0.13	-0.054	0.05	-0.002	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	0.1833	0.1479	0.05
	0.031	0.017	0.0029	0.0025	4E-06	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0336	0.0219	0.0025
r23		0.05			0.0038			0.0343			0.0346			0.0038			0.058	
		0.017			0.0013			0.0114			0.0115			0.0013			0.0193	
		0.129			0.0354			0.107			0.1074			0.0355			0.139	
	0.025	-0.03	-0.054	0.25	0.1979	0.0646	-0.15	-0.104	-0.031	0.05	-0.004	-0.035	0.0292	-0.021	-0.05	0.1833	0.1479	0.05
	6E-04	9E-04	0.0029	0.0625	0.0392	0.0042	0.0225	0.0109	0.001	0.0025	2E-05	0.0013	0.0009	0.0004	0.0025	0.0336	0.0219	0.0025
r24		0.004			0.1058			0.0343			0.0038			0.0038			0.058	
		0.001			0.0353			0.0114			0.0013			0.0013			0.0193	
		0.038			0.1878			0.107			0.0355			0.0355			0.139	
	0.025	-0.03	-0.054	0.05	-0.002	-0.035	0.05	-0.004	-0.031	0.05	-0.004	-0.035	0.2292	0.1792	0.05	-0.017	-0.052	-0.05
	6E-04	9E-04	0.0029	0.0025	4E-06	0.0013	0.0025	2E-05	0.001	0.0025	2E-05	0.0013	0.0525	0.0321	0.0025	0.0003	0.0027	0.0025
r25		0.004			0.0038			0.0035			0.0038			0.0871			0.0055	
		0.001			0.0013			0.0012			0.0013			0.029			0.0018	
		0.038			0.0354			0.0341			0.0355			0.1704			0.0428	
	0.225	0.171	0.0458	-0.15	-0.102	-0.035	0.05	-0.004	-0.031	0.05	-0.004	-0.035	0.2292	0.1792	0.05	0.1833	0.1479	0.05
	0.051	0.029	0.0021	0.0225	0.0104	0.0013	0.0025	2E-05	0.001	0.0025	2E-05	0.0013	0.0525	0.0321	0.0025	0.0336	0.0219	0.0025
r26		0.082			0.0342			0.0035			0.0038			0.0871			0.058	
		0.027			0.0114			0.0012			0.0013			0.029			0.0193	
		0.165			0.1067			0.0341			0.0355			0.1704			0.139	
	-0.18	-0.13	-0.054	0.05	-0.002	-0.035	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.017	-0.052	-0.05
	0.031	0.017	0.0029	0.0025	4E-06	0.0013	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0003	0.0027	0.0025
r27		0.05			0.0038			0.1056			0.0346			0.0463			0.0055	

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		0.017			0.0013			0.0352			0.0115			0.0154			0.0018	
		0.129			0.0354			0.1876			0.1074			0.1242			0.0428	
	-0.18	-0.13	-0.054	0.25	0.1979	0.0646	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	0.4292	0.1792	0.05	-0.017	-0.052	-0.05
	0.031	0.017	0.0029	0.0625	0.0392	0.0042	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.1842	0.0321	0.0025	0.0003	0.0027	0.0025
r28		0.05			0.1058			0.1056			0.0346			0.2188			0.0055	
		0.017			0.0353			0.0352			0.0115			0.0729			0.0018	
		0.129			0.1878			0.1876			0.1074			0.2701			0.0428	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r29		0.05			0.0342			0.0343			0.0346			0.0463			0.058	
		0.017			0.0114			0.0114			0.0115			0.0154			0.0193	
		0.129			0.1067			0.107			0.1074			0.1242			0.139	
	-0.18	-0.13	-0.054	0.25	0.1979	0.0646	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	0.031	0.017	0.0029	0.0625	0.0392	0.0042	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r30		0.05			0.1058			0.1056			0.0346			0.0463			0.058	
		0.017			0.0353			0.0352			0.0115			0.0154			0.0193	
		0.129			0.1878			0.1876			0.1074			0.1242			0.139	
	-0.18	-0.13	-0.054	0.25	0.1979	0.0646	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0625	0.0392	0.0042	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r31		0.05			0.1058			0.1056			0.0346			0.0463			0.0726	
		0.017			0.0353			0.0352			0.0115			0.0154			0.0242	
		0.129			0.1878			0.1876			0.1074			0.1242			0.1555	
	0.225	0.171	0.0458	0.45	0.3979	0.2646	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	-0.017	-0.052	-0.05
	0.051	0.029	0.0021	0.2025	0.1583	0.07	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0003	0.0027	0.0025
r32		0.082			0.4308			0.0343			0.0346			0.0038			0.0055	
		0.027			0.1436			0.0114			0.0115			0.0013			0.0018	
		0.165			0.379			0.107			0.1074			0.0355			0.0428	

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	0.225	0.171	0.0458	-0.15	-0.102	-0.035	0.25	0.1958	0.0687	0.05	-0.004	-0.035	0.4292	0.3792	0.25	-0.017	-0.052	-0.05
	0.051	0.029	0.0021	0.0225	0.0104	0.0013	0.0625	0.0384	0.0047	0.0025	2E-05	0.0013	0.1842	0.1438	0.0625	0.0003	0.0027	0.0025
r33		0.082			0.0342			0.1056			0.0038			0.3905			0.0055	
		0.027			0.0114			0.0352			0.0013			0.1302			0.0018	
		0.165			0.1067			0.1876			0.0355			0.3608			0.0428	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.25	0.1958	0.0646	-0.171	-0.121	-0.05	0.3833	0.3479	0.25
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0625	0.0384	0.0042	0.0292	0.0146	0.0025	0.1469	0.121	0.0625
r34		0.05			0.0342			0.0343			0.105			0.0463			0.3305	
		0.017			0.0114			0.0114			0.035			0.0154			0.1102	
		0.129			0.1067			0.107			0.1871			0.1242			0.3319	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.45	0.3958	0.2646	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.2025	0.1567	0.07	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r35		0.05			0.0342			0.0343			0.4292			0.0463			0.0726	
		0.017			0.0114			0.0114			0.1431			0.0154			0.0242	
		0.129			0.1067			0.107			0.3782			0.1242			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.05	-0.004	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0025	2E-05	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r36		0.05			0.0342			0.0343			0.0038			0.0463			0.0726	
		0.017			0.0114			0.0114			0.0013			0.0154			0.0242	
		0.129			0.1067			0.107			0.0355			0.1242			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	0.25	0.1958	0.0646	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0625	0.0384	0.0042	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r37		0.05			0.0342			0.0343			0.105			0.0463			0.0726	
		0.017			0.0114			0.0114			0.035			0.0154			0.0242	
		0.129			0.1067			0.107			0.1871			0.1242			0.1555	
	0.225	0.171	0.0458	-0.15	-0.102	-0.035	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	0.4292	0.3792	0.25	-0.217	-0.152	-0.05
	0.051	0.029	0.0021	0.0225	0.0104	0.0013	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.1842	0.1438	0.0625	0.0469	0.0231	0.0025

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r38		0.082			0.0342			0.1056			0.0346			0.3905			0.0726	
		0.027			0.0114			0.0352			0.0115			0.1302			0.0242	
		0.165			0.1067			0.1876			0.1074			0.3608			0.1555	
	-0.18	-0.13	-0.054	0.45	0.3979	0.2646	-0.15	-0.104	-0.031	0.25	0.1958	0.0646	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	0.031	0.017	0.0029	0.2025	0.1583	0.07	0.0225	0.0109	0.001	0.0625	0.0384	0.0042	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r39		0.05			0.4308			0.0343			0.105			0.0463			0.058	
		0.017			0.1436			0.0114			0.035			0.0154			0.0193	
		0.129			0.379			0.107			0.1871			0.1242			0.139	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r40		0.05			0.0342			0.0343			0.0346			0.0463			0.0726	
		0.017			0.0114			0.0114			0.0115			0.0154			0.0242	
		0.129			0.1067			0.107			0.1074			0.1242			0.1555	
	0.225	0.171	0.0458	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	0.1833	0.1479	0.05
	0.051	0.029	0.0021	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0336	0.0219	0.0025
r41		0.082			0.0342			0.0343			0.0346			0.0463			0.058	
		0.027			0.0114			0.0114			0.0115			0.0154			0.0193	
		0.165			0.1067			0.107			0.1074			0.1242			0.139	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	0.25	0.1958	0.0687	-0.15	-0.104	-0.035	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0625	0.0384	0.0047	0.0225	0.0109	0.0013	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r42		0.05			0.0342			0.1056			0.0346			0.0463			0.0726	
		0.017			0.0114			0.0352			0.0115			0.0154			0.0242	
		0.129			0.1067			0.1876			0.1074			0.1242			0.1555	
	0.225	0.171	0.0458	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.4292	0.3792	0.25	0.1833	0.1479	0.05
	0.051	0.029	0.0021	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.1842	0.1438	0.0625	0.0336	0.0219	0.0025
r43		0.082			0.0342			0.0343			0.0346			0.3905			0.058	
		0.027			0.0114			0.0114			0.0115			0.1302			0.0193	

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		0.165			0.1067			0.107			0.1074			0.3608			0.139	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.2292	0.1792	0.05	0.1833	0.1479	0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0525	0.0321	0.0025	0.0336	0.0219	0.0025
r44		0.05			0.0342			0.0343			0.0346			0.0871			0.058	
		0.017			0.0114			0.0114			0.0115			0.029			0.0193	
		0.129			0.1067			0.107			0.1074			0.1704			0.139	
	0.425	0.371	0.2458	-0.15	-0.102	-0.035	0.25	0.1958	0.0687	0.25	0.1958	0.0646	0.0292	-0.021	-0.05	-0.217	-0.152	-0.05
	0.181	0.138	0.0604	0.0225	0.0104	0.0013	0.0625	0.0384	0.0047	0.0625	0.0384	0.0042	0.0009	0.0004	0.0025	0.0469	0.0231	0.0025
r45		0.379			0.0342			0.1056			0.105			0.0038			0.0726	
		0.126			0.0114			0.0352			0.035			0.0013			0.0242	
		0.355			0.1067			0.1876			0.1871			0.0355			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	-0.15	-0.104	-0.031	-0.15	-0.104	-0.035	0.0292	-0.021	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0225	0.0109	0.001	0.0225	0.0109	0.0013	0.0009	0.0004	0.0025	0.0469	0.0231	0.0025
r46		0.05			0.0342			0.0343			0.0346			0.0038			0.0726	
		0.017			0.0114			0.0114			0.0115			0.0013			0.0242	
		0.129			0.1067			0.107			0.1074			0.0355			0.1555	
	-0.18	-0.13	-0.054	0.25	0.1979	0.0646	0.05	-0.004	-0.031	-0.15	-0.104	-0.035	0.4292	0.3792	0.25	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0625	0.0392	0.0042	0.0025	2E-05	0.001	0.0225	0.0109	0.0013	0.1842	0.1438	0.0625	0.0469	0.0231	0.0025
r47		0.05			0.1058			0.0035			0.0346			0.3905			0.0726	
		0.017			0.0353			0.0012			0.0115			0.1302			0.0242	
		0.129			0.1878			0.0341			0.1074			0.3608			0.1555	
	-0.18	-0.13	-0.054	-0.15	-0.102	-0.035	0.25	0.1958	0.0687	0.45	0.3958	0.2646	-0.171	-0.121	-0.05	-0.217	-0.152	-0.05
	0.031	0.017	0.0029	0.0225	0.0104	0.0013	0.0625	0.0384	0.0047	0.2025	0.1567	0.07	0.0292	0.0146	0.0025	0.0469	0.0231	0.0025
r48		0.05			0.0342			0.1056			0.4292			0.0463			0.0726	
		0.017			0.0114			0.0352			0.1431			0.0154			0.0242	
		0.129			0.1067			0.1876			0.3782			0.1242			0.1555	

APPENDIX F

RESPONDEN		4.4			5.1			5.2			5.3			5.4			5.5	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r1		0.0222			0.0782			0.0324			0.0045			0.0405			0.0377	
		0.0074			0.0261			0.0108			0.0015			0.0135			0.0126	
		0.086			0.1614			0.1039			0.0388			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r2		0.0222			0.0782			0.0324			0.0308			0.0405			0.0377	
		0.0074			0.0261			0.0108			0.0103			0.0135			0.0126	
		0.086			0.1614			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	0.1792	0.1396	0.0396	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	0.45	0.38	0.24	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0321	0.0195	0.0016	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.2025	0.1444	0.0576	0.0225	0.0132	0.002
r3		0.0222			0.0532			0.0324			0.0308			0.4045			0.0377	
		0.0074			0.0177			0.0108			0.0103			0.1348			0.0126	
		0.086			0.1331			0.1039			0.1013			0.3672			0.1122	
	-0.121	-0.083	-0.025	0.3792	0.3396	0.2396	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.1438	0.1153	0.0574	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r4		0.0222			0.3165			0.0324			0.0308			0.0405			0.0377	
		0.0074			0.1055			0.0108			0.0103			0.0135			0.0126	
		0.086			0.3248			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r5		0.0222			0.0782			0.0324			0.0308			0.0405			0.0377	
		0.0074			0.0261			0.0108			0.0103			0.0135			0.0126	

APPENDIX F

		0.086			0.1614			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	0.3792	0.3396	0.2396	0.0542	0	-0.033	0.4583	0.4021	0.2667	-0.15	-0.12	-0.06	0.25	0.185	0.055
	0.0146	0.0069	0.0006	0.1438	0.1153	0.0574	0.0029	0	0.0011	0.2101	0.1617	0.0711	0.0225	0.0144	0.0036	0.0625	0.0342	0.003
r6		0.0222			0.3165			0.004			0.4429			0.0405			0.0998	
		0.0074			0.1055			0.0013			0.1476			0.0135			0.0333	
		0.086			0.3248			0.0367			0.3842			0.1162			0.1823	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	0.0542	0	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	0.25	0.185	0.055
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0625	0.0342	0.003
		0.0222			0.0782			0.004			0.0308			0.0405			0.0998	
r7		0.0074			0.0261			0.0013			0.0103			0.0135			0.0333	
		0.086			0.1614			0.0367			0.1013			0.1162			0.1823	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	0.0542	0	-0.033	-0.142	-0.098	-0.033	0.25	0.18	0.04	0.25	0.185	0.055
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0625	0.0324	0.0016	0.0625	0.0342	0.003
r8		0.0222			0.0782			0.004			0.0308			0.0965			0.0998	
		0.0074			0.0261			0.0013			0.0103			0.0322			0.0333	
		0.086			0.1614			0.0367			0.1013			0.1794			0.1823	
	-0.121	-0.083	-0.025	0.1792	0.1396	0.0396	0.2542	0.2	0.0667	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0321	0.0195	0.0016	0.0646	0.04	0.0044	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r9		0.0222			0.0532			0.109			0.0308			0.0405			0.0377	
		0.0074			0.0177			0.0363			0.0103			0.0135			0.0126	
		0.086			0.1331			0.1907			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r10		0.0222			0.0077			0.0324			0.0308			0.0405			0.0377	
		0.0074			0.0026			0.0108			0.0103			0.0135			0.0126	
		0.086			0.0508			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	0.0542	0	-0.033	0.4583	0.4021	0.2667	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045

APPENDIX F

	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0029	0	0.0011	0.2101	0.1617	0.0711	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r11		0.0222			0.0077			0.004			0.4429			0.0405			0.0377	
		0.0074			0.0026			0.0013			0.1476			0.0135			0.0126	
		0.086			0.0508			0.0367			0.3842			0.1162			0.1122	
	0.0792	0.0167	-0.025	0.1792	0.1396	0.0396	0.2542	0.2	0.0667	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	0.25	0.185	0.055
	0.0063	0.0003	0.0006	0.0321	0.0195	0.0016	0.0646	0.04	0.0044	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0625	0.0342	0.003
r12		0.0072			0.0532			0.109			0.0308			0.0405			0.0998	
		0.0024			0.0177			0.0363			0.0103			0.0135			0.0333	
		0.0489			0.1331			0.1907			0.1013			0.1162			0.1823	
	0.2792	0.2167	0.075	0.1792	0.1396	0.0396	0.0542	0	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	0.25	0.185	0.055
	0.0779	0.0469	0.0056	0.0321	0.0195	0.0016	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0625	0.0342	0.003
r13		0.1305			0.0532			0.004			0.0308			0.0405			0.0998	
		0.0435			0.0177			0.0013			0.0103			0.0135			0.0333	
		0.2086			0.1331			0.0367			0.1013			0.1162			0.1823	
	0.0792	0.0167	-0.025	-0.221	-0.16	-0.06	0.2542	0.2	0.0667	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0063	0.0003	0.0006	0.0488	0.0257	0.0037	0.0646	0.04	0.0044	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r14		0.0072			0.0782			0.109			0.0308			0.0405			0.0377	
		0.0024			0.0261			0.0363			0.0103			0.0135			0.0126	
		0.0489			0.1614			0.1907			0.1013			0.1162			0.1122	
	0.0792	0.0167	-0.025	0.3792	0.3396	0.2396	0.4542	0.4	0.2667	-0.142	-0.098	-0.033	0.45	0.38	0.24	-0.15	-0.115	-0.045
	0.0063	0.0003	0.0006	0.1438	0.1153	0.0574	0.2063	0.16	0.0711	0.0201	0.0096	0.0011	0.2025	0.1444	0.0576	0.0225	0.0132	0.002
r15		0.0072			0.3165			0.4374			0.0308			0.4045			0.0377	
		0.0024			0.1055			0.1458			0.0103			0.1348			0.0126	
		0.0489			0.3248			0.3818			0.1013			0.3672			0.1122	
	0.2792	0.2167	0.075	0.1792	0.1396	0.0396	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	0.25	0.18	0.04	-0.15	-0.115	-0.045
	0.0779	0.0469	0.0056	0.0321	0.0195	0.0016	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0625	0.0324	0.0016	0.0225	0.0132	0.002
r16		0.1305			0.0532			0.0324			0.0045			0.0965			0.0377	

APPENDIX F

		0.0435			0.0177			0.0108			0.0015			0.0322			0.0126	
		0.2086			0.1331			0.1039			0.0388			0.1794			0.1122	
	0.2792	0.2167	0.075	-0.021	-0.06	-0.06	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	0.45	0.38	0.24	0.45	0.385	0.255
	0.0779	0.0469	0.0056	0.0004	0.0037	0.0037	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.2025	0.1444	0.0576	0.2025	0.1482	0.065
r17		0.1305			0.0077			0.0324			0.0045			0.4045			0.4158	
		0.0435			0.0026			0.0108			0.0015			0.1348			0.1386	
		0.2086			0.0508			0.1039			0.0388			0.3672			0.3723	
	-0.121	-0.083	-0.025	0.1792	0.1396	0.0396	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	0.25	0.18	0.04	0.25	0.185	0.055
	0.0146	0.0069	0.0006	0.0321	0.0195	0.0016	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0625	0.0324	0.0016	0.0625	0.0342	0.003
r18		0.0222			0.0532			0.0324			0.0045			0.0965			0.0998	
		0.0074			0.0177			0.0108			0.0015			0.0322			0.0333	
		0.086			0.1331			0.1039			0.0388			0.1794			0.1823	
	0.2792	0.2167	0.075	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	0.2583	0.2021	0.0667	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0779	0.0469	0.0056	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0667	0.0408	0.0044	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r19		0.1305			0.0782			0.0324			0.112			0.0405			0.0377	
		0.0435			0.0261			0.0108			0.0373			0.0135			0.0126	
		0.2086			0.1614			0.1039			0.1932			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r20		0.0222			0.0782			0.0324			0.0308			0.0405			0.0377	
		0.0074			0.0261			0.0108			0.0103			0.0135			0.0126	
		0.086			0.1614			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	0.0542	0	-0.033	0.2583	0.2021	0.0667	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0029	0	0.0011	0.0667	0.0408	0.0044	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r21		0.0222			0.0077			0.004			0.112			0.0405			0.0377	
		0.0074			0.0026			0.0013			0.0373			0.0135			0.0126	
		0.086			0.0508			0.0367			0.1932			0.1162			0.1122	

APPENDIX F

	0.0792	0.0167	-0.025	-0.021	-0.06	-0.06	0.0542	0	-0.033	0.0583	0.0021	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0063	0.0003	0.0006	0.0004	0.0037	0.0037	0.0029	0	0.0011	0.0034	4E-06	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r22		0.0072			0.0077			0.004			0.0045			0.0405			0.0377	
		0.0024			0.0026			0.0013			0.0015			0.0135			0.0126	
		0.0489			0.0508			0.0367			0.0388			0.1162			0.1122	
	0.0792	0.0167	-0.025	0.1792	0.1396	0.0396	0.2542	0.2	0.0667	0.2583	0.2021	0.0667	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0063	0.0003	0.0006	0.0321	0.0195	0.0016	0.0646	0.04	0.0044	0.0667	0.0408	0.0044	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r23		0.0072			0.0532			0.109			0.112			0.0405			0.0377	
		0.0024			0.0177			0.0363			0.0373			0.0135			0.0126	
		0.0489			0.1331			0.1907			0.1932			0.1162			0.1122	
	0.2792	0.2167	0.075	0.3792	0.3396	0.2396	0.0542	0	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0779	0.0469	0.0056	0.1438	0.1153	0.0574	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r24		0.1305			0.3165			0.004			0.0308			0.0405			0.0377	
		0.0435			0.1055			0.0013			0.0103			0.0135			0.0126	
		0.2086			0.3248			0.0367			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	0.4542	0.4	0.2667	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.2063	0.16	0.0711	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r25		0.0222			0.0077			0.4374			0.0308			0.0405			0.0377	
		0.0074			0.0026			0.1458			0.0103			0.0135			0.0126	
		0.086			0.0508			0.3818			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	0.1792	0.1396	0.0396	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	0.05	-0.015	-0.045
	0.0146	0.0069	0.0006	0.0321	0.0195	0.0016	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0025	0.0002	0.002
r26		0.0222			0.0532			0.0324			0.0308			0.0405			0.0048	
		0.0074			0.0177			0.0108			0.0103			0.0135			0.0016	
		0.086			0.1331			0.1039			0.1013			0.1162			0.0398	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	0.05	-0.02	-0.06	0.05	-0.015	-0.045
	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0025	0.0004	0.0036	0.0025	0.0002	0.002

APPENDIX F

r27		0.0222			0.0077			0.0324			0.0045			0.0065			0.0048	
		0.0074			0.0026			0.0108			0.0015			0.0022			0.0016	
		0.086			0.0508			0.1039			0.0388			0.0465			0.0398	
	0.2792	0.2167	0.075	0.1792	0.1396	0.0396	-0.146	-0.1	-0.033	0.2583	0.2021	0.0667	0.05	-0.02	-0.06	0.25	0.185	0.055
	0.0779	0.0469	0.0056	0.0321	0.0195	0.0016	0.0213	0.01	0.0011	0.0667	0.0408	0.0044	0.0025	0.0004	0.0036	0.0625	0.0342	0.003
r28		0.1305			0.0532			0.0324			0.112			0.0065			0.0998	
		0.0435			0.0177			0.0108			0.0373			0.0022			0.0333	
		0.2086			0.1331			0.1039			0.1932			0.0465			0.1823	
	0.0792	0.0167	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	0.05	-0.02	-0.06	-0.15	-0.115	-0.045
	0.0063	0.0003	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0025	0.0004	0.0036	0.0225	0.0132	0.002
r29		0.0072			0.0782			0.0324			0.0308			0.0065			0.0377	
		0.0024			0.0261			0.0108			0.0103			0.0022			0.0126	
		0.0489			0.1614			0.1039			0.1013			0.0465			0.1122	
	0.0792	0.0167	-0.025	0.1792	0.1396	0.0396	0.0542	0	-0.033	-0.142	-0.098	-0.033	0.25	0.18	0.04	0.45	0.385	0.255
	0.0063	0.0003	0.0006	0.0321	0.0195	0.0016	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0625	0.0324	0.0016	0.2025	0.1482	0.065
r30		0.0072			0.0532			0.004			0.0308			0.0965			0.4158	
		0.0024			0.0177			0.0013			0.0103			0.0322			0.1386	
		0.0489			0.1331			0.0367			0.1013			0.1794			0.3723	
	0.2792	0.2167	0.075	0.1792	0.1396	0.0396	0.0542	0	-0.033	-0.142	-0.098	-0.033	0.45	0.38	0.24	0.25	0.185	0.055
	0.0779	0.0469	0.0056	0.0321	0.0195	0.0016	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.2025	0.1444	0.0576	0.0625	0.0342	0.003
r31		0.1305			0.0532			0.004			0.0308			0.4045			0.0998	
		0.0435			0.0177			0.0013			0.0103			0.1348			0.0333	
		0.2086			0.1331			0.0367			0.1013			0.3672			0.1823	
	0.4792	0.4167	0.275	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	0.45	0.38	0.24	0.45	0.385	0.255
	0.2296	0.1736	0.0756	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.2025	0.1444	0.0576	0.2025	0.1482	0.065
r32		0.4788			0.0782			0.0324			0.0308			0.4045			0.4158	
		0.1596			0.0261			0.0108			0.0103			0.1348			0.1386	

APPENDIX F

		0.3995			0.1614			0.1039			0.1013			0.3672			0.3723	
	0.2792	0.2167	0.075	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0779	0.0469	0.0056	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r33		0.1305			0.0782			0.0324			0.0308			0.0405			0.0377	
		0.0435			0.0261			0.0108			0.0103			0.0135			0.0126	
		0.2086			0.1614			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	-0.146	-0.1	-0.033	0.2583	0.2021	0.0667	0.05	-0.02	-0.06	0.25	0.185	0.055
	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0213	0.01	0.0011	0.0667	0.0408	0.0044	0.0025	0.0004	0.0036	0.0625	0.0342	0.003
r34		0.0222			0.0077			0.0324			0.112			0.0065			0.0998	
		0.0074			0.0026			0.0108			0.0373			0.0022			0.0333	
		0.086			0.0508			0.1039			0.1932			0.0465			0.1823	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	0.2542	0.2	0.0667	0.0583	0.0021	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0646	0.04	0.0044	0.0034	4E-06	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r35		0.0222			0.0077			0.109			0.0045			0.0405			0.0377	
		0.0074			0.0026			0.0363			0.0015			0.0135			0.0126	
		0.086			0.0508			0.1907			0.0388			0.1162			0.1122	
	0.0792	0.0167	-0.025	0.1792	0.1396	0.0396	0.4542	0.4	0.2667	0.0583	0.0021	-0.033	0.25	0.18	0.04	-0.15	-0.115	-0.045
	0.0063	0.0003	0.0006	0.0321	0.0195	0.0016	0.2063	0.16	0.0711	0.0034	4E-06	0.0011	0.0625	0.0324	0.0016	0.0225	0.0132	0.002
r36		0.0072			0.0532			0.4374			0.0045			0.0965			0.0377	
		0.0024			0.0177			0.1458			0.0015			0.0322			0.0126	
		0.0489			0.1331			0.3818			0.0388			0.1794			0.1122	
	0.2792	0.2167	0.075	0.1792	0.1396	0.0396	-0.146	-0.1	-0.033	0.2583	0.2021	0.0667	-0.15	-0.12	-0.06	0.05	-0.015	-0.045
	0.0779	0.0469	0.0056	0.0321	0.0195	0.0016	0.0213	0.01	0.0011	0.0667	0.0408	0.0044	0.0225	0.0144	0.0036	0.0025	0.0002	0.002
r37		0.1305			0.0532			0.0324			0.112			0.0405			0.0048	
		0.0435			0.0177			0.0108			0.0373			0.0135			0.0016	
		0.2086			0.1331			0.1039			0.1932			0.1162			0.0398	
	-0.121	-0.083	-0.025	-0.021	-0.06	-0.06	-0.146	-0.1	-0.033	0.4583	0.4021	0.2667	0.45	0.38	0.24	0.25	0.185	0.055

APPENDIX F

	0.0146	0.0069	0.0006	0.0004	0.0037	0.0037	0.0213	0.01	0.0011	0.2101	0.1617	0.0711	0.2025	0.1444	0.0576	0.0625	0.0342	0.003
r38		0.0222			0.0077			0.0324			0.4429			0.4045			0.0998	
		0.0074			0.0026			0.0108			0.1476			0.1348			0.0333	
		0.086			0.0508			0.1039			0.3842			0.3672			0.1823	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	0.05	-0.02	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0025	0.0004	0.0036	0.0225	0.0132	0.002
r39		0.0222			0.0782			0.0324			0.0045			0.0065			0.0377	
		0.0074			0.0261			0.0108			0.0015			0.0022			0.0126	
		0.086			0.1614			0.1039			0.0388			0.0465			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r40		0.0222			0.0782			0.0324			0.0045			0.0405			0.0377	
		0.0074			0.0261			0.0108			0.0015			0.0135			0.0126	
		0.086			0.1614			0.1039			0.0388			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	0.0583	0.0021	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0034	4E-06	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r41		0.0222			0.0782			0.0324			0.0045			0.0405			0.0377	
		0.0074			0.0261			0.0108			0.0015			0.0135			0.0126	
		0.086			0.1614			0.1039			0.0388			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	0.25	0.18	0.04	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0625	0.0324	0.0016	0.0225	0.0132	0.002
r42		0.0222			0.0782			0.0324			0.0308			0.0965			0.0377	
		0.0074			0.0261			0.0108			0.0103			0.0322			0.0126	
		0.086			0.1614			0.1039			0.1013			0.1794			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r43		0.0222			0.0782			0.0324			0.0308			0.0405			0.0377	

APPENDIX F

		0.0074			0.0261			0.0108			0.0103			0.0135			0.0126	
		0.086			0.1614			0.1039			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	0.2542	0.2	0.0667	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0646	0.04	0.0044	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r44		0.0222			0.0782			0.109			0.0308			0.0405			0.0377	
		0.0074			0.0261			0.0363			0.0103			0.0135			0.0126	
		0.086			0.1614			0.1907			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	0.0542	0	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0225	0.0132	0.002
r45		0.0222			0.0782			0.004			0.0308			0.0405			0.0377	
		0.0074			0.0261			0.0013			0.0103			0.0135			0.0126	
		0.086			0.1614			0.0367			0.1013			0.1162			0.1122	
	-0.121	-0.083	-0.025	-0.221	-0.16	-0.06	-0.146	-0.1	-0.033	-0.142	-0.098	-0.033	-0.15	-0.12	-0.06	0.05	-0.015	-0.045
	0.0146	0.0069	0.0006	0.0488	0.0257	0.0037	0.0213	0.01	0.0011	0.0201	0.0096	0.0011	0.0225	0.0144	0.0036	0.0025	0.0002	0.002
r46		0.0222			0.0782			0.0324			0.0308			0.0405			0.0048	
		0.0074			0.0261			0.0108			0.0103			0.0135			0.0016	
		0.086			0.1614			0.1039			0.1013			0.1162			0.0398	
	-0.121	-0.083	-0.025	0.1792	0.1396	0.0396	0.0542	0	-0.033	-0.142	-0.098	-0.033	0.25	0.18	0.04	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.0321	0.0195	0.0016	0.0029	0	0.0011	0.0201	0.0096	0.0011	0.0625	0.0324	0.0016	0.0225	0.0132	0.002
r47		0.0222			0.0532			0.004			0.0308			0.0965			0.0377	
		0.0074			0.0177			0.0013			0.0103			0.0322			0.0126	
		0.086			0.1331			0.0367			0.1013			0.1794			0.1122	
	-0.121	-0.083	-0.025	0.3792	0.3396	0.2396	0.2542	0.2	0.0667	0.2583	0.2021	0.0667	0.05	-0.02	-0.06	-0.15	-0.115	-0.045
	0.0146	0.0069	0.0006	0.1438	0.1153	0.0574	0.0646	0.04	0.0044	0.0667	0.0408	0.0044	0.0025	0.0004	0.0036	0.0225	0.0132	0.002
r48		0.0222			0.3165			0.109			0.112			0.0065			0.0377	
		0.0074			0.1055			0.0363			0.0373			0.0022			0.0126	
		0.086			0.3248			0.1907			0.1932			0.0465			0.1122	

APPENDIX F

RESPONDEN	5.6			5.7		
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r1		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r2		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r3		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r4		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	0.21	0.165	0.05
	0.0169	0.0056	0.0001	0.0441	0.0272	0.0025
r5		0.0226			0.0738	
		0.0075			0.0246	
		0.0868			0.1569	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r6		0.0056			0.0568	
		0.0019			0.0189	
		0.0433			0.1376	
	0.07	0.025	-0.01	0.21	0.165	0.05
	0.0049	0.0006	0.0001	0.0441	0.0272	0.0025
		0.0056			0.0738	
r7		0.0019			0.0246	
		0.0433			0.1569	
	0.07	0.025	-0.01	0.41	0.365	0.25
	0.0049	0.0006	0.0001	0.1681	0.1332	0.0625
r8		0.0056			0.3638	
		0.0019			0.1213	
		0.0433			0.3482	
	-0.13	-0.075	-0.01	0.01	-0.035	-0.05
	0.0169	0.0056	0.0001	0.0001	0.0012	0.0025

APPENDIX F

r9		0.0226			0.0038	
		0.0075			0.0013	
		0.0868			0.0357	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r10		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	0.07	0.025	-0.01	0.01	-0.035	-0.05
	0.0049	0.0006	0.0001	0.0001	0.0012	0.0025
r11		0.0056			0.0038	
		0.0019			0.0013	
		0.0433			0.0357	
	0.07	0.025	-0.01	0.01	-0.035	-0.05
	0.0049	0.0006	0.0001	0.0001	0.0012	0.0025
r12		0.0056			0.0038	
		0.0019			0.0013	
		0.0433			0.0357	
	0.27	0.225	0.09	0.21	0.165	0.05
	0.0729	0.0506	0.0081	0.0441	0.0272	0.0025
r13		0.1316			0.0738	
		0.0439			0.0246	
		0.2095			0.1569	
	0.07	0.025	-0.01	0.21	0.165	0.05
	0.0049	0.0006	0.0001	0.0441	0.0272	0.0025
r14		0.0056			0.0738	
		0.0019			0.0246	
		0.0433			0.1569	
	0.07	0.025	-0.01	0.41	0.365	0.25
	0.0049	0.0006	0.0001	0.1681	0.1332	0.0625
r15		0.0056			0.3638	
		0.0019			0.1213	
		0.0433			0.3482	
	0.07	0.025	-0.01	0.01	-0.035	-0.05
	0.0049	0.0006	0.0001	0.0001	0.0012	0.0025
r16		0.0056			0.0038	
		0.0019			0.0013	
		0.0433			0.0357	
	0.07	0.025	-0.01	0.01	-0.035	-0.05
	0.0049	0.0006	0.0001	0.0001	0.0012	0.0025
r17		0.0056			0.0038	
		0.0019			0.0013	
		0.0433			0.0357	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05

APPENDIX F

	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r18		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r19		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r20		0.1316			0.0568	
		0.0439			0.0189	
		0.2095			0.1376	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r21		0.1316			0.0568	
		0.0439			0.0189	
		0.2095			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r22		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r23		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r24		0.0056			0.0568	
		0.0019			0.0189	
		0.0433			0.1376	
	0.27	0.225	0.09	0.01	-0.035	-0.05
	0.0729	0.0506	0.0081	0.0001	0.0012	0.0025
r25		0.1316			0.0038	
		0.0439			0.0013	
		0.2095			0.0357	
	0.27	0.225	0.09	0.01	-0.035	-0.05
	0.0729	0.0506	0.0081	0.0001	0.0012	0.0025
r26		0.1316			0.0038	
		0.0439			0.0013	
		0.2095			0.0357	

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	0.07	0.025	-0.01	0.01	-0.035	-0.05
	0.0049	0.0006	0.0001	0.0001	0.0012	0.0025
r27		0.0056			0.0038	
		0.0019			0.0013	
		0.0433			0.0357	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r28		0.1316			0.0568	
		0.0439			0.0189	
		0.2095			0.1376	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r29		0.1316			0.0568	
		0.0439			0.0189	
		0.2095			0.1376	
	0.27	0.225	0.09	0.01	-0.035	-0.05
	0.0729	0.0506	0.0081	0.0001	0.0012	0.0025
r30		0.1316			0.0038	
		0.0439			0.0013	
		0.2095			0.0357	
	-0.13	-0.075	-0.01	0.21	0.165	0.05
	0.0169	0.0056	0.0001	0.0441	0.0272	0.0025
r31		0.0226			0.0738	
		0.0075			0.0246	
		0.0868			0.1569	
	0.47	0.425	0.29	0.21	0.165	0.05
	0.2209	0.1806	0.0841	0.0441	0.0272	0.0025
r32		0.4856			0.0738	
		0.1619			0.0246	
		0.4023			0.1569	
	0.07	0.025	-0.01	0.01	-0.035	-0.05
	0.0049	0.0006	0.0001	0.0001	0.0012	0.0025
r33		0.0056			0.0038	
		0.0019			0.0013	
		0.0433			0.0357	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r34		0.0056			0.0568	
		0.0019			0.0189	
		0.0433			0.1376	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r35		0.1316			0.0568	
		0.0439			0.0189	

		0.2095			0.1376	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r36		0.1316			0.0568	
		0.0439			0.0189	
		0.2095			0.1376	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r37		0.0056			0.0568	
		0.0019			0.0189	
		0.0433			0.1376	
	0.47	0.425	0.29	-0.19	-0.135	-0.05
	0.2209	0.1806	0.0841	0.0361	0.0182	0.0025
r38		0.4856			0.0568	
		0.1619			0.0189	
		0.4023			0.1376	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r39		0.0056			0.0568	
		0.0019			0.0189	
		0.0433			0.1376	
	0.27	0.225	0.09	-0.19	-0.135	-0.05
	0.0729	0.0506	0.0081	0.0361	0.0182	0.0025
r40		0.1316			0.0568	
		0.0439			0.0189	
		0.2095			0.1376	
	-0.13	-0.075	-0.01	0.21	0.165	0.05
	0.0169	0.0056	0.0001	0.0441	0.0272	0.0025
r41		0.0226			0.0738	
		0.0075			0.0246	
		0.0868			0.1569	
	-0.13	-0.075	-0.01	0.01	-0.035	-0.05
	0.0169	0.0056	0.0001	0.0001	0.0012	0.0025
r42		0.0226			0.0038	
		0.0075			0.0013	
		0.0868			0.0357	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r43		0.0056			0.0568	
		0.0019			0.0189	
		0.0433			0.1376	
	0.07	0.025	-0.01	-0.19	-0.135	-0.05
	0.0049	0.0006	0.0001	0.0361	0.0182	0.0025
r44		0.0056			0.0568	

		0.0019			0.0189	
		0.0433			0.1376	
	-0.13	-0.075	-0.01	-0.19	-0.135	-0.05
	0.0169	0.0056	0.0001	0.0361	0.0182	0.0025
r45		0.0226			0.0568	
		0.0075			0.0189	
		0.0868			0.1376	
	-0.13	-0.075	-0.01	0.01	-0.035	-0.05
	0.0169	0.0056	0.0001	0.0001	0.0012	0.0025
r46		0.0226			0.0038	
		0.0075			0.0013	
		0.0868			0.0357	
	0.27	0.225	0.09	0.01	-0.035	-0.05
	0.0729	0.0506	0.0081	0.0001	0.0012	0.0025
r47		0.1316			0.0038	
		0.0439			0.0013	
		0.2095			0.0357	
	-0.13	-0.075	-0.01	0.21	-0.035	-0.05
	0.0169	0.0056	0.0001	0.0441	0.0012	0.0025
r48		0.0226			0.0478	
		0.0075			0.0159	
		0.0868			0.1263	

APPENDIX G

Mlearning PCS activities

Learning activities which students have to engage on to fulfill the below course outcomes:

By the end of the course, students should be able to:

1. apply the principles and practices of professional oral communication skills.
2. present information confidently, accurately and fluently in a variety of professional, business and social settings.
3. persuade effectively in a variety of professional, business and social settings.
4. communicate interpersonally, and work effectively individually and in teams.

Please tick (√) your response in box provided.

	Activites	Agree	Not sure	Disagree	Short Comments
1	Attend in class lectures.				
2	Access and listen to lectures on podcasts through mobile devices.				
3	Access and read slides on lectures/notes on mobile devices.				
4	Post messages on blogs or other social sites through mobile devices.				
5	Watch, listen and comment on video presentation of other students through mobile devices.				
6	**Record self presentations and upload videos of presentation to illicit comments through mobile devices:**				
	1. Comments from the PCS lecturer				
	2. Comments from other students(peers)				
	3. Comments from other course lecturer (ex. Engineering lecturers)				
	4. Others ___________________________				
7	Answering short online quizzes on grammar through mobile devices.				
8	Answering short online quizzes on effective communication or presentation through mobile devices.				
9	Search and browse for information through mobile devices.				
10	Sending and receiving SMS through mobile devices.				
11	Sending and receiving MMS through mobile devices.				

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12	Video conferencing (Face time conversation) through mobile devices.				
13	Online group discussions through mobile devices.				
14	Listening or reading online microcourse notes through mobile devices.				
15	Download others students' video presentations to comment and evaluate through mobile devices.				
16	Setting up blogs or chatrooms for online discussion through mobile devices.				
17	Post their location at a venue ("check-in") and connect with friends using location-based social networking website such as foursquare or gowalla through mobile devices.				
18	Learning Contracts both in-class and through mobile devices.				
19	Small Group Work both in-class and through mobile devices.				
20	Discussion of group project/task through mobile devices.				
21	Case Study through mobile devices.				
22	Forming new online small groups to discuss new shared topic. Ex. Effective body language in presentation, Voice control or projection etc. Developing effective slide presentations				
23	Forming new online small groups to discuss and solve shared problems in language or presentation skills. Ex. Overcoming stage fright Grammar or other language competence related.				
24	**Mentorship**				
	1. Lecturer-student				
	2. Student-student				
	3. Group-student				
	4. Others ______________________________				
25	**Forum**				
	1. Online video forum (Skype)				
	2. Blog or other social sites (facebook, twitter)				
	3. Others ______________________________				
26	**Evaluation on PCS presentation**				
	1. Synchronous Online evaluation on PCS presentation through mobile devices by the lecturer.				
	2. Synchronous Online evaluation on PCS presentation through mobile devices by the students.				
	3. Asynchronous Online evaluation on PCS				

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	presentation through mobile devices by the lecturer.				
	4. Asynchronous Online evaluation on PCS presentation through mobile devices by the students.				
	5. In-class evaluation by the lecturer.				
27	**Develop Quick Respond (QR) codes for :**				
	1. PCS resources- ex. Notes, slides, audio or video podcasts on effective presentation and communication. 2. Language resources- ex. Grammar, correct spoken English, quizzes etc. 3. Feedback on presentations. 4. Others ____________________________				
30					
31					
32					
33					
34					

APPENDIX H

FINAL LIST OF MLEARNING ACTIVITIES

EXPERT NUMBER : ☐

Based on our discussion on the selection of the mobile learning activities, below is the final list of the learning activities that we have agreed. Please give a ranking number to indicate your preference for each learning activity to be included in the mLearning implementation model. The preference scale is from 1 to 7.

Please tick (✔) in the box correspond to the number of your preference. The interpretation of the scale is as the following:

1 = Least favorable

2 = Slightly Favorable

3 = Moderately favorable

4 = Favorable

5 = Very favorable

6 = Highly favorable

7 = Most favorable

	Learning Activities	1	2	3	4	5	6	7
1	Listening to or reading online micro information on effective communication, competence (grammar) or technical use of mobile tools and devices through 'push' technology via mobile devices.							
2	Online group discussions on task given by lecturer via mobile environment.							
3	Develop 'mobile tags' for information and knowledge on communication, language competence, and technical use of mobile devices via QR code or social bookmarking.							
4	Synchronous or asynchronous mLearning forum on specific communication or competence issues.							
5	Collaborative redesign of in-class language activities to improve communicative or competence skills.							

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	Learning Activities	1	2	3	4	5	6	7
6	Asynchronous online evaluation on students' presentation through mobile devices by the lecturer.							
7	Asynchronous online evaluation on students' presentation through mobile devices by other students.							
8	Attend in-class lectures on effective communication.							
9	Collaborative redesign of method to improve specific communicative or competence skills.							
10	In-class evaluation on students' presentation by the lecturer.							
11	Video conferencing with other students and/or the lecturer via mobile devices to improve communicative and competence skills.							
12	Search and browse for information on effective communication, competence, and technical use of devices through mobile devices.							
13	Reflection on what students have learned and establish new learning target to develop new or higher communication/language skills.							
14	Forming separate online small groups (social blogs) to discuss and solve shared problems in language, communication, or presentation.							
15	Learning through modeling.							
16	Synchronous online evaluation on students' presentation through mobile devices by other students.							
17	Access and listen to lectures about effective communication on podcasts through mobile devices.							

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	Learning Activities	1	2	3	4	5	6	7
18	Forming separate online small groups (social blogs) to discuss shared topics in-class or mobile.							
19	Search and browse information for content to be used for presentation materials.							
20	Playing mobile language games either individually or in groups.							
21	Record and upload presentations to elicit comments from lecturers and peers via mobile devices.							
22	Mentorship to help students or group of students by lecturer or by other more capable peers.							
23	Synchronous online evaluation on students' presentation through mobile devices by the lecturer.							
24	Establish 'learning contract' to be fulfilled through both in-class and informal (online and mobile) learning activities.							

A Priority value will be calculated based on the ranking numbers. A Priority list of the learning activities will be generated from the values. The learning activities will be inserted into the ISM program based on the priority list.

THANK YOU.