University of Surrey
School of Management

Customer Acceptance of Technology in
Hong Kong Public Libraries

by

Karen Chan

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Abstract

The rapid development in technology and the huge funding in technological systems in Hong Kong Public Libraries have drawn the attention for researchers to conduct library technology research. While traditional research focuses on the technological development, it is found that there is lack of user-focused research. During the past ten years, public libraries in Hong Kong spent millions of dollars on the development of different technological systems. However, there is no proof that public library users have used them sufficiently.

Therefore, the purpose of this study was to identify factors affecting user acceptance of library technology in Hong Kong. Considering the reported underutilization of library technology and the importance of promoting them, this study aimed to provide better understanding of the different factors of user acceptance based on a well established theoretical foundation. This study integrated different technology acceptance models towards intention to use library technology in a public library environment. These models are prominent models used to explain the effects of users' internal beliefs and attitudes on their system usage behaviour. Fourteen variables are included in the proposed model in this study.

This study employed a cross-sectional field study using a mixed research method which first included qualitative and then quantitative techniques. The study targeted public library users who have experience using library technology. The population of the study was public library users sampled in three major libraries and in three major districts in Hong Kong. Based on a sample of 462 public library users, the proposed integrated model was found to be strongly effective in explaining user acceptance of library technology. It also demonstrates the effects of external variables on behavioural intention through perceived usefulness and perceived ease of use.

The results of the data analysis showed that perceived ease of use had a stronger effect on user acceptance than perceived usefulness, suggesting that user acceptance of library technology depends on the ease of using one system. Relevance, system reliability and perceived ease of use showed positive effects on perceived usefulness. Also, it was found that accessibility, domain knowledge and level of navigation showed positive effects on perceived ease of use while level of understanding of terminology did not. Moreover, the results indicated that user
training has a significant effect on perceived usefulness but not on perceived ease of use. This calls for a need to re-examine the effectiveness of user training in the context of library technology. The results also suggested that although subjective norm does not directly affect users’ intention to use library technology, it exerts an influence for users in order to get to know this technology. Additionally, the results indicated that there were significant differences of age towards the acceptance of library technology while younger users were found to have more intention to use library technology than older users. The findings of this study provide public library managers with increased understanding so that they can implement improved strategic, marketing and operational changes. Details of the full range of management benefits of the findings are available in Chapter Eight of this study.
Declaration of Originality

I declare that my thesis entitled Customer Acceptance of Technology in Hong Kong Public Libraries for the degree of Doctor of Business Administration (DBA) of the University of Surrey, embodies the results of an original research programme undertaken by me. I have included specific references to any other work, by me or other sources, whether published or not.

Signature: Karen Chan

Name in Print: Karen CHAN

Date: 1 March 2009
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Chapter One

Introduction

Over the past decade, computer-based technologies have become dominant forces to shape the products and services provided by public libraries in Hong Kong. The application of library technologies has had a profound impact on the way library resources are being used and new technologies have led public library users to experience efficient services.

This emergence of technology has brought fundamental changes to the public library industry which calls for research involving various disciplines. Traditional research of library and information sciences focuses on various areas such as system integration of digital library and the issue of copyright. There is a lack of research that examines the systems from the users’ perspective. Moreover, over the past ten years, there are huge amounts of research literatures on computer attitudes. Many researchers have studied the relationship between computer attitudes and system used. The importance of users’ attitudes towards computers and technologies is widely acknowledged. However, most research concentrates on using one new system in a commercial setting - which is a working environment. There is lack of research that focuses on public users in a public sector. Therefore, it is essential to know why public users intend to use technology in a public services environment.

According to the Public Library Technology Act of the Delaware State Government (2008), "Library technology" includes, but is not limited to, technologies that support the storage, retrieval, processing and dissemination of information necessary for the efficient and effective operation of libraries in meeting the information needs of their users. Items and services that considered being included within the definition of "library technology" are: hardware, software, training, installation, networking, telecommunication, database migration and consultant costs.

The major advantages of using library technological services as compared to traditional services include: (1) users enjoy fast and easy access to extensive library collections which is relevant to their interested areas; (2) users are supported by both printed and electronic resources; (3) users can access to the library services 24-hour a day; (4) users enjoy remote
access to databases from home via public library's website; (5) the library supports the use of these electronic services and databases by providing users with instruction and users' guide in using those databases and services (Henderson, 2002).

After the implementation of Library Automation System in the 1990s, the Hong Kong Government has invested a lot to promote the application of electronic information and services in Hong Kong Public Libraries. The unprecedented pace of technological change in the development of electronic services and digital information networks has helped to expand the role of the public library. Once it was a storehouse of printed materials, the public library is now a place which can provide both printed and digitalized resources. Users can experience the use of advanced technological library services. They are able to conduct sophisticated library searches from the comfort of their homes. These technological services provided by Hong Kong Public Libraries during the recent years is found to be more convenient and have more advantages compared with more traditional means.

Apart from implementing a library automation system and introducing a library website which provides 24-hour Internet library services for on-line searching, reservation and renewal of library materials, the Hong Kong Public Libraries continues to induce different technologies such as self-check terminals, telephone renewal services and other online resources such as electronic books and online databases. The successful implementation of the Multimedia Information System (MMIS) was a turning point in the development of digital library services. MMIS provides audio and video services on demand, on-line CD-ROMs and reference resources, also searching and viewing of documents are available through workstations at the libraries and the Internet. In 2003, the government's new Hong Kong smart ID card was launched which allowed the public libraries to provide residents with the option of using their smart ID cards as library cards to borrow, renew and reserve library materials. In addition, a number of computer terminals with Internet access have been installed with e-Cert compatible smart card readers to promote wider use of information technology and electronic services among the public. This was followed by an e-mail notification service which was introduced at the end of 2003 in order to enable registered readers to receive overdue and reservation notices through e-mail to improve service efficiency and to economise on the use of paper.
However, many public library users are still struggling to cope with the changes brought on by the rapid advances of information technology. On one hand, library users can enjoy various types of technological services such as using self-charging terminals, online renewal and reservation through the library website. On the other hand, users have to learn how to identify relevant sources and navigation protocols before using library electronic services or finding appropriate information through electronic sources. It would be nice to understand users' attitude towards the use of library technology.

Moreover, since many resources have been devoted to develop electronic services, public libraries must ensure these services are fully utilized. If those implemented technologies are not used widely, then it will be difficult to defend their considerable investments and the potential benefits they offer will not accrue to users. Hence there is a necessity to identify factors that can increase user acceptance of library technology. Therefore, user acceptance of library technology has been an important issue for Hong Kong Public Libraries as well as the government in assessing the success of its efforts in facilitating the application of those electronic services.

Therefore, this study aims to investigate to what extent public library users accept these services and the factors that affect users using them. The study is set in a rapidly changing library and information environment in Hong Kong. The researcher will attempt to integrate models from the variables of traditional technology acceptance models including Ajzen and Fishbein's theory and Technology Acceptance Model (TAM) (Davis, 1989). Within these models, TAM is being treated as a primary model for the investigation of the acceptance of new technology and has a large base of academic recognition. TAM is an established model in explaining information system adoption behaviour. According to the TAM model, the adoption behaviour is determined by the intention to use a particular system, which in turn is determined by perceived usefulness and perceived ease of use of the system. One key benefit of using TAM to understand system usage behaviour is that it provides a framework to investigate the effects of external variables on system usage. The TAM model shows that acceptance is determined by users' perceptions of system usability, that is, its usefulness and ease of use. Usefulness has a direct influence on user acceptance because individuals will be more willing to use a system that provides helpful functions. While ease of use refers to the easier it is for a
person to interact with the system, the more likely that person will continue to use it.

Following this precedent, the researcher will add additional variables and integrate an enhanced technological acceptance model for a public library environment. The model will be revised according to the results obtained from focus group research in order to achieve explanatory power. Then the researcher will test the proposed model based on the sample population of public library users through questionnaires to see if it can predict users' intention to adopt library technology and online resources. Apart from identifying variables that have significant effects on users' intention to use library technology, the researcher will also test whether there is a difference between older and younger users towards their intention to use library technology. By explaining intention to use from users' perspectives, the findings in this research will not only help public library managers to understand factors affecting user acceptance of library technology so that they can provide more 'user-accepted' electronic services, but also provide valuable insights into how to prepare potential users for the new information technology age. The implications of this study are discussed at the end of this work.
Chapter Two

Literature Review

The literature review underpins the thesis in relation to the application of technology in use and access to library resources. The whole review explains the development of technology acceptance models. The researcher incorporates characteristics from these models and creates an Integrated Technology Acceptance Model which best suits the circumstances of public libraries in Hong Kong.


The researcher presents an extensive review of literature associated with those models related to this research. Criticism of these models as well as different examples of other extended and combined technology acceptance models are also discussed.

2.1 Theoretical Framework

In response to the growing importance of information technology, user acceptance of technology has been studied intensively. These studies examine different aspects of technology acceptance using a variety of theoretical perspectives (Karahanna and Straub, 1999; Straub et al., 1997; Igbaria and Tan, 1997, Sheppard et al., 1988).

A key objective of Technology Acceptance research is to assess the value of information
technology to an organization and to understand the determinants of the value. Its purpose is to help organizations better deploy and manage Information Technology resources and enhance overall effectiveness.

During the recent years, numerous technology acceptance theories have been developed in various disciplines including information systems, management, sociology and medicine (Gong et al., 2004; Eriksson et al., 2005; Ndubisi and Jantan, 2003; Lu et al., 2003; Hu et al., 1999). With empirical studies on user acceptance of information systems, theoretical frameworks for user acceptance in the implementation of the systems are developed to help researchers and practitioners better understand adoption and usage processes. There are accumulated studies that propose theoretical frameworks and provide empirical findings for the respective theoretical framework.

2.2. History of Technology Acceptance Models

Since the mid 1970s, researchers started to understand the topic of technology acceptance. Early acceptance models were normally derived from research efforts of psychologists who studied the topic of satisfaction. According to Legris (2003), satisfaction was considered the sum of one’s feeling or attitudes toward a variety of factors that are affecting the situation.

Different acceptance models have been developed over the past years. Since there was robust development of information technology during the late 1990s, the topic of technology acceptance became a subject of interest in the information technology research field. Generally speaking, technology acceptance models are usually based on one of the following models: Rogers’ (2003) Diffusion of Innovation model developed in 1962; Ajzen and Fishbein’s (1975) Theory of Reasoned Action (TRA) published in 1975; Davis’s (1989) Technology Acceptance Model (TAM) developed in 1989; Ajzen’s (1991) Theory of Planned Behaviour which is an extension of TRA; Bandura’s (1986) Social Cognitive Theory (SCT) developed in 1986 and Task Technology Fit Model proposed by Goodhue (TTF) in 1995. Among these models, TRA and TPB are general theories developed in social psychology which attempt to explain and predict individual behaviour across a wide variety of domains while TAM has been recognized as the most robust and influential model which attempts to explain individual behaviour.
towards technology. As of January 2000, the Institute for Scientific Information's Social Science Citation Index listed 424 journal citations to the two journal articles that introduced TAM, while Burton-Jones and Hubona (2005) also identified 40 additional TAM studies between January 2000 and 2003. Despite its criticisms (Plouffe et al., 2001; Legris et al., 2003), interest has not abated.

In the 1990s, many researchers proposed new factors which were to be added to the original TAM and extended the models which best suited their professional environment. In 2000, Venkatesh and Davis (2000) introduced an Extended Technology Acceptance Model (TAM2). At the same time, other derivations of the TPB were also developed. Until 2003, Vankatesh, Morris and Davis (2003) created a unified model of technology acceptance that combined eight previous technology acceptance models. The characteristics as well as contributions of these models are described in this chapter.

2.3. Diffusion of Innovation (1962)

When looking at the matter of determinants of user acceptance of information technology researchers normally incorporated the Diffusion of Innovation (Rogers, 2003) literature developed by E. M. Rogers in 1962. Diffusion is defined as the process by which an innovation is communicated through certain channels over time among the members of social systems. An innovation is an idea, practice or object that is perceived as new by an individual or another unit of adoption (Rogers, 2003).

The adoption and diffusion of innovation is a stage-based process by which one passes from initial awareness and knowledge of the innovation, to the formulation of a positive and negative attitude about the innovation, to a decision to adopt or reject the innovation. According to Rogers (2003), there are five stages that are linked to innovation decision processes (Figure 2-1). Each stage represents systems acceptance among users. In the knowledge stage, users are introduced to the innovation and gain an initial understanding of the innovation. In the persuasion stage, the decision makers create the attitude toward the innovation. In the decision stage, the users arrive at a decision to accept or to reject the innovation. In the implementation stage, users actually use the innovation. Finally, the adoption and rejection of decision is reconfirmed or reversed in the confirmation stage. That is,
upon use, one ultimately returns to the original decision, either affirming that decision or reversing one's initial adoption decision (Xia and Lee, 2000; Rogers, 2003).

Figure 2-1 – Diffusion of Innovation Process (Rogers, 1962)

Furthermore, Rogers (2003), through a synthesis of several previous studies examining adoption behaviours, identified five attributes of an innovation that are key influences on acceptance behaviour. According to Rogers, these attributes include relative advantage, complexity, compatibility, trialability and observability.

Research of diffusion of innovation is based on the following attributes. Rogers (2003) defined them as follows:

- Relative advantage – the degree to which an innovation is perceived as being better than its precursor.
- Compatibility – the degree to which an innovation is perceived as being consistent with existing values, needs and past experience of potential adopters.
- Complexity – the degree that the innovation is perceived as being difficult to use.
- Trialability – the degree to which an innovation may be experimented with before adoption.
- Observability – the degree to which the results of an innovation are observable to others.

These five attributes are adopted to have different relative importance on adoption decision making in various research. In Tornatzky and Klein's (1982) meta-analysis of 75 studies of Innovation of Diffusion Theory, they found that only relative advantage and compatibility were
consistently related to innovation adoption.

The Diffusion of Innovation theory was grounded in sociology and was widely adopted since the 1960s to study a variety of innovation, ranging from agricultural tools to organizational innovation (Tornatzky and Klein, 1982). Many researchers found support for the predictive validity of these innovation characteristics (Moore and Benbasat, 1996; Agarwal and Prasad, 1997, 1998; Karahanna et al., 1999; Plouffe et al., 2001).

Succi and Walters (1999) criticized that the model for Diffusion of Innovation was too complex. Moreover, since the model focuses on the adoption of innovations, it is difficult to apply when researcher examines the acceptance of information technology. While receiving certain criticism, this theory has been empirically verified in the information technology literature. Branchauer (1987) and Branchauer and Wetherby (1990) discovered a strong linkage between relative advantage and compatibility and adoption of spreadsheet software across a variety of industries, while Hoffer and Alexander (1992) found the same linkage in the diffusion of database machines. Also, Moore (1989) and Moore and Benbasat (1991) discovered these same causal connections in the field of personal computer’s adoption. Similarly, Karahanna (1993) found support for the influence of relative advantage and compatibility on the intentions of users to adopt Windows software.

In 1991, Moore and Benbasat (1991) expanded the relevant innovation attributes characteristics set and developed an instrument to measure the perceived characteristics of using an innovation. The new measurement was widely adapted in subsequent research studies (Moore and Banbasat, 1996; Agarwal and Prasad, 1997; Karahanna et al., 1999). However, Gilbert et al. (2004) claimed that these studies tend to apply to the adoption of technology regarding information systems for performing job roles and as such may not be valid when they apply to consumers. Thus, identifying antecedents of technology usage may be different for a consumer adopting technology to receive a service and an employee who is using the technology to perform their work responsibilities.

Diffusion of Innovation was integrated into other proposed models and tested by Fitzgerald and Kiel (2002). In the comprehensive model, the set of attributes proposed by Moore and
Benbasat (1991) were explored in the context of online purchasing. The results indicated that attitude was a strong factor explaining intent to use in the future for both adopters and non-adopters.

Moreover, researcher Al-Gahtani (2003) tested a subset of Diffusion of Innovation attributes in a study aimed at computer technology adoption by workers in Saudi Arabia in 136 organizations. The results confirmed the five proposed attributes proposed by Moore and Benbasat (1991).

Recent innovation studies have also shown another variable derived from Diffusion of Innovation, personal innovativeness in the domain of IT (PIIT) (Yi et al., 2006). PIIT refers to the willingness of an individual to try out any new IT; it plays an important role in determining the outcomes of user acceptance of technology. PIIT is initially proposed as a moderator of, but later re-conceptualized as a direct determinant of perceived usefulness and perceived ease of use. However, its relationships with other innovation characteristics such as result demonstrability and image, or the Theory of Planned Behaviour variables such as subjective norm and perceived behavioural control, which are going to be explained later in this chapter, have not been investigated.

2.4 Theory of Reasoned Action (1975)

In 1975, Fishbein and Ajzen submitted the Theory of Reasoned Action (TRA). In fact, development of TRA started in 1950s and the first research concerning TRA was published in 1967 (Ajzen and Fishbein, 1980). Drawn from social psychology, it is one of the most fundamental and influential theories that has proven successful in predicting and explaining a wide range of human behaviour (Sheppard et al., 1988). The fundamental premise of this theory is that individuals will adopt a specific behaviour if they perceive it will lead to positive outcomes (Compeau and Heggins, 1995). The theory has been applied to a variety of situations to predict an individual’s behaviour. This includes predicting voting behaviour (Ajzen, Timko and White, 1982); user acceptance of information systems (Davis et al., 1989; Malhotra and Galletta, 1999); seat-belt use (Budd, North, and Spencer, 1984) and consumer behaviours (Bagozzi, Baumgartner and Yi, 1992; Brewer et al., 1999).
The theory builds a distinction between beliefs, attitudes and intention. It is based on the assumption that human beings make rational decision based on the information available to them. Additionally, TRA assumes that people also took into account the effects of their possible actions and based on this reasoning made the decision whether or not to take action (Ajzen and Fishbein, 1980). That is, they make the obvious assessment that an individual's beliefs influence individual's attitude. Individuals would use computers if they have a feeling that there could be positive benefits (outcomes) associated with using computers (Compeau and Higgins, 1995). According to the Theory of Reasoned Action, a person's behavioural intention is also determined by his or her attitude toward performing the behaviour and by his or her subjective norm. Behavioural intention is a measure of the strength of one’s intention to perform a specific behaviour. Attitude toward behaviour refers to an individual’s positive or negative feelings about performing the target behaviour, and subjective norm refers to the person’s perception that most people who are important to ‘him’ think ‘he’ should or should not perform the behaviour (Ajzen and Fishbein, 1975). The theory hypothesizes that a person's behavioural intention (BI) to perform (or not to perform) a behaviour is the immediate determinant of that person's attitude (A) and subjective norm (SN) (BI=A+SN). This behavioural intention at the end directly affects the actual behaviour of that individual.

In summary, the theory suggests that it is possible to explain and predict an individual’s behaviour by measuring his attitude towards the behaviour, his subjective norm, and relative weights of these attitudinal and normative factors.
The model of Theory of Reasoned Action is described as below:

![Figure 2-2 - Theory of Reasoned Action](image)

Source: Ajzen and Fishbein (1980)

In 1980, Ajzen and Fishbein also explained their beliefs that external variables may influence a person’s belief and the relative weights of ‘his’ attitudinal or normative beliefs. These variables can be personal characteristics such as introversion, extroversion and authoritarianism; demographics variables including age and gender; and other factors such as social status and intelligence (Ajzen and Fishbein, 1980). However, these external variables were not included in the integral part of the Theory of Reasoned Action since the authors claimed that external variables were not expected to have consistent effects in different contexts, and there was no necessary relation between any external variable and a given behaviour.

A clear movement could be seen from the development of psychological model to this Theory of Reasoned Action. While psychological models concentrate at the topic of satisfaction, which is the sum of one’s feeling or attitude toward a variety of factors affecting the situation (Legris, 2003), the Theory of Reasoned Action clearly explains how a person’s attitude about a behaviour is influenced by that person own set of beliefs. Moreover, one contribution of TRA is that both attitude and subjective norm in TRA do not directly predict behaviour but do directly predict intention which in turn predicts a person’s actual behaviour.

TRA has been tested and used extensively and its extension, the theory of planned behaviour (TPB) (Ajzen, 1991) utilized widely. The model has proven to be successful in predicting and
explaining behaviour across a wide variety of domains. Pavlou (2003) applied the TRA in an e-commerce trust / risk context and used three experimental survey studies. The rationale behind the three experiments was to test the model in the following strategies: 1) predetermined, 2) self-selected, or 3) general on-line retailer. The authors concluded that the theory is robust models in the e-commerce context. Similar studies that used the TRA as one of the foundation models were done in e-commerce and online purchasing. Korzaan (2003) combined flow theory with the TRA in the context of online purchasing. Using a two phased structural equation analysis, Korzaan concluded that attitude is a direct and significant influencer of intention to engage in online purchasing transactions. Korzaan added two constructs (exploratory behaviour and flow) to the TRA. The result showed significant effect from both constructs on attitude towards online purchasing.

TRA was also empirically studied in spreadsheet applications (Davis, 1989) and information technology ethics (Banerjee et al., 1998). Ajzen and Fishbein (1980) demonstrated that attitudes toward an object influence intentions and ultimately influence behaviour with respect to the object, that is, its use. Davis et al. (1989) found that behavioural intention to use that system was significantly correlated with usage and that behavioural intention is a major determinant of user behaviour, while other factors influence user behaviour indirectly through behavioural intentions. Hill et al. (1987) also indicated that behavioural intentions significantly predict action. Similarly, Sheppard et al. (1988), in a meta-analysis of 86 TRA studies, found an average correlation of 0.54 between intentions and actions.

2.5 Social Cognitive Theory (1986)

In 1986, Albert Bandura, a Stanford psychologist, translated his years of basic research using a behaviourist and social learning framework into what he called Social Cognitive Theory (SCT). This theory is one of the most powerful theories of human behaviour. (Bandura, 1986). It is widely adopted in the field of psychology as well as individual behaviour research. SCT is based on the premise that environmental influences such as social pressures or unique situational characteristics, cognitive and other factors including personality, as well as demographic characteristics and behaviour, are reciprocally determined (Bandura, 1977; 1986; Compeau and Higgins, 1995). Thus, individuals choose the environments in which they wish
to exist in addition to being influenced by those environments. Additionally, behaviour in a given situation is affected by environment or situational characteristics, which are in turn affected by behaviour. SCT explicitly acknowledges the existence of a continuous reciprocal interaction between the environment in which an individual operates his or her cognitive perceptions (such as self-efficacy and outcome expectation) and his or her behaviour (Bandura, 1986; Compeau and Higgins, 1995).

While the perspective of Davis' Technology Acceptance Model focuses almost exclusively on beliefs about technology and the outcomes of using it, SCT includes the belief that one has the capability to perform a particular behaviour, independent of perceived outcomes.

One key element in SCT is the concept of self-efficacy, which refers to an individual's belief in his own capability to perform a specific task (Bandura, 1986). Self-efficacy perceptions have been found to influence decisions about behaviour to undertake, the effort exerted and persistence in attempting, the emotional responses (such as stress and anxiety) of the individual performing the behaviours, and the actual performance attainments of the individual with respect to the behaviour (Bandura, 1977, 1982, 1986). Estimation of self-efficacy is formed through a gradual and dynamic weighting, integration and evaluation of complex cognitive, linguistic, social and enactive studies. Several studies (Burkhardt and Brass, 1990; Gist, Schwoerer and Rosen, 1989; Hill, Smith and Mann, 1986, 1987; Webster and Martocchio, 1992, 1993) have examined the relationship between self-efficacy with respect to computer use and a variety of computer studies. These studies found evidence in the relationship between self-efficacy and the adoption of high technology products (Hill, Smith and Mann, 1986), registration in computer courses at universities (Hill, Smith and Mann, 1987) and technology innovation adoption (Burkhardt and Brass, 1990) as well as performance in software training (Gist, Schwoerer and Rosen, 1989; Webster and Martocchio, 1992, 1993).

Based on SCT, self-efficacy is viewed as an antecedent to use, but successful interactions with technology are also viewed as influences on self-efficacy. Thus, SCT incorporates two specific expectations. They are outcome expectations and expectations related self-efficacy (Igbaria and Livari, 1995). Outcome expectations are similar to the perceived usefulness in Davis' Technology Acceptance Model (TAM), where users tend to undertake behaviours they believe
will help them perform their job better. Wood and Bandura (1989) stated that expectations related self-efficacy is the beliefs in one’s capabilities to mobilise the motivation, cognitive resources and courses of action which needed to meet given situational demands. SCT claims that both expectations are basic determinants of user behaviour. Moreover, according to Bandura (1986), self-efficacy is concerned not with skills one has but with judgements of what one can do with whatever skills one possesses. The concept of self-efficacy plays a pivotal role in SCT. Bandura (1997), in his more recent publication, provided a detailed conceptual analysis and empirical overview of how self-efficacy operates in concert with socio-cognitive determinants represented by SCT in influencing human action, adaptation and change. Bandura’s publication has proved that SCT successfully influences cognitive functioning such as students’ grades and writing proficiency; health functioning such as prognostic judgement; clinical functioning such as eating disorders and depression; athletic functioning such as athletic performance and organizational functioning such as organizational decision making. Below is the diagram of the social cognitive theory:

Figure 2-3 – Social Cognitive Theory

B represents behaviour
P represents personal factors in the form of cognitive, affective, and biological events
E represents the external environment.

Source: Bandura (1986)
On the other hand, Kinzie et al. (1994) also defined self-efficacy as an individual’s confidence in his or her ability that may impact the performance of tasks. They noted that self-efficacy reflected an individual’s confidence in the ability to perform the behaviour required to produce specific outcomes and was thought to impact directly on the choice to engage in a task, the effort that would be expended and the persistence that would be exhibited. On the other hand, Brandura (1977) argued that self-efficacy must be considered to understand users’ behaviours. He stated that individuals can believe that a particular course of action will produce certain outcomes, but if individuals entertain serious doubts about whether they can perform the necessary activities, such information does not influence their behaviour. This argument emphasises the impact of the users’ cognitive state on outcomes and the importance of understanding self-efficacy.

Since the development of the Bandura’s SCT, the theory has been used to study a wide range of health problems, from medical therapy compliance, alcohol abuse, to immunizations. One particularly fruitful area of investigation to which the SCT has been employed is the study of moral and value internalization among children. In fact, Johnston et al. (1997) had once stated that the greatest contribution of the SCT is its aid in understanding how children are socialized to accept the standards and values of their society.

During the recent years, self-efficacy continued to be shown as an important construct in a wide variety of behaviours, such as career development, research productivity and sales performance. In 1995, Compeau and Higgins (1995) applied and extended the Social Cognitive Theory to the context of computer utilization. This is one of the papers that related self-efficacy to computer use. It describes a programme of research which aims at understanding the impact of self-efficacy on individual reactions to computer technology. The study involves the development of a measure for computer self-efficacy and a test of reliability and validity.

Moreover, researcher Harrison, Rainer, Hochwarter and Thompson (1997) tested the effect of self-efficacy on computer usage. One interesting finding was that self-efficacy was more strongly related to past performance than future performance but was still a strong predictor of future performance. Also, significant results were yielded when Gist, Schwoerer and Rosen...
(1989) tested the effect of self-efficacy on performance within the context of computer training through experimental settings.

A number of studies followed adopting the measure and validation of its applications to technology acceptance researches (Compeau et al., 1999; Venkatesh and Davis, 1996) though the objectives of the studies are different. These studies show that individual self-efficacy and outcome expectations are positively influenced by the encouragement of others, as well as others' use of computer. Computer self-efficacy is then developed to exert a significant influence on individuals' expectations of the results of using computers, their emotional reaction to computers as well as their actual computer use. According to Murphy et al. (1989), computer self-efficacy is an individual's perception of their capabilities regarding specific computer knowledge and skills. Since self-efficacy has been viewed in the SCT as an important antecedent to technology acceptance, understanding this concept is important to the successful implementation of information technology in organizations (Bandura, 1986; Compeau and Higgins, 1995; Compeau et al., 1999). Researchers Chan and Lu (2004) had once investigated the adoption behaviour within the context of Hong Kong Internet Banking services. A research framework based on the extended Technology Acceptance Model (TAM2) and Social Cognitive Theory was developed to identify factors that would influence the adoption and continue use of Internet Banking. The results revealed that computer self-efficacy played significant roles in influencing the intention to adopt Internet Banking. The authors claimed that one has to incorporate risk perception and computer self-efficacy in order to give a more in-depth analysis of adoption behaviour of Internet banking. This was because the perceived lack of security and privacy over the Internet has been a recognized obstacle in people's adoption of electronic commerce. Thus, customers adopted Internet Banking only when they perceived it as being low-risk. Moreover, users of Internet Banking needed to have the necessary knowledge to operate a computer and use the Internet. Therefore, computer self-efficacy helped to explain the adoption and rejection decisions of the users.

Although self-efficacy is an important element in SCT, Davis (1989) held another view when he first developed his Technology Acceptance Model (TAM). Davis claimed that the concept of self-efficacy only provided one of the several theoretical perspectives suggesting that perceived usefulness and perceived ease of use are the basic determinant of user behaviour. In
his TAM model, self-efficacy was not an important construct and would not be a determinant of technology acceptance framework.

In 1996, Ventakesh and Davis further studied the self-efficacy construct by adopting the measure taken by Compeau and Higgins (1995). However, self-efficacy was still only considered as an antecedent of perceived ease of use.

2.6 Technology Acceptance Model (1989)

Although there have been numerous studies conducted in the areas of system acceptance, research on the effect of users’ internal beliefs and attitudes on system acceptance has produced mixed and inconclusive findings. Realizing that lack of consistent findings in the usage behaviour studies could be attributed to different measures employed in the studies and inadequate theoretical and psychometric justification, Davis (1989) developed and validated the measures of key theoretical constructs, they are perceived in terms of usefulness and perceived ease of use.

In 1989, Davis introduced the Technology Acceptance Model (TAM). He adapted Ajzen and Fishbein’s (1975) Theory of Reasoned Action (TRA) to model intentions to accept information technology. Davis’ (1989) Technology Acceptance Model is being treated as currently the most effective tool to describe adoption (Klopping and Mckinney, 2004) and is one of the most utilized models in studying information system acceptance (Davis et al., 1989; Mathieson, 1991; Davis and Venkatesh, 1996; Gefen and Straub, 2000; Al-Gahtani, 2001). The model is extensively tested and is widely accepted among researchers especially in the field of information technology as a theoretically based model with good predictive validity. TAM specifically aims to model user acceptance of information systems. It explains user acceptance of an information system based on user perception. According to Davis, Bagozzi and Warshaw (1989), the goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a board range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified.
Davis’ Technology Acceptance Model is presented as below:

Figure 2-4 – Technology Acceptance Model

![Technology Acceptance Model diagram]

Source: Davis (1989)

Figure 2-4 shows the original TAM. Like all the other theories of technology acceptance, the model assumes that users choose to use IT based on rational cost/benefit tradeoff (Compeau et al. 1999). Following the Theory of Reasoned Action (Fishbein and Ajzen, 1975), TAM maintains that the decision to use a particular IT follows four stages:

1. External variables → beliefs: Users consider a range of external variables (such as their individual abilities, the type of IT, the task, and situational constraints) to evaluate the consequences of using an IT. Their overall evaluation is reflected in their beliefs about perceived usefulness (the degree to which using it will increase their job performance) and perceived ease of use (the degree to which using it will be free from effort).

2. Beliefs → Attitude: Users’ beliefs about the consequences of using an IT drive their attitude toward that behaviour.

3. Attitude → Intention: Users’ favourable or unfavourable attitudes towards using an IT drives the extent to which they intend to use it.
4. Intention → Use: Users’ intention to use the IT drives whether they will actually use it. (Ajzen, 2002).

TAM explains the casual links between beliefs (perceived usefulness and perceived ease of use) and users’ attitudes, intentions and actual usage of the system. Usage was studied as a phenomenon of interest in its own right (Davis, 1989, 1993; Davis et al., 1989, 1992; Mathieson, 1991; Moore and Benbasat, 1993; Thompson et al., 1991; Hartwick and Barki, 1994).

As a key variable in the Information Technology research literature, usage is of increasing theoretical interest. It is also of increasing practical importance, as the usage of IT becomes more pervasive. From a pragmatic point of view, understanding the determinants of IT usage should help to ensure effective deployment of IT resources in an organization (Taylor and Todd, 1995). Such usage is a necessary condition for ensuring productivity payoffs from IT investments (Davis, 1989; Mathieson, 1991). TAM is widely regarded as a relatively robust theoretical model for explaining IT use (Straub et al., 1997).

From a practitioner perspective, TAM is useful for predicting whether users will adopt new information technologies. Acceptance is a key to successful software choice and use (Borthick, 1988). TAM attempts to test and predict why people accept or reject information technology.

Similar to the Theory of Reasoned Action, TAM involves an action, actual system use, which impacted by a behavioural intention towards the action, which in turn is affected by attitude toward the action. While removing subjective norm from TRA, Technology Acceptance Model proposed two theoretical constructs which become the foundation of the model. These two factors are fundamental determinants of user acceptance of an information system. They are perceived usefulness and perceived ease of use. According to Davis et al. (1989), people tended to use or not to use an application to the extent they believed it will help them to perform their job better. This first variable is referred to as the perceived usefulness of IT technology. However, even if potential users believe that a given application is useful, they may, at the same time believe that the system is too hard to use and that the performance benefits of usage are outweighed by the effort of using the application. Therefore, in addition
to usefulness, usage is theorized to be influenced by perceived ease of use. These two factors of perceived usefulness and perceived ease of use have been extensively investigated by other researchers using different samples and generally confirmed to be important factors in affecting system usage. (Adams et al., 1992; Hendrickson and Collins, 1996; Subramanian, 1994).

Davis (1989) further defined perceived usefulness as “the degree to which a person believes that using a particular system would enhance his or her job performance”. Within an organizational context, people are generally reinforced for good performance by raises, promotions, bonuses, and other rewards (Pfeffer, 1982; Schein, 1980; Vroom, 1964). A system high in perceived usefulness, in turn, is one that a user believes will lead to a positive use-performance relationship. In other words, the user believes that the use of such a system would yield positive benefits for task performance. Davis (1989) also stated that perceived usefulness affects the attitude toward using a system and behavioural intention to use a system.

Perceived ease of use, in contrast, refers to “the degree to which a person believes that using a particular system would be free from effort”. Radner and Rothschild (1975) stated that effort is a finite resource that a person may allocate to the various activities for which he or she is responsible for. Hence, Davis purposed that when all else being equal, an application perceived to be easier to use than another is more likely to be accepted by users. In TAM, perceived ease of use affects perceived usefulness and attitudes toward system use.

While perceived usefulness has been identified consistently in the literature as significant in attitude formation (Agarwal and Prasad, 1999; Davis, 1989; Dishaw and Strong, 1999; Gefen and Keil, 1998; Igbaria et al., 1996; Moon and Kim, 2000; Taylor and Todd, 1995; Venkatesh, 2000; Vankatesh and Davis, 2000), the evidence for perceived ease of use has been inconsistent. For perceived usefulness and for perceived ease of use antecedents have been suggested including information quality (Lin and Lu, 2000), enjoyment (Teo, Lim and Lai, 1999) and risk (Lee et al. 2001).

In fact, Davis (1989) once declared that the two factors, perceived usefulness and perceived ease of use, were not equal in strength. The link between perceived usefulness and the
intention to use is significantly stronger than the link between the perceived ease of use and the intention to use (Davis et al., 1989). The regression analyzes of the joint effect of the two variables on intention to use shows that this difference is even more prominent. In this regression analyzes result, perceived usefulness and intention to use relationship is strong, and the perceived ease of use and intention to use is diminished to a large extent. Researchers Ma and Liu (2004) conducted a meta-analysis which also concluded that there was a strong significant relationship between perceived usefulness and technology acceptance. However, there is a weak relationship between perceived ease of use and technology acceptance, and its significance did not pass the fail-safe test.

Davis (1989) concluded that the differences between these two relationships were actually sensible. Users normally tend to adopt an information system mainly because of the functions it performs for them, how difficult or easy to get the system to perform those functions is in their secondary consideration. Users are often willing to cope with some difficulty of use in the system that provides the functions they need. Since Davis’ (1989) elucidation of these two constructs, numerous researchers discovered that technology acceptance theory yields consistently high explained variance for why users choose to utilize systems (Adams et al., 1992; Mathieson, 1991; Pavri, 1988; Thompson et al., 1991). Also, different studies have provided significant results for these two factors to predict behaviour intention (Matheson, 1991; Venkatesh and Davis, 1996; Hu et al., 1999; Chau and Hu, 2001).

External variables are also included in TAM, these may include system features, training, documentation and user support consultants (Davis et al., 1989). In TAM, external variables are postulated to influence perceived usefulness and perceived ease of use. According to Davis (1989), external variables provided the bridge between the internal beliefs, attitudes and intentions represented in TAM and the various individual differences, situational constraints and managerially controllable interventions impinging on behaviour. In a system implementation, system developers can influence users’ beliefs of the system and subsequently their behavioural intentions and system use by manipulating these external variables (Hong, Thong, Wong and Tam, 2002).

Numerous studies have extended TAM by identifying different external variables. Recent
studies related to TAM involve the use of Internet (Glassberg, 2000), Intranet use (Horton et al., 2001), web-based learning (Gong, Xu and Yu, 2004) and use of the Internet for B2C Ecommerce (Ruth, 2000; Chen 2000). There are two other studies which analyze the effect of system components on the adoption of digital libraries (Hong, Thong, Wong and Tam, 2002; Vaidyanathan, Sabbaghi and Bargellini, 2005). Examples of extending TAM in different areas are discussed later in this section.

One key set of external variables is users’ individual differences, such as personality, age and education level. Individual differences such as these have long been important in IS research (Zmud, 1979). The role of individual differences has also been examined in the TAM context. For example, Agarwal and Prasad (1999) extend TAM by incorporating individual differences (role with regard to technology, tenure in workforce, level of education, prior experiences and participation in training) as external variables. The study results support TAM and demonstrate the significant relationships between several individual difference variables and belief variables.

Researchers had incorporated the effect of gender or experience in the context of TAM (Gefen and Straub, 1997; Taylor and Todd, 1995). Gefen and Straub (1997) examined whether TAM could explain differences between the way men and women use e-mail. They found that gender had a significant impact on perceived ease of use and perceived usefulness but had no direct effect on email use. In a subsequent study of gender, Vankatessh and Morris (2000) discovered that gender can moderate the effect of perceived usefulness and perceived ease of use on usage intentions. Vankatessh and Morris (2000) extended TAM to include subjective norm and gender. Recognizing that the role of social influence on an individual’s usage behaviour was different depending on gender, the study revealed perceived usefulness had a strong influence on usage decision for men. In contrast, women’s usage decisions were more strongly affected by their perceptions of ease of use and subjective norm. However, the influence of subjective norm diminished with increasing experience.

Other studies have also found that individual differences are significant factors in both end-user computing (Harrison and Rainer, 1992) and decision-support systems (Alavi and Joachimsthaler, 1992). For example, Burtan-Jones and Hubona (2005) conducted a study to
determine the effect of staff seniority, age and education level on usage behaviour. They found that these individual user differences have significant direct effects on both the frequency and volume of usage. Agarwal and Prasad (1999) extended TAM by incorporating individual differences (role with regard to technology, tenure in workforce, level of education, prior experiences and participation in training) as external variables. The study results supported TAM and demonstrated the significant relationships between several individual difference variables and belief variables.

Since TAM is an extension of TRA, there are clear similarities in their theoretical aspects. However, these two models also have some considerable differences. Firstly, in TRA, beliefs are bound to each context and hence they cannot be generalized. In contrast, TAM includes two belief constructs, perceived usefulness and perceived ease of use, as general determinants of user acceptance. The second significant difference is that beliefs in TRA are summed together, but in TAM both beliefs, perceived usefulness and perceived ease of use, are represented separately. Modelling each belief separately enables researchers to identify the relative influence of each belief on attitude (Davis et al., 1989).

TAM specifies the two constructs, perceived usefulness and perceived ease of use as the two variables that determine attitude toward an information technology, intention to use and actual use, thus, it does not need to be tailored to individual behaviour, as long as that behaviour is the use of IT. Moreover, the model does not include subjective norm as a determinant of behavioural intention in the adoption and utilization of information systems, the subjective norm construct has not been significant (Davis et al., 1989; Mathieson, 1991) The exclusion of subjective norm is due to its uncertain theoretical and psychometric status suggested based on Davis et al.’s (1989) observation. Davis believed that it is difficult to distinguish direct effects of subjective norm on behavioural intention from indirect effects via attitude. In fact, Fishbein and Ajzen (1975) had once stated that subjective norm was one of the least understood aspects of Theory of Reasoned Action. Taylor and Todd (1995) gave a possible explanation for this. That is, they found that many of the tests of TAM used students as sample population. However, subjective norms might be more important in an organizational setting since users may feel some social pressure to use the IT.
Since there is a need to account for the social influence which is omitted in TAM, researchers have often incorporated the social influence construct into TAM. Davis et al. (1989) suggested that the role of social influences in applications of TAM can be further examined to better understand user acceptance. Lucas and Spitler (1999) found that social norms are more important in user acceptance of an information system than user perceptions. Taylor and Todd (1995) also discovered that subjective norm had a direct effect on behavioural intention. Malhotra and Galletta (1999) extended TAM by incorporating individual’s attitudes. Analyses of the data obtained from the field study suggested that social influence was an important factor affecting user acceptance and usage behaviour. Among the processes of social influence, internalization of the induced behaviour was found to have a stronger effect on attitudes toward system use. Karahanna, Straub and Chervany (1999) empirically examined differences across pre-adopter and post-adopter beliefs and attitudes and their influence on usage behaviours to investigate if the factors affecting system usage change over time. The findings indicated that there were differences in the determinants of subjective norm, attitude, and behavioural intention between pre-adopters (potential adopters) and post-adopters (users). Subjective norm was the most important determinant of behavioural intention to pre-adopters whereas post-adopters’ behavioural intention was mostly determined by attitude.

Moreover, Vankatesh and Davis (2000) examined the impact of three interrelated social forces (subjective norm, voluntariness and image) on user’s adoption or rejection of an information system. They found that subjective norm had a significant direct effect on usage intention over and above perceived usefulness and perceived ease of use when system use was perceived to be mandatory, but not when system use was perceived to be voluntary.

In fact, Kelman’s (1958) social influence processes can provide a theoretical framework for understanding the role of social influences in TAM. In an attempt to investigate the nature and depth of attitude change, the author constructed his research on a broader theoretical framework that concerns the analysis of different processes of attitude change resulting from social influence. The theoretical analysis was based on the observation that changes in attitudes and actions exerted by social influence may occur at different levels. These differences in the nature or level of changes correspond to differences in the process whereby the individual accepts influence. When an individual adopted an induced behaviour, the processes that
underlie his behaviour may be different, even though the resulting outward behaviour appears the same time.

Kelman (1958) distinguished three different processes of influence: compliance, identification and internalization. These processes represent three qualitatively different ways that individuals accept influence. Compliance occurs when an individual accepts influence to obtain a favourable reaction from another person or group. When conformity takes the form of compliance, the individual adopts the induced behaviour to gain specific rewards or approval and avoid specific punishments or disapproval. In this case, satisfaction brought by compliance is due to the social effect of accepting influence. Identification occurs when an individual accepts influence to establish and maintain a satisfying relationship to another person or group. The individual may want to be a part of a group, respecting its values without adopting them as his own (O’Reilly and Chatman, 1986). When conformity takes the form of identification, the individual adopts the induced behaviour because it is associated with the desired relationship. Satisfaction brought by identification is due to the act of conforming as such. Internalization occurs when an individual accepts influence because the content of the induced behaviour — the ideas and actions of which it is composed — is intrinsically rewarding (Kelman, 1958). When conformity takes the form of internalization, the individual adopts the induced behaviour because it is congruent with his own value system. Behaviours adopted in the form of internalization are integrated with his existing values. Satisfaction brought by internalization is due to the content of the new behaviour.

These three different identified processes are the probability of accepting influence which is a combined function of the relative importance of the anticipated effect, the relative power of the influencing agent and the prepotency of the induced response. Each of the three processes (compliance, identification and internalization) is characterized by a distinctive set of antecedent conditions. Each process takes qualitatively variant form. Thus, they can be differentiated in terms of the nature of the anticipated effect, the source of the influencing agent’s power, and the manner in which the induced response has become prepotent. Influencing on adopting the induced behaviour will take the form of compliance, identification or internalization depending on the particular set of antecedents. Similarly, each of the three processes is characterized by a distinctive set of consequent conditions. These consequents are
qualitatively a variation in the subsequent history of the induced response. According to Kelman (1958), responses adopted through different processes will be performed under different conditions, they will be changed and extinguished under different conditions, and will have different properties. Each of the three processes plays a mediating role between a distinct set of antecedents and a distinct set of consequents, and this variation of the antecedent conditions affects the consequents.

Depending on whether the attitudes of a particular individual or group are formed through the process of compliance, identification or internalization, the conditions under which these attitudes are likely to be changed, and kinds of actions to which they are likely to lead, and the ways in which they are likely to affect reactions to particular events will vary (Kelman, 1958). An induced response adopted through compliance tends to be performed only under conditions of surveillance by the influencing agent and an induced response adopted through identification tends to be performed under conditions of relevance of the issue, regardless of surveillance or salience.

Kelman encouraged the application of this theoretical framework to the analysis of the effects of social influence on attitudes or actions. In 1999, Malhotra and Galletta (1999) applied Kelmen’s theoretical framework in the context of information system use. They suggested that the social influence processes determined an individual’s commitment to the use of an information system. Individuals who use the system because they think it is congruent with their values and can be recognized as the users who adopt the system use it on the basis of the internalization process. In contrast, individuals who use the system to obtain rewards and avoid punishments can be recognized as the users who adopt the system use it through the compliance process. This conception use as a continuum is in contrast to the traditional conception of system use in terms of use and non-use (Malhotra and Galletta, 1999). They define the range in this continuum from avoidance to use (non-use) to meagre and unenthusiastic use (compliant use) to skilled, enthusiastic and consistent use (committed use) depending on the user’s commitment to the use of the information system.

In 2000, Venkatesh and Davis (2000) extended the original TAM by introducing the second generation of the model labelled TAM2 to explain how subjective norms and cognitive
instrumental processes affect perceived usefulness and intentions. Details of TAM2 are described later in this chapter.

Apart from TAM2, there is an impressive body of research which has validated and extended TAM (Chin and Todd, 1995; Segars and Grover, 1993; Vankatesh, 2000; Vankatesh and Davis, 2000). One important characteristic of TAM is the degree to which each variable (beliefs, attitudes and intention) fully mediates its antecedents (Agarwal and Prasad, 1999; Venkatesh, 1999; Venkatesh, 2000).

However, in a recent critical review of TAM, Legris et al. (2003) claimed that analysis of empirical research using TAM showed that results are not totally consistent or clear. The authors declared that significant factors are not included in the models. At last, Legris et al. concluded that TAM is a useful model, but had to be integrated into a more inclusive model incorporating variables related to both human and social change processes as well as the adoption of an innovation. However, until now, no studies had attempted to integrate the three research streams.

On the other hand, in order to understand factors affecting system usage, there is a need to examine the theoretical determinants of user beliefs (perceived usefulness and perceived ease of use). Venkatesh and Davis (1996) underscored the importance of understanding the determinants of perceived usefulness and perceived ease of use for TAM to explain user acceptance beyond the influences of ease of use and usefulness perceptions on system usage. There are numerous studies which extend TAM by incorporating external variables, hypothesizing that beliefs mediate the external variables and user acceptance. Since previous research on TAM focused on perceived usefulness and perceived ease of use as the determining factors of system usage rather than exploring specific determinants that shape the individual’s beliefs and behaviours, Igbaria and Tivari (1995) extended TAM by incorporating self-efficacy and other determinants such as experience and organizational support as external variables. Igbaria, Guimaraes and Davis (1995) also examined the impact of the external factors on TAM by incorporating individual, organizational and system characteristics as determinants of perceived usefulness, perceived ease of use and usage. The findings supported TAM and confirmed the effects of the external factors of perceived usefulness and perceived
ease of use. Vankatesh and Davis tested another model that incorporated computer self-efficacy and objective usability as the determinants of perceived ease of use. They conducted three experiments using six different systems. The results indicated that computer self-efficacy had a significant effect on perceived ease of use both before and after direct experience with a system, and objective usability had a significant effect on perceived ease of use only after direct experience. In contrast, Igbaria, Zinatelli, Gragg and Cavaye (1997) also extended TAM by adding intra-organizational factors (internal computing support, internal computer training and management support) and extra-organizational factors (external computing support and external computing training) in a small firm context. Both perceived usefulness and perceived ease of use had a strong effect on system usage. However, the results were found inconsistent with previous studies, perceived ease of use was found to have a greater effect on usage but there was relatively little support for the influence of both internal support and internal training. The authors speculated that these inconsistent results might be associated with distinct characteristics of small firms.

Apart from the above studies, there are researchers who have incorporated various constructs into TAM to develop a more comprehensive model that explain user acceptance. Jackson, Chow and Leith (1997) extended TAM by adding user involvement constructs. The extended model, which includes situational involvement, intrinsic involvement, argument for change, prior usage and attitude constructs, exhibits better descriptive ability than the original TAM. Lucas and Spitler (1999) extended TAM by incorporating perceptions of system quality, subjective norms and user performance. The results indicated that organizational variables such as social norms and one’s job requirements were found to be more important predictors of use than the core perception variables specified in TAM’s perceived usefulness and perceived ease of use. The authors speculated that the results might be associated with the mandatory nature of use of the system under investigation. Venkatesh (1999) utilized TAM as theoretical perspective to explore the role of intrinsic motivation in the context of end-user training. The results showed that the users in a game-based training programme who design to enhance intrinsic motivation show higher potential acceptance of a system than those in traditional training programme. In the mean time, Chau (1996) identified two distinct types of perceived usefulness (near-term usefulness and long-term usefulness) and tested them in the TAM context. Analyses of data suggest that perceived near-term usefulness has the most significant
influence on the behavioural intention to use, and perceived long-term usefulness have lesser, but significant influence on intention. Other detailed examples of extensions of TAM are reviewed later in this chapter.

2.7 Theory of Planned Behaviour (1991)

In many situations a positive attitude and subjective norm are formed but the behaviour is never formed. For example, end-users in one organization may record positive evaluations of information systems that management wants to implement, however the same group of end-users may never adopt the information at the end. Perhaps they think that they do not have the specialized skills or are incapable of learning new skills to use the system. Also, users may think they do not have enough resources such as facilities and training. Behaviours that do not appear under personal control are less likely to occur.

As a result, Azjen (1991) created the Theory of Planned Behaviour (TPB) to extend the TRA to include these extenuating circumstances. According to Ajzen (1991), Theory of Planned Behaviour modified Theory of Reasoned Action by introducing a new construct, perceived behavioural control. It is influenced by the effects of facilitating conditions (Triandis, 1980) and self-efficacy (Bandura, 1982). Ajzen (1991) presented a review of several studies that successfully used TPB to predict intention and behaviour in different aspects. Armitage and Conner (2001) analyzed previous research using the TPB in a meta-analysis study. The major conclusions were support for the efficacy of the TPB and the significant independent prediction of intention by perceived behavioural control.

Mathieson (1991) stated that TPB was designed to predict behaviour across many settings and has been applied to the use of information systems. In fact, different studies (Mathieson, 1991; Taylor and Todd, 1995; Harrison et al., 1997) have successfully applied TPB to the understanding of individual acceptance and usage of many different technologies.
Below is the TPB model created by Ajzen (1991).

**Figure 2-5 – Theory of Planned Behaviour**

![Diagram](image)

Source: Ajzen, 1991

Those factors above are defined by Mathieson (1991) as:

- **Attitude** toward the behaviour – the user's evaluation of the desirability of his or her using the system.
- **Intention** – intention to perform the behaviour.
- **Subjective norms** – the individual's perception of social pressure to perform the behaviour.
- **Behavioural Belief** – the subjective probability that the behaviour will lead to a particular outcome.
- **Perceived behavioural control** – the individual's perception of his or her control over performance of the behaviour.
Normative belief – the individual’s perception of a referent other’s opinion about the individual’s performance.

Control belief – a perception of the availability of skills, resources and opportunities.

The theory of Planned Behaviour (TPB) asserts that behaviour is a direct function of behavioural intention (BI) and perceived behavioural control (PBC). Also asserted is that behavioural intention is formed by one’s attitude (A), which reflects feelings of favourableness and unfavourableness toward performing behaviour. Subjective norm (SN) reflects perceptions that significant referents desire the individual to perform or not to perform behaviour. Perceived behavioural control reflects perceptions of internal and external constraints on behaviour (Azjen, 1985, 1991).

In TPB, behaviour is a weighted function of intention and perceived behavioural control. Intention is the weighted sum of the attitude, subjective norm and perceived behavioural control components. Therefore, according to the TPB model:

\[ B = BI + PBC \]
\[ BI = A + SN + PBC \]

Researchers such as Taylor and Todd (1995) suggested that the evaluation criteria used to decide between utilizing the original or alternative Ajzen models should be based on their contribution to understanding. They claimed that contributions to understanding are determined by the degree of generality. General models, such as TRA, provide the overall model for a given behaviour while a specific model, such as TPB with decomposition of belief structures and interdependency effects, offers more detailed determinants of behavioural intentions.

Different researchers have investigated bicausal effects between belief constructs in Theory of Reasoned Action and Theory of Planned Behaviour (Ryan, 1982; Shimp and Kavas, 1984; Oliver and Bearden, 1985; Taylor and Todd, 1995). Within these researchers, Taylor and Todd (1995) found significant interdependence between belief constructs in terms of TPB, they averred that inclusion of interdependence terms in TPB provides more specific information in
explaining determinants of a person’s behavioural intention. However, the directions of the interdependent relationships between beliefs in TRA and TPB are mixed. For example, in Taylor and Todd’s (1995) study of new product adoption, normative beliefs appear to have direct influence on attitude. On the other hand, a few IT studies tested TPB (Mathieson, 1991), and found that the model lacks sufficient scale development and empirical baseline for IT studies.

One of the studies that utilized the Theory of Planned Behaviour in the technology acceptance domain was done by Hu and Chau (1999). The researchers empirically tested the theory utilizing 421 physicians in the voluntary use of technology. The results showed that attitudes and perceived behavioural control were significant predictors of intention while they also found a significant relationship between subjective norms and intention in the voluntary setting of the study. Also, Harrison, Mykytyn and Riemenschneider (1997) utilized the TPB to test for the adoption of information technology in small business firms and concluded that a stronger adoption decision is based on attitudes, subjective norms and perceived behavioural controls. In addition, Morris and Venkatesh (2000) utilized the Theory of Planned Behaviour to test for age differences in technology adoption domain and concluded that when making a decision to adopt technology, younger respondents were influenced by attitudes while older respondents were influenced by subjective norms.

When comparing Technology Acceptance Model and Theory of Planned Behaviour, Mathieson (1991) claimed that there are three main differences among these models. Firstly, TAM’s understanding of beliefs is a more general model than TPB. Secondly, TAM did not explicitly include any social variables. Factors such as image and job relevance are not included in the original TAM model. Thirdly, the models treat behavioural control differently. In TAM, behavioural control such as skills and resources to use the system are folded into perceived ease of use factors. However, perceived ease of use does not include external control issues. Therefore, it is unclear if a person using TAM clearly thinks about external control issues. For example, the barrier of control to access the internet of one respondent could be the cost of a computer and for another respondent is geographical location. In contrast, behavioural control in TPB directly affects intention to perform the behaviour and may directly affect behaviour in situations where the user intends to perform the behaviour, but is prevented from doing so.
(Ajzen, 1985). Whether behavioural control is significant depends on the particular behaviour. For example, behavioural control is important in accounting for whether students intend and actually receive a distinction in a course, but not for whether students attend classes (Ajzen and Madden, 1986). However, for IT usage behaviour, behavioural control has had limited importance.

After being tested in many studies (Davis, 1989; Davis et al., 1989; Mathieson, 1991; Adam et al., 1992; Davis, 1993; Segars and Grover, 1993; Taylor and Todd, 1995), it is found that TAM’s ability to explain attitude toward using an information system is better than other models (TRA and TPB) (Mathieson, 1991). These studies have found that TAM consistently explains a significant amount of the variance (typically around 40 percent) in usage intentions and behaviour. The use of an information system has been understood in many studies as the user acceptance of the information system in question (Davis et al., 1989; Davis, 1993; Al-Gahtani, 2001). In other words, the use of information system acts as an indicator for information system’s acceptance. Since all factors in TAM are seen as fundamental to any acceptance model, they are all captured and used in this research.

### 2.8 Model of PC Utilization (1991)

The Model of Personal Computer (PC) Utilization derived largely from Triandis’ (1977) theory of human behaviour. Venkatesh et al. (2003) claimed that Triandis’ model presented a competing perspective to that proposed by Theory of Reasoned Action and Theory of Planned Behaviour. According to Triandis (1980), behaviour is determined by what people would like to do, what they think they should do, what they have usually done and what they expect to experience as a result.

Based on the model proposed by Triandis (1980), Thompson et al. (1991) adopted and refined it for information system contexts and use the model to predict PC utilization. Thompson et al, proposed six factors which influence the utilization of Personal computers. These factors are long term consequences of PC use, near-term job fit with PC use, complexity of PC use, affect toward PC use, social factors influencing PC use, and facilitating conditions for PC use.
The model was tested and it is found that four factors (complexity, near-term job fit, long-term consequences of PC use and social factors influencing PC use) within the models are proved to have strong influences on utilization.

Below is the Model of PC Utilization presented by Thompson:

![Figure 2-6 – PC Utilization Model](image)

The characteristics of the determinants in the PC Utilization Model are defined by Thompson et al. (1991) as follow:

- **Job-fit** – the extent to which an individual believes that using a technology can enhance the performance of his or her job.
♦ Complexity – the degree to which an innovation is perceived as relatively difficult to understand and use.

♦ Long term consequences – outcomes that have a pay-off in the future.

♦ Affect towards use – feelings of joy, elation, pleasure, or depression, disgust, displeasure and hate which are associated by an individual with a particular act.

♦ Social factors – the individual’s internalization of the reference group’s subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations.

♦ Facilitating conditions – objective factors in the environment that observers agree to make an act easy to accomplish. For example, provision of support for users of PCs is a kind of facilitating condition that can influence system utilization.

Although the created model is mainly for predicting PC Utilization, the nature of the model makes it particularly suitable to predict individual acceptance and use of a range of information technologies. The authors seek to predict usage behaviour rather than intention. However, current studies keep examining the effect of those determinants on intention in order to keep the theory’s roots. These examinations are important to ensure a fair comparison of different models. In 1994, Thompson et al. (1994) examined the influence of experience on PC utilization, the results suggested that experience influences utilization directly while indirect influences are also presented but less pronounced, and that moderating influence of experience between six antecedent constructs and utilization was generally quite strong.

In the research related to the technology usage, Cheung et al. (2000) integrated aspects of the original Triandis’ model an the PC utilization model by using behaviour as the dependent variable, which they suggested could be predicted by habit hierarchies, intention and facilitating conditions. Intention can be influenced by social factors, affect and perceived consequences. The authors restructured the original Triandis model and the Model of PC Utilization to predict Internet usage. At last, the research tested the effect of complexity on
affect, near-term and long-term consequences and all results were found to be significant.

2.9 Motivational Model (1992)

Motivational perspectives, similar to the use of Theory of Reasoned Action to study human behaviour, have been widely used to understand individual behaviour. Research in psychology supports general motivation theory as an explanation for behaviour. Different studies have examined motivational theory and adapted it for specific contexts. For example, Vallerand (1997) presented an excellent review of the fundamental tenets of this theoretical base.

The motivational model is a well-established theory that yielded two important constructs in the technology acceptance domain: Intrinsic motivation and extrinsic motivation. Intrinsic motivation emphasizes the pleasure and inherent satisfaction derived from a specific activity (Vallerand, 1997) while extrinsic motivation highlights performing a behaviour to achieve a specific goal, such as rewards. In other words, intrinsic motivation is based on performing an activity purely for enjoyment of the activity itself and extrinsic motivation refers to the performance of an activity because it is believed to be instrumental in achieving values outcomes that are separate from the activity. Hence, perceived usefulness in TAM is a form of extrinsic motivation and perceived enjoyment is a form of intrinsic motivation (Teo et al., 1999).

Venkatesh (1999) integrated the concepts of the motivational theories into the TAM by integrating playfulness and enjoyment as an intrinsic motivation driver, and perceived usefulness as an extrinsic motivation driver. The author conducted two studies to test for the effect of training contexts. Training was performed via two methods: traditional training and game-based training. The results showed that intrinsic motivation influenced perceived ease of use and thus affected intention. The author demonstrated the importance of intrinsic motivation in training and in technology acceptance contexts.

In information technology area, Webster, E.J. (1989, 1992) ascertained the importance of the role of enjoyment, a form of intrinsic motivation, in workplace computing. Moreover, Davis et al. (1992) had once applied motivational theory to understand user adoption and the use of new
technology. He proposed that extrinsic motivation and intrinsic motivation are key drivers of behavioural intention to use computers. In his study which examined intrinsic and extrinsic motivations in the workplace, Davis et al. (1992) found that people's intentions to use computers were influenced mainly by their perceptions of how useful the computers were for improving their job performance, and to a smaller extent, by the degree of enjoyment they experience in using the computer itself. Similar findings had also been reported by Igbaria et al.'s (1994) study on the respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology.

In recent research that has also examined an intrinsic factor (enjoyment), the results showed that enjoyment had a positive effect on the intention to use information technology (Atkinson & Kydd, 1997; Vankatesh, 1999). Additionally, an extrinsic factor (usefulness) was also found to have a positive effect on the intention to use computers (Igbaria, 1993).

Apart from the U.S., studies on extrinsic and intrinsic motivations were also conducted in other countries so that researchers could examine the external validity of current research results to other cultures. For example, Igbaria et al. (1995) conducted a study using Finnish companies and found that participants were more affected by perceived usefulness than participants in American companies because of cultural differences.

In 1997, other researchers, Teo et al. (1997) modified Igbaria et al.'s (1995) study by examining intrinsic and extrinsic motivations in the context of Internet instead of microcomputers. The authors tried to examine whether previous research findings in the western countries remain valid in an Asian setting. Thus, their study was carried out in Singapore. The results indicated that local Internet users use the Internet mainly because they perceived the Internet to be more useful to their job tasks. Perceived enjoyment and perceived ease of use were their secondary concerns. Findings also demonstrated that while perceived usefulness had consistently strong effects on all usage dimensions, perceived ease of use and perceived enjoyment affected each specific usage dimension differently.
2.10 Task-Technology Fit (1995)

In 1995, Goodhue (1995) proposed task-technology fit (TTF) as the ability of information technology to support a task. This theory implies matching the capabilities of the technology to the demands of the task. TTF is designed to evaluate an organization's overall information technology system rather than individual application. TTF posits that information technology would be used if, and only if, the functions available to the user support (fit) the activities of the users. Rational, experienced users would choose those tools and methods that enable them to complete the task with the greatest net benefit. Information technology that does not offer sufficient advantage would not be used. Dishaw and Strong (1999) also backup this theory and said that information technology should fit the activities.

Higher degree of “fit” lead to higher performance (Goodhue, 1988) and expectations of consequences of use (Goodhue, 1995). The latter findings were of primary interest, as it provided a link between fit in Theory of Reasoned Action and perceived usefulness in TAM.

There are many versions of Task Technology Fit models apart from Goodhue's one. Another popular version of TTF model is the basic one proposed by Dishaw and Strong (1999) which had also been tested.
The Dishaw and Strong’s TTF model is shown as follow:

Figure 2-7 – Dishaw and Strong’s version of Task Technology Fit Model (1999)

![Diagram of Dishaw and Strong’s TTF model]

The figure shows the theoretical model. In this model the factor task technology came from the matching of measurement of two factors (Tool requirement and Tool functionality). The given tool function is matched with its associated task requirement.

According to Goodhue (1995), Task Technology Fit is defined as the extent that technology functionality matches task requirements and individual abilities. The model is presumed to lead to a high performance. Also, if users utilize a technology because of its instrumentally in their task it is reasonable to believe that they are capable of evaluating that technology’s Task Technology Fit from their personal experience.

By implication, it is expected that when users evaluate information systems, they would be sensitive to the same effects systems which lead from a task and technology to TTF and performance. A common addition to a TTF model, such as the one proposed by Goodhue (1988, 1995), is individual abilities. The inclusion of individual abilities is supported by both work adjustment theory from which TTF is originally derived and recent management information system studies in which experience with particular IT is generally associated with higher utilization of that IT (Guinan et al., 1997; Thompson et al., 1994). According to Goodhue (1998), a user’s evaluation of TTF is determined by task characteristics, individual
characteristics and information systems and services. It hypothesizes that correspondence between an information system's functionality and task requirements lead to positive user evaluations. As the task characteristics or the abilities of the usage change, the information systems and services must change accordingly to meet new demands. Therefore, task characteristics and individual characteristics moderate the relationship between the characteristics of the systems and services and user evaluation.

In tests of the TTF model, individual abilities negatively affect perceived fit between task and technology when it operationalizes as computer literacy. However, it operationalizes as experience with particular IT, which in turn positively affects utilization (Goodhue, 1995). That is, users give higher evaluations based not only on inherent characteristics of a system, but also on the extent to which that system meet their individual abilities and needs. Therefore, one could get very different evaluations from users with different abilities and needs.

Figure 2-8 – Task Technology Fit Model (Goodhue, 1988)

Goodhue (1995) proposed that TTF should be used as user evaluation constructs to measure information system success and he suggested that higher TTF would result in better performance. The model is tested by researchers in system usage for organizational-wide systems deployment (Goodhue, 1995; Goodhue and Thompson, 1995). TTF is related to the concept of cognitive fit (Vessey, 1991; Vessey and Galleta, 1991) which draws on cognitive psychology literature and notions of cognitive effort and mental models to explain how
Although a universal definition of Task Technology does not exist (Dishaw and Strong, 1998), some literatures contain several similar definitions. According to Vessey and Galletta (1991), cognitive fit is a cost benefit characteristic that suggests that, for most effective and efficient problem solving to occur, the problem representation and any tools or aids should all support the strategies (methods or processes) required to perform that task. This definition of fit emphasizes the support of task performance by appropriate tools and problem representation. This definition is similar to the definition of ‘task-system’ fit (Goodhue and Thompson, 1995) which is the degree to which an information system or systems environment assist an individual in performing his or her portfolio of tasks. Essentially, the TTF model states that fit between task and technology is the extent to which software tool is appropriate for a certain task. Although TTF is relatively new in management information system literature, the concept of fit, also called correspondence or matching, is common in organizational theories. For example, the theory of work adjustment, from which TTF is originally developed, considers the correspondence between the abilities of an individual and the ability requirements of a job in determining an individual’s satisfactoriness for the job (Goodhue, 1988, 1995). Research on strategic fit, which is the correspondence between an organization and its environment, has influenced the methods for computing TTF (Dishaw and Strong, 1998; Goodhue, 1995; Venkatraman, 1989).

Apart from all the strengths, Goodhue (1995) also stated certain limitations of fit focus models. Firstly, he indicated that models focusing on fit alone do not give sufficient attention to the fact that systems must be utilized before they can deliver performance impacts. Secondly, since utilization is a complex outcome, besides fit, there are many other factors such as habit and social norms. Therefore, the fit model can benefit from the addition of a richer understanding of utilization and its impact on performance.

### 2.11 Extended Technology Acceptance Model (2000)

In 2000, Davis and Venkatesh proposed an extension to the Technology Acceptance Model which is referred to by most articles as TAM2. The new version of TAM2 extends TAM by including subjective norm as an additional predictor of intention in the case of mandatory settings (Venkatesh and Davis, 2000). These are represented by seven new factors.
Below is the Extended Technology Acceptance Model.

**Figure 2-9 – Extended Technology Acceptance Model**

TAM2 incorporates additional theoretical constructs spanning social influence processes (subjective norm, voluntariness, image and experience) and cognitive instrumental processes (job relevance, output quality and result demonstrability).

These seven factors of the social influence process as well as cognitive instrumental processes are defined as follows:

Source: Venkatest and Davis (2000)
Social Influence Process

♦ Subjective norm – A person’s perception that most people who are important to him think he should or should not perform the behaviour in question (Fishbien and Ajzen, 1975).

♦ Voluntariness – The extent to which potential adopters perceive the adoption decision to be non-mandatory (Chimar and Wiley-Patton, 2002; Moore and Benbasat, 1991).

♦ Image – The degree to which use of an innovation is perceived to enhance one’s status in one’s social system (Moore and Benbasat, 1991).

♦ Experience – Knowledge gained from what one has observed, encountered, or undergone (Stein, 1984).

Cognitive Instrumental Processes

♦ Job Relevance – An individual’s perception regarding the degree to which the target system is applicable to his or her job (Fishbien and Ajzen, 1975).

♦ Output Quality – An individual’s perception of how well the new technology performs the tasks that it is capable of performing along with the degree that these tasks match the job relevance (Fishbien and Ajzen, 1975).

♦ Result Demonstrability – The tangibility of the results of using innovation (Croteau and Vieru, 2002).

They validate the new theory with four longitudinal studies. The results show consistency across four organizations and over three time periods. The extended model is being tested in both voluntary and mandatory settings and the results strongly support TAM2. When comparing it with the original TAM, TAM2 drops attitude because it has been found to only partially mediate the effects of perceived usefulness and perceived ease of use on behavioural intention. In fact, TAM without attitude construct has already been applied and tested before in
several other investigations, including studies of Saade and Bahli (2005) and Venkatesh (1999).

As one of the extension of the original TAM, TAM2 has become popular during the recent years. Many researchers such as Chan and Lu (2004) have implemented the new TAM2 model to their own studies.

Apart from its strengths, the model also receives some criticisms. Bhattacharjee, A. and Premkumar, G. (2004) claimed that although the longitudinal studies provide some preliminary evidence regarding temporal changes in TAM constructs such as perceived usefulness (e.g., Venkatesh and Morris 2000), they do not attempt to explain why or how these constructs change with time or the emergent factors driving such change. Furthermore, by virtue of being single-stage models of IT usage, the above model could not theoretically identify any emergent factors. Yi et al. (2006) also claimed that TAM2 examined their effects only on perceived usefulness, instead of incorporating them into the nomological network of TAM.

2.12 UTAUT (2003)

In an attempt to integrate the main competing user acceptance models, Venkatesh, Morris, Davis G. and Davis F. (2003) compared eight traditional models and their extensions such as Theory of Reasoned Action and Theory of Planned Behaviour to formulate the Unified Theory of Acceptance and Use of Technology (UTAUT).

The UTAUT model, which is also known as TAM3, contains four core constructs which play a significant role as direct determinants of user acceptance and usage behaviour. They are performance expectancy, effort expectancy, social influence, and facilitating conditions. These four determinants affect the main two constructs, behaviour intention and usage behaviour which appear in many technology acceptance models. Moreover, the UTAUT models introduces four moderating factors, gender, age, experience, and voluntariness of use. However, these attract smaller attention when comparing them with the four core determinants.

Below is the UTAUT model:
The four core constructs of UTAUT are defined as follows (Venkatesh et al., 2003):

<table>
<thead>
<tr>
<th>Construct in UTAUT</th>
<th>Definition</th>
<th>Constructs from other Technology models that go into the creation of UTAUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy</td>
<td>the degree to which an individual believes that using the system will help one to attain gains in job performance</td>
<td>Perceived usefulness, Extrinsic motivation, job-fit, relative advantage and outcome expectations</td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>the degree of ease associated with the use of the system</td>
<td>Perceived ease of use, complexity, ease of use</td>
</tr>
<tr>
<td>Social Influence</td>
<td>the degree to which an individual perceives that most people who are important to him or her believe he or she should use the system.</td>
<td>Subjective norm, social factors, image</td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system</td>
<td>Perceived Behavioural Control, Facilitating Conditions, Compatibility</td>
</tr>
</tbody>
</table>
The UTAUT is tested and found to outperform the eight individual models (Venkatesh et al., 2003). Thus, the model successfully provides useful tool for managers who need to access the likelihood of success for new technology introductions. It also helps them to understand the drivers of acceptance in order to design interventions, such as training and marketing, target at populations of users that may be less inclined to adopt and use new systems. The UTAUT is well-known and is mentioned by many researchers. In 2005, researchers, Abu Shanab and Emad Ahmed, carried out a study which explored the acceptance of Internet banking in Jordan using UTAUT. The results of the study indicated a support of the UTAUT with respect to the predictors' effect on behavioural intentions and a partial support in the moderation effect. Since UTAUT is still a newly developed model, up to the middle of 2006, the researcher in this study can only retrieve the above study which implements this model.
### 2.13 Summary of major approaches in technology acceptance area

The table below summaries different technology acceptance models, these behavioural models are all unique and can successfully explain users' acceptance of technology.

<table>
<thead>
<tr>
<th>Model</th>
<th>Year</th>
<th>Major citations</th>
<th>Major Constructs</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion of Innovation</td>
<td>1962</td>
<td>Rogers (2003)</td>
<td>Relative advantage, Compatibility, Complexity, Observability, Trialability</td>
<td>Diffusion of Innovations is a theory that analyzes, as well as helps explain, the adaptation of a new innovation.</td>
</tr>
<tr>
<td>Theory of Reasoned Action (TRA)</td>
<td>1975</td>
<td>Fishbein and Ajzen (1975)</td>
<td>Attitude, Subjective Norm, Behavioural Intention, Actual Behaviour</td>
<td>Theory of Reasoned Action posits that individual behaviour is driven by behavioural intention where behavioural intention is a function of an individual's attitude toward the behaviour and subjective norms surrounding the performance of the behaviour.</td>
</tr>
<tr>
<td>Technology Acceptance Model (TAM)</td>
<td>1989</td>
<td>Davis (1989)</td>
<td>Perceived Usefulness, Perceived Ease of Use, Intention to Use, Actual System Use</td>
<td>TAM is an adaptation of the Theory of Reasoned Action (TRA) to the field of information system. TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving as a mediator of actual system use.</td>
</tr>
<tr>
<td>Model</td>
<td>Year</td>
<td>Major citations</td>
<td>Major Constructs</td>
<td>Descriptions</td>
</tr>
<tr>
<td>--------------------------------------------</td>
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<td>-----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Theory of Planned Behaviour (TPB)</td>
<td>1991</td>
<td>Azjen (1991)</td>
<td>Behavioural Beliefs, Attitude, Normative Beliefs, Subjective Norms, Control Beliefs, Perceived Behavioural Control, Intention, Behaviour</td>
<td>The Theory of Planned Behaviour proposes that a behaviour intent is influenced by the attitude towards that behaviour (Attitude), the influence of social pressure that is perceived by the person (Subjective Norm), and the person’s perception of how easy or difficult performing the behaviour will be (Perceived Behavioural Control).</td>
</tr>
<tr>
<td>Motivational Model (MM)</td>
<td>1992</td>
<td>Deci and Ryan (1985), Deci et al. (1991) and Davis et al. (1992)</td>
<td>Intrinsic Motivation, Extrinsic Motivation, Amotivational Style, Behaviour</td>
<td>The theory yielded two important constructs (intrinsic motivation and extrinsic motivation) in the technology acceptance domain. While intrinsic motivation was defined as a behaviour that resulted from the satisfaction derived from performing the behaviour itself and extrinsic motivation was defined as a behaviour for the sake of something else.</td>
</tr>
<tr>
<td>Task-Technology Fit (TTF)</td>
<td>1995</td>
<td>Goodhue (1988)</td>
<td>Task Characteristics, Individual Characteristics, Task Technology Fit</td>
<td>Task-Technology Fit is the matching of the capabilities of the technology to the demands of the task, that is, the ability of information technology to support a task.</td>
</tr>
<tr>
<td>Extended Technology Acceptance Model (TAM2)</td>
<td>2000</td>
<td>Venkatesh and Davis (2000)</td>
<td>Social Influence Process (Subjective Norm, Voluntariness, Image, Experience)</td>
<td>In addition to TAM which posits that an individual’s intention to use a system is determined by two primary belief factors: perceived usefulness and perceived ease of use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cognitive Instrumental Process (Job Relevance, Output Quality, Result Demonstrability)</td>
<td>TAM2 however, incorporates two additional theoretical constructs: cognitive instrumental processes and social influence processes. Four cognitive factors (job relevance, output quality, result demonstrability, and perceived ease of use) influence perceived usefulness and three social forces (subjective norm, image, and voluntariness) influence perceived usefulness.</td>
</tr>
<tr>
<td>Model</td>
<td>Year</td>
<td>Major citations</td>
<td>Major Constructs</td>
<td>Descriptions</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------</td>
<td>-----------------------------------------</td>
<td>-------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The Unified Theory of Acceptance and Use of Technology (UTAUT)</td>
<td>2003</td>
<td>Venkatesh, Morris, Davis and Davis (2003)</td>
<td>Performance Expectancy, Effort Expectancy, Social Influence and Facilitation Conditions</td>
<td>The UTAUT aims to explain user intentions to use an IS and subsequent usage behaviour. The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behaviour.</td>
</tr>
</tbody>
</table>
2.14 Extensions of TAM

Davis (1989) in his original article of Technology Acceptance Model had once stated that future research on technology acceptance could explore how other external variables might affect perceived usefulness, perceived ease of use and user acceptance.

TAM is one of the most widely used models in information systems adoption research. It has been applied to a wide range of applications and user profiles in the past decades. Researchers have replicated Davis’ (1989) study and support its validity and reliability in explaining and predicting user acceptance of various information systems. Apart from Venkatesh and Davis’ (2000) famous extensions of TAM2, Adams, Nelson, and Todd (1992) replicated Davis’ study to evaluate the psychometric properties of the perceived usefulness and perceived ease of use scales and examine the relationships between two variables and usage. The study confirms that the psychometric properties of the two scales developed by Davis are robust across studies and user groups. However, the examination of the relationships between perceived usefulness, perceived ease of use and usage yield somewhat mixed results. Adam, Nelson and Todd explained that the observed differences in the user’s level of experience or the different natures of the software packages. Later, Segars and Grover (1993) performed a confirmatory factor analysis to examine the possible measurement problems in Adam et al.’s study using its own data. They found out that the two-factor model consisting of perceived usefulness and perceived ease of use was not enough to explain the observed correlations in the data, they derived a three-factor model consisting of ease of use, usefulness and effectiveness.

Raising concerns regarding the exploratory procedure used by Segars and Grover (1993), Chin and Todd (1995) re-examined whether the usefulness construct developed by Davis is multi-dimensional or uni-dimensional. Using the original Adam et al. data and their own data set, they performed traditional sample based tests of model fit, distribution-free re-sampling procedures, and cross validations. They concluded that the separation of the usefulness construct into two dimensions (usefulness and effectiveness) had no empirical support or substantive rationale to support Davis’ two-factor model. Subramanian (1994) also replicated the construct measurement of perceived usefulness and perceived ease of use with a new data set collected from a survey targeting users of two different systems.
This replication study suggested that the two-factor model provides a better fit than the three-factor model. The study also found consistent results with earlier studies that perceived usefulness was a determinant of predicted future usage, but perceived ease of use did not show a significant influence on usage.

Hendrickson, Massey and Cronan (1993) examined the test-retest reliability of the perceived usefulness and perceived ease of use to determine the consistency and reliability of the instrument developed by Davis (1989). The findings confirmed that the instrument showed a high degree of test-retest reliability. Szajna (1994) examined the predictive validity of the perceived usefulness and perceived ease of use in TAM. In order to address problems associated with self-reported measures such as common method variance, Szajna used the subject’s actual choice of a software package as a measure of behavioural intention. The findings suggested that the constructs developed by Davis exhibited the predictive validity for intentions to use, self-reported usage, self-predicted usage, attitudes toward use, and choice. Szajna (1996) also conducted a confirmatory test of the revised TAM using the data collected from a longitudinal study. The results support that TAM adequately predicts and explains behavioural intention. In this study, user acceptance was measured as both self-reported and actual usage. The test of the post-implementation version of the model revealed that the effect of intentions was stronger on self-reported usage than on actual usage, suggesting relatively weak support for the convergent validity of self-reported usage and actual usage. In the meantime, Doll, Hendrickson and Deng (1998) pointed out those TAM-related empirical studies have produced conflicting and equivocal results despite TAM’s wide influence on studies of the determinants of system usage. Therefore, Doll et al. assessed the measurement equivalence of Davis’ perceived usefulness and perceived ease of use instruments across type of application, level of experience and gender. The findings confirm that all items of perceived usefulness and perceived ease of use scales have good validity and reliability, and the instruments have robustness across most, but not all, subgroups.

In addition to these replication studies, researchers have recognized the importance of re-examining and comparing existing theoretical models of user acceptance. Taylor and Todd (1995) identified two lines of theoretical perspectives (intention-based models and models from social psychology) that provided an understanding of the determinants of system usage and compared three models (TAM, TPB and decomposed TPB that
incorporates additional factors that are not in TAM) from the two lines in terms of overall model fit, explanatory power and significant of paths. The results indicated that all three models had a good fit and roughly equivalent explanatory power with each model having its own strengths. The authors concluded that while TAM could be preferably used when the research goal was the prediction of system usage, the decomposed TPB model provided a more complete understanding of the determinants of system usage by incorporating subjective norm and perceived behavioural control constructs. Chau and Hu (2001) replicated previous comparison studies of technology acceptance theories and the models suggested by Mathieson (1991), Taylor and Todd (1995) in the context of physicians’ acceptance of telemedicine. They compared TAM, TPB and a decomposed TPB to investigate the extent to which the models could explain user acceptance. Relatively poor reliabilities and R-square shown in the study suggested that the prevalent theoretical models such as TAM and TPB might have limited explanatory utility in a healthcare professional context, calling for the inclusion of additional factors.

Researchers attempt to derive a stronger model that provides more explanatory power than a model standing alone by integrating existing models and theories (Chau, 1996; Dishaw and Strong, 1999; Thompson et al., 1991). Integrating constructs from existing models and theories allows the researchers to better explain factors that influence user acceptance. Thompson et al. (1991) adapted TRA (Fishbein and Azjen, 1975) and a competing theory of behaviour proposed by Triandis (1980) as the theoretical grounding to investigate factors that influence PC use of knowledge workers. The authors found that among the proposed relationships, social norms and three components of expected consequences (complexity of use, for between the job and PC capabilities and long-term consequences) had significant effects on use. In the study, job fit is a stronger predictor of PC utilization than complexity. The results was consistent with Davis et al.’s (1989) findings which had demonstrated a stronger effect of perceived usefulness then perceived ease of use. Dishaw and Strong (1999) integrated TAM with task technology fit model (TTF) to provide a more complete model. The extended TAM with TTF constructs provides more explanatory power than do either TAM or TTF alone. The study findings indicated that system utilization was influenced by both individual’s attitude toward the system (construct specified in TTF). In another study to examine determinants of CASE (computer-aided software engineering) acceptance by system developers, Chau (1996) tested a research model that integrated TAM and the personal computer utilization model developed by Thompson et al. (1991). The
findings by Chau were inconsistent with previous studies. Perceived ease of use was found to exert a stronger influence on user acceptance than perceived usefulness. Chau (1996) speculated that the results might be attributed to the subjects' limited experience with CASE.

One of the researchers who used TAM as a basis for his dissertation was Guus Pijpers (2002). Pijpers' primary objective was to identify the key factors and relationships likely to influence information technology used by senior executives. He extended the Technology Acceptance Model by proposing a large number of external variables that directly and indirectly affect the original factors of the TAM. Pijpers suggested the external variables as possible antecedents of managerial beliefs, attitude and use of information technology. The results showed significant support for external variables that folded into different categories. They were demographics, managerial and IT knowledge, manager's personality, company characteristics, characteristics of the IT resources.

Results also found that three categories were found to have no variables that had a significant relationship. They were social factors, environmental characteristics and task related characteristics.

Similar to TAM2 which contains external variables influencing perceived usefulness and perceived ease of use, Pijpers' model contains its own set of external variables which influence perceived usefulness and perceived ease of use. This research is heavily influenced by the TAM since it provides a detailed bibliography of TAM related articles.

Another research example of implementing Davis' Technology Acceptance Model is Succi and Walker's (1999) research on health care professionals. The authors applied an existing factor, perceived usefulness and added a new dimension to it. The new factor was called perceived usefulness towards professional status. The two authors collected data on a representative sample of US physicians and health care administrators. The authors pointed out that physicians acquired professional knowledge in their work. Physicians in this research felt that they have completed autonomy in their individual work domains. The result was that physicians' job performances were hard to evaluate. There were two implications the authors drew because of this. Firstly, performance evaluations were less critical to the success of physicians. Secondly, physicians had an interest in maintaining a
monopoly over the medical knowledge that they had acquired. The knowledge justified their exclusive license to practice the profession of medicine.

Because of this exclusivity, Succi and Walter (1999) proposed adding a new factor to the TAM. Their new model utilized information about the user’s attitudes regarding the effects of information technology on a profession. Their particular definition of this new factor was the degree to which information technology is perceived by professionals to affect their overall professional status such as degree of professional autonomy dominance. This model can be seen in the following figure.

Figure 2-11 – Professional Status Addition

![Diagram showing the addition of professional status to the TAM model.](image)

Source: Succi and Walker’s (1999)

In this new model, it includes the original TAM factors of perceived usefulness, perceived ease of use, intention to use and actual system use. The original TAM claims that perceived usefulness and perceived ease of use could be influenced by external variables. TAM2 details its version of external variables. The other factor, attitude toward using comes from the Theory of Planned Behaviour. Also, one can say that the factor perceived usefulness towards professional status is similar to the factor "Image" in TAM2.
Yi et al. (2006) also developed a more complete, coherent and unified model and tested the resulting model in the context of PDA acceptance by health professionals. The research explained 57% of the physician’s intention to accept an innovation, with good model fit. Yi et al.'s study produced useful insights into the factors that influenced technology acceptance decisions by professionals and provided ideas in the understanding of user acceptance of technology. Gilbert et al. (2004) also combined attitudinal technology adoption models and the service quality concept to examine the reasons individuals would choose electronic self-service delivery methods over more traditional methods of service delivery for government services. Trust, financial security, information quality (adoption barriers), time and money (adoption benefits) were found to predict potential usage. That is, willingness to use the online delivery option would be presented if organizations could develop trust relationships with individuals, assured them that their financial details were secure, saved individual's time and money, and provided them with relevant, accurate and up-to-date information. The results are significant to this research since the Hong Kong Public Libraries' website is a kind of government's electronic services. Therefore, the findings provided by Gilbert et al. (2004) allow researcher to consider the factors adoption of government e-services.

Another example of TAM extension research was Chismar and Patton’s (2002) research which showed that other researchers have folded previous technology acceptance factors into other existing technology acceptance factors in order to reduce the total number of factors. Chismar and Patton (2002) obtained slightly different results for the application of TAM2 for physicians. The researchers collected data in the form of survey that involved 89 practising paediatricians in Hawaii. In this model, the authors removed the factor “voluntariness” since they believed the Internet was not mandated as an Individual was free to choose if they wanted to use the Internet. The factor “experience” was also excluded because the authors believed the study did not look at the results over a period of two or more discrete points in time. Usage behaviour was also removed because researchers felt that they were not testing an actual technology system. The researchers used Cronbach’s alpha values to confirm the reliability of their survey instrument and then utilized factor analysis to examine convergent and discriminate validity. To specifically address their research question of testing the applicability of TAM2 for pediatricians, the researchers performed separate regression analyses with intention to use and perceived usefulness as the criterion variables.
Extensive review of research articles on user technology acceptance shows that many researchers extended the original Technology Acceptance Model. Likewise, the integrated model in this article is also one of the extensions of the original TAM. The following technology acceptance models are some examples of other research studies that have either modified or added factors to the original TAM.

2.15 Extensions of TAM in the Context of the Internet

During the recent years, the rapid growth of the Internet leads to wide studies of user acceptance of various Internet technologies. Researchers extend TAM in the World Wide Web (WWW) context to examine Web user behaviour (Agarwal & Karahana, 2000; Lederer, Maupin, et al., 2000; Moon and Kim, 2001; Liaw, 2001). There are also many other technology acceptance researches on the web related context such as Internet banking (Chan and Lu, 2004; Pikkarainen et al., 2004), e-commerce (Gefen and Straub, 2000; Lin and Lu, 2000; Childers, Carr, Peck & Carson, 2001; Lee, Park and Ahn, 2001; Chen, Gillenson and Sherrell, 2002; Lee et al., 2001; Liaw, 2002; Gefen, Karahanna and Straub, 2003; Klopping and McKinney, 2004) and online learning (Drennan, Kennedy and Pisarski, 2005).

To date there has been limited but promising use of the TAM to predict web technology adoption by consumers (Chen et al., 2002; Childers et al., 2001; Magal and Mirchandani, 2001). Lederer et al. (2000) tested TAM for work-related tasks with WWW and identified antecedents to Perceived Usefulness and Perceived Ease of Use. The results supported TAM. It confirmed the use of web site depends on both perceived usefulness and perceived ease of use. Two other factors with the highest predictive power for perceived usefulness and perceived ease of use were ease of understanding and information quality. Teo et al. (1999) reported a similar result, that is, both perceived usefulness and perceived ease of use predicted Internet use at work. They also found that perceived enjoyment or playfulness was a significant antecedent of Internet use. In one of the first applications of the TAM to consumer web adoption, Lee et al. (2001) found that the TAM predicted individual purchasing behaviour online. They also showed that perceived risk affects perceived usefulness. They admitted their model is incomplete and suggested that it missed important
factors such as demographic and type of product measures. Magal and Mirchandani (2001) found that TAM is effective in evaluating online shopping at a particular virtual on-line store. Childers et al. (2001) also found that TAM can successfully predict attitude toward online shopping.

In the WWW context, one of the factors that had been studied in TAM related work is the effect of the intrinsic and extrinsic motivation factors on user acceptance. As mentioned above in the Motivational Model, extrinsic motivation referred to the performance of an activity to help achieve valued outcomes that are distinct from the activity itself, such as improving job performance (Deci, 1975), and Intrinsic motivation referred to the performance of an activity for no apparent reason other than the process of performing it. (Deci, 1975). Intrinsic motivation factors include constructs such as perceived enjoyment or perceived fun.

Moon and Kim (2001) provided an example of expanding a technology acceptance model in the World Wide Web context. The model had split off a new factor that influenced attitude toward using. The authors believed that factors contributing to the acceptance of new information technology were likely to vary with the technology, target users, and context. They claimed that the World Wide Web qualified as an emerging new IT since it changed the way people access information. Similar to Lederer at al. (2000), perceived usefulness and perceived ease of use were both identified as important to the users’ perception of the World Wide Web system. Recognizing that most work of TAM had been conducted from an extrinsic motivation perspective, Moon and Kim (2001) added a new external factor called “perceived playfulness” to TAM as an intrinsic motivation factor in order to influence user’s attitude about using the WWW. That is, the authors considered playfulness to be an intrinsic belief or motive that was shaped from the individual’s experience with the environment. Playfulness was formed from the individual’s subjective experience with the WWW. Thus, one of the hypotheses in the research was that there was a positive relationship between perceived playfulness and attitude toward using the WWW.

The study findings showed that although all three user beliefs (perceived ease of use, perceived usefulness and perceived playfulness) had significant effect on the use of WWW, perceived playfulness had a more significant effect than usefulness, implying that intrinsic motivational factors had stronger effects on system usage then extrinsic motivational factors in the WWW context. Furthermore, they defined three dimensions of perceived
playfulness. Firstly, individual perceived that his or her attention was focused on the interaction with the WWW. Secondly, individual was curious during the interaction. Thirdly, individual found the interaction intrinsically enjoyable or interesting.

On the other hand, Teo, Lim, and Lai (1999) examined the impact of intrinsic (perceived enjoyment) and extrinsic (perceived usefulness) factors on the use of the Internet. Unlike Moon and Kin’s findings, the test of their proposed research model indicated that perceived usefulness had a much stronger effect on Internet usage than perceived enjoyment, suggesting that extrinsic motivation had a stronger influence than intrinsic motivation. These conflicting results might be due to different characteristics of the user groups. Whether a research targeted on teenage users and grown-up users might provide very different findings since teenagers would be more concerned with perceived enjoyment than perceived usefulness and grown-up users would be more concerned with perceived usefulness.

A contingency underlying the mixed findings could be identified by further investigating possible moderating effects. Agarwal and Karahama (2000) incorporated a conceptual construct label cognitive absorption, an intrinsic motivation related construct, into TAM in the WWW context. Cognitive absorption referred to a state of deep involvement with software. It is theorized to have five dimensions: temporal dissociation, focused immersion, heightened enjoyment, control and curiosity. The authors proposed a theoretical model. In this model, cognitive absorption was postulated to be an antecedent of user beliefs, and the individual characteristics such as playfulness and personal innovativeness were proposed as determinants of cognitive absorption. The findings showed a direct effect of cognitive absorption on user beliefs and behavioural intention to use, implying that intrinsic motivation factors are important predictors of the intention to use the WWW.

As mentioned above, there were also researches extending TAM in the context of e-commerce. Lee, Park and Ahn (2001) proposed the e-Commerce Adoption Model (e-CAM) to explain the factors affecting a consumer’s online purchasing behaviour based on TAM and the theories of perceived risk. The model included perceived risk with products (PRP), and perceived risk in the context of online transaction (PRT) as contextual constructs that influence the consumer’s adoption of e-commerce in addition to the core perception variables in TAM. That is, perceived usefulness and perceived ease of use. The
results indicated that perceived usefulness, perceived risk in the context of online transaction and perceived risk with products have significant direct effects on e-commerce adoption, and perceived ease of use has only indirect effect through perceived usefulness.

Gefen, Karahanna and Straub (2003) examined factors influencing consumer decisions to return to an e-vendor by integrating TAM constructs and trust in the e-vendor. The authors believed that trust is an important issue in e-commerce. Analyses of data from experienced repeat online shoppers showed that both trust and TAM belief constructs (perceived usefulness and perceived ease of use) had influences on the consumers’ intentions to transact with the e-vendor from whom they purchased. Among the four trust-building antecedents proposed in the study, institution-based structural assurances and situational normality were found to have strong effects on trust. Gefen and Straub (2000) examined the effects of perceived ease of use on user acceptance in the context of e-commerce. They recognized that TAM related studies had yielded mixed results concerning the effects of perceived ease of use on system use. It was found that perceived ease of use influence user acceptance directly when the task nature was intrinsic. The results showed that perceived ease of use influences usage when the task was purchasing (extrinsic). However, it does not affected usage when the task was inquiring about products (intrinsic). The findings suggested that perceived ease of use exerted varying effects, but it depended on whether the type of use is intrinsic or extrinsic.

Other researchers had also conducted different studies that extend TAM to various Internet Technologies. Wober and Gretzel (2000) used TAM to identify key factors which influence managers’ adoption of an Internet-based marketing decision support system (MDSS) in the tourism industry. MDSS allowed employees in tourism organizations to retrieve marketing research data for their various business information needs. Wober and Gretzel proposed a research model which adopted the modified TAM from Hendrickson and Collins (1996) and further incorporate experience, task and attitude constructs. Data analyses showed that the total effect of perceived ease of use was greater than that of perceived usefulness on usage. The results implied that user friendliness and usability of the system seemed to be highly regarded among tourism managers. Also, complexity and timeliness are found to have a strong influence on perceived usefulness.

User acceptance of a courseware management tool is examined and system usage is compared to student performance in the course. Their findings provided support for TAM. Lu, Yu, Liu and Yao (2003) proposed a revised TAM that depicts the factors affecting user acceptance of Wireless Internet via Mobile Devices (WIMD). The proposed model includes external factors such as indifferences, facilitating conditions, social influences to provide more complete understanding of WIMD acceptance, calling for empirical studies to test the proposed relationship.

Finally, Heijden (2003) explored the TAM in website context. The author utilized a large sample from the Internet and the survey was related to generic portal website. The results confirmed the validity of the TAM as usage which was influenced by intention to use. Moreover, enjoyment and ease of use were found as significant predictors when predicting attitudes and intention.

These empirical studies which utilized TAM suggested that the measurement scales for TAM showed relatively high reliability and validity and that TAM had adequate explanatory power in explaining user acceptance of information systems in various contexts.

2.16 Extension of TPB

One example of the use of the Theory of Planned Behaviour would be Benham and Raymond’s (1996) research. The researchers examined the ability of TPB to explain user acceptance of voice mail. In the model, researchers incorporated some of the factors from Moore and Benbasat’s survey instrument (1991) based on Rogers’ Innovation Diffusion Theory. The survey instrument measured eight belief scales (voluntariness, relative advantage, compatibility, image, ease of use, results demonstrability, visibility and trialability). The contribution of this new model was the development of the antecedents to the Theory of Planned Behaviour.

The hypotheses are:
- Attitude toward use of voice-mail is dependent upon the behavioural beliefs of relative advantage, ease of use, compatibility and result demonstrability.

- Subjective norms about the use of voice-mail are dependent upon normative beliefs of image and visibility.

- Perceived behavioural control about the use of voice mail is dependent upon control beliefs of voluntariness, trialability and support.

- Intention to use voice mail is dependent upon attitudes towards the use of voice mail, subjective norms about the use of voice mail and perceived behavioural control about the use of voice mail.

Below is the extended Theory of Planned Behaviour by Benham and Raymond:

**Figure 2-12 – Benham’s Extended Theory of Planned Behaviour (1996)**
Benham's extended TPB specified the factors that influenced each of the beliefs (behaviour, normative and control). These factors included the general characteristics previously mentioned in Roger’s Theory of Reasoned Action. The two factors, demonstrability and image, were seen in Davis’ Extended Technology Acceptance Model.

2.17 Combining TAM and TTF

Both Technology Acceptance Model (TAM) and Task Technology Fit (TTF) Model provided a much needed theoretical basis for exploring the factors that explain software utilization and its link with user performance. These models offered different, though overlapping perspectives on utilization behaviour. While TAM focused on the attitudes toward using a particular IT which users developed based on perceived usefulness and perceived ease of use, TTF focused on the match between user task needs and the available functionality of the IT.

Dishaw and Strong (1999), as mentioned above, believed that while TAM (1989) and TTF (Goodhue and Thompson, 1995; G.D.L., 1995) each offered significant explanatory power alone, a model that integrated constructs from both TAM and TTF could offer a significant improvement over either model alone. While TTF models explicitly included task characteristics, which was the weakness of TAM, they did not explicitly include attitudes towards IT, which was the core of TAM. Rather than arguing for TTF as an alternative to TAM, the authors proposed adding the strengths of TTF models to TAM to produce an integrated model incorporating both attitudes toward IT and the fit between IT functionality and the characteristics of the tasks that IT users were accomplishing with it. This example was important because the suggested integrated model for Hong Kong Public Libraries’ users’ technology acceptance use certain factors from this combined TAM and TTF model. In the new integrated model, task characteristics, like ability to read information are included in tool functionality.

The authors justified why tool responsibilities and task-technology fit could both link with TAM’s perceived usefulness and perceived ease of use. Their combination of TAM and TTF is shown as below.
Dishaw and Strong analyzed each model alone and then analyze the integrated model. The conclusion was that their integrated model explained much more of the variance in the dependent variable, which was actual tool use. One could see that TTF influenced many factors in Dishaw and Strong’s integrated model. Like the integrated model in this research, tool experience and tool functionality influenced perceived ease of use. The results of Dishaw and Strong’s research proved that adding TTF constructs to TAM explained significantly more of the variance in utilization than either TAM or TTF alone. It is suggested that research using the integrated model should lead to a better understanding of choices about using IT.

Klopping and McKinney (2004) also combined the technology acceptance model with task-technology fit model to predict online shopping activity (both the intention to shop online and actual purchases) in their recent research.
2.18 Combining TAM, TPB and TRA

Lopez and Manson (2003) took constructs from different models to create a research model of information system usage. This example was included in this literature review because some of the statements that were included in the questionnaire for this research came from the factors social pressure and computer self-efficacy.

Below is Lopez and Manson’s research model.

![Diagram of Lopez and Manson Model (2003)](image)

Social pressure came from Fishbein and Ajzen’s Theory of Reasoned Action (1975) and Ajzen’s Theory of Planned Behaviour (1991), perceived usefulness came from Technology Acceptance Model, while computer self-efficacy is similar to Theory of Planned Behaviour’s perceived behavioural control (Fishbein, M., Ajzen, I., and McArdle, 1991).
2.19 Combining TAM, TPB and DIT

Xia and Lee (2000) are researchers who investigated the influence of persuasion, training and experience and their relationship with technology user's acceptance of information technology innovation. This research is one of the examples of researchers to create a new technology acceptance model that combined factors from other models. The two factors, training and experience, were included in this research.

The study was based on several theories. They were Rogers’ Diffusion of Innovation (2003), Davis’s Technology Acceptance Model (1989), Ajzen’s Theory of Planned Behaviour (1991) and the statement by the researchers (Xia and Lee, 2000) that persuasion was shown to be one of the most important strategies for influencing beliefs and behaviour (1980).

The four conclusions of the research were that firstly, persuasion significantly offsets the formation of users’ initial perceptions, attitude toward and intention to adopt information technology. Secondly, training provided at the introductory stage helps the user to form a more realistic expectation. Thirdly, as users direct use and experience with the IT innovation increases over time, their perceptions and adoption intention change substantially. Lastly, persuasion, training and direct use are important variables and need to be considered in IT innovation and adoption research and practice.

2.20 Combining TAM and TPB

In the study of software acceptance, four researchers examined the acceptance of a piece of software called COPLINK which was utilized by individual Tucson Arizona law enforcement officers (Lin, Hu and Chen, 2003). The initial COPLINK studied individual law-enforcement officers who were surveyed immediately upon their completion of the COPLINK training. The authors utilized relevant technology acceptance/adoption research (TAM and TPB), used the unique characteristics of law-enforcement setting and developed a model that explained and predicted individual officer’s technology acceptance decisions.
The final model is shown as below.

Figure 2-15 – COPLINK Research Model (2003)

There were several interesting items that the researchers noted with their original model. Firstly, the authors combined Davis’ Technology Acceptance Model and Ajzen’s Theory of Planned Behaviour. Secondly, a technological grouping was created that focused on the identification of key technology related factors and their determinants, for example the technologies usefulness ease of use interface quality and connectivity to external data sources.

Thirdly, the social context group examined the prevailing sources of social influences, such as influences from supervisors and peers, on individual’s technology acceptance decision. Fourthly, the implementation group in which the researchers examined what were the internal conditions in an organization that were likely to affect individual technology acceptance such as the availability of computer equipment, training and in-house technical support. Fifthly, the resulting model showed twenty constructs, that is, factors pertaining to
the technological social and implementation constructs but many of which had been seen in other research models. Sixthly, the technological context looked very similar to TAM2, perceived usefulness had divided to five factors and perceived ease of use had divided to four factors. Seventhly, the implementation context was closely related to the TPB model. Lastly, the social context looked at the subjective norm which was related to the Theory of Reasoned Action. In 2004, the COPLINK was transformed to a simplified model (Figure 12).

2.21 Critique of technology acceptance models

The above models and theories have been developed to explain user technology acceptance behaviour. However, researchers Sun and Zhang (2005) claimed that although these models have generally contributed to readers' understanding of user acceptance perceptions and behaviours, there is still room for improvement. The authors then pointed out that these models have two limitations. The first limitation concerns the explanatory power of the models. Although there may be many other factors that are beyond researchers' reach, the differences in explanatory power between laboratory studies and field studies, and between studies using students and using professionals, imply some complex contextual factors in the real world that should be taken into account such as the influence of organizational factors and the voluntariness of IT usage. The second limitation of these models is the inconsistent relationships among constructs, making researchers (Lee et al., 2003; Legris et al., 2003; Ma and Liu, 2004) question the generalizability of these models across different contexts. Legris et al. (2003) provided a review of the TAM literature and concluded that the TAM is a useful model but needs to be integrated into a broader perspective. The review included 80 articles published in six periodicals from 1980 to 2001. The results indicated the evolving shape and coverage of the TAM. The authors found that as the model was tested more and more, conflicting and contradicting results appeared. The author then suggested that moderating factors may account for both the limited explanatory power and the inconsistencies between studies. In fact, Adams et al. (1992), Agarwal and Prasad (1998) had also called for more research to investigate moderating effects.

Researchers Plouffe, Hulland and Vandenbosch (2001) contrasted Davis' Technology Acceptance Model with Diffusion of Innovation in the process of exploring merchant's
 adoption of a smart card-payment system. The authors adapted all the constructs proposed by Moore and Benbasat (1991). The findings showed that the two models were significant in predicting intention. It is found that Diffusion of Innovation constructs explained 45% of the variance in intention to adopt, while TAM explained only 32.7%. Therefore, the authors concluded that TAM might have an advantage of being parsimonious and less costly but it might be misleading in certain situations. In contrast, Diffusion of Innovation provided more detail and explanatory power than TAM and might lead to different results with respect to their adoption decision.

Moreover, researchers begin to notice and to analyze the effect of mandatory usage on technology acceptance models. The research of Rawstorne et al. (2000) pointed out that the mandatory usage of technology hinders a person’s option to perform a given behaviour. Once the employer has decided that the employee must accept the technology, the employees lose the ability to make a choice. Rawstorne further went on to say that this was an important distinction because Ajzen, in his research, added a variable called perceived behaviour control to the TRA model in order to take account of this non-voluntary behaviour. Rawstorne et al. (2000) tended to doubt the usefulness of the new variable for explaining and predicting mandated information technology usage. Rawstorne et al. (2000), Hartwick and Barki (1994), Moore and Benbasat (1991) supported the notion of variance within the constraints of mandated use. They recognised that there is still lack of research to confirm or deny the issue. Rawstorne et al. believed that one should predict multiple types of behaviour, but the current models are not geared toward that.

Another issue that Rawstorne et al. (2000) pointed out is that people who have studied the issue of mandatory usage tended to include any heterogeneous sample of individuals from many organizations and that these individuals occupied different positions, or use different information systems. One is invited to again look at the work of Hartwick and Barki (1994) and also Moore and Benbasat (1991). Rawstorne et al. said that when usage has been mandated then the research participants should all have the same employer conditions and all the research participants should have the usage of the technology being mandated by their employer.

Singletary et al. (2002) also wrote on the subject of mandatory usage. The researchers identified the factors that influence the software usage of high school students. They
investigated whether the TAM2 model could be adopted to explain and predict innovative use of software application by high school students when the initial use of the application is mandatory.

2.22 Demographics

A further way to affect the prediction of technology acceptance is demographics. Demographics is the selected population characteristics which is frequently used in government or economic and marketing research. Demographics commonly include information such as race, age, income, disabilities, mobility, educational level and employment status. In technology acceptance research, some researchers considered demographics as one of the external variables in the TAM model (Davis, 1989). In 2003, the UTAUT model (Venkatesh and Morris, 2003), commonly known as TAM3, also suggested four moderating influences in which age was coded as a continuous variable which was consistent with researchers’ prior research (Morris and Venkatesh, 2000). Researchers Gilbert and Littleboy (2004) also consider the moderating influence of demographics which are important in the marketing context of customer segmentation.

In fact, within all the demographics, age is an important factor. Sharit and Czaja (1994) suggested that age difference has an important impact on the ability to use and the intention to adopt new technological advances. These results are supported by other studies such as Milligan (1997) which stated that younger bank customers were more likely to use on-line banking than older customers. Langard et al. (1981) found out younger study participants have a higher propensity to use self-service technology. Within the service quality field, age has been shown to be a discriminator in the perceptions of service quality in banking industry (Stafford, 1996).

During the recent years, studies began to investigate the affect of age on the acceptance of technology. Morris and Venkatesh (2000) demonstrated that the antecedents of technology adoption vary significantly with age. However, the research was conducted for an employment-based information system, which was in a mandatory nature instead of a voluntary nature. Zhu et al (2002) found out that age was significant in the variation of service quality attributes for on-line banking. Moreover, Gilbert and Littleboy (2004)
demonstrated a significant difference in the willingness to use the technology according to the age of the respondents. Therefore, age places an important role in explaining why individuals would adopt a technology, specifically in means of electronic services.

2.23 Summary

This chapter explained a history of technology acceptance models. Ten behavioural and technology acceptance models were described in detail. The review includes models such as Davis’ Technology Acceptance Model (1989), Vankatesh and Davis’ Extended Technology Acceptance Model (2000), Ajzen’s (1991) Theory of Planned Behaviour and Goodhue’s (1995) Task Technology Fit Model. All these acceptance and behavioural models provided a strong foundation for understanding human behaviour. Rich history of research that combined technology acceptance models was also shown.

Moreover, TAM related empirical studies were reviewed, including replication studies, studies that examined the effects of user beliefs and social influences on user acceptance and studies that extended TAM in the context of the Internet.

The rest of the thesis is organized as follows. Chapter 3 explains the libraries’ technology, its online resources and its related researches, technology acceptance of digital libraries and related environment are also explained. Chapter 4 reviews the theoretical mechanisms underlying the primary hypothesis, including the research model. Chapter 5 outlines the research design and instrument validation. Chapter 6 presents the findings of the focus groups. Chapter 7 presents the quantitative research method and its statistical analysis technique that the researcher uses to test the hypotheses, the findings of the survey research will also be shown. Chapter 8 discusses the findings and concludes the thesis.
Chapter Three

Library Technology

The purpose of this chapter is, firstly, to illustrate different kinds of technology that has been implemented in Hong Kong Public Libraries and how technology is making an impact in library services. A few examples of technology implementation in both academic and public libraries are given. Secondly, the chapter reports recent research and related studies in the area of the acceptance of digital libraries and online databases.

3.1 Introduction of Hong Kong Public Libraries and its technology implementation

The Hong Kong Public Library System is part of the Hong Kong Government’s Leisure and Cultural Services Department. The department strongly supports the use of technology to improve the provision of public services and to satisfy the public's growing expectations. In line with the Government's comprehensive e-government strategy, the department has employed Information technology as a crucial facilitator for delivery of its services through electronic means on an 'anytime and anywhere' basis (LCSD, 2003).

The Hong Kong Public Libraries provide a network of 66 static libraries and 10 mobile libraries. They are evenly spread over the territory of Hong Kong and interconnected by an integrated automated library system to provide convenient access to a wide range of library services for people of all age groups and walks of life. The Library collection has 12 million items, including books, audio-visual materials, newspapers, periodicals, CD-Rom databases, microforms and maps. This public libraries system serves a population of 7.1 million in Hong Kong with an annual circulation over 60 million, while more than half of the population are registered borrowers.

Since 1995, the library implements a library automation system which provides 24-hour Internet library services for bilingual on-line searching, reservation and renewal of library materials. There are over 1,500 terminals for this automation system. In 2003, 14.10 million items of library materials were renewed through the Internet and telephone renewal
services (LCSD, 2004). The Hong Kong Public Libraries continue to introduce different technologies such as self service terminals, and other online resources such as online databases and online newspapers. The successful implementation of the Multimedia Information System (MMIS) was a watershed in the development of digital library services. MMIS provides audio and video services on demand, on-line CD-ROMs and reference resources, as well as searching and viewing of documents through workstations at the libraries and the Internet. In 2003, the government's new Hong Kong smart ID card was launched which allowed the public libraries to provide residents with the option of using their smart ID cards as library cards to borrow, renew and reserve library materials. In addition, a number of computer terminals with Internet access have been installed with e-Cert compatible smart card readers to promote wider use of information technology and electronic services among the public. In December 2003, an e-mail notification service was introduced to enable registered readers to receive overdue and reservation notices through e-mail to improve service efficiency and economise on the use of paper. Also, an e-Newsletter of the Hong Kong Public Libraries was introduced to provide the public with more convenient and speedy access to library news. It accepts on-line registration from the public for subscription to the library e-Newsletter.

3.2 Examples of Technological Use in Hong Kong Public Libraries

1. Digital Library Project
   [Multi-media Information System (MMIS)]

According to Fox (1993), a digital library is an assemblage of digital computers, storage, and communication machinery together with the context and software needed to produce, emulate, and extend those services provided by conventional libraries based on paper and other material means of collecting, finding and disseminating information.

In Hong Kong, Public Libraries as well as academic libraries are developing different digital library projects. Among these projects, the Open University of Hong Kong’s Electronic Library Project and the Hong Kong Public Libraries’ MMIS are both award-winning digitization projects.
The Multimedia Information System (MMIS) of the Hong Kong Public libraries allows users to enjoy audio and video-on-demand services through the 470 LAN and ATM workstations which are strategically placed throughout the building. The aim of the system is to integrate both digitised and non-digitised materials into one single interface, providing a one-stop search and access services as well as interactive broadcast system. Information is stored in a three-level structure - servers, jukeboxes and a conventional distribution system with a computer-controlled analogue audio-visual switch. MMIS also provides document-imaging materials, ranging from newspapers and books to photographs, maps, posters, clippings and house programmes of cultural activities etc. for ready access by the public, not only at the libraries, but also at home or at place of work. Through the MMIS, users can instantly gain access to more than 1.4 million pages of digital images and documents, including back issues of Hong Kong newspapers, house programmes, posters, maps, photos, news clippings, books and manuscripts. The system also incorporates more than 100,000 items of audio and visual materials and over 70 online reference resources in different subject areas. Moreover, the system contains over 2 million images of old Hong Kong newspapers, maps, Hong Kong art and artist clippings, photographs, manuscripts etc. The Libraries keep adding new contents to the database of the MMIS to cope with readers' ever increasing aspiration for information.

MMIS is a bilingual digital system which contains three types of searching in MMIS - Basic, Advanced and Image Search. Unlike the normal Internet searches which generate thousands of irrelevant entries, MMIS allows specific searches as well as searches by graphic, colour etc. Access to Internet and a wide range of selected online databases is also feasible from any workstation of the same system under a unified interface that makes sources for information searching more comprehensive. MMIS also allows users to submit print requests to centralized print queues after viewing and then pay the required charges at the counter or through self-serve workstations using a stored value card, which is implemented to reduce the risk of wastage by paying charges after printing. For guaranteed access to shared resources such as multimedia workstations and contents, MMIS also provides online booking services. Library card holders can perform bookings using the booking interface either at the workstations in the Library or over the Internet. In 2002, the system won an award in the E-Government and Services category of the Asia Pacific Information and Communication Technology Awards (APICTA) in Malaysia as well as a Silver Award in the Application Category of IT Excellence Awards 2001 by the Hong Kong
2. Online Databases

Online Databases are collections of electronic information on one or more related topics, often a subject literature such as chemistry, medicine, psychology, and so forth. These databases can be bibliographic in nature, or have full-text, numerical, images, sound, or audio (Rochtanek, 2002).

In the past 30 years, many of the world’s leading publishers had developed computer-searchable versions of their traditional print products and made them available through various search services. Database producers created the secondary publications and the Online Search Services brokered access to subsets of those databases. Today, most services offer online access to information in different subject disciplines. Nowadays, more than six out of ten databases are produced in the United States, while the remaining 40 percent are produced internationally. Also, the contributions of commerce to online databases productivity increased rapidly from 22% in 1979 to 81% in 2000 (Williams, 2001). Many vendors moved to provide innovative new products, such as providing access to personalized content delivery using a library online catalogue.

During recent years, the budget spent on online databases keeps increasing in Hong Kong Public Libraries. Since all citizens in Hong Kong are their target users, the libraries subscribe academic online databases such as Ebscohost and Proquest 5000 as well as general online databases such as Wisenews (contains all HK newspapers’ content), Grolier Online (General Encyclopaedias) and Biography Resources Centre. They also subscribe online databases for youth readers such as Testing and Education Reference Centre, Naxos Spoken Word Library and Opposing Viewpoints Resource Centre. Apart from English Databases, Chinese Online Databases such as China Journal Net and China Infobank are subscribed. Since the libraries organize training sessions every week and there is heavy promotion on the above products, these online databases are getting popular among readers.
3. E-books


According to Rao (2004), there are four types of e-books. They are

- **Downloadable e-books**: contents are available on a Web site for downloading to user’s PC.

- **Dedicated e-book reader**: contents are downloaded to a dedicated hardware device with a high-quality screen and special capabilities for book reading.

- **Web-accessible e-books**: published on provider’s Web site and may be accessed for a fee or purchase books to receive indefinite access.

- **Print-on-demand books**: contents are stored in a system connected to a high-speed, high-quality printer and bound copies are produced on demand.

There are several advantages and disadvantages for end users when using e-book. The advantages are that firstly, it is highly accessible as users can find a title in an online bookshop 24 hours a day and it is not likely for a title to become out of print. Secondly, it is easy for readers to search for passages, keywords and definitions in texts. Thirdly, it is flexible to change display brightness, font size and style. Lastly, e-book offers multimedia facilities such as audio, video and arbitrary extension applications that can enhance an e-book in an integrated way. The disadvantages are due to shortcomings of current e-book technology and its derivatives, including costs and mis-match with current user expectations about how books are handled. Typical issues that make e-books less user friendly than their paper counterparts are display, form factors and haptic feedback.

The Hong Kong Public Libraries continuously subscribe web-accessible English e-book,
NetLibrary and Chinese e-book, Founder Apabi D-Lib. In 2006, the libraries also subscribe e-books from Safari Tech Book Online which provides online e-books mainly on technology and computer sciences. Since remote access is available for all Hong Kong Public Libraries' users, the number of usage is high and it is getting popular among library users.

4. Library Websites

The Hong Kong Public Libraries provide 24-hour Internet library services for online searching, reservation and renewal of library materials. In 2003, over 14 million items of library materials were renewed through the Internet and Telephone Renewal Services (LCSD, 2004). Remote access of e-books and some online databases are also available for registered library users through the library website. Through the website, the public can submit their reference enquiries to the Internet Reference Enquiry Service. After submitting the enquiries, readers can get their reply within two working days for simple and factual questions. For those that require lengthy research, suggested sources would be provided within ten days. With growing popularity of on-line public library services, the Hong Kong Public Libraries homepage (www.hkpl.gov.hk) was ranked fifth among the most popular websites in Hong Kong 2003. (Lee, 2004)

The website was also selected as one of the winning websites in the "2005 Meritorious Websites" contest. The contest was jointly organised by the Television and Entertainment Licensing Authority and the Hong Kong Young Women's Christian Association, the aim of the contest is to encourage young people to properly use the Internet by visiting healthy websites, and motivates Internet content providers to create more healthy websites for children and young people. (Meritorious Websites contest, 2005)

5. Online Public Access Catalogue (OPAC)

An Online Public Access Catalogue (OPAC) is a computerized online catalogue of the materials held in the library. It allows library staff as well as library users to access the catalogue at different computer terminals within the library or via the Internet. Since the mid 1980s, it has replaced the card catalogues in most libraries. Also, character-based OPAC interfaces are being replaced by web-based interfaces in themed 1990s. OPAC are
often part of an integrated library system.

Most integrated library systems offer a Windows-based OPAC module as a standard capability or optional feature. OPAC modules rely on pulldown menus, popup windows, dialog boxes, mouse operations and other graphical user interface components to simplify the entry of search commands and formatting of retrieved information.

The Online Public Access Catalogue (OPAC) in the Hong Kong Public Libraries is one of the world's largest computerised library systems with both Chinese and English capabilities. It enables readers to search for both Chinese and English library collection. Readers can search for any library materials over a wide assortment of search options, such as author, title, subject and title keyword search. Within the whole collection, readers can also narrow their search to either books, audio-visual materials or other categories only.

Readers can know instantaneously from any OPAC terminal whether the item they need is available on shelf, checkout or being reserved. Through OPAC, readers will know the due date of any checkout items. They could also check the forthcoming events and activities which would be held in different public libraries. Moreover, readers can also check their own borrowing record which gives them information such as how many items they have checked out and which item is overdue. Renewal and reservation of library materials are also available through OPAC.

6. Self Service Terminals

Self Service Terminals enable users to borrow items without the need to queue at the circulation counter. The system provides real-time updating of loan details in the Library's record. Once a reader wants to borrow library materials, they can take their items to the Self Service Terminals and place their library card on the marked spot. After entering a 4-digit PIN for validation, they can put the library items one after another on the cradle for charging out. Then, the system records the loan and generates a date due receipt for each item.

According to Morris et al. (2001), there are several benefits and opportunities of using self service terminals. Firstly, it is a way of providing a high level service with limited staff
resources and can be invaluable at library peak hours. Secondly, as mentioned in the last paragraph, it resolves loan queues at the circulation counter. Thirdly, it is vital for both academic and public libraries to embrace new technologies, in this case, using self service to meet users’ needs and maintain competitiveness.

Several studies had been carried out on the ease of use of self service terminals in the UK during the mid 1990s. In a survey at Sunderland, 86 percent of students questioned found the units easy to use (Hurst, 1995). Also, over 80 percent of self-issue users in the Maidenhead Public had no problems when they were actually using the system. However, 26 percent of users at Hull University found the system was hard to use.

Largerborg (1997) concluded that the interface is an important part of the unit. In order for the transaction to be successful, the screen design has to be user-friendly with clear operating instructions. One example of poor design occurred at Sutherland with their self service terminals, users suffering from colour blindness had difficulties in distinguishing which slot to use to return their books. This problem was resolved by changing the colour slots to more distinguishable colours.

In Hong Kong, 3M self service terminals have been installed in 26 libraries and the installation of self service terminals are kept increasing in the remaining libraries in order to encourage self service in public libraries.

### 3.3 Availability of Traditional Services

Though the Hong Kong Public Libraries introduce different library technology, use of library technology is not mandatory. Users can have the alternative to use traditional services since are still available in public libraries in Hong Kong. For information searching and circulating services such as borrowing and renewal of library materials, users can approach to the libraries’ reference enquiry counter and circulation counter where library staff are available to serve in person.

Moreover, instead of reading e-books and digitized newspapers, users can choose to read equivalent printed copies which are available in various public libraries. They can also
choose whether they would like to search information through online databases or scanning printed copies of journal articles.

3.4 Recent Research

Most of the recent research on the acceptance of library related technologies has centred on the acceptance of digital libraries and online databases. There have been two groups of researches which studied the technology acceptance of digital libraries, one on web-based learning, one on the acceptance of online databases and one on the acceptance of information services using online newspaper as an example. Below are the examples of these recent researches.

User Technological Acceptance of Digital Libraries

In 2002, researchers at Hong Kong University of Science and Technology (Hong et al., 2001) investigated the acceptance of the Digital Library and added computer self-efficacy as well as other factors to Davis’ TAM.

The study investigates the effect of a set of individual differences (computer self-efficacy and knowledge of search domain) and system characteristics (relevance, level of understanding of terminology and level of navigation) on users’ intention to adopt digital libraries. Based on 585 users of Open University’s award-winning digital library, the results support the utilization of TAM in predicting users’ intention to adopt digital libraries. The researchers found that all of the above factors have significant effects on perceived usefulness and perceived ease of use of digital libraries, while relevance has the strongest effect on perceived usefulness of digital libraries.

Later in 2005, another group of U.S. researchers from Indiana University South Band also studied individual acceptance of digital libraries (Vaidyanathan, 2005). Based on the earlier research of Hong et al. (2001), the researchers identified another factor, system reliability, which can increase user acceptance of digital libraries. In their study, five individual and system components such as search function, screen design and navigation are used to explore individual user acceptance of a digital library. Similar to the earlier research, the researchers find that the above components have significant effects on perceived
ease-of-use and perceived usefulness which in turn have a significant effect on individual user acceptance.

**User Technology Acceptance on Web-based learning**

Researchers Gong et al. (2004) combined Davis’ (1989) technology acceptance model (TAM) and the social cognitive theory (SCT) of Bandura (1977) to provide a framework for the analysis of the technology acceptance for web-based learning. The results of the study are consistent with the TAM factors for explaining behavioural intention. Also, the study indicates that the computer self-efficacy has substantial influence on technology acceptance.

**User Technology Acceptance on online databases, online newspaper and E-book**

In 2005, researcher Kim (2005) conducted a research to determine the factors affecting user acceptance of web-based subscription databases while another researcher Luo (2005) conducted another study on the user acceptance of Internet-based information services using online newspaper as an example.

Kim’s study (2005) tested an integrated model of the antecedents and consequents of user beliefs toward intended use by extending the Technology Acceptance Model in order to explain the effects of users’ internal beliefs and attitudes on their system usage behaviour. The study targeted 121 undergraduate students who have experience using the databases provided by the university libraries. The results showed that perceived usefulness had a stronger effect on user acceptance than ease of use. Moreover, it was found that job relevance and result demonstrability have a positive effect on perceived usefulness while output quality did not. Also, clarity of level of understanding of terminology and accessibility were found to be important determinants for ease of use of the database.

On the other hand, Luo (2005) developed and tested the theoretical model of effects of intrinsic and extrinsic motivations on user acceptance of online newspaper which is one of the Internet-based information services. The results show that entertainment motivation is an important factor in determining the use of online services in addition to the behavioural intention. The belief constructs of the Technology Acceptance Model, perceived ease of use
and perceived usefulness are also confirmed as predictors of behavioural intention.

Hage (2006) also investigated the relationship among self-efficacy, usage levels and E-book technology acceptance of working professionals in the home or office environment based on gender and age. The findings showed that there is a significant difference in the usage level of e-book technology by professionals across age group. There is also a significant difference in the self-efficacy level of professionals using e-book technology between genders.

3.5 Summary

The chapter first, gives many examples of different kinds of library technology. These devices are adapted to serve the particular needs of an individual. Also, the chapter reported on recent research of technology acceptance in the field of library technology. Most of the current research in library technology focused on user acceptance of digital libraries. Also, there has been other research which looks at the use of online information services such as online databases and online newspapers. These types of research give relevant background information and ideas for the researcher to develop the Integrated Technology Acceptance Model for Library Technology (ITAMLT).
Chapter Four

The Research Model

The previous chapter reinforced the message that library technology is playing a significant role in public libraries. What has not been seen in the research literature is an assessment of the factors that foster the acceptance of library technology and a model derived from those factors. The proposed model, Integrated Technology Acceptance Model for Library Technology (ITAMLT) is presented in this research. Each factor of the model will be defined in detail.

4.1 Proposed Research Model

This research adds to the body of knowledge of technology acceptance models. It draws upon the knowledge of four popular technology acceptance models. These models are mentioned in the earlier chapter Davis' Technology Acceptance Model (TAM), Venkatesh and Davis' Extended Technology Acceptance Model (TAM2), Ajzen's Theory of Planned Behaviour (TPB), and Goodhue's Task-Technology Fit (TTF). The proposed research model, illustrated in Figure 4-1, incorporates factors from each of these models.

Within these four models, the Technology Acceptance Model (TAM) defines the two basic constructs of the technology acceptance models. These two factors are perceived usefulness and perceived ease of use. TAM2 then further explains these two basic constructs by relying upon social influence and cognitive instrumental processes. The TPB adds a new component called perceived behaviour control. The Task Technology Fit model addresses the importance of technology by providing the functionality that fit the task requirements of users. The researcher will explain below, one by one, the four selected models, and some of their factors are included in the proposed integrated model.

Technology Acceptance Model

As mentioned earlier in the literature review, the model has four main factors, perceived usefulness, perceived ease of use, intention to use and usage behaviour. According to Davis
(1989), perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" while "perceived ease of use was defined as the degree to which a person believes that using a particular system would be free from effort." The factor, intention to use is taken from the Theory of Reasoned Action and the Theory of Planned Behaviour, which is applied as an indicator of user acceptance. Examining behavioural intention as an indicator of user acceptance is consistent with previous studies using TAM (Agarwal and Karahanna, 2000; Agarwal and Prasad, 1999; Chau, 1996; Gefen and Straub, 2000; Hong et al., 2001; Hu et al., 1999; Jackson et al., 1997; Melone, 1990). Therefore, the proposed model posits that intention to use library technology is jointly determined by perceived usefulness and perceived ease of use and subjective norm. The effects of user beliefs on behavioural intention are examined in this study.

Theory of Planned Behaviour

Apart from intention to use which also appear in TAM, the researcher will add two other factors from the Theory of Planned Behaviour to the integrated technology acceptance model for library technology. They are subjective norm and perceived behaviour control. The other three types of belief (behavioural, normative and control) are not included in the proposed model. The rational for the exclusion of the three types of beliefs is that the concepts are folded into the other factors. For example, behavioural beliefs and evaluation are fold into attitude. Normative beliefs and motivations are fold into subjective norm. Control belief and facilitations are fold into perceived behaviour control.

Although in one instance, researchers Taylor and Todd (2001) divided subjective norm into superior influence and peer influence, the proposed model uses the original subjective norm. What the Theory of Planned Behaviour says is that a person's belief would influence the given attitude of a person using the piece of technology. Fishbein and Ajzen's (1975) research also used subjective norm in their study, they defined subjective norm as the perception that most people who are important to him or her think that he or she should or should not use the technology.

In the early COPLINK study (Lin et al. 2003, Lin et al. 2004), perceived behaviour control came from the Theory of Planned Behaviour and it referred to a person's perceptions of the
presence or absence of requisite resources, opportunities and facilitating condition necessary for using the system.

Attitude is found in Fishbein and Ajzen’s work which is defined as “an individual’s positive or negative feelings about performing the target behaviour. However, this factor, attitude, which is included in both TAM and TPB as mediating construct between beliefs and intentions, was later excluded based on Davis et al’s (1989) observation that attitude does not generally intervene between beliefs and intentions. In fact, several recent studies utilizing TAM also excluded attitude from the model based on the empirical evidence that it did not fully mediate the effects of beliefs on behavioural intention (Agarwal and Karahanna, 2000; Igbaria et al., 1997; Igbaria, Guimaraes and Davis, 1995; Gefen et al., 2003; Hong et al., 2001; Szajna, 1996; Venkatesh and Davis, 1996; Venkatesh and Morris, 2000). Following the previous research, attitude is excluded from the proposed research model.

**Extended Technology Acceptance Model**

The third adopted technology acceptance model is Venkatesh and Davis’ Extended Technology Acceptance Model (TAM2) which was developed in 2000. The factor “voluntariness” is not included in the proposed model since the use of library technology is not mandatory. In fact, Venkatesh and Davis used this factor to demonstrate that if the device is seen as non-mandatory that the overall effect of subject norm is lessened.

Also, Fishbein and Ajzen (1975) defined the factor “output quality” as an individual’s perception of how well the new technology performs the tasks that it is capable of performing, is similar to task technology fit which Goodhue (1995) describes as the ability of information technology to support a task. Moreover, the factor “Image” which Moore and Benbasat (1991) define as the degree to which the use of innovation is perceived to enhance one’s status in one’s social system is captured in the definition of perceived usefulness. Therefore, the above factors will be excluded from the proposed model.

Since experience is also called system or tool experience, Hubona (1997) defined that computer experience would be the years of experience using a computer for any purpose while system experience is a self reported factor detailing “length of elapsed time since a
user first used the application being studied”. The factor “experience” is therefore folded into another factor called “computer self-efficacy”. In this Extended Technology Acceptance Model, the factors job relevance and result demonstrability will be used. Result demonstrability is defined by Moore and Benbasat (1991) as the tangibility of the results of using innovation while job relevance comes from TAM2 which is the user’s perception that using a device is linked to the user’s job.

**Task Technology Fit**

Goodhue (1995) described task technology fit as the ability of information technology to support a task. This implies matching the capabilities of the technology to the demands of the task (Goodhue, 1995). Dishaw and Strong (1999) explained that information technology will be used if, and only if, the functions available to the user support the task. That is, the functions “fit” the task.

In Dishaw and Strong’s model the factor task technology fit comes from the matching of the measurements of two factors. The model looks at matching a given tool function with its associated task requirement. Dishaw and Strong expressed that tool functionality can be a factor that influences perceived ease of use. That is, if a device’s main functions are easy to use, then it follows that the user’s perception of ease of use will be positive. In this model, tool requirements are folded into the factor “task technology fit”, while tool experience is captured in the factor “computer self-efficacy”, however, “computer self-efficacy” is found to be less important nowadays. Also, individual performance is regarded as an extension of usage behaviour. All these three factors will not be included in the proposed model.

**New factors**

Apart from the above factors which are adopted from other behavioural models, the researcher also identified other factors that impact on the acceptance of library technology. They are accessibility, reliability, user training, level of navigation, level of understanding of terminology and knowledge of search domain. These new factors are more applicable to the library technology.
Combining all the factors from the four models and adding the new ones, figure 4-1 depicts the Integrated Technology Acceptance Model for Library Technology (ITAMLT).

Figure 4-1 – Integrated Technology Acceptance Model for Library Technology

Source: This Study
4.2 Definition of the ITAMLT factors

♦ Perceived Usefulness is the degree to which the user believes that using library technology would enhance his or her job performance (Davis, 1989).

♦ Perceived Ease of Use is the degree to which a person believes that using library technology would be free from effort (Davis, 1989).

♦ Intention to Use is defined as the user’s intention to use library technology (Davis, 1989).

♦ Perceived Behavioural Control is defined as the user’s perception of the presence or absence of requisite resources, opportunities and facilitating condition necessary for using library technology (Ajzen, 1991).

♦ Task Technology Fit is the user’s perception of the ability of library technology to support a task (Goodhue and Thompson, 1995).

♦ Subjective Norm is defined as the perception that most people who are important to him or her think that he or she should or should not use library technology (Fishbein and Ajzen, 1975).

♦ Accessibility refers to a multidimensional concept encompassing physical access to the source, the interface to the source and the ability to physically retrieve potentially relevant information (Culnan, 1985).

♦ Result Demonstrability is the tangibility of the results of using library technology (Moore and Benbasat, 1991).

♦ Relevance refers to the success of the system in returning the desired information that has been queried by the end user (Lindgaard, 1994).
Reliability is the construct measuring the system quality as well as user confidence, response time, system support and security (Vaidyanathan, 2005).

User Training refers to the tasks associated with training new users in how to utilize library technology and existing users in how to utilize new features (SPR, 2005). In this study, the variable user training stands for the perceived importance placed on user training, which means the degree to which a person believes that user training is important to them in order to understand library technology.

Level of Navigation is the way information is presented on the screen for navigating.

Level of understanding of terminology refers to the understanding of words, sentences and abbreviations used by the system.

Computer Self-Efficacy is defined as an individual judgement of one’s capability to use new information systems (Compeau and Higgins, 1995).

Knowledge of search domain refers to the domain knowledge that leads to the efficient search by helping users to separate relevant information from irrelevant responses, facilitating learning of search principles and formulating more accurate queries (Linde and Bergstrom, 1988; Marchonini et al., 1993; Meadow et al., 1995).

4.3 Research Hypotheses

The proposed research model, illustrated in Figure 4-1, incorporates factors from four previous models based on prior research on user acceptance. The model proposes that intention to use library technology is determined by perceived usefulness, perceived ease of use, subjective norm, task technology fit and perceived behavioural control. Following Davis' (1989) suggestion to include external variables in the model to examine the effects of various individual differences, situational constraints and system characteristics, the model incorporates the antecedents of user beliefs based on previous studies on technology acceptance.
In the proposed model, intention to use is applied as an indicator of user acceptance. Numerous researchers in previous studies have examined intention to use as an indicator of user acceptance (Agarwal and Karahanna, 2000; Agarwal and Prasad, 1999; Chau, 1996; Gefen et al., 2003; Gefen and Straub, 2000; Hong et al., 2002; Hu et al., 1999, Jackson et al., 1997; Melone, 1990). In accordance with these studies, researcher in this study will also examine the effects of user beliefs on intention to use.

According to Agarwal and Karahanna (2000), individuals’ beliefs about or perceptions of information systems have a significant influence on usage behaviour. These beliefs are also important in that they are amenable to managerial manipulation through interventions such as screen design and training (Agarwal and Karahanna, 2000; Davis, 1993, Venkatesh, 1999). According to the original TAM model (Davis, 1989), user acceptance of a system is influenced by user beliefs about the usefulness and ease of use of a system, that is, perceived usefulness and perceived ease of use. The influence of these two factors on users’ intention to use the system has been supported in many studies (Agarwal and Karahanna, 2000; Gefen et al., 2003; Hong et al., 2002 and Jackson et al., 1997).

Belief concerning factors affecting intention to use toward library technology

Hypothesis 1: There is a correlation between perceived usefulness and intention to use.

Previous research has discovered that perceived usefulness is a major determinant of user acceptance of a system or it has a positive effect on intention to use (Adams et al., 1992; Agarwal and Karahanna, 2000; Davis et al., 1989; Gefen et al., 2003; Straub, Limayem et al., 1995). Perceived usefulness is a “measure of the individual’s subjective assessment of the utility offered by the new IT in a specific task-related context” (Gefen et al., 2003). According to motivation theory, the influence of perceived usefulness on system use can be explained in that an individual is inclined to accept a new information system when he/she perceives it to be instrumental for achieving valued outcomes (Igbaria and Livari, 1995).

Perceived usefulness is often found to have a stronger relationship with system use compared to perceived ease of use. This prominence of perceived usefulness suggests that users tend to accept a system primarily because of the functions it performs, implying ease of use cannot compensate for a system that does not provide needed functionality (Davis,
In accordance with Technology acceptance Model, it is assumed that perceived usefulness will have a positive direct effect on intention to use library technology.

Hypothesis 2: There is a correlation between perceived ease of use and intention to use.

User beliefs about ease of use are another important determinant of user acceptance. Perceived ease of use is an “indicator of the cognitive effort needed to learn and to utilize the new IT” (Gefen et al., 2003). According to self-efficacy theory, the easier a system is to interact with, the greater should be the user’s sense of efficacy (Davis et al., 1989). Previous research that examined the effect of perceived ease of use on user acceptance has yielded mixed results.

Some studies found out that there was a significant effect of perceived ease of use on intention to use (Chau, 1996; Hendrickson and Collins, 1996; Igbaria et al., 1997; Wober and Gretzel, 2000). However, there were also studies which found that perceived ease of use does not have a positive effect on intention to use. It just indirectly affects intention to use through perceived usefulness (Davis, 1989; Karahanna and Straub, 1999; Mathieson, 1991).

Hypothesis 3: There is a correlation between perceived ease of use and perceived usefulness.

Davis et al. (1989) suggested the role of perceived ease of use as a causal antecedent to perceived usefulness. This implies that system usability affects the functionality of a system (Goodwin, 1987). There are also studies which found that perceived ease of use has a significant effect on perceived usefulness (Adam et al., 1992; Davis et al., 1989; Gefen and Straub, 2000; Igbaria et al., 1997; Karahanna and Straub, 1999; Lee et al., 2001). According to Davis (1989), the direct effect of perceived ease of use on perceived usefulness is explained in that increased perceived ease of use can contribute to improved performance by saving effort needed to do the same work. In this study, it is hypothesized that perceived ease of use has a positive effect on intention to use. It also is hypothesized it has a positive indirect effect on intention to use through perceived usefulness.
Hypothesis 4: There is a correlation between subjective norm and intention to use library technology.

Previous research has shown that social norm has an influence on one’s behaviour (Pavri, 1988; Thompson et al., 1991; Triandis, 1971). Although the original technology acceptance model does not account for social influences, Davis et al. (1989) acknowledged the need to further investigate the conditions that govern the impact of social influences on system use. According to Fishbein and Ajzen (1975), subjective norm is defined as one’s perception that most people who are important to him or her think he or she should or should not perform the behaviour. In the Theory of Reasoned Action, subjective norm is a key determinant of intention to use. A direct effect of subjective norm on intention to use is based on the rationale that people may choose to perform a behaviour that important referents think they should even if they are not themselves favourable toward the behaviour (Fishbein and Ajzen, 1975).

However, Davis et al. did not include subjective norm in his original Technology Acceptance Model since his research findings failed to demonstrate a significant effect of subjective norm on system use. The researchers explained that this non-significant finding may be due to the characteristics of the system investigated in the study or the weak psychometric properties of the measurement scale.

Numerous studies incorporated subjective norm to Technology Acceptance Model (Lucas and Spitler, 1999; Malhotra and Galletta, 1999; Mathieson, 1991; Taylor and Todd, 1995; Venkatesh and Morris, 2000). Thompson et al. (1991) conducted a field study targeting knowledge workers and discovered a significant effect of social norms on PC use. While Lucas and Spitler (1999) found that subjective norm is a more important factor in predicting system use than one’s perceived ease of use and perceived usefulness. Venkatesh and Davis (2000) argue that subjective norm takes place through the process of compliance effect on usage behaviour. Due to the above findings, it is hypothesized that subjective norm will have a positive effect on intention to use library technology.
Hypothesis 5: There is a correlation between task-technology fit and intention to use.

Task-technology fit refers to the ability of information technology to support a task. The task-technology fit model suggests that individuals not only consider beliefs about perceived usefulness and perceived ease of use, but also the extent to which the technology meet their task needs and individual abilities (Goodhue, 1995). Therefore, the above hypothesis is proposed.

Hypothesis 6: There is a correlation between perceived behavioural control and intention to use.

Perceived behavioural control comes from Theory of Planned Behaviour (Ajzen, 1991) and the later decomposed Theory of Planned Behaviour (Taylor and Todd, 1995). It refers to an individual's perception of the presence or absence of requisite resources and opportunities needed to perform a behaviour (Ajzen and Madden, 1986). Perceived behavioural control is a general construct dealing with whether an individual feels it is within his or her control to perform a specific behavioural act. Several studies also found that perceived behavioural control is significant to predict intention to use (Hausenblas et al., 1997; Notani, 1998; Hu et al., 1999). Following the theory of planned behaviour and its related studies, it is hypothesized that perceived behavioural control will have a positive effect on intention to use library technology.

Antecedents of Perceived Usefulness and Perceived Ease of Use

In the Technology Acceptance Model, Davis (1989) suggests that user beliefs mediate the effects of external variables on user acceptance of a system. That is external variables are expected to influence intention to use indirectly through perceived usefulness and perceived ease of use. Studies have incorporated external variables to the technology acceptance model for improvement of its specificity and explanatory utility (Agarwal and Prasad, 1998; Mathieson, 1991). Davis (1989) also asserted that future research is needed to examine how external variables affect perceived usefulness and perceived ease of use. Different research had added different external variables which affect perceived usefulness and perceived ease of use according to different fields of studies. This proposed research model also incorporates different external variables of perceived usefulness and perceived
ease of use in relation to library technology.

**Result Demonstrability**

Hypothesis 7: There is a correlation between result demonstrability and perceived usefulness.

Venkatesh and Davis (2000) suggested that result demonstrability is a cognitive instrumental determinant of usefulness perceptions. Result Demonstrability is defined as the tangibility of the results of using the innovation (Moore and Benbasat, 1991). People are likely to form favourable perceived usefulness of system if subsequent results of using the system are discerned to be positive. However, if the result demonstrability of a system is obscure, users are not likely to understand how useful the system is (Venkatesh and Davis, 2000). Previous studies has proved that result demonstrability has a significant effect on perceived usefulness (Agarwal and Prasad, 1997; Venkatesh and Davis, 2000). Based on the above studies, the above hypothesis is set.

**Relevance**

Hypothesis 8: There is a correlation between relevance and perceived usefulness.

Relevance is the degree to which the system matches tasks as carried out in the current environment and is specific in the task analysis. Lindgaard’s (1994) definition of relevance is more applicable in the context of a library environment. According to Lindgaard (1994), job relevance pertains to the success of the system in returning the desired information that has been queried by the end user. In other words, it is the degree to which the system, in this case, the library technology, successfully provides the users with the information they are requesting. An example of relevance is the list of search results a user gets when utilizing an online database. When a user is requesting information from one information system, the results provided to the user must be meaningful and let the user feel successful in the search. Therefore, the researcher proposed the above hypothesis.
Reliability

Hypothesis 9: There is a correlation between system reliability and perceived usefulness.

This variable measures the system quality as well as user confidence, response time, system support and security. These are all important among various technical systems and there is no difference related to library technology. The integrity of the actual files, user’s comfort and confidence in the system, security and fast response time all belong to this construct. Therefore, the hypothesis for this external variable is constructed.

User Training

Hypothesis 10: There is a correlation between user training and perceived usefulness.

Hypothesis 11: There is a correlation between user training and perceived ease of use.

User Training has been found to play an important role in forming user beliefs about an information system. Previous studies have shown that user training influences users’ perceptions toward a system as well as their later use of the system (Igbaria, 1990; Igbaria et al., 1995; Nelson and Cheney, 1987; Gist, 1987).

Davis et al. (1989) suggested that training may influence perceived ease of use as an external factor in his technology acceptance model. In fact, findings from several studies provide support for the relationship between user training and perceived ease of use (Thompson et al., 1991; Igbaria et al., 1997; Igbaria et al., 1995).

Moreover, studies also found that training has a positive effect on perceived usefulness as well as user acceptance (Agarwal and Prasad, 1999; Igbaria et al., 1997; Igbaria et al., 1995; Raymond, 1988). These researchers explained that user training may facilitate an individual’s awareness of a system’s functions and contents, and thereby affect the individual’s perceptions of usefulness of the system. Agarwal and Prasad (1999) suggested that participation in training had a positive effect on perceived usefulness, training might be essential in facilitating individual’s recognition of system capabilities. However, in Karahanna and Straub’s (1999) study, it is found that the availability of training and support
had no significant effect on both perceived usefulness and perceived ease of use. This non-significant result might be due to the operational definition of the construct in that the items measuring the factor were phased with respect to general information technology and did not refer to the system under specific investigation.

In general, training affects user acceptance of technology through its influence on perceived usefulness and perceived ease of use. Therefore, it is hypothesized that user training will have a positive effect on perceived usefulness and perceived ease of use of library technology.

Accessibility

Hypothesis 12: There is a correlation between accessibility and perceived ease of use.

User perceptions of information system accessibility have been found to be associated with information use (Culnan, 1984). According to Culnan (1985), accessibility is a multidimensional concept encompassing physical access to the resources, the interface of the resources and the ability to physically retrieve potentially relevant information. Culnan (1984) found that physical access to the information is independent of the accessibility of an information system, and actual system use appears to be more related to users' perceptions of accessibility. Provision of physical access is essential to facilitate acceptance and use of information systems. However, this provision is not sufficient to guarantee the actual use of the system. Information systems such as online databases were recognized as being less accessible than other sources utilized to obtain the same external information.

Several studies reported that for potential adopters of information, accessibility to information has a stronger effect on actual system use than the output quality of the system. (Hardy, 1982; O'Reilly, 1982). This stronger effect may be due to the uncertainty of the value of retrieved information both before and after retrieval (Rice and Shook, 1988). In contrast, Davis et al. (1989) found that there is no significant effect of accessibility on intention to use and usage behaviour. They explained that this result might be caused by psychometric weaknesses of their measure of accessibility. Also, accessibility might have a significant influence when accessibility is variant to all users.
Apart from the studies of Davis, previous research tends to report a positive effect of accessibility on perceived ease of use (Karahanna and Straub, 1999). Therefore, the following hypothesis is proposed.

**Level of navigation**

**Hypothesis 13:** There is a correlation between level of navigation and perceived ease of use.

Level of navigation is the way information is presented on the screen for navigating. Similar construct has been widely supported in various studies such as the design of the screen and the display of information have a tremendous influence on user’s satisfaction with the system. Also, it can greatly influence end users’ search strategies and performance (Jarvenpaa, 1989; Lingaard, 1994; Todd and Benbasat, 1991). Users tend to be more satisfied with the system if the design and display of information is presented in an organized manner and makes them easy to navigate the system and quickly retrieve the desired information. According to Hong et al. (2001), a good screen design can create a comfortable virtual environment. Having an organized and well-designed screen aids users in scanning and identifying relevant information more easily. Therefore, it is expected that level of navigation will have a positive effect on perceived ease of use of library technology.

**Level of Understanding of Terminology**

**Hypothesis 14:** There is a correlation between level of understanding of terminology and perceived ease of use.

Level of understanding of terminology refers to the understanding of words, sentences and abbreviations used by the system. The variable, level of understanding of terminology, can be described as language. For this variable, a user needs to be able to understand that specific language in order to accept and use the technology. One major problem with terminology for an information system is inappropriately used jargons. The vocabulary that users use to express their information needs often differs from the terminology of the information providers. Vocabularies in library interfaces which consist of professional,
technical and official terminology often differ from users’ vocabularies which express their information needs (Talja et al., 1998). This difference not only makes it difficult for the users to interact with the system, but also decreases the potential benefits that the information system can provide to the users. Specific efforts have to be made in order to avoid such a problem (Chen et al., 1997).

Different studies have reported that level of understanding of terminology had positive effect on user acceptance in an information system (Hill et al., 1997; Spivey, 2000). Hong et al. (2001) also found that level of understanding of terminology had a significant effect on perceived ease of use of a digital library. Thus, the researcher constructs the above hypothesis.

**Computer self-efficacy**

Hypothesis 15: There is a correlation between computer self-efficacy and perceived ease of use.

Computer self-efficacy is defined as an individual judgement of one’s capability to use a new information system (Compeau and Higgins, 1995). It is a kind of internal control factor, which affects the usability of one system. As a reflection of self-reported computer skill, computer self-efficacy measures the level of confidence a user has when using an unfamiliar system.

Grounded in social cognitive theory, computer self-efficacy has been found to be an important predictor of the usage of information technology (Compeau and Higgins, 1995; Compeau et al, 1999; Hill and Smith, 1987). This factor has been examined in various information system researches (Agarwal et al., 2000; Johnson and Marakas, 2000).

There exists empirical evidence of the casual relationship between computer self-efficacy and perceived ease of use. For example, Venkatesh and Davis (1996) found that computer self-efficacy significantly influences perceived ease of use of microcomputers. Igararia and Livari (1995) demonstrated that computer self-efficacy has a direct effect on perceived ease of use. Moreover, Agarwal et al’s (2000) study also found computer self-efficacy to be a key antecedent of perceived ease of use. Based on these previous studies, it is hypothesized
that computer self-efficacy will have a positive effect on perceived ease of use of library technology.

**Knowledge of Search Domain**

Hypothesis 16: There is a correlation between knowledge of search domain and perceived ease of use.

Users’ knowledge of the subject domain is another individual factor that can influence user acceptance of library technology. Domain knowledge can support more efficient searches by helping users to separate relevant information from the irrelevant responses, facilitating learning of search principles and formulating more accurate queries (Linde and Bergstrom, 1988; Marchionini et al., 1993; Meadow et al., 1995). Once users have better knowledge of the subject domain, they are more proficient in producing suitable queries, interpreting outputs of those queries, and adjusting their searches accordingly. Consequently, they will be more eager to use library technology.

A successful system will accommodate the diversities in users’ domain knowledge. A simple query interface will allow users with less domain knowledge to key in the term they are searching for without being baffled by a complex interface while an advanced query interface will have more comprehensive options available to support users with more domain knowledge. Therefore, the researcher conducts the following hypothesis.

Further hypotheses are set to identify factors that can predict users’ perceived usefulness, perceived ease of use and intention to use library technology, and whether there is difference in the above three constructs according to age.

**4.4 Summary**

This chapter has explained how the proposed Integrated Technology Acceptance Model for Library Technology was formed by incorporating factors from four traditional behavioural models: Davis’ Technology Acceptance Model, Venkatesh and Davis’ Extended Technology Acceptance Model, Ajzen’s Theory of Planned Behaviour and Goodhue’s Task-Technology
Fit model. Also, additional new factors were included in the new model in accordance with a library environment. Explanations were given as to why different factors were accepted or rejected for the proposed model. The 15 constructs in the model were defined and the hypotheses were set. The coming chapter will explain the research methodology that is going to be used for this dissertation.
Chapter Five

Research Methodology

The previous chapter described the proposed Integrated Technology Acceptance Model for Library Technology (ITAMLT) and formulated hypotheses to investigate factors which affect the technology acceptance of Hong Kong Public Libraries’ users.

In this chapter, the research method used to accomplish the research objective is described in detail. The research design is formulated to empirically test and explain the relationship implied by the research model. Data collection procedures and sampling processes are also discussed. Descriptions of the data analysis method undertaken in this study is also provided at the end of this chapter.

5.1 Research Purpose

The purpose of this study is to identify factors which influence users’ acceptance of library technologies in Hong Kong and to find out whether potential usage varies with age against a number of variables.

As mentioned in the earlier chapter, the researcher could not locate any study on the user acceptance of library technologies in Hong Kong, both the adoption and usage trend remains unclear. Although many researchers had developed different technology acceptance models during the past few years, there exists limited knowledge on the subject area of library matters. Therefore, a better understanding of user technological acceptance in public libraries circumstances is needed. This study attempts to provide information on the current trend of library technology acceptance in Hong Kong.

5.2 Proposed model

The proposed model in Figure 4-1, as described in detail in the last chapter, identifies factors which affect users’ acceptance of library technology. The researcher developed an integrated technology acceptance model in the context of library technology based on prior
research on user acceptance. The model posits that intention to use is jointly determined by perceived usefulness, perceived ease of use, task technology fit, subjective norm and perceived behavioural control. Following the suggestion of Davis et al.'s (1989), the researcher includes external variables in the model to examine the effects of various individual differences, situational constraints and managerially controllable interventions on use, the model incorporates the antecedents of user beliefs based on previous studies on technology acceptance.

5.3 Application in Library Sector

During the last few years, public libraries in Hong Kong are in favour of the Hong Kong e-government strategy in providing integrated, one-stop and customer-centric e-services that deliver increased value and facilitate better access to public services (E-government in Hong Kong, 2006). The HKSAR Government in its “digital 21 strategy” also mentioned that starting from the implementation of the e-government programme in 2000, 90% of the amenable public services are covered by an e-option. (Digital 21 Strategy, 2004)

The public libraries embrace with the government's mission in providing e-services for public easy access. Below are some examples of technological use in Hong Kong Public Libraries.

<table>
<thead>
<tr>
<th>Type of Technology</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-media Information System</td>
<td>◆ Launched in 2001&lt;br&gt;◆ Access to more than 1.4 million pages of digital images and documents such as Hong Kong newspaper, posters, maps, etc.&lt;br&gt;◆ Provide audio and video-on-demand services</td>
</tr>
<tr>
<td>(Digital Library Project)</td>
<td></td>
</tr>
<tr>
<td>Online Databases</td>
<td>◆ Continuous subscription&lt;br&gt;◆ User education provided</td>
</tr>
<tr>
<td>E-books</td>
<td>◆ Continuous subscription&lt;br&gt;◆ User education provided</td>
</tr>
<tr>
<td>Type of Technology</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Library Websites</td>
<td>♦ Launched in 2001&lt;br&gt;♦ Online reservation and renewal of library materials&lt;br&gt;♦ Access library e-newsletter, online databases and e-book&lt;br&gt;♦ Apply for e-mail notification through the homepage&lt;br&gt;♦ 24 hour service available for readers to access a wide range of electronic information and services.&lt;br&gt;♦ On average, attract over 700,000 visitors per month.&lt;br&gt;♦ Display borrowers’ records</td>
</tr>
<tr>
<td>Self Service Terminal</td>
<td>♦ Self-help borrowing services</td>
</tr>
<tr>
<td>Use of smart ID card for library services</td>
<td>♦ Launched in June 2003&lt;br&gt;♦ Use for borrowing library materials and reservation of computer terminals</td>
</tr>
</tbody>
</table>

The library sector is chosen as the application for this study since no research has been done on this matter. Therefore, this research is important as it provides factors which affect users to use library technology before they consider using it. Several studies demonstrated that older people are less inclined to the adoption of technology such as online access to government services (Gilbert and Littleboy, 2004) and the use of computer systems (Burton-Jones and Hubona, 2005). It would be interesting to know if these results also applied to the use of library technology in Hong Kong.

5.4 Identification of variables

As described in the previous chapter, the purpose of this study is to identify factors that contribute to the acceptance of library technology by public library users. The constructs in the research model are drawn from the following sources.

♦ Technology Acceptance Model (Davis,1989)
♦ Theory of Planned Behaviour (Ajzen, 1991)
♦ Extended Technology Acceptance Model (Vankatesh and Davis, 2000)
♦ Task Technology Fit (Goodhue and Thompson, 1995)
Additional factors drawn from other models  
(Fishbein and Ajzen, 1975; Culnan, 1985; Moore and Benbasat, 1991; Marchonini et al., 1993; Lindgaard, 1994; Compeau and Higgins, 1995; Meadow et al., 1995; Vaidyanathan, 2005).

A set of constructs are identified from the above and are summarised as below:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness</td>
<td>the degree to which the user believes that using library technology would enhance his or her job performance</td>
<td>Davis (1989)</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>the degree to which a person believes that using library technology would be free from effort</td>
<td>Davis (1989)</td>
</tr>
<tr>
<td>Intention to Use</td>
<td>the user’s intention to use library technology</td>
<td>Davis (1989)</td>
</tr>
<tr>
<td>Perceived Behavioural Control</td>
<td>the individual’s perception of his or her control over performance of the behaviour.</td>
<td>Mathieson, 1991</td>
</tr>
<tr>
<td>Task Technology Fit</td>
<td>the user’s perception of the ability of library technology to support a task</td>
<td>Goodhue and Thompson (1995)</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>the perception that most people who are important to him or her think that he or she should or should not use library technology</td>
<td>Fishbein and Ajzen (1975)</td>
</tr>
<tr>
<td>Accessibility</td>
<td>a multidimensional concept encompassing physical access to the source, the interface to the source and the ability to physically retrieve potentially relevant information</td>
<td>Culnan (1985)</td>
</tr>
<tr>
<td>Result Demonstrability</td>
<td>the tangibility of the results of using library technology</td>
<td>Moore and Benbasat (1991)</td>
</tr>
<tr>
<td>Relevance</td>
<td>the success of the system in returning the desired information that has been queried by the end user</td>
<td>Lindgaard (1994)</td>
</tr>
<tr>
<td>Reliability</td>
<td>the construct measuring the system quality as well as user confidence, response time, system support and security</td>
<td>Vaidyanathan (2005)</td>
</tr>
<tr>
<td>Construct</td>
<td>Definition</td>
<td>Sources</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>User Training</td>
<td>the tasks associated with training new users in how to utilize library technology and existing users in how to utilize new features. In this study, it refers to the perceived importance placed on user training.</td>
<td>SPR (2005)</td>
</tr>
<tr>
<td>Level of navigation</td>
<td>the way information is presented on the screen for navigating.</td>
<td>This study</td>
</tr>
<tr>
<td>Level of understanding of terminology</td>
<td>the understanding of words, sentences and abbreviations used by the system.</td>
<td>This study</td>
</tr>
<tr>
<td>Knowledge of search domain</td>
<td>the domain knowledge that leads to the efficient search by helping users to separate relevant information from irrelevant responses, facilitating learning of search principles and formulating more accurate queries</td>
<td>Linde and Bergstrom (1988)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marchonini et al. (1993)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meadow et al. (1995)</td>
</tr>
</tbody>
</table>

### 5.5 Operationalisation of Research Questions

After identifying factors that may affect users' acceptance of library technology, description of how the proposed model will be tested is provided in this section.

Most previous technology acceptance studies use survey as the only method that investigated users' acceptance of technology. For example, the research of Lucas and Spitler (1999) used an extended TAM to test the adoption of Multifunctional workstation within a financial company. Venkatesh and Davis' (2000) study applied the extension of TAM which includes subjective norms and task technology fit to test the adoption of four different systems in four different companies. Also, researchers Taylor and Todd (1995) applied the combination model of TAM, TPB and decomposed TPB to test the usage of university computing for business school students in one university.

Most of the instruments in the previous research studies are applicable in a single work or study environment where the system has been physically introduced to the users. In most circumstances, users were pushed to use the technology and they did not have a choice of
not using it.

However, in the public libraries section, users have an option to choose whether they would like to use or not to use the services. The technology mentioned in this study is totally passive and users may not have to use it.

Most previous studies (Lederer et al., 2000; O’Cass and Fenech, 2002; Van Riel et al., 2001) focuses on the actual usage as most of the variables in the model are based on the knowledge of information systems. Since the use of library technology is very common in Hong Kong, it is assumed that respondents in this study have come across at least one type of library technology, especially the online public access catalogue.

Apart from measuring actual perceptions, the researcher investigates the factors that library users think are important when considering their usage. The research also studies whether the acceptance of library technology various with age. All information is important to Hong Kong Public Libraries since the information collected contributes towards the future development of library technology. Moreover, it is useful for the public libraries when considering the implementation of RFID technology.

5.6 Hypothesis Development

A hypothesis is defined as a logically conjectured relationship between two or more variables expressed in the form of testable statements. Relationships are conjectured on the basis of the network of associations established in the theoretical framework formulated for the research study. By testing the hypotheses and confirming the conjectured relationships, it is expected that solutions can be found to correct the problem encountered (Sekaran, 2000).

In the last chapter the researcher formulated the hypotheses which were drawn from the theoretical framework in this study. These hypotheses are directional because the direction of the relationship between variables (positive) is indicated. The researcher in this study formulated hypotheses in order to identify factors that affect users to use library technology and whether they can predict perceived usefulness, perceived ease of use and intention to
use. Also, further hypotheses are formulated to see whether there is difference towards the above three factors according to age.

5.7 Research Paradigms

A paradigm is a set of values and techniques which is shared by members of a scientific community (Kuhn, 1970). It acts as a guide map, dictating the kinds of problems scientists should address and the types of explanations that are acceptable to them.

There are three most widely utilized research paradigms. They are positivism, interpretivism and critical science (Kim, 2005).

Positivism is based on the assumption that there are universal laws that govern social events, and uncovering these laws enables researchers to describe, predict and control social phenomena (Wardlow, 1989). Interpretive research, in contrast, seeks to understand values, beliefs and meanings of social phenomena, thereby obtaining a deep and sympathetic understanding of human cultural activities and experiences (Smith and Heshusius, 1986). Critical science seeks to explain social inequities through which individuals can take actions to change injustices (Comstock, 1982). These three approaches take different epistemological positions. Among these paradigms, positivism and interpretivism are most appropriate in this research. Interpretativism refers to the inductive process while positivism refers to the deductive process in this study.

5.8 Research Design

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. The plan is the complete scheme or program of the research. It includes an outline of what the researcher will do from writing the hypotheses and their operational implications to the final analysis of data (Kerlinger, 1986).
Below is the flow chart showing the stages of the research method.

Figure 5-1 – Flow Chart Showing the Stages of Research Method of this Research

Source: Kerlinger (1986)
There are two main types of research methods; qualitative and quantitative research methods. Both quantitative and qualitative methods are often used in business related research studies, including information systems. While quantitative methods involves numerical representation and manipulation of observations for the purpose of describing and explaining phenomena that those observations reflect, qualitative research on the other hand involves non-numerical examination and interpretation of observations, for the purpose of discovering the underlying meaning and patterns of relationships. (Casebeer and Verhoef, 1997; Zikmund, 2003; McDaniel and Gates, 1996; Miles and Huberman, 1994; Easterby-Smith, et al., 1991; Bellenger, et al., 1989).

Quantitative research method involves using structured questions and a large number of respondents, while qualitative research method collects, analyzes and interprets data by observing what people do and say.

According to Vidich and Lyman (1994), a quantitative researcher seeks causes and facts from the outsider’s view, or from a worldview perspective. They believe that there is reality that can be studied, and that science stands objectively and value free outside that reality (Morrall, 2001). Quantitative research findings are based on the researcher’s interpretations of events and the relationship between the variables (Morse and Field, 1996).

A quantitative research method is appropriate to measure overt behaviour. Several advantages of a quantitative approach are that the survey-based studies are strong in measuring descriptive aspects. It allows flexibility in the treatment of data, in terms of comparative analyses, statistical analyses and repeatability of data collection in order to verify reliability. Moreover, it produces broad data across a large population. This permits a simple comparative analysis between ages as it clearly illustrates the composition of the populations, their obvious behaviour, and their scaleable attitudes towards pre-determined items.

Jayaratne (1993) introduces a further advantage of using quantitative research method, noting that it produces objective data as well as objective analysis. It claims scientific credibility since many of the scales used within quantitative studies are tested for validity and reliability.
However, quantitative approach contains several weaknesses. Firstly, it is expensive, time-consuming and it takes a lot of effort. Secondly, it fails to provide any explanation or analysis beyond the descriptive level. That is, it is unable to ascertain deeper underlying meanings and explanations of a research topic even if it is significant and valid. Thirdly, quantitative approach assumes that people can be reduced to a set of variables which are somehow equivalent across persons and across situations (Reason and Rowan, 1981). Although quantitative methods can be used to measure human factors, their appropriateness in explaining them in depth is limited.

In contrast, qualitative approach is strong in those areas that have been identified as weaknesses within the quantitative approach. For example, the use of focus groups and observations can provide a deep, rather than a broad set of knowledge about a particular phenomenon. The advantages of a qualitative approach are that firstly, quantitative approach encourages the respondents to introduce concepts of importance from the emic aspect, rather than adhering to subject areas that have been pre-determined by the researcher. Secondly, qualitative approach permits the identification of longitudinal changes in users' behaviour, whereas quantitative approaches tend to take a snapshot of behaviour at a particular time. Thirdly, this approach allows the cognitive and affective components of users' behaviour to be explored in greater depth than quantitative approach. This depth allows the researcher to achieve empathetic understanding, while empathetic understanding is the basis for a critique of quantitative research designs. The argument used is that quantitative methods measure human behaviour from outside, without accessing the meanings that individuals give to their measurable behaviour, it neglects the fact that humans contain psychological dimensions.

One of the disadvantages of qualitative approach is the problem of reliability. That is, it is difficult to measure the stability of findings. Same as quantitative approach, qualitative approach is expensive and time consuming. Also, the low sample numbers cannot represent the whole population.

Basically, qualitative research is more subjective than quantitative research. Both methods use different ways of collecting information; Qualitative research collects information through individual, in-depth interviews and focus groups while quantitative research mainly collects information through survey.
Quantitative research is based on testing a theory and analyzed using statistical techniques. The goal of quantitative methods is to determine whether the predictive generalizations of a theory hold true.

By contrast, the aim of qualitative research is to understand a social or human problem from multiple perspectives. It involves a process of developing a complex and holistic picture of the phenomenon of interest.

Moreover, qualitative research generates rich and valid data that contribute to in-depth understanding of context. Quantitative research generates population-based data and is suited to establishing cause-and-effect relationship.

**Use of mixed methods research design**

Since both qualitative and quantitative approaches have their strengths and weaknesses, the combination of both approaches can focus on their relevant strengths. Quantitative analysis can complement the findings of qualitative methods by indicating their extent within a larger population, while qualitative methods can assist the researcher in understanding the underlying explanations of significance. The researcher in this study aims to achieve the situation where blending both qualitative and quantitative approaches can produce a final product which highlights the significant contributions of both (Nau, 1995). By adopting the assumptions that qualitative methods allow the researcher to develop an overall picture of the subject under investigation which can guide the initial phases of the research and quantitative analysis is more appropriate to assess descriptive components of the study, the researcher can ensure that the final report maximises the strengths of a mixed methods approach.

In most technology acceptance research, researchers use single methodology due to pragmatic argument such as time constraints and the need to limit the scope of a study (Creswell, 2003). However, since no one has done any research on the user acceptance of library technology in Hong Kong Public Libraries, qualitative approach helps to sketch the acceptance model which shows those variables that affects user acceptance of library technology. Then, quantitative approach is used to test the relationship of those variables
after the model is set.

Therefore, mixed method design is used in this study. A mixed research design is the integration of both quantitative and qualitative research methods which provides a deeper insight into the research findings.

Because the nature of the study is both exploratory and explanatory, data collected through multi-methods and multiple sources was a necessity in order to add rigor to the study (Sekaran, 2000; Mingers, 2001). It is asserted that a multi-method approach in an information system research study would produce more reliable and richer research results (Sekaran, 2000; Mingers, 2001).

In a mixed method approach, metaphor of triangulation is used in such a way that the results of qualitative and quantitative methods are regarded as analogous to the results of the single measurement operations. Normally, in describing different aspects of the same phenomenon or even different phenomena by two methods, one would naturally expect different results. In a mixed method approach, qualitative and quantitative methods have to be combined in order to produce sound sociological explanations.

There are several types of mixed method designs (Tashakkori and Teddlie, 1998). In this study, the researcher will apply sequential mixed method design, that is, the researcher conducts a qualitative phase of a study and then a separate quantitative phase, or vice versa. Creswell (2003) called this design a two-phase design. The researcher in this study will use the QUAL/QUAN sequence (See Figure 5-2), where the investigator starts with qualitative data collection and analysis on a relatively unexplored topic, using the results to design a subsequent quantitative phase of the study. According to Meekers (1994), QUAL/QUAN is a common type of sequencing because in most quantitative survey research, the quantitative closed-end instruments are developed after exploratory qualitative interviews have been analyzed or narrative data have been content analyzed.
The researcher in this study first uses a qualitative research approach to revise the proposed model. Strauss and Corbin (1990) claim that qualitative research is used to describe how groups or people live, or how they cope with their daily lives. It is useful for giving intricate details of phenomena that are difficult to convey with quantitative methods. The participants provide a description that may enable the reader to understand and make sense of reality. The researcher then develops theory using those description, data synthesis and abstraction (Morse and Field, 1995; Morse and Field, 1996).

After the qualitative research process, a quantitative approach using survey as data collection method is used to ascertain the revised technology acceptance model for library technology.

Quantitative methods utilize statistical measures and control procedures that decrease the bias level and confound variables as much as possible (Emory and Cooper, 1991). It is an effective technique in addressing, to a large extent, many of the problems of reliability, internal validity and external validity of measures and procedures (Guba and Lincoln, 1994).

By using different sources and methods at various points in the evaluation process, evaluation can build on the strength of each type of data collection and minimize the weaknesses of any single approach. A mixed methods approach to evaluation can increase both the validity and reliability of evaluation data, and may also lead evaluators to modify or expand the evaluation design and the data collection methods (Patton, 1990).

Therefore, using more than one method to study the same phenomenon can strengthen the validity of the results, which is often mentioned as the main advantage of the mixed method approach. Moreover, it can provide stronger evidence for a conclusion at the convergence and corroboration of findings and can add insights and understanding that
might be missed when only a single method is used.

A typical design might start out with a qualitative segment such as a focus group which will alert the researcher to issues that should be explored in a survey of participants. Also, a mixed method approach may lead evaluators to modify or expand the evaluation design and data collection methods (Miles and Huberman, 1994; William, R. Shadish, 1993; Greene et al., 1989). The disadvantages of mixed methods research are that it is expensive and time consuming.

Several studies such as Sieber (1982), Strauss (1987), Bryman (1988, 1992) and Mason (1994) demonstrate that the integration of both quantitative and qualitative methods provides a deeper insight into research findings. Therefore, the mixed method approach is appropriate in this study.

The research presented in this thesis consists of an initial exploratory study followed by an extensive phase of explanatory research. Exploratory research is conducted to provide a tentative understanding of a research problem and should be used as input to further research (Malhotra, 1999). Explanatory research aims to provide evidence of cause and effect relationships (Aaker et al., 2001).

In this exploratory study, focus groups are arranged with some users of Hong Kong Public Libraries to gain insights about the research problem and to discover the effective factors in relation to the adoption of library technologies by individual users. Based on the data collected in this focus group, the researcher revised the proposed Integrated Technology Acceptance Model of Library Technology (ITAMLT) for an explanatory study. The revised model is tested in the explanatory phase of the research, using quantitative methods. In this case, cross-sectional survey methodology is undertaken to find out the relationship between the dependent variables of the research model and user adoption.

A cross-sectional study, also known as one-shot studies, is a single investigation of a sample of elements selected from the studies population and is conducted in order to have a snapshot of an ongoing situation (Hussey and Hussey, 1997). This design is best suited to studies aimed at finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population. Cross-sectional studies are simple and
inexpensive. They have low time and resources requirements and are ethically safe. However, the biggest disadvantage is that they cannot measure change. (Kumar, 2005).

5.9 Source of data

Data can be collected from primary or secondary data sources. Data is collected from a primary data source when the researcher goes directly to the originator of the evidence while a secondary source would be information that is published or available published or available indirectly (Remenyi, 2005). Primary data is original data collected by one researcher through several choices which includes observations, experiments, surveys, interviews and focus groups. Secondary data is information collected by others which includes in books, journal articles and online data sources such as online information of firms, governments and different organizations. (Ghauri and Gronhaug, 2005).

The main advantage of primary data is they are most consistent with the researcher’s research problems and research objectives. The disadvantage is that these data can take a long time and can cost a lot to collect. Oppositely, the foremost advantage of using secondary data obviously is the enormous saving in time and money. However, one of the main problems is that these data are collected for another study with different research objectives and they may not completely fit the researcher’s problem.

Since different sources of data have their strengths, none of them can fully capture the complexities of a research, the researcher in this research decides to collect and analyse data from diverse sources.

Therefore, this research begins with making up the literature review using secondary data. This gives the researcher detailed background information on the subject area. Then the researcher identifies the research question and develops a research method which seeks to collect qualitative data through focus group and quantitative data through survey on the areas of public libraries in order to support the theory and for further research. The collected data will then be tested and analyzed for the research findings.
5.10 Focus Group

Focus group is a type of research method that the researcher can get together with several respondents at the same time and initiate a discussion on a certain topic. This method is considered a relatively cheap and convenient way of gathering information from several respondents in a short time (Ghauri and Gronhaug, 2005). Focus group means a small group of people interacting with each other to seek information on a small (focused) number of issues (Stewart and Shamdasani, 1990; Bryman and Bell, 2003).

The advantages of focus group are that firstly, it is quick, flexible and inexpensive method of data collection. Secondly, it produces very rich and in-depth data expressed in respondents’ own words and reactions which is normally difficult to obtain through quantitative method. The disadvantages are that this type of data collection makes it very difficult to summarize and categorize the information gathered. Also, the responses of the group members might be influenced by each other.

Focus groups are normally made up of people with certain common characteristics and similar levels of understanding of a topic, rather than aiming for diversity (Litosellite, 2003). It is because people tend to express personal views and disclose more to those whom they perceive as similar to them in certain ways, than to those who differ from them (Morgan, 1988; O’Brien, 1993; Kruegar, 1994).

Ghauri and Gronhaug (2005) claimed that focus group should include a small number of individuals, normally from six to around ten people who discuss a particular topic under the direction of a moderator and keep the discussion on track. The discussion may last from half an hour to around two hours.

Focus Group Method

In this study, six focus groups are arranged. Each group targets to contain eight participants. Public library users who have experiences in using library technology would be identified and invited to participate in the study. The researcher arranges a time and place convenient to all participants and conducts a focus group discussion. In the beginning of this
discussion, a cover letter explaining the purpose of the discussion and a statement guaranteeing the confidentiality of respondents will be given. It is expected that the discussion will be approximately one and a half hours in length. For other follow-up action, the researcher will contact the participants via various methods such as e-mail, telephone, fax or a formal visit if needed. After the discussion, the researcher will send an acknowledge e-mail letter to all participants to thank them for their participation in return. A copy of the report summary will be forwarded to those participants who requested it.

According to Stewart and Shamdosani (1990) (Figure 5-3), there are eight steps involved in conducting a focus group:

Figure 5-3 – Steps in Conducting a Focus Group (1990)
All questions in the focus group are open-ended questions which are the most distinctive feature of focus group interview. Open-ended questions allow the respondents to determine the direction of the response.

According to Krueger (1998), there are five categories of questions. They are opening questions, introductory questions, transition questions, key questions and ending questions. Different types of questions are used at different times during the focus group and each type of question has a distinct purpose. The level of importance influences the amount of time spent on the question as well as the intensity of the analysis.

Below is a table which shows the purpose of each type of question.

<table>
<thead>
<tr>
<th>Question type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>Participants get acquainted and feel connected</td>
</tr>
<tr>
<td>Introductory</td>
<td>Begins discussion of topic</td>
</tr>
<tr>
<td>Transition</td>
<td>Moves smoothly and seamlessly into key questions</td>
</tr>
<tr>
<td>Key</td>
<td>Obtains insight on area of central concern in the study</td>
</tr>
<tr>
<td>Ending</td>
<td>Helps researchers determine where to place emphasis and brings closure to the discussion</td>
</tr>
</tbody>
</table>

The researcher in this study follows Krueger's (1998) suggestions. Twelve questions will be asked in the focus group and they are divided into the above five categories.

<table>
<thead>
<tr>
<th>No.</th>
<th>Question type</th>
<th>Question</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Opening</td>
<td>Question about background information (eg. age, education level, experience)</td>
<td>5 min</td>
</tr>
<tr>
<td>2</td>
<td>Introduction</td>
<td>Could you please describe the library technology that you know?</td>
<td>5 min</td>
</tr>
<tr>
<td>3</td>
<td>Transition</td>
<td>Do you use any of these library technologies?</td>
<td>2 min</td>
</tr>
<tr>
<td>4</td>
<td>Transition</td>
<td>Think back to the past several years. Could you identify any changes about the library technology in Hong Kong?</td>
<td>5 min</td>
</tr>
<tr>
<td>5</td>
<td>Transition</td>
<td>How do users perceive library technological services compared to traditional services?</td>
<td>5 min</td>
</tr>
<tr>
<td>6</td>
<td>Key</td>
<td>Could you tell me the factors that make you use the library technology?</td>
<td>15 min</td>
</tr>
<tr>
<td>7</td>
<td>Key</td>
<td>Could you tell me factors that affect one to adopt and use library technology as an individual?</td>
<td>13 min</td>
</tr>
<tr>
<td>8</td>
<td>Key</td>
<td>Could you tell me about the users' attitude and behaviour toward using library technology?</td>
<td>10 min</td>
</tr>
<tr>
<td>9</td>
<td>Key</td>
<td>What kind of strategies the library should use to change users attitude towards using library technology?</td>
<td>15 min</td>
</tr>
<tr>
<td>10</td>
<td>Key</td>
<td>What the library can do to help the individuals to accelerate the adoption of library technology?</td>
<td>10 min</td>
</tr>
<tr>
<td>No.</td>
<td>Question type</td>
<td>Question</td>
<td>Time</td>
</tr>
<tr>
<td>-----</td>
<td>--------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>11</td>
<td>Key</td>
<td>Which of those mentioned is most influential?</td>
<td>5 min</td>
</tr>
<tr>
<td>12</td>
<td>Ending</td>
<td>The public libraries are trying to adopt and motivate the users to use library technology. What advice do you have for this?</td>
<td>10 min</td>
</tr>
</tbody>
</table>

### 5.11 Piloting (Focus Group)

A pilot test is conducted before the discussion starts. This pilot testing is done with people who meet the specifications for being in the focus group. Therefore, two of the potential participants will be invited to respond to and comment on the questions draft for the focus group. Due to the result of the pilot test, the researcher can find out whether the words flow smoothly and are conversational or not. That is, this process fine tunes the data-gathering methods and heightens the researcher’s theoretical sensitivity towards the phenomenon of integration. Theoretical sensitivity refers to the attribute of having insight, the ability to give the meaning of data, the capacity to understand, and capability to separate the pertinent from that which is not (Strauss and Corbin, 1990).

Participants in the pilot test suggested that the opening question about respondents’ background information is too sensitive as people may not want to share their personal particulars such as age and education level in a focus group discussion. It is suggested that respondents should answer this type of questions in terms of filling in a separate personal particular form. By doing this, the researcher could save time and avoid respondents from feeling embarrassed.

Participants also found that question one should be replaced by question four. It is because asking respondents to identify changes about library technology in Hong Kong can stimulate participants’ mind. This makes them easier to start a discussion and continue to answer further questions. The final version of the focus group questions are shown in Appendix A and with the registration form shown in Appendix B.
5.12 Survey

Surveys, normally concerned with the administration of questionnaires, offer an opportunity to collect large quantities of data of evidence in a quick and convenient manner (Oppenheim, 2001). According to Ghauri and Gronhaug (2005), survey is an effective tool to get opinions, attitudes and descriptions as well as for getting cause-and-effect relationships. Moreover, it is among the most popular data collection methods used in business studies.

Since this study is targeted to all public library users of technological use, a survey method is considered appropriate. Through surveys, data is collected from a substantial group of people who represent a population or a random sample of a population.

Survey is considered suitable for this study for two reasons. Firstly, survey is appropriate because respondents could not be easily assigned to control and treatment groups on a prior arrangement basis. Secondly, it is suitable because the variables of interest are difficult for the researcher to manipulate (Emory and Cooper, 1991). Hakanson and Snehota (1997) argue that survey is the key to establishing informant reports. This method is therefore an appropriate method to test hypotheses and measure many variables, including multiple indicators.

Neuman (2003) claims that survey is very beneficial in producing information that is inherently statistical in nature. It is usually designed with the objective of measuring awareness, knowledge, behaviour and opinions (Zikmund, 2003; Malhotra, 1993). It can be a powerful and effective tool for collecting data on human attitudes, behaviour and characteristics. A survey is made when a sample of elements is selected to represent the investigated population. Sometimes it is the only available option for acquiring information to examine research questions. However, a survey may not be the best approach for every study, as it requires a familiarity with the basic principles and methods of statistical analysis for large survey data sets (Doyle, 2003).

Also, survey method is an important technique in technology acceptance research. The ability to get quick feedback from the actual users’ point of view is invaluable. Having this
information can give insight to the appropriate knowledge needed for successful innovation implementation. During innovation testing, surveys can provide information on user preference, user satisfaction and perceptions on design (Kuter & Yilmaz, 2001).

5.13 Questionnaire

deVaus (2002) explains a questionnaire as a general term to include all techniques of data collection in which each person is asked to respond to the same set of questions in a predetermined order.

Saunders (2003) claims that questionnaire is one of the most widely used survey data collection techniques. Each respondent is asked to respond to the same set of questions, it provides an efficient way of collecting responses from a large sample prior to quantitative analysis.

The development of the survey research instrument and the approach for analysing the collected data is described in the following sections.

5.14 Instrument Development

Overview

The research instrument developed for this quantitative part of the research is self-administered questionnaire. Self-administrated questionnaire is data collection technique in which each respondent reads and answers the same set of questions in a predetermined order without an interviewer being present (Saunders, 2003).

This method is chosen to minimise potential interviewer bias. The disadvantages of this approach are the predominantly low response rates and the consequent biases (Oppenheim, 2001).

In order to avoid potential low responses rate, delivery and collection of the questionnaire is used, that is, the questionnaire is delivered to each respondent. Each respondent reads
and answers the same set of questions in a predetermined order without an interviewer being present before the completed questionnaire is collected (Saunders, 2003).

Since most studies shown in the literature review used a questionnaire approach, the question items for each construct in the model are developed from previous studies referenced in the literature review.

The questionnaire consists of three parts:

Part 1 – Introduction
Part 2 – Factual questions related to demographics of the respondents such as age
Part 3 – Attitude questions relating to technology acceptance in library technology

Below is the explanation of each section of the questionnaire.

**Part 1 - Introduction section**

The purpose of the study and confidentiality of the data gathered are explained in the cover letter on the first page of the questionnaire. Participants are instructed that the study is conducted to explore their perceptions and use of library technologies and the participation was voluntary. The researcher attempts to gain the confidence of the recipient and increase the response rate by giving assurance of anonymity and by expressing the potential for the findings to be used to improve library services in Hong Kong (Hussey and Hussey, 1997).

Moreover, the introduction section is used to explain what is meant by library technology, examples of the types of library technological services are also given to them. Respondents are alerted that they could withdraw from the study at any time and that they must be Hong Kong Public Library users. They are also provided with the e-mail address for contacting the researcher to make inquiries or to obtain the results of the study.

For those participants who prefer to complete the questionnaire at home, the researcher in the study will send the questionnaire to them via e-mail. These participants’ e-mail address will also be kept private and confidential.
Part 2 – Factual questions

In the beginning of this section, respondents are asked to provide demographic information such as age and gender. The remaining questions are asked if the respondents had used any of the library technologies provided by the Hong Kong Public Libraries. Descriptions of library technologies will be given and the website of Hong Kong Public Libraries will be provided. Those who had experience using the public libraries will be asked if they have previously used any of the library technologies. Only respondents who report that they had used the library technologies are asked to answer the following question items measuring the constructs in the research model.

Part 3 – Attitude questions

The questionnaire is planned to include around 60 items asking respondents to rate the importance of the ITAMLT factors. On average it takes respondents around 10 minutes to finish it.

In order to enhance validity, the measures for the constructs in the research model are mostly adapted from those validated in prior studies with minor wording changes made to incorporate the context of library technologies (Table 5). Following Churchill’s (1979) recommendation, multiple measurement items are used for each construct.

A seven-point Likert scale is developed by the researcher to measure the user training construct. Respondents are asked whether they think it is important to them to receive user training on how to use library technology in order to use those technologies effectively. Respondents are asked to rate how strongly they agree or disagree using the scale ranging from strongly disagree (1) to strongly agree (7). The measure for accessibility is adapted from Culnan (1984), two items are adapted from Culnan’s eight-item scale measuring accessibility. The measure is rated on a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7). The measure of intention is adopted from Agarwal and Karahanna (2000) and Chau and Hu (2001). Respondents are asked whether they intend to continue using library technologies in the future and whether they intend to use the library technologies as often as they needed. The measure is rated on seven-point Likert scale. The measures of subjective norm and perceived behavioural control are adopted from Ajzen
(1991), the measure is also rated on seven-point Likert Scale.

Measures for other constructs including perceived usefulness and perceived ease of use are rated on a seven-point Likert scales ranging from strongly disagree (1) to strongly agree (7). These measures are adopted from those validated by Venkatesh and Davis (2000). Each question represents a component of the research model. The questions are selected for their theoretical importance and potential relevance to practice.

All question items for the constructs in the research model are mixed together in order to minimize potential biases due to response consistency (Davis and Venkatesh, 1995). Appendix C shows the proposed instruments of the questionnaire and the final version of questionnaire will be provided in Appendix D after the conduction of the survey pilot test.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>Adapted from</th>
</tr>
</thead>
</table>
| Relevance   | 1. The resources of the library website and online databases relate well to what I want.  
2. The library website and online databases have enough resources for my search.  
3. The quality of output I get from online databases is high.  
4. The results shown in the online public access catalogue (OPAC) and online databases are relevant to my study/work. | Davis et al.,1989 |
| Reliability | 1. System stability is an important issue for me when I use library technology.  
2. Quick response of the library technological system is an important issue for me.  
3. Data security is an important issue for me when I use library technology.  
4. Privacy of information is an important issue for me when I use library technology. | Lapeczynski, 2004 |
| User Training | 1. It is important for the public libraries to provide user education sessions on the use of e-books and online databases.  
2. It is important for the public libraries to provide user training on technology use.  
3. It is important for the library to provide self-training materials such as user manuals and online help for users who use library technology. | Kim, 2005 |
<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>Adapted from</th>
</tr>
</thead>
</table>
| Accessibility           | 1. Library technology is highly accessible.  
2. My access to library technology is unrestricted.  
3. It is important for the library to provide additional channels such as website and telephone to access library services.                                                                                       | Culnan, 1984               |
| Level of navigation     | 1. It is essentials that the commands of different library technological systems are well depicted by buttons and symbols.  
2. It is essentials that the layout of the screens of library technological systems is clear and consistent.  
3. It is essentials that users can easily navigate through the menus on the library website.  
4. It is essentials that readers could easily read the information displayed on the library technological systems.                                                                                           | Hong et al., 2002          |
| Level of understanding of Terminology | 1. I understand most of the terms used throughout different systems of library technology.  
2. It is essentials that the use of terms is consistent throughout different library technologies.  
3. I understand different terms / words relating to library technology.                                                                                                                                  | Hong et al., 2002          |
| Perceived Usefulness    | 1. Library technology improves my effectiveness in searching information and using library services.  
2. Using library technology enables me to save time.  
3. I would find library technology useful.  
4. The library services nowadays (with library technology) are more convenient than traditional services.  
5. Using library technology would make it easier for me to do my work / study.                                                                                                                        | Venkatesh and Davis, 2000 |
| Perceived Ease of Use   | 1. I find library technology easy to use.  
2. Using library technology does not require a lot of mental effort.  
3. My interaction with library technology is clear and understandable.  
4. I find it easy to get the library technology to do what I want to do.                                                                                                                             | Venkatesh and Davis, 2000 |
| Subjective Norm         | 1. My friends think that I should use library technology.  
2. My family thinks that I should use library technology.  
3. People who influence my behaviour think that I should use library technology.                                                                                                                      | Ajzen, 1991                |
| Task-Technology Fit     | 1. All in all, library technology is satisfactory in meeting my needs.  
2. The technology provided by the library meet my needs adequately.                                                                                                                               | Thompson et al., 1991      |
| Perceived Behavioural Control | 1. At home, I have the resources necessary to access to library website.  
2. I feel comfortable using library technology on my own.  
3. I feel confident about my knowledge and ability to use different library technologies.                                                                                                          | Ajzen, 1991                |
In order to provide thanks for users' participation, three HK$100 dollars supermarket gift certificates will be publicized as an incentive. The respondents will be asked to write down their name and address at the end of the questionnaire if they are willing to enter the random draw for the gift coupons. The winners of the lucky draw will be informed and given the gift certificates.

5.15 Population and sampling

The study population

Population refers to the entire group of people that the researcher wishes to investigate (Sekaran, 2003). Therefore, the population for this study will be public library users in Hong Kong. According to the CIA world factbook (2006), the estimated population of Hong Kong was 6,940,432 at the end of July 2006, within that, more than 3 million of them (HKPL, 2006) are registered borrowers of the Hong Kong Public Libraries. Therefore, the population for this study will be these 3 million registered borrowers and other walk-in users.

Sampling design

According to Sekaran (2003), a study of a sample rather than the entire population can sometimes produce more reliable results. There are two major types of sampling design: probability and non-probability. While non-probability sampling refers to a selection of sampling techniques in which the chance or probability of each case being selected is not known (Saunders, 2003). Therefore, the findings from the study of the sample cannot be confidently generalized to the population (Sekaran, 2003). Also, this method does not allow for statistical inferences about the population, it is not appropriate in this study.

While probability sampling is a selection of sampling techniques in which the chance or
probability of each case being selected from the population is known. That is, the possibility of each representative sample in the population being selected is equal for all in the population. Since this type of sampling allows wider generalization, it is suitable in this study.

**Sample frame**

In most studies, a sample frame is required during the sample selection. A sample frame is a list of members of the population from which the actual sample is drawn (Ghauri and Gronhaug, 2005). The more complete and accurate the sample frame, the better the sample will represent the population as a whole. (Alreck and Settle, 2004). Since the list of the total population in this study is not known and the use of systematic sampling method may not need a sample frame, sample frame is not used in this study.

**Sample size**

The necessary sample size is estimated based on the final number of independent variables. According to the recommendations of Hair et al. (1998), the sample should be 15-20 per variable for generalizability purposes. It is assumed that there are 15 variables in the revised model. For power calculations and to detect significant differences in $R^2$ with a power level of 0.8, the sample size should be greater than 100. The minimum level of $R^2$ value that can be detected is 15%. Following to the suggestions of Hair et al. (1998), the change in the $R^2$ value can be reduced to 0.05 by increasing the sample size to 370. Hair et al. (1998) also suggest that a large sample size makes the significance test sensitive and yields significant relationships with low $R^2$. Therefore, a minimum sample size targeted in this study is 370. Respondents will be required to finish a ten-minute questionnaire. The research will deliver 800 questionnaires and is targeted to have at least a 50% response rate.

**Sampling method**

In the questionnaire stage, public library users are selected randomly. The sampling process is taken place at the Hong Kong Central Library and two major libraries located in different
districts, which are the City Hall Public Library and the Tsuen Wan Public Library. It is assumed that no difference exists between the users in the three libraries as they provide similar services. The purpose of using three libraries in different districts is to reinforce the external validity of the study. All these libraries provide full library services with different library technologies such as self-check terminals and online databases. User training is also available in these libraries. The choice of libraries for sampling purposes (the three selected samples in this study) is based on the size and the availability of the contact person within the library to facilitate the process of data collection.

Sekaran (2003) claimed that probability sampling can be either simple random sampling (unrestricted) or complex random sampling (restricted). This study will use systematic random sampling (taken on intervals) of the users entering the selected libraries in a two-week period of time. Systematic sampling is one of the most common complex probability sampling designs. It involves researchers to select the sample at regular intervals from the sampling frame. This type of sampling works equally well with a small and large number of cases (Saunders, 2003). According to Ghauri and Gronhaug (2005), systematic random sampling is simple and a sample frame is not always needed. This method can therefore be used to interview a sample of persons passing by a corner during a particular day. The units in the sample will be spread evenly over the ordered population. Sometimes this will increase precision.

5.16 Piloting (Questionnaire)

Similar to the qualitative approach in stage one, a pilot study will be carried out in order to find out if the questionnaire needs further revision or not. Necessary changes will be made to the final instrument based on the results of the pilot test. Therefore, the main survey is implemented using the questionnaire modified from the pilot test.

-Phase 1

A small focus group which involves public library users is arranged. A proposed questionnaire is circulated to respondents in the focus group. The respondents are required to complete the questionnaire in advance and then comment on it during the focus group discussion. The
The following important points were raised:

- Clearer explanation was needed in the beginning of the questionnaire in order to explain the purpose of the research.

- Different types of library technology were needed to be explained in details.

- The question on profession was felt to be quite personal and it was not necessary in this study. Therefore this question was deleted.

- Reverse questions were removed as they caused confusion.

- The participants felt there were too many questions in the questionnaire and it took far more than 10 minutes to finish it. Also, some questions were felt to be too similar. As a result, the researcher reduced the total numbers of statement from 65 to 49.

- It was suggested that instead of mixing the statements together, the statements should be grouped into different sections with different sub-headings in order to avoid confusion.

- It was suggested that a Chinese version questionnaire was needed since some respondents prefer to look at English and some prefer to look at Chinese. Therefore, it would be nice if both versions were available for participants to choose.

The questionnaire was revised after the focus group discussion in Phase 1. Also, the questionnaire was reviewed and translated by two translators. After translation, the Chinese version was reviewed for differences between the translations (just minor differences were found). The Chinese version was then passed to another two translators to back translate the Chinese version to English language version (Brislin, 1976). At the end, the two English versions (the initial one and the back-translated one) were reviewed for consistency. The versions contained non-significant differences suggesting that the translation of the instrument was acceptable.

All in all, the focus group was beneficial since it helped to remove those questions which were unnecessary to be included in the questionnaire. All participants felt the topic is interesting and
they would like to have a copy of the research result. Moreover, they suggested that the public libraries in Hong Kong should carry out more similar research studies in order to understand more about library users' perceptions.

-Phase 2

In this phase of the study, 37 questionnaires are distributed to public library users. The respondents are requested to complete the questionnaires. Delivery and collection questionnaire technique is used in order to ensure high response rate in the pilot test.

The convenience of the pilot sample is important as the purpose of the pilot testing is the readability of the instrument and the flow of the questions. The results of a pilot test can indicate that the instrument flows well and does not include any mistakes or confusing items.

Cronbach's Alpha is used to calculate for each of the factors in the pilot test of the revised model. Cronbach's Coefficient Alpha is a measurement of reliability (UCLA, 2006). It measures how well a set of items (or variables) measures a single one-dimensional latent construct. If the inter-item correlations of the questions on one construct are high, then there is evidence that the items are measuring the same underlying construct. Two reasons that may cause low value for Cronbach's Alpha are the wording of the test items, or the ordering of the items. An advantage of using Cronbach's Alpha for this research is that this procedure tests the internal consistency of the test items. The measurement can be determined from a single administration of a single form of the test. A typical example in which the use of Cronbach's Alpha would be appropriate is that of estimating the internal consistency reliability of an attitude scale. Therefore, the items being measured would be Likert scale. The number for Cronbach's Alpha of .70 or higher is considered acceptable in most research situations (Nunally, 1978; Pallant, 2005).

Details of the pilot test are shown as follow:

Pilot study summary

The instrument was pilot tested to evaluate the psychometric properties of the measures. 48
public library users participated in the pilot test. All respondents reported that they had experienced with at least one type of the library technology.

In the pilot test, 43.8 percent were male and 56.3 percent were female. Most respondents (70.8%) were from the age group 16-34, 20.8% of them between 35-54 and 8.3% were 55 or above. Nearly all of them (97.9%) had secondary education level or higher. 87.5% of the respondents reported that they use Hong Kong Public Library services at least once a month. All of them had experienced with at least one type of library technology. Within that, library website, online public access catalogue (OPAC) and self-charging terminals were the most popular means of library technology. Descriptive statistics of the respondents of the pilot test are presented in Table 5-2.

Table 5-2 – Descriptive Statistics of the Respondents of the Pilot Test

<table>
<thead>
<tr>
<th>Respondent Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>43.8%</td>
</tr>
<tr>
<td>Female</td>
<td>27</td>
<td>56.3%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-34 years</td>
<td>34</td>
<td>70.8%</td>
</tr>
<tr>
<td>35-54 years</td>
<td>10</td>
<td>20.8%</td>
</tr>
<tr>
<td>55 or above</td>
<td>4</td>
<td>8.3%</td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>1</td>
<td>2.1%</td>
</tr>
<tr>
<td>Secondary</td>
<td>30</td>
<td>62.5%</td>
</tr>
<tr>
<td>Post-Secondary</td>
<td>3</td>
<td>6.3%</td>
</tr>
<tr>
<td>Degree</td>
<td>12</td>
<td>25%</td>
</tr>
<tr>
<td>Master or above</td>
<td>2</td>
<td>4.2%</td>
</tr>
<tr>
<td><strong>Frequency of using Library Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>6</td>
<td>12.5%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>17</td>
<td>35.4%</td>
</tr>
<tr>
<td>Frequently</td>
<td>20</td>
<td>41.7%</td>
</tr>
<tr>
<td>Always</td>
<td>5</td>
<td>10.4%</td>
</tr>
<tr>
<td><strong>Types of Library Technology Used (Multiple Options)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Databases</td>
<td>21</td>
<td>43.8%</td>
</tr>
<tr>
<td>Self-charging</td>
<td>37</td>
<td>77.1%</td>
</tr>
<tr>
<td>OPAC</td>
<td>39</td>
<td>83.1%</td>
</tr>
<tr>
<td>Library websites</td>
<td>42</td>
<td>87.5%</td>
</tr>
<tr>
<td>MMIS</td>
<td>28</td>
<td>58.3%</td>
</tr>
<tr>
<td>SmartID</td>
<td>4</td>
<td>8.3%</td>
</tr>
<tr>
<td><strong>Frequency of using Library Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>9</td>
<td>18.8%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>21</td>
<td>43.8%</td>
</tr>
<tr>
<td>Frequently</td>
<td>16</td>
<td>33.3%</td>
</tr>
<tr>
<td>Always</td>
<td>2</td>
<td>4.2%</td>
</tr>
<tr>
<td><strong>Home access to library website for library services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>43</td>
<td>89.6%</td>
</tr>
</tbody>
</table>
Cronbach's Alpha is used to calculate for each of the factors in the pilot test of the revised model. Cronbach’s Coefficient Alpha is a measurement of reliability (UCLA, 2006). It measures how well a set of items (or variables) measures a single one-dimensional latent construct. If the inter-item correlations of the questions on one construct are high, then there is evidence that the items are measuring the same underlying construct. Two reasons that may cause low value for Cronbach’s Alpha are the wording of the test items, or the ordering of the items. An advantage of using Cronbach’s Alpha for this research is that this procedure tests the internal consistency of the test items. The measurement can be determined from a single administration of a single form of the test. A typical example in which the use of Cronbach’s Alpha would be appropriate is that of estimating the internal consistency reliability of an attitude scale. Therefore, the items being measured would be Likert scale. Such is the case with this research where the researcher uses Cronbach’s Alpha to test the reliability of the survey instrument. The number for Cronbach’s Alpha of 0.7 or higher is considered acceptable in some research situations (Nunally, 1978; Pallant, 2005) whereas others consider 0.8. The researcher in this study uses 0.7 which is suggested by Nunally (1978) and Pallant (2005) as a compromise value to take as the benchmark. Fourteen factors use multiple questions as their basis were tested for reliability. The following table presents the reliability measures for the thirteen constructs.

Table 5-3 – Reliability of Measures in the Pilot Test

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>0.894</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.831</td>
</tr>
<tr>
<td>User Training</td>
<td>0.735</td>
</tr>
<tr>
<td>Accessibility</td>
<td>0.787</td>
</tr>
<tr>
<td>Level of navigation</td>
<td>0.930</td>
</tr>
<tr>
<td>Level of understanding of</td>
<td>0.842</td>
</tr>
<tr>
<td>Terminology</td>
<td></td>
</tr>
<tr>
<td>Knowledge of Search Domain</td>
<td>0.874</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>0.861</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>0.891</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>0.965</td>
</tr>
<tr>
<td>Task-Technology Fit</td>
<td>0.899</td>
</tr>
<tr>
<td>Perceived Behavioural Control</td>
<td>0.929</td>
</tr>
<tr>
<td>Intention to Use</td>
<td>0.917</td>
</tr>
</tbody>
</table>

Source: This Study

Table 5-3 shows that all measures demonstrated adequately reliability with Cronbach’s alpha coefficients ranging from 0.735 to 0.965 which are all acceptable value. The
measurement items used in the pilot test are presented in Appendix C.

Apart from reliability, the questionnaire also achieves validity by using statements that replicate previous technology acceptance research. That is, the revised promotes the use of questions for constructs that are previously used in other technology acceptance models. Moreover, it should be noted that the questionnaire was reviewed by several library users in a focus group who determined the appropriateness of the questions. None of the responses collected in the pilot test will be used in the final analysis.

5.17 Data Analysis

In this study, analysis of data is an ongoing process. It is advised that in qualitative research, interweaving data collection and data analysis right from the first focus group is the best policy (Miles and Huberman, 1994). This allows theory to develop alongside the growing volume of data, allowing the research problem to be formulated or even reformulated at the same time. Therefore, the researcher conducts another focus group after the data collected through the first one has been analysed.

When accepting the data, the researcher uses the traditional analysis of texts to analyze the collected data. That is, the evidence has to be read, re-read, and such themes or concepts have to be catalogued. (Remenyi, 1998)

The researcher first constructs a simple narrative of each focus group. This is important since the researcher is attempting to develop explanations and track a phenomenon over time.

The researcher then comes to a sifting process, coding. The researcher codes the data so that they can be broken down, accepting, put together and presented in an understandable manner.

Coding procedures, memo writing and diagramming are used as data analysis strategies. Facts or incidents obtained from focus groups are coded in a systematic way. Memos are written as records of analysis and diagrams are developed as visual representations of the
relationships between concepts. Code notes, memos and diagrams become progressively more detailed and sophisticated as the analysis moves through coding.

Computer-assisted qualitative data analysis software (CAQDSA), Nvivo, is used to help in this coding process. Nvivo is one of the CAQDSA which encourages an exploratory approach to analysis. The software program is particularly useful in rendering data analysis in a more systematic way. (Gibbs, 2002)

The researcher then cluster identifies categories according to common characteristics into meaningful groups. Other techniques such as matrices and pattern matching are also applied in this research. Matrices are the processes of explaining the interrelationship between identified factors while pattern matching involves comparison between a predicted and empirically based pattern. Then the final Integrated Technology Acceptance Model for Library Technology (ITAMLT) is constructed.

Throughout the data analysis process, the participants in the research may be involved in verifying the data.

In the second part of this study where questionnaire is conducted, the researcher first uses descriptive statistics to summarize the demographic variables of respondents and to provide a guide for multivariate analysis (Sekaran, 1992). This data is organized in an effective and meaningful manner.

The researcher utilizes a multi-step approach to test for the effects and relationships hypothesized in this study. Therefore, the following statistical procedures are performed on factors in the ITAMLT.

Frequency distributions are constructed for the questions that define the factors in the model. The percentage of agreement with the individual questions which helps to determine factors that are important for a typical respondent. Two way frequencies, also known as cross tabs, give the percentages of an answer to a particular question broken down by sub-groups. For example, respondents who answer “strongly agree” to a particular question are further broken down into frequent and non-frequent users of library technology.
Correlation statistics analysis is used in this research. Correlation statistics analysis is often used to describe the relationship between two or more variables. Karl Pearson (1857-1936) derived a measure of relationship called the product-moment coefficient of correlation within a range in value from -1 to +1 (Glass & Hopkins, 1995). The absolute value of the Pearson correlation coefficient tells one the strength of the linear relationship. If the sign of the coefficient is positive, the values of the two variables increase together. If the sign of the coefficients is negative, as the value of one variable increase, the value of the other decrease.

This research uses two types of correlation statistics (Cohen, 1975).

1. Bivariate statistics – the linear correlation coefficient measures the degree of the linear relationship between two variables.

2. Multivariate statistics – allows the researcher to describe and explore the relationship among three or more variables. This research will look at part correlation. Reported along with the regression coefficients part correlation defines the contribution of each independent to the r-squared. In this research the part correlation is used to calculate the percent contribution of each independent variable in the multiple regression analysis. The higher the percentage the more important is the relationship between the independent variable and the dependent variable. Also, when these percentages are accepted for the regression one can determine what percentage of the total relationship between the independent variables is due to co-linearity between the independent variables.

Analysis of variance (ANOVA) is also used in the data analysis. Analysis of variance is a procedure used for comparing sample means to see if there is sufficient evidence to infer that the means of the corresponding population distributions also differ (George and Mallery, 2005). One-way ANOVA is most easily explained by contrasting it with t tests. Whereas t tests compare only two distributions, ANOVA is able to compare many (George and Mallery, 2005). This method can also be used to test the null hypothesis that several independent population means are equal (Norusis, 2005). In this study, the researcher uses
ANOVA to determine whether there are significant differences existing between older people and younger people regarding to the use of library technology. Since age is dichotomous, Levene's test for equality of variances of $t$ test is also conducted. Moreover, the researcher also uses ANOVA F-test to examine whether the means of demographic groups on dependent variables differ significantly from each other.

According to Sekaran (1992), for quantitative method and scale data such as survey questionnaires, multiple and simple regressions can be used to evaluate the research model and the hypotheses associated with the research model. In this research, multiple regression analysis is used to estimate the coefficients of a linear equation. Multiple regression analysis is a multivariate technique that estimates the relationships between a dependent variable and multiple independent variables (Hair et al., 1998). The objective of the method is to explain the variance in the dependent variable using the values of the independent variable(s). The dependent variable in multiple regressions must be metric and only one dependent variable can be measured at a time.

Researchers aim at explaining the variance in the dependent variable when using multiple regressions. The process is based on two main purposes: maximizing the overall predictive power of the independent variables and to explain the relationship between the dependent and independent variables. Exploring the relative importance of each independent variable and the individual contribution of each variable in explaining the variance in the dependent variable are examples of such objectives. Also, the relationship between the independent variables themselves is an important issue that can be explored when performing multiple regressions. Several assumptions are considered when using multiple regressions: they are normality, linearity, homoscedasticity, multicollinearity and reliability. These assumptions will be discussed in details later in the data analysis chapter.

From the regressions the following information is reported in the analysis (Triola, 2004).

- **Standardized Coefficients** – The coefficients that are obtained and the outcome variables are standardized prior to the analysis. This makes them useful for comparing the size of the coefficient across variables. The size of the coefficient represents what a one unit increase in independent variable results in a corresponding coefficient value increase or decrease in the dependent variable.
T statistic and its associated probability – Each independent variable in a regression has its own standardized coefficient as was described above. A t-statistic and an associated probability which are calculated from the data. The t-statistic shows if the coefficient value happened by chance or is valid. As a rule of thumb, when the probability value associated with the t-statistic is less than 0.10 then one can accept the standardized coefficient value.

R square (coefficient of determination) – the proportion of variance in the dependent variable which can be predicted from the independent variable(s).

Computer-assisted quantitative statistical analysis software, SPSS 12.0, which is a well-known software for statistical analysis, is used to help in the process of quantitative analysis.

Reliability

Reliability is the degree to which data collection methods will yield consistent findings, similar observations would be made or conclusions reached by other researchers or there is transparency in how sense was made from the raw data. (Saunders, 2003)

In the qualitative aspect, this study secures reliability through the following tactics. Firstly, reliability is attained through the structured process of focus groups. Secondly, reliability is achieved through acceptance structured processes for recording, writing and interpreting data. Finally, the use of a pilot test to assist in revising focus group questions is another way that reliability can be achieved (Guba and Lincoln, 1994). Therefore, a test of reliability is applied to the first stage of this study.

The researcher also prepares research instruments such as survey guide, data recording sheets to guide analysis of focus groups discussions. Data recording sheets are designed to facilitate document analysis, so it is possible to address reliability issues regarding the consistency of those methods for recording data.
In the second stage of the study, the researcher also enhances reliability of the data collected of questionnaires by being rigorous on sampling, the design of questions, the structure of the questionnaires and the process of pilot testing which uses Cronbach’s alpha to test the reliability to test the scales.

Validity

Validity is the extent to which data collection methods accurately measure what they were intended to measure. (Saunders, 2003)

This research enhances validity by means of a triangulation. In 1978, Denzin (1978) applied the term triangulation in a book on sociological methods. The original term “triangulation” refers to a surveying process in which two points are used to determine the unknown distance to a third point. Denzin’s concepts of triangulation involved combining data sources to study the same social phenomenon. He divided triangulation into four basic types. They are data triangulation (the use of a variety of data sources in a study), investigator triangulation (the use of several different researchers), theory triangulation (the use of multiple perspectives to interpret the results of a study) and methodological triangulation (the use of multiple methods to study a research problem). Methodological triangulation is applied in this study.

Triangulation allows the research design to be put to the test, by ensuring that findings are not just a reflection of the methodology used (Bouchard, 1976). A researcher can benefit from the advantages of both approaches, counterbalancing the defects of one approach with the qualities of the other (Jick, 1979).

Ghauri and Gronhaug (2005) state that triangulation can improve accuracy of judgements and thereby results, by collecting data through different methods or even collecting data on the subject matter of the study. Triangulation is important because if several different sources of evidence all point to a certain interpretation of events or to certain key interactions or key facts, the quality of the data and the overall validity of the research is improved.
Moreover, focus group achieves construct validity through three tactics. Firstly, triangulation of focus group questions is established in the research design stage by two or more carefully worded questions that look at the subject matter from different angles. Secondly, the focus group method contains an inbuilt negative case analysis where, in each discussion and before the next, the technique explicitly requires that the researcher attempts to disprove emerging explanations interpreted in the data (Dick, 1990). Thirdly, the flexibility of the mode allows the researcher to re-evaluate and re-design both the content and process of the focus group program, thus establishing content validity.

The questionnaire also achieves face validity by having a pilot test which leads to changes to the questionnaire. Face validity is a measure of whether the instrument measures what it claims to measure (Sekaran, 2003).

5.18 Ethical Considerations

This research will follow the ethical research procedures of the ethics guidelines provided by the Ethics Committee of the University of Surrey

The informed consent of the following people will be obtained at the commencement of the study.

- The library management.
- The duty librarians where survey take place.
- The library users who take part in the focus groups.
- The library users chosen in the survey sample group.

The informed consent of other additional staff and library users will be sought at the time they are approached to participate in the study. All information pertaining to participants remains the property of the researcher and will not be used for any purpose except for execution of this study.

5.19 Summary
This chapter presents an overview of the selected methodology for this study. It includes an overview of the research design and a comprehensive discussion of the selected population and sample. Data collection processes and the statistical procedures which are used in data analysis are explained in detail. A summary of the pilot test of the questionnaire is also provided. The next chapter shows the results of the qualitative data and the analysis of the information received from the respondents.
Chapter Six

Analysis of Focus Groups

Background and purpose of the focus groups

It was decided to hold focus groups in order to extract some qualitative information from the library users taking part and to investigate whether participants felt that they shared similar problems and experiences. This would be an effective way to probe the problems they are facing, in particular to identify factors which leads to their intention to use library technology. Six focus groups were held between February and March in 2007. Each focus group contained five to seven participants, a facilitator and an assistant.

The purpose of the facilitator was to guide the discussion from question to question, probe and encourage discussion, and ensure that all participants contributed their views. The assistant mostly remained silent, recorded her impressions of the meeting and helped administratively such as scheduling participants.

The questions asked at the focus groups were compiled from the feedback from the focus group pilot test. They were informal sessions with refreshment held either at lunchtime or early evening. Each meetings last approximately one and a half hours. They were held in a quiet meeting corner in a club house, lunch or supper were provided for participants after each meeting. It is not entirely neutral territory, but it is away from an explicitly academic environment. Other venues were investigated, but the meeting corner in a club house is believed most suitable in accordance with the researcher’s expected budget. Also, the location is quiet and convenient. All conversation was recorded in a MP3 digital recorder. Each session followed the same structure with the identical questions being put to the group. At the beginning of each session all participants were encouraged to explain any recent use of Hong Kong public libraries.

For the first question participants were asked to identify any changes about the library technology in Hong Kong as well as any problems or frustrations experienced while using the library technology. These two actions helped to breakdown any reservations of the
participants and encouraged group interaction. For the most part the conversation followed
the structure intended, although at some points participants wandered off topic. They were
always led back to the broad topic under discussion, but if the point they were making was
relevant to another questions they were allowed to make some statements before being led
back. At the end of each meeting, participants were requested to fill in the focus group
registration form which contained personal details such as age and contact number for
necessary follow-up actions. This registration form is shown in Appendix B.

Qualitative data analysis started right from the first focus group. Then the researcher can
have a better concept on the data collected. Also, this allows theory to develop alongside
the growing volume of data, allowing the revised research model to be formulated at the
same time. Therefore, the researcher conducts another focus group after the data collected
through the first one has been analysed. The qualitative data analysis process such as
coding and diagramming were carried out after each focus group. A final selection of
quotations which seemed to illustrate key issues was made in this chapter.

Participants

Focus group participants included library users throughout different Hong Kong major
public libraries were selected in order to ensure that different users served by the Hong
Kong library services were represented. The focus groups were comprised of users from
different age groups and different levels of involvement. The user segments are described
as below:

- Users aged 16 – 34 who frequently uses library technology (Heavy Users).
- Users aged 16 – 34 who seldom uses library technology (Non-heavy Users).
- Users aged 35 – 54 who frequently uses library technology (Heavy Users).
- Users aged 35 – 54 who seldom uses library technology (Non-Heavy Users).
- Users aged 55 or above who frequently uses library technology (Heavy Users).
- Users aged 55 or above who seldom uses library technology (Non-Heavy Users).

The assistant of these focus groups helps to organize focus groups in order to ensure that
the composition of each group represents a user segment based on their age groups and
their level of involvement in library technology.
Details of the Focus Group Sessions

Six focus groups were conducted in this study, details as outlined below:

<table>
<thead>
<tr>
<th>Group</th>
<th>User age group</th>
<th>User type</th>
<th>No. of participants</th>
<th>Session Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>16 – 34</td>
<td>Heavy</td>
<td>5</td>
<td>10 February 2007</td>
</tr>
<tr>
<td>B</td>
<td>16 – 34</td>
<td>Non-heavy</td>
<td>7</td>
<td>21 February 2007</td>
</tr>
<tr>
<td>C</td>
<td>35 – 54</td>
<td>Heavy</td>
<td>6</td>
<td>28 February 2007</td>
</tr>
<tr>
<td>D</td>
<td>35 – 54</td>
<td>Non-heavy</td>
<td>6</td>
<td>1 March 2007</td>
</tr>
<tr>
<td>E</td>
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<td>F</td>
<td>55 or above</td>
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The following questions were posed in the focus groups.

**Q1. Think back to the past several years. Could you identify any changes about the library technology in Hong Kong?**

This is an opening question which tries to get participants to talk. The intent of this question is to make participants think after they have heard responses from others.

**Q2. Could you please describe the recent library technology that you know?**

This question introduces the general topic of the discussion and provides participants with an opportunity to reflect on experiences and their connection with the overall topic.

**Q3. Do you use any of these library technologies?**

This question helps to move the conversation toward the key questions.

**Q4. How do users perceive library technological services compared to traditional services?**

This question helps participants envisage the topic in a broader scope. It asks participants to go into more depth about their experiences of using library technology.
Q5. Could you tell me the factors that make you to use the library technology?

FOLLOW UP:
Knowledge of search domain
Terminology
Accessibility
Reliability
Result demonstrability
Task-technology fit

Computer self-efficacy
Level of navigation
User training
Relevance
Subjective Norm
Perceived Behavioural Control

This question is a key one of the meeting and was asked as a direct result of the preliminary findings of the study, this led the researcher to identify the factors that affect user acceptance of library technology.

Q6. Could you tell me factors that affect one to adopt and use of library technology as an individual?

This is another key question which leads participants to think of the factors that affect their use of technology as an individual.

Q7. Could you tell me about the users’ attitude and behaviour toward using library technology?

This question was asked primarily to balance question number five. It also helps the researcher to have a deeper understanding of users’ attitude.

Q8. What kind of strategies should the library use to change users attitude towards using library technology?

This is a key question the library would like to know. It was in direct response to the aim of the public library of encourage users’ acceptance of library technology.
Q9. What can the library do to help the individuals to accelerate the adoption of library technology?

This is another key question which tries to get more findings from participants by asking question number eight from a different angle.

Q10. Which of those mentioned is most influential?

This is a key question in order to know whether the most influential factor is different within different age groups.

Q11. The public libraries are trying to adopt and motivate the users to use library technology. What advice do you have for this?

This question enables participants to reflect on previous comments and brings closure to the discussion.

Findings

There were many common themes expressed across the focus groups. Different factors were identified in six focus groups. Many of them can be grouped into the constructs which are suggested in the proposed model. They are relevance, reliability, user training, accessibility, level of navigation, level of understanding terminology etc. These factors are mainly divided into two streams: perceived usefulness and perceived ease of use. Other factors such as subjective norm and perceived behavioral control, which can directly affect one to use the technology, were also mentioned in the focus groups.
Factors that affect users' intention to use library technology

Perceived Usefulness

Relevance

All groups mentioned that relevance is an element that makes the technology useful, which give them intention to use the technology. It is also reported that relevance is the most important factor of all.

"The most important part is that I can find the right information."

"...A database is useful just because they can find relevant information."

"I am not keen on using technology unless I can find the information that I need."

"If I can find the information effectively, I will try my best to learn how to use the system."

"It is unavoidable nowadays if you don’t know how to use the library online catalogue. It is the only way that you can find the right book."

"If there is no Wisenews, I am afraid I have to spend one week in the library searching for relevant articles."

Reliability

Five groups identified that reliability of the technological system is an important factor which affects their acceptance of a technology. Some participants mentioned that stability of a system is very important, while some believed that security is their major concerns.

A: "I spent an hour acceptance all the way from Tsuen Wan to Hong Kong Central Library in Causeway Bay to use an online database. And it just shows ‘Error message’ on the screen. What the hell is going on?"
B: “It happened to me, especially China Journal Net. I had been to the library twice last month and I couldn’t use it. At last I just gave up.”

“There was one time the librarian shows me how to use ‘WiseNews’. I thought it was very useful. I went there the next day and it told me system maintenance.”

“When I first use self-check terminals to check out library items, it seemed to me that the borrowing process is successful. However, when I left the library, the security system alarmed. I felt the system is not reliable and I did not use it afterwards.”

“I am really afraid that people can get my personal details from the computer system so that they can use my personal information to apply for credit card…”

“…I was checking my borrowers’ record the other time and the computer just hanged, I didn’t know whether the machine stuck in my personal page or not. I just waited until the reboot of computer finished before I left the library.”

User Training

All six groups believed that user training can affect users’ intention to use library technology. For participants aged 55 or above, they even believed they would not use any library technology if there was no user training.

“I’ll ask for help from duty librarian if I don’t know how to use it, it is always nice to have someone around and show you how it works”

“I had been to online databases user education sessions twice and found them useful.”

“It would be nice if the library can have more detailed descriptions on the databases that they are going to teach, instead of just the title. I remember there was once I spend an hour in the training session about a database which I do not use.”

A: “It is too complicated to read the user guides and I prefer to be taught by the librarian
who is keen on using it.”

B: “Me too. I believe if I just read the user guide, I’ll waste my time to read a lot of useless information. I believe I can get my answer straightly if I am directly taught by the librarian.”

“User guides may help, but I am afraid that I may miss something in it, it is always better to have someone for you to ask.”

“If I get direct training, I can always look at the screen and see how it works. It is impossible for me to figure out how it works if I have not seen it.”

“User training is the only way that I can get to use technology in the library.”

“If there are no user training sessions, I don’t think I know the library has subscribed e-book and other online databases.”

Perceived Ease of Use

Accessibility

This was identified as a factor in four of the groups. Participants found that accessibility was an important factor since they were not restricted in any location if there was remote access to library services. Moreover, they could use library services 24 hours a day. All participants aged 55 or above felt that accessibility was not a matter as they just used those technologies inside the library.

“I am a full time worker. I am not able to go to the public libraries during their opening hours. I am very pleased as the library services in Hong Kong are so systematic and highly accessible.”

“It is great that I can reserve and renew library materials through the library website so that I need not to waste all my time accepting in and out of the library.”
“It is so convenient that patrons can found information from the online databases at home via the library websites. Every night my daughter can listen to English stories from Naxos Spoken Word Library at home after she finished her homework.”

“It is incredible that all Hong Kong citizens can share the same source of information services provided by the Hong Kong Public Library services.”

However, some participants do not feel accessibility is important.

A: “I do not think accessibility is a matter as I am a frequent user of the library. I go there to read the newspapers every morning. If I need to renew library materials or find any information, I prefer to do it in the library.”

B: “I agree. I just want to take a rest when I am not in the library. I am not the person who will go online at home.”

C: “My son always occupies the PC, I’d rather not to fight with him. If I want to find information, I’ll go straight to the library and ask for assistance.”

Level of navigation

This factor was identified in four of the groups. Participants believed that clear and attractive screen design and display can attract their intention to use the technology.

“I prefer large screen device rather than small screen device. Clear and large screen display can attract me to use the system.”

“A bad design just pushes me off.”

“The new library website is much better than the old one. The grouping of resources in the previous library website is not logical to my way of thinking.”

A: “I believe screens of one system must have a consistence ‘look and feel’.”
B: “I agree. I had seen a system with totally different styles of design in different pages. It was absolutely ridiculous.”

A: “Proquest 5000 is one of the best designs. It is moderate in its use of fonts and colors. Moreover, it is visually consistent throughout the whole system.”

B: “I agree. I hate screen design with dark background colors, it never attracts my attention.”

“There should be a convenient way to visit related screens where the links are obvious intent to the destination.”

**Level of understanding of Terminology**

Two focus groups mentioned that understanding of terminology affects their intention to use the technology. A number of participants suggested that detailed descriptions or definitions should be provided by the library.

“There are so many terms in the databases that I don’t understand. I feel difficult to understand the terminology in different systems.”

“There was a time I wanted to search for information from one particular journal. There was one database use the word ‘source’ to stand for ‘journal name’. It took me a while to figure out what it is.”

“When I inserted the subject keyword ‘trainers’, I couldn’t find anything. Then I search for ‘sports shoes’, more than 400 items turned up.”

“Since different systems use different abbreviations, I think the library should simply make a list of those differences or give detailed descriptions to the users.”
Knowledge of search domain

Three groups mentioned that knowledge of search domain makes them feel easier to search through the databases or the library catalogue. They believed that search domain knowledge can help them to get more effective search.

"Domain knowledge can separate relevant information from the irrelevant, it makes me easier to find the information that I need."

"Sometimes I feel difficult if I just use the basic search function, I put a command in and it gave me more than 13,000 items of results, I just like swimming in the ocean and never get what I want."

"If I don’t know the search technique, I mostly find a lot of rubbish. I will end up keep pressing the ‘next page’ button until I give up."

"Before I just knew how to search through simple search interface and one day I had read a book on finding the right information, I found that I can get more relevant information by using advanced search."

"I remember one time I searched for information on football gambling in an online database. I would like to find information in Hong Kong, however, I ended up got thousands of articles and most of them were journal articles in mainland China or Taiwan, just small amount of information on Hong Kong. I found it difficult to search things through online databases."

However, there were a couple of participants who do not think search domain is important.

"I don’t know any search domain. I don’t like to remember these types of things. I’d better stick with simple search even though I know the search result would not be perfect."

"I never use advanced search, but I still feel satisfied with the information that I get in the system."
Subjective Norms

Group A and B which contains participants aged 16-34 identified subjective norms as a factor which affect their intention to use library technology. However, they also mentioned that though this factor affects them, but it is not important.

"If all my friends know how to use the technology and I don’t know. I’ll be ashamed of that.”

"I would like to be treated as an ‘in-fashion’ person instead of an old-fogey.”

"I think I can be easily affected by others, if my friends use it, I just follow them.”

"My friends can indirectly affect by my intention, but this is not the important factor which makes me use the technology.”

However, participants in the other four groups believed subjective norms is not an important factor to them.

"I don’t think I should follow anyone in terms of using technology.”

"...my friends’ preferences are their preferences only, whether they adopts technology or not is their own businesses. I don’t think it makes any differences to me.”

"I don’t know why some people have to use something just because other people are using it.”

A: “…adopting technology is a very personal matter. One uses technology just because they feel it is useful. It totally depends on an individual’s need…”

B: “Of course. Some people may like reading newspapers or books online, but I would rather look at printed copies.”
Perceived Behavioral Control

Three groups claimed that they use the library technology because they believe that technology can easily be handled. There is no problem for them to use different technology since the beginnings.

"I feel comfortable using technology. It just gives me so much fun and I feel much convenient when I am using it."

"I prefer typing and look at the screen rather than looking at printed materials."

"Information technology is my profession and I never have any problems of using technology."

"I am good at using technology. My company always requires me to try new systems."

"I am able to use technology in the library even if there is no one around to show me how to use it."

"I can easily adopt technology. I always use PDA, E-banking, online-payment, and I do online shopping such as buying books and cinema tickets. I think that technology is great."

"Some people believe technology is controlling us, but I believe that we should control technology."

However, the other three groups, including Group E and F (with participants aged 55 or above), felt they cannot handle technology easily. They just used it because there was no other choice.

"I don't think I can learn new things easily, especially technology. I start to know simple computer techniques in year 2001 just because I have to send e-mail to my grandson in America. Until now, it still takes me a long time to adopt new things."

"I always prefer to read hard copies. It is much more convenient to pick up printed
materials and read rather than login into the system.”

“System interfaces always change. I am not the type of person who can easily learn new things. I have to learn from the very beginning even though there are just minor changes in one interface.”

Therefore, the statement above shows that the factor, perceived behavioral control, can generally affect participant perception towards library technology.

Task Technology Fit

Three groups mentioned that if technology can meet their task, it is important for them to accept new technology.

“I am tired of standing in a long queue. I use shelf check terminals since the only purpose for me to go to the library is to borrow books.”

“I normally renew books either on the library website or through telephone renewal so that I no need to carry all the books to the library.”

“I make reservation through the library website. It is so easy that I just find the book in the system. Once I place the order, the library will deliver that said items to my pickup library. It saves me a lot of time.”

“Sometimes I use ‘Ask a librarian Service’ for reference enquiry through the website, I always get quick reply from them. It just like that I have really asked the librarian in the reference counter, but I am actually at home.”

Conclusion

The focus groups highlighted a number of factors affecting users’ intention to use the library technology. This result shows that the views of the participants are very close to the proposed research model. Those factors mentioned by the participants were all covered in
the proposed model. Just two factors, result demonstrability and computer self-efficacy, was not mentioned in a groups. It is suggested since using library technology in public libraries is voluntary and many people go to the public library for leisure use, result demonstrability of using library technology is not their main concern in this case. Also, it is believed that nowadays nearly all Hong Kong public library users have got certain knowledge of computer and related technology use, computer self-efficacy is nearly an insignificant factor. Therefore, these two constructs are to be deleted in the revised model.

Moreover, it is found that there was no difference between heavy and non-heavy users according to their attitudes towards the acceptance of library technology. Also, part of the participants felt accessibility, domain knowledge and subjective norms were not important to them. These will be investigated in the survey section and the researcher will try to find out whether these differences are different between ages. Mind maps of the focus groups findings are provided in Appendix E.
Chapter Seven

Data Analysis and Results

7.1 Introduction

The study examined the factors that influence user's acceptance of library technologies in Hong Kong and identified whether potential usage varies with age against some of the important variables.

This chapter reports the results of data analysis. The data collected was analyzed using descriptive statistics and the relationships among thirteen variables were identified by the Pearson product-moment correlation coefficient. Multiple regressions were utilized to predict the relationship between independent variables and dependent variables. Also ANOVA was conducted to test whether the acceptance of library technology varies with age. In this study, demographic findings are first presented, followed by hypothesis testing results. Data analysis examined the effects of different variables on the usage behaviour of library technology. Computer-assisted quantitative statistical analysis software, SPSS 12.0, was used to help in the process of analysis.

7.2 Data Collection

The questionnaires were given to 800 public libraries users and were collected during the period from 28 June 2007 to 12 July 2007. All respondents are those who have experienced using library technology that is provided at Hong Kong Public Libraries. The questionnaires were distributed in the main entrances of the Hong Kong Central Library and two major libraries, the City Hall Public Library and Tsuen Wan Public Library. The above libraries are located in different districts in Hong Kong where different types of library technology are provided. The users were approached in a random method by selecting one out of every eight users entering the library. The decision to complete the survey was voluntary. To encourage participation in the study, five HK$100 supermarket gift certificates were publicized as an incentive. 238 respondents entered in the random
draw for the gift certificates and five winners were rewarded the certificates.

Within 800 questionnaires, 486 were returned resulting in a response rate of 60.75%. Out of those questionnaires received, six responses could not be used due to missing demographic information and another 18 responses were deleted due to missing data, resulting in 462 usable responses.

**Exploratory factor analysis**

The purpose of using factor analysis in this study was to confirm item loadings and to check the validity of the measures used. The results of the analysis were used to develop a set of summated measures representing the thirteen variables used in the study. An additional purpose of factor analysis was to reduce some of the number of items measuring each variable. This research deleted one item that did not load significantly on its intended variable.

The sample used for factor analysis was 462 cases. Hair et al. (1998) recommends a ratio of 1-to-10 between the items to be factored and the number of cases used, with a minimum of 1-to-5. In this study, factor analysis was conducted on 43 items and the ratio of items to cases was 1-to-10.7.

Exploratory factor analysis (also called confirmatory factor analysis) with Varimax rotation and the scree test criterion is used to identify the number of factors to extract (Hair et al., 2006; Nunnally and Bernstein, 1994). The Varimax rotational method was used because direct un-rotated solutions are not sufficient. Also, in most cases rotation will improve interpretation by reducing the ambiguities accompanying initial analysis.

Preliminary analyses on the results indicated the overall suitability of factor analysis based on Barlett's test of Sphericity with a $X^2_{1275} = 20314.929$, $p<.001$. (Table 7-1). While the Kaiser-Meyer-Olkin measure of sampling adequacy was used to check for excessive correlations with a value equal to 0.961 (recommended value of KMO is greater than 0.5). This suggests the existence of correlations between variables.
In this study, preliminary analyses using Kaiser-Meyer-Olkin (KMO=0.961) and Barlett’s test of sphericity (significant at the 0.000 level) indicated the appropriateness of using factor analysis to the data. The criterion for the significance of factor loadings was set at 0.50 following the suggestion of Hair et al., (2006) for a sample size of 200.

Table 7-1 – KMO and Barlett’s Test

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</th>
<th>0.961</th>
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<tr>
<td>Barlett’s Test of Sphericity</td>
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<tr>
<td>Approx. Chi-Square</td>
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<td>Df</td>
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<td>Sig.</td>
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Source: This Study

One aspect of an exploratory factor analysis is the ability to limit the number of factors to be extracted. In this study, based on the proposed research model and literature review, thirteen factors were extracted. The analysis limited the number of factors to thirteen. As shown in the following table of total variance explained, the cumulative variance explained was 84.7%.

To estimate the item loadings on each factor, factor analysis was run to assess the validity of the constructs using varimax rotation and using only the items that load previously with value greater than 0.5 on their respective factors in order to achieve construct validity. Table 7-2 shows the factor loadings.

Factors extracted represented all the variables in the research model. Nearly all factors,
including perceived usefulness (PU), perceived ease of use (PEU), reliability (Relia), level of navigation (LN), relevance (Rele), subjective norm (SN), user training (UT), intention to use (IN), Level of understanding of terminology (T), knowledge of search domain (SD), accessibility (A) and task-technology fit (TTF) loaded as expected on unique factors with significant loadings, that is, loadings greater than 0.5 (Hair et al. (1998)).

To estimate the item loadings on each factor, factor analysis was run. Table 7-2 shows the final factor loadings in which all values are greater than 0.5.
Table 7-2 - Final Factor Analysis

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<td>.161</td>
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<td>.615</td>
</tr>
</tbody>
</table>


Source: This Study
Reliability Estimates of factors

The final set of items was used to estimate the reliabilities of the factors identified in the study. Cronbach’s alpha was used as a measure of the reliability of scale. According to Nunnally (1978), reliability estimates of around 0.6 are considered as sufficient for basic research. In this research, the acceptable value for Cronbach’s alpha range from 0.7 or above. The reliability measures are listed in Table 7-3.

Table 7-3 – Cronbach’s Alpha’s Result

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach’s Alpha</th>
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</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>0.887</td>
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<tr>
<td>Reliability</td>
<td>0.929</td>
</tr>
<tr>
<td>User Training</td>
<td>0.869</td>
</tr>
<tr>
<td>Accessibility</td>
<td>0.829</td>
</tr>
<tr>
<td>Level of navigation</td>
<td>0.946</td>
</tr>
<tr>
<td>Terminology</td>
<td>0.856</td>
</tr>
<tr>
<td>Knowledge of Search Domain</td>
<td>0.920</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>0.947</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>0.941</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>0.943</td>
</tr>
<tr>
<td>Task-Technology Fit</td>
<td>0.930</td>
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<tr>
<td>Perceived Behavioural Control</td>
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<tr>
<td>Intention to Use</td>
<td>0.918</td>
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</table>

Source: This study
7.3 The Demographic Information

Characteristics of the Respondents

There were three public libraries conveniently selected for this survey. In the formal survey, 486 questionnaires were submitted and 462 were valid. Table 7-4 presents descriptive statistics of the respondents including age, gender and education levels. 43.7% were male with the remainder, 56.3%, being female. 51.7%, 33.5% and 14.7% of them were in the age group 16-34, 35-54 and 55 or above respectively. The majority of respondents (71.9%) had post-secondary education or above. Within the respondents, 0.4% finished primary education, 27.7% had secondary / higher school education level, 24.9% had post-secondary education, 32.3% had university degree and the remaining 14.7% had master degree or above.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>202</td>
<td>43.7</td>
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<tr>
<td>Female</td>
<td>260</td>
<td>56.3</td>
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<tr>
<td>Total</td>
<td>462</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-34 years</td>
<td>239</td>
<td>51.7</td>
</tr>
<tr>
<td>35-54 years</td>
<td>155</td>
<td>33.5</td>
</tr>
<tr>
<td>55 or above</td>
<td>68</td>
<td>14.7</td>
</tr>
<tr>
<td>Total</td>
<td>462</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
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<td></td>
</tr>
<tr>
<td>Primary</td>
<td>2</td>
<td>0.4</td>
</tr>
<tr>
<td>Secondary / High School</td>
<td>128</td>
<td>27.7</td>
</tr>
<tr>
<td>Post-secondary / Higher education</td>
<td>115</td>
<td>24.9</td>
</tr>
<tr>
<td>University Degree</td>
<td>149</td>
<td>32.3</td>
</tr>
<tr>
<td>Master or above</td>
<td>68</td>
<td>14.7</td>
</tr>
<tr>
<td>Total</td>
<td>462</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: This Study
Use of Library Services

All respondents are Hong Kong Public Library users. 24.2% of them reported that they rarely use the library services (Less than once a month), 38.1% sometimes (1 to 2 times a month) use the public library services, 29.2% reported that they use the public library services once a week and the remaining 8.4% comes to the library almost daily (see Table 7-5). Figure 7-1 is the pie chart which graphically depicts the frequencies of public library users who comes to the library.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rarely (Less than once a month)</td>
<td>24.2</td>
</tr>
<tr>
<td>Sometimes (1 to 2 times a month)</td>
<td>38.1</td>
</tr>
<tr>
<td>Frequently (Once a week)</td>
<td>29.2</td>
</tr>
<tr>
<td>Always (Almost Daily)</td>
<td>8.4</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: This study

Figure 7-1 – Percentage of Usage of Library Services
Use of Library Technology

This is a multi-selection question and respondents could check more than one item. Table 7-6 shows all different types of library technology being used by the respondents. All respondents had used at least one kind of library technology. The majority of them accessed to library website for library services which contains the highest percentage of 80.7%. 70.8% of them used Online Public Access Catalogue (OPAC) to search for library materials. 64.7% of them used self-check terminals to borrow / renew library items. While using Smart ID card for library services had the lowest percentage of 25.3. Figure 7-2 is a horizontal histogram which graphically depicts the usage of different types of library technology.

<table>
<thead>
<tr>
<th>Types</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Databases</td>
<td>224</td>
<td>52.8</td>
</tr>
<tr>
<td>Self-check Terminals</td>
<td>299</td>
<td>64.7</td>
</tr>
<tr>
<td>Online Public Access Catalogue (OPAC)</td>
<td>327</td>
<td>70.8</td>
</tr>
<tr>
<td>Public Library website</td>
<td>373</td>
<td>80.7</td>
</tr>
<tr>
<td>Multi-media Information System (MMIS)</td>
<td>150</td>
<td>32.5</td>
</tr>
<tr>
<td>Smart ID card for Library services</td>
<td>117</td>
<td>25.3</td>
</tr>
</tbody>
</table>

Source: This study

Figure 7-2 – Usage of Different Types of Library Technology

Source: This Study
Frequency of using public library technology

Table 7-7 shows the frequency of library users to use library technology. The majority of respondents (40.9%) reported that they sometimes (1 to 2 times a month) use library technology. 27.3% of them use library technology once a week including those who access to library website at home to search or renew library materials. 23.4% of them use library technology less than once a month and the remaining 8.4% of them use library technology almost daily. Figure 7-3 graphically depicts the frequency of using library technology through a pie chart.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rarely (Less than once a month)</td>
<td>23.4</td>
</tr>
<tr>
<td>Sometimes (1 to 2 times a month)</td>
<td>40.9</td>
</tr>
<tr>
<td>Frequently (Once a week)</td>
<td>27.3</td>
</tr>
<tr>
<td>Always (Almost Daily)</td>
<td>8.4</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: This study

Figure 7-3 – Frequency of Using Library Technology

Source: This Study
Remote Access to library services

Table 7-8 shows that 82.3% of the respondents access to library website for library services such as checking library catalogue, reserving and renewing library materials at home and the remaining 17.7% of them never access to library website at home. Within those who use remote access to library website, 31.6% of them access to library website less than once a month, 32.5% of them access to library website 1 to 2 times a month. The rest 17.1% and 1.1% access are in the category frequently (once a week) and always (almost daily) respectively. The percentage of library users accesses to library website at home are shown as pie chart in Figure 7-4.

<table>
<thead>
<tr>
<th>Frequency</th>
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<tbody>
<tr>
<td>Never</td>
<td>17.7</td>
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<tr>
<td>Rarely (Less than once a month)</td>
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<tr>
<td>Sometimes (1 to 2 times a month)</td>
<td>32.5</td>
</tr>
<tr>
<td>Frequently (Once a week)</td>
<td>17.1</td>
</tr>
<tr>
<td>Always (Almost Daily)</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
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</table>

Source: This Study

Figure 7-4 – Percentage of Remote Access to Library Services

Source: This study
Ways of knowing library technology

This is a multi-selection question. 68.2% of the respondents learnt to use library technology through library promotions such as posters, leaflets and resources guides (Table 7-9). This shows that library promotion plays an important role on guiding users to use library technology. 38.3% of the respondents learnt to use library technology through family and friends. 20.3% of them learnt to use library technology through mass media and the remaining 16.7% of them through word-of-mouth which is the least influential factor. Graphical depiction of the results is shown in Figure 7-5 through a horizontal histogram.

<table>
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<tr>
<th>Ways of knowing library technology</th>
<th>Frequency</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Family</td>
<td>177</td>
<td>38.3%</td>
</tr>
<tr>
<td>Mass Media</td>
<td>94</td>
<td>20.3%</td>
</tr>
<tr>
<td>Library Promotion</td>
<td>315</td>
<td>68.2%</td>
</tr>
<tr>
<td>Word-of-mouth</td>
<td>77</td>
<td>16.7%</td>
</tr>
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</table>

Source: This study

Figure 7-5 – Ways of Knowing Library Technology
At last, respondents were asked whether they would recommend their family and friends to use library technology. The result shows that 87.4% of them reported that they would recommend their family and friends to use library technology and the rest of them (12.6%) reported that they would not do that. Figure 7-6 is the pie chart which shows the percentage of respondents who would/would not recommend library technology to their family and friends.

Figure 7-6 – Percentage of Respondents Who Would Introduce Library Technology to Others

Source: This Study
Use of parametric tests

When performing statistical analysis, one should consider the nature of the data in order to decide which test can be used. Generally, parametric tests are those that incorporate assumptions about population parameters. They are used for data measured with interval scales. While non-parametric tests are those that are relatively free of assumptions about population parameters. They are used for nominal and ordinal scales. Likert scales, which were a type of ordinal scale, were used in this study. Parametric tests are often used on Likert-scale data under the assumption that the scale is measuring an underlying construct that has the characteristics of an interval scale (Grimm 1993). Such an assumption is made here, and is consistent with the previous literature reviewed for this research. Also, the sample size is large enough (greater than 30) that the sampling distribution will approximate a normal distribution. (Grimm 1993).
7.4 Research Questions and Statistical Analysis

Correlation

The first research question focused on investigating the perceptions of library users towards the use of library technology. The thirteen variables included Relevance, Reliability, User Training, Accessibility, Level of Navigation, Level of understanding of Terminology, Knowledge of Search Domain, Perceived Usefulness, Perceived Ease of Use, Subjective Norms, Task Technology Fit, Perceived Behavioural Control and Intention to use. The relationships among these variables were identified by the Pearson product-moment correlation coefficient.

According to George and Mallery (2005), the Pearson Product-moment correlation or the Pearson $r$ is designated by the lower case letter $r$, and range is in value from $-1$ to $+1$. A correlation of $+1$ designates a perfect, positive correlation. Perfect indicates that one variable is precisely predictable from the other variable. Positive means that as one variable increases in value, the other variable also increases in value. A correlation of $0$ indicates no relation between the two variables. A negative but not perfect correlation indicates a relation in which as one variable increases the other has a tendency to decrease. The closer the correlation value is to $-1$, the stronger is that tendency. The closer the correlation value is to $0$, the weaker is that tendency. Cohen (1988) reported the following interpretations of the sample size of correlation coefficients:
♦ When Pearson's correlation coefficient $r$ below 0.3 means no association. It is considered the point where there is virtually no relationship between two variables.

♦ Correlation range from 0.3 to 0.7, is useful for limited prediction. It shows weak to medium correlation between two variables. They are the typical values used to identify variable membership in the statistical procedure of factor analysis, and many correlation coefficients for bivariate relationships fall into this area.

♦ When correlation is larger than 0.7, the association is supposed to be strong, good prediction can result from one variable to the other. Coefficients in this range would be considered large.

The Pearson product-moment correlation coefficients among these thirteen variables were reported in Table 7-10. The results showed that their correlations were significant at the 0.01 level.

In order to avoid some analyses being seriously influenced by outliers (Pallant, 2005), extreme outliers were removed from the data set, resulting in 454 sample size available for the analyses.
Table 7-10 – Correlations among Variables

<table>
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<tr>
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<th>Usefulness</th>
<th>Ease of use</th>
<th>Intention</th>
<th>Relevance</th>
<th>Reliability</th>
<th>Usertraining</th>
<th>Accessibility</th>
<th>Level of navigation</th>
<th>Terminology</th>
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<th>Subjective Norm</th>
<th>Task technology</th>
<th>PBC</th>
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<td>.488(**)</td>
<td>.359(**)</td>
<td>.553(**)</td>
<td>.662(**)</td>
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<td>.431(**)</td>
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<tr>
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<tr>
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<td>.200(**)</td>
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<tr>
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<td>.201(**)</td>
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<td>.305(**)</td>
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<td>.498(**)</td>
<td>.412(**)</td>
</tr>
<tr>
<td>Task-technology Fit</td>
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<td>.464(**)</td>
<td>.607(**)</td>
<td>.400(**)</td>
<td>.321(**)</td>
<td>.618(**)</td>
<td>.498(**)</td>
<td>.497(**)</td>
<td>.521(**)</td>
<td>.498(**)</td>
<td>1</td>
<td>.725(**)</td>
</tr>
<tr>
<td>PBC1</td>
<td>.662(**)</td>
<td>.431(**)</td>
<td>.516(**)</td>
<td>.558(**)</td>
<td>.555(**)</td>
<td>.241(**)</td>
<td>.633(**)</td>
<td>.615(**)</td>
<td>.534(**)</td>
<td>.643(**)</td>
<td>.412(**)</td>
<td>.725(**)</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).

Source: This study
Hypothesis Testing

Hypothesis 1: There is a correlation between perceived usefulness and intention to use.

![Scatter plot showing correlation between perceived usefulness and intention to use.]

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Usefulness</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usefulness</strong></td>
<td>Pearson Correlation</td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td>Usefulness</td>
<td>1</td>
<td>.613(**)</td>
</tr>
<tr>
<td>Intention</td>
<td>.613(**)</td>
<td>1</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

The relationship between perceived usefulness and intention to use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between perceived usefulness and intention to use is 0.613. The result provided support for hypothesis 1. This suggests that there was a positive correlation between the two variables \( r=0.613, n=454, p<0.0005 \), with high levels of perceived usefulness associated with high levels of intention to use.
Hypothesis 2: There is a correlation between perceived ease of use and intention to use.

The relationship between perceived ease of use and intention to use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between perceived ease of use and intention to use is 0.758. The result provided strong support for hypothesis 2. This suggests that there was a strong, positive correlation between the two variables \( r=0.758, n=454, p<0.0005 \), with high levels of perceived ease of use associated with high levels of intention to use. This shows perceived ease of use is a significant determinant of intention to use.
Hypothesis 3: There is a correlation between perceived ease of use and perceived usefulness.

The relationship between perceived ease of use and perceived usefulness was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between perceived ease of use and perceived usefulness is 0.558. The result provided strong support for hypothesis 3, which was drawn from the research model. This suggests that there was a positive correlation between the two variables ($r=0.558$, $n=454$, $p<0.0005$), with high levels of perceived ease of use associated with high levels of perceived usefulness.
Hypothesis 4: There is a correlation between subjective norms and intention to use library technology.

The relationship between subjective norm and intention to use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between subjective norms and intention to use is 0.278. The result did not provide support for hypothesis 4. Since the correlation is below 0.3, this suggests that there is no correlation between the two variables [r=0.278, n=454, p>0.0005]. Subjective norm is not an influential factor in determining intention to use.
Hypothesis 5: There is a correlation between task-technology fit and intention to use.

The relationship between task-technology fit and intention to use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between task technology fit and intention to use is 0.464. The result provided support for hypothesis 5. This suggests that there was a medium, positive correlation between the two variables [r=0.464, n=454, p<0.0005], with high levels of task technology fit associated with high levels of intention to use. This variable appears to be less influential than perceived usefulness and perceived ease of use in determining users' intention to use library technology.
Hypothesis 6: There is a correlation between perceived behavioural control and intention to use.

The relationship between perceived behavioural control and intention to use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between perceived behavioural control and intention to use is 0.516. The result provided strong support for hypothesis 6. This suggests that there was a positive correlation between the two variables \( r=0.516, n=454, p<0.0005 \), with high levels of perceived behavioural control associated with high levels of intention to use.
Hypothesis 7: There is a correlation between relevance and perceived usefulness.

![Scatter plot](image)

The relationship between relevance and perceived usefulness was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between relevance and perceived usefulness is 0.561. The result provided support for hypothesis 7. This suggests that there was a positive correlation between the two variables \( r=0.561, n=454, p<0.0005 \), with high levels of relevance associated with high levels of perceived usefulness.
Hypothesis 8: There is a correlation between system reliability and perceived usefulness.

The relationship between system reliability and perceived usefulness was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between system reliability and perceived usefulness is 0.568. The result provided strong support for hypothesis 8. This suggests that there was a positive correlation between the two variables \([r=0.568, n=454, p<0.0005]\), with high levels of system reliability associated with high levels of perceived usefulness.
Hypothesis 9: There is a correlation between user training and perceived usefulness.

The relationship between user training and perceived usefulness was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between user training and perceived usefulness is 0.319. The result provided support for hypothesis 9. This suggests that there was a positive correlation between the two variables \(r=0.319, n=454, p<0.0005\), with high levels of user training associated with high levels of perceived usefulness. However, user training appears to be less influential compare with the other factors in determining perceived usefulness.
Hypothesis 10: There is a correlation between user training and perceived ease of use.

The relationship between user training and perceived ease of use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between user training and perceived ease of use is 0.155, which is statistically significant at the 0.001 level. The result does not provide support for hypothesis 10. Since the correlation is below 0.3, this suggests that there is no correlation between the two variables \( r = 0.155, n = 454, p > 0.0005 \). User training is not an influential factor in determining perceived ease of use.
Hypothesis 11: There is a correlation between accessibility and perceived ease of use.

The relationship between accessibility and perceived ease of use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between accessibility and perceived ease of use is 0.427. The result provided support for hypothesis 11. This suggests that there was a positive correlation between the two variables \( r=0.427, n=454, p<0.0005 \), with high levels of accessibility associated with high levels of perceived ease of use.
Hypothesis 12: There is a correlation between level of navigation and perceived ease of use.

The relationship between level of navigation and perceived ease of use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between level of navigation and perceived ease of use is 0.376. The result provided support for hypothesis 12. This suggests that there was a positive correlation between the two variables \[ r = 0.376, n = 454, p < 0.0005 \], with high level of navigation associated with high levels of perceived ease of use.
Hypothesis 13: There is a correlation between level of understanding of terminology and perceived ease of use.

![Scatter plot showing correlation between terminology and ease of use](image)

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Terminology</th>
<th>Easeofuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminology</td>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Easeofuse</td>
<td>Pearson Correlation</td>
<td>.333(***), N=454</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).

The relationship between level of understanding of terminology and perceived ease of use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between level of understanding of terminology and perceived ease of use is 0.333. The result provided support for hypothesis 13. This suggests that there was a positive correlation between the two variables [r=0.333, n=454, p<0.0005], with high levels of understanding of terminology associated with high levels of perceived ease of use. However, the correlation between the two variables is considered to be weak.
Hypothesis 14: There is a correlation between knowledge of search domain and perceived ease of use.

The relationship between knowledge of search domain and perceived ease of use was investigated using Pearson product-moment correlation coefficient. As shown in the above table, the correlation between knowledge of search domain and perceived ease of use is 0.398. The result provided strong support for hypothesis 14. This suggests that there was a positive correlation between the two variables \( r=0.398, n=454, p<0.0005 \), with high levels of knowledge of search domain associated with high levels of perceived ease of use.
The above results demonstrate that there were correlations between different variables set. Strong correlation could be found in the factors perceived ease of use towards intention to use, which have correlation coefficients above 0.7. Most of the other factors have correlation coefficients that fall into the range from 0.3 to 0.7, which shows medium correlation between two variables. The results align with Cohen's saying that “many correlation coefficients for bivariate relationships fall into this area.” Most hypotheses set in this question were accepted apart from the relationship between subjective norms and intention to use as well as user training and perceived ease of use. The correlation between subjective norms and intention to use was 0.278, while the correlation between user training and perceived ease of use was 0.155, which showed insignificant results. Therefore, the two hypotheses ‘There is a correlation between subjective norms and intention to use’ and ‘There is a correlation between user training and perceived ease of use’ were rejected.

Since the critical value of correlation required to be significant could be very small with large sample sizes, one should be aware of the above interpretation. Grimm (1993) suggested that researchers could consider the squared value of the correlation, which provided the amount of shared variance between variables.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variables</th>
<th>r</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness</td>
<td>0.613</td>
<td>0.376</td>
<td></td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>0.758</td>
<td>0.574</td>
<td></td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>0.278</td>
<td>0.077</td>
<td></td>
</tr>
<tr>
<td>Task-Technology Fit</td>
<td>0.464</td>
<td>0.215</td>
<td></td>
</tr>
<tr>
<td>Perceived Behavioural Control</td>
<td>0.516</td>
<td>0.266</td>
<td></td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>0.558</td>
<td>0.311</td>
<td></td>
</tr>
<tr>
<td>Relevance</td>
<td>0.561</td>
<td>0.314</td>
<td></td>
</tr>
<tr>
<td>System Reliability</td>
<td>0.568</td>
<td>0.323</td>
<td></td>
</tr>
<tr>
<td>User Training</td>
<td>0.319</td>
<td>0.102</td>
<td></td>
</tr>
<tr>
<td>User Training</td>
<td>0.155</td>
<td>0.024</td>
<td></td>
</tr>
<tr>
<td>Accessibility</td>
<td>0.472</td>
<td>0.223</td>
<td></td>
</tr>
<tr>
<td>Level of navigation</td>
<td>0.376</td>
<td>0.141</td>
<td></td>
</tr>
<tr>
<td>Terminology</td>
<td>0.333</td>
<td>0.111</td>
<td></td>
</tr>
<tr>
<td>Domain Knowledge</td>
<td>0.398</td>
<td>0.158</td>
<td></td>
</tr>
</tbody>
</table>

Source: This study
The above table (Table 7-11) shows that perceived ease of use shared the variance of greater than 50% with intention to use, with perceived usefulness at 38% and perceived behavioural control at 27%. For the construct perceived usefulness, the factor perceived ease of use shared variance of 31% while the factor relevance and system reliability shared the variance of 31% and 32% respectively. For perceived ease of use, apart from accessibility and domain knowledge, the other three independent factors (User training, level of navigation and level of understanding of terminology) shared a variance of 15% or lower. Therefore, it appeared to have a relationship between intention to use with perceived usefulness, perceived ease of use, task-technology fit and perceived behavioural control; perceived usefulness with perceived ease of use, relevance and system reliability; perceived ease of use with accessibility and domain knowledge.

This is a reboot result which supported the previous studies. It is found that the above main factors such as relevance and accessibility as well as minor factors such as level of understanding of terminology and domain knowledge are all important factors which affect usage behaviour. It is also found that users are not easily affected by others. They will not adopt library technology just because of the pressure from their family and friends. Hence, user training is a secondary factor which is not significant to affect perceived ease of use. This is an important result for the public library managers. They can understand what users are concerned with when adopting one system as well as improving user training methods.
Multiple Regression

The first question used correlation analysis to indicate whether there was a relationship between different variables in the research model. However, it did not provide any causality inferences in this study. That is, correlations could show the association between two variables. However, they could not indicate prediction of one variable from another.

The second research question focuses on investigating whether perceived usefulness, perceived ease of use, subjective norm, perceived behavioural control and task-technology fit actually predict users’ intention to use library technology. Multiple regression is used in this question.

Multiple regression attempts to predict a normal dependent variable from a combination of independent variables.
Multiple regression assumptions

A starting point in testing various assumptions necessary for multiple regression is the variables used in the model. Independent variables must be continuous or categorical, and the dependent variable must be continuous. In this study, the scale used (seven point Likert scale) is a continuous measure, which satisfies this assumption (Berry, 1993; Field, 2000).

Normality of the error term is the major assumption in multiple regression and is tested using residual frequency plots and normal probability plots. In both, the data displayed a normal distribution. Berry (1993) emphasized that violating this assumption is less critical when the sample size is large (more than 20 items per variable). In this case, the sample size is large enough to support the assumption and the generalizability of findings.
Multicollinearity

Multicollinearity is an important assumption that means no exact linear relationship exists between any two independent variables. To test for the presence of multicollinearity, the researcher used the correlation matrix generated by correlating all variables against each other (Table 7-12). When inspecting the correlation matrix, a perfect correlation does not exist between any two independent variables as the maximum correlation was 0.558 between perceived usefulness and perceived ease of use.

Also, as recommended in the literature (Field, 2000 and Hair et al., 1998), the VIF measure should be less than 10. As indicated in Table 7-14, all values is of the independent variables were less than 2.665.

Table 7-12 – Correlations

<table>
<thead>
<tr>
<th></th>
<th>Intention</th>
<th>Usefulness</th>
<th>Easeofuse</th>
<th>Subjective norm</th>
<th>Task Technology</th>
<th>PBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usefulness</td>
<td>.613</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easeofuse</td>
<td>.758</td>
<td>.558</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjectivenorm</td>
<td>.278</td>
<td>.359</td>
<td>.289</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tasktechnology</td>
<td>.464</td>
<td>.553</td>
<td>.461</td>
<td>.498</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>.516</td>
<td>.662</td>
<td>.431</td>
<td>.412</td>
<td>.725</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Source: This study

Finally, the variance proportion of each variable on any factor (eigenvalue) should not be extremely high. Checking these values in the collinearity disgonostics tables, (Table 7-13), all values for the variables were less than 0.85. Concerns are reported in the literature when values of 0.9 and more are associated with the same dimension.

Table 7-13 – Collinearity Diagnostics(a)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Eigenvalue</th>
<th>Condition Index (Constant)</th>
<th>Usefulness</th>
<th>Easeofuse</th>
<th>Subjective norm</th>
<th>Task Technology</th>
<th>PBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.863</td>
<td>1.000</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>2</td>
<td>.053</td>
<td>10.512</td>
<td>.01</td>
<td>.01</td>
<td>.53</td>
<td>.38</td>
<td>.00</td>
</tr>
<tr>
<td>3</td>
<td>.038</td>
<td>12.479</td>
<td>.12</td>
<td>.02</td>
<td>.32</td>
<td>.54</td>
<td>.01</td>
</tr>
<tr>
<td>4</td>
<td>.022</td>
<td>16.353</td>
<td>.72</td>
<td>.00</td>
<td>.02</td>
<td>.01</td>
<td>.19</td>
</tr>
<tr>
<td>5</td>
<td>.015</td>
<td>19.607</td>
<td>.15</td>
<td>.65</td>
<td>.07</td>
<td>.04</td>
<td>.31</td>
</tr>
<tr>
<td>6</td>
<td>.009</td>
<td>25.851</td>
<td>.00</td>
<td>.32</td>
<td>.06</td>
<td>.02</td>
<td>.49</td>
</tr>
</tbody>
</table>

Source: This study

a Dependent Variable: Intention
Factors affecting intention to use

Since the correlation shows a relationship between different constructs, a multiple regression analysis is performed to see which variables have the greatest effect. The ITAMLT model includes five independent variables predicting intention to use; they are perceived usefulness, perceived ease of use, subjective norm, task-technology fit and perceived behavioural control. Therefore, the following hypothesis is set as follow and the results are shown in Table 7-14.

H1: Perceived usefulness, perceived ease of use, subjective norm, task-technology fit and perceived behavioural control is a predictor of intention to use library technology.

The analysis indicated significant results for all five variables and an R value of 0.798, with a standard error of the estimate of 2.185. The $R^2$ value is 0.637 (Adjusted $R^2 = 0.633$). The linear combination of the factors was significantly related to the intention to use library technology, accounting for approximately 64% of the variance ($F=157.43, p<0.05$). The following table provides the output of the analysis.

Table 7-14 – Results of Multiple Linear Regression on Factors affecting Intention to Use

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>3758.304</td>
<td>5</td>
<td>751.661</td>
<td>157.430</td>
</tr>
<tr>
<td>Residual</td>
<td>2139.009</td>
<td>448</td>
<td>4.775</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5897.313</td>
<td>453</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.798</td>
<td>0.637</td>
<td>0.633</td>
<td>2.185</td>
</tr>
</tbody>
</table>

Unstandardized Coefficients | Standardized Coefficients | t  | Sig. | Collinearity Statistics |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>(Constant) 2.044</td>
<td>0.618</td>
<td>3.308</td>
<td>0.001</td>
<td>0.467</td>
</tr>
<tr>
<td>Perceived Usefulness 0.137</td>
<td>0.029</td>
<td>0.198</td>
<td>4.753</td>
<td>0.000</td>
</tr>
<tr>
<td>Perceived Ease of Use 0.398</td>
<td>0.023</td>
<td>0.598</td>
<td>16.986</td>
<td>0.000</td>
</tr>
<tr>
<td>Subjective Norm -0.016</td>
<td>0.032</td>
<td>-0.017</td>
<td>-0.519</td>
<td>0.604</td>
</tr>
<tr>
<td>Task-technology Fit -0.034</td>
<td>0.076</td>
<td>-0.020</td>
<td>-0.447</td>
<td>0.655</td>
</tr>
<tr>
<td>PBC 0.172</td>
<td>0.054</td>
<td>0.149</td>
<td>3.202</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Source: This study
Intention to use library technology can be predicted by using the following equation, which included perceived usefulness, perceived ease of use, subjective norm, task-technology fit and perceived behavioural control. The coefficients used in this equation are the unstandardized coefficients for each construct in the equation.

\[
\text{Intention to use} = 2.044 + 0.137 \times \text{Perceived Usefulness} + 0.398 \times \text{Perceived Ease of Use} - 0.016 \times \text{Subjective Norm} - 0.034 \times \text{Task-technology Fit} + 0.172 \times \text{Perceived Behavioural Control}
\]

However, these coefficients do not provide an indication as to which is the most important factor. This can be obtained by considering the acceptance beta coefficients, the t-values and the significance values. It can be seen that the significant predictors of intention to use library technology at the 95% confidence level, according to the data collected in this study, are perceived ease of use, perceived usefulness and perceived behavioural control. While perceived ease of use contributed most in predicting intention to use.

The result in this study showed the adjusted R squared value was 0.633. This indicated that 63% of the variance in intention to use was explained by the model. According to Cohen (1988), this is a large effect. Therefore, this result implies that users have the intention to use library technology if it is useful and if it is easy to use. Also, perceived behavioural control is an important consideration for them. This is consistent with previous studies, particularly for the Technology Acceptance Model, whereby the model accounts for just over 50% of the variance in intention to use (Venkatesh and Davis 2000).

In summary, the hypothesis is accepted for perceived usefulness, perceived ease of use and perceived behavioural control, and is rejected for subjective norm and task-technology fit.

Apart from measuring factors that directly affect intention to use, this research measured the effect of relevance, reliability, user training and perceived ease of use on perceived usefulness. Moreover, the effect of accessibility, level of navigation, level of understanding
of terminology and knowledge of search domain on perceived ease of use were also tested.

Factors affecting perceived usefulness

Multiple regression was conducted to determine the best linear combination of relevance, reliability, user training and perceived ease of use for predicting perceived usefulness. The following hypothesis is set.

H1: Relevance, reliability, user training and perceived ease of use is a predictor of perceived usefulness.

The analysis indicated significant results for four variables and an R value of 0.738, with a standard error of the estimate of 3.536 (Table 7-15). The R^2 value is 0.544 (Adjusted R^2 = 0.540). The linear combination of the factors was significantly related to the perceived usefulness, accounting for approximately 54% of the variance (F=133.885, p<0.05). The following table provide the output of the analysis.

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>6697.869</td>
<td>4</td>
<td>1674.467</td>
<td>133.885</td>
</tr>
<tr>
<td>Residual</td>
<td>5615.525</td>
<td>449</td>
<td>12.507</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12313.394</td>
<td>453</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R | R^2 | Adjusted R^2 | Std. Error of the Estimate |
---|-----|-------------|---------------------------|
0.738 | 0.544 | 0.540 | 3.53649 |

Unstandardized Coefficients | Standardized Coefficients | t    | Sig. | Collinearity Statistics |
---|------------------------|------|------|-------------------------|
(Constant) | B | Std. Error | Beta | 2.659 | 0.008 | Tolerance | VIF |
Relevance | 0.357 | 0.055 | 0.249 | 6.517 | 0.000 | 0.698 | 1.443 |
Reliability | 0.383 | 0.046 | 0.320 | 8.380 | 0.000 | 0.695 | 1.438 |
User Training | 0.108 | 0.049 | 0.076 | 2.190 | 0.029 | 0.843 | 1.187 |
Ease of Use | 0.342 | 0.034 | 0.356 | 10.154 | 0.000 | 0.828 | 1.208 |

Source: This study
Perceived usefulness can be predicted by using the following equation, which included relevance, reliability, user training and perceived ease of use. The coefficients used in this equation are the unstandardized coefficients for each construct in the equation.

\[
\text{Perceived usefulness} = 2.982 + 0.357 \text{ (Relevance)} + 0.383 \text{ (Reliability)} + 0.108 \text{ (User Training)} + 0.342 \text{ (Ease of Use)}
\]

However, these coefficients do not provide an indication as to which is the most important factor. This can be obtained by considering the beta coefficients, the t-values and the significance values. It can be seen that the significant predictors of perceived usefulness at the 95% confidence level, according to the data collected in this study, is relevance, reliability, user training and perceived ease of use.

In summary, the hypothesis is accepted for all variables including relevance, reliability, perceived ease of use and user training.
Factors affecting perceived ease of use

Multiple regression was conducted to determine the best linear combination of accessibility, level of navigation, level of understanding of terminology, domain knowledge and user training for predicting perceived ease of use. The analysis indicated significant results for five variables and an R value of 0.483, with a standard error of the estimate of 4.767 (Table 7-16). The $R^2$ value is 0.233 (Adjusted $R^2 = 0.225$). The linear combination of the factors was significantly related to the perceived usefulness, accounting for approximately 23% of the variance ($F=27.203$, $p<0.05$). The following hypothesis is set and Table 7-16 provides the output of the analysis.

H1: Accessibility, level of navigation, level of understanding of terminology, domain knowledge and user training is a predictor of perceived ease of use.

<table>
<thead>
<tr>
<th>Table 7-16 – Results of Multiple Linear Regression on Factors affecting Perceived Ease of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sum of Squares</strong></td>
</tr>
<tr>
<td>Regression</td>
</tr>
<tr>
<td>Residual</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>R</strong></th>
<th><strong>$R^2$</strong></th>
<th><strong>Adjusted $R^2$</strong></th>
<th><strong>Std. Error of the Estimate</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.483</td>
<td>0.233</td>
<td>0.225</td>
<td>0.483</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B</strong></td>
<td><strong>Std. Error</strong></td>
<td><strong>Beta</strong></td>
<td><strong>t</strong></td>
<td><strong>Sig.</strong></td>
</tr>
<tr>
<td>Constant</td>
<td>3.898</td>
<td>1.398</td>
<td>2.788</td>
<td>0.006</td>
</tr>
<tr>
<td>Accessibility</td>
<td>0.380</td>
<td>0.107</td>
<td>0.213</td>
<td>3.542</td>
</tr>
<tr>
<td>Level of navigation</td>
<td>0.164</td>
<td>0.107</td>
<td>0.129</td>
<td>2.170</td>
</tr>
<tr>
<td>Terminology</td>
<td>0.138</td>
<td>0.098</td>
<td>0.079</td>
<td>1.411</td>
</tr>
<tr>
<td>Domain Knowledge</td>
<td>0.411</td>
<td>0.113</td>
<td>0.190</td>
<td>3.642</td>
</tr>
<tr>
<td>User Training</td>
<td>-0.076</td>
<td>0.071</td>
<td>-0.051</td>
<td>-1.063</td>
</tr>
</tbody>
</table>

Source: This study

Perceived ease of use can be predicted by using the following equation, which included accessibility, level of navigation, level of understanding of terminology, knowledge of search domain and user training. The coefficients used in this equation are the
unstandardized coefficients for each construct in the equation.

| Perceived ease of use = 3.898 + 0.380 (Accessibility) + 0.164 (Level of Navigation) + 0.138 (Terminology) + 0.411 (Knowledge of search domain) -0.076 (User Training) |

However, these coefficients do not provide an indication as to which is the most important factor. This can be obtained by consider the beta coefficients, the t-values and the significance values. It can be seen that the most significant predictor of perceived ease of use at the 95% confidence level, according to the data collected in this study, is accessibility, while terminology and user training showed insignificant effect, with beta coefficient as 0.079 and -0.051 respectively.

In summary, the hypothesis is accepted for accessibility, domain knowledge, level of navigation, and is rejected for level of understanding of terminology and user training.
Age and Perceived Usefulness, Perceived Ease of Use and Intention to Use

The first two questions have identified the factors that affect users’ attitudes towards using library technology, and the relationship between these factors.

Similar research shows that intention to use technology varies according to age. It is found that the older generation was less likely to use library technology. This study would like to find out whether this difference also applies to the area of library technology only.

Therefore, the third research question examined if age influenced the perceptions of library users’ towards using library technology regarding perceived usefulness, perceived ease of use and intention to use. Therefore, the following hypotheses are set.

H1: The means of ‘perceived usefulness’ are the same for each age group.
H2: The means of ‘perceived ease of use’ are the same for each age group.
H3: The means of ‘intention to use’ are the same for each age group.

To test the above hypotheses, one-way ANOVA was used to examine. Before using a One-Way ANOVA, normality assumption was tested. Huck (2004) suggested that prior to data analysis, the data should be screened for outliers, and normality of distribution. If there were no obvious outliers, and skewness and kurtosis tests indicated no serious departure from normality, the data would then be considered to be acceptable. After removing outliers, normality was screened in this study. The normality assumption of the three dependent variables: (1) perceived usefulness, (2) perceived ease of use and (3) intention to use were considered for conducting one-way ANOVA. Table 7-17 showed all measures of central tendency and dispersion for the three dependent variables. All tests resulted in absolute values of less than 1. In this study, the sample size of 454 cases (after removing outliers) was considered large enough to uncover departures from normality. According to Tabachnick and Fidell (2001), with sufficiently large sample sizes, sampling distributions of means are normally distributed regardless of the distributions of variables.
Table 7-17– Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean Statistic</th>
<th>Std. Statistic</th>
<th>Skewness Statistic</th>
<th>Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness</td>
<td>27.0595</td>
<td>5.21363</td>
<td>-.787</td>
<td>.115</td>
<td>.897</td>
<td>.229</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>18.6894</td>
<td>5.41383</td>
<td>-.544</td>
<td>.115</td>
<td>-.346</td>
<td>.229</td>
</tr>
<tr>
<td>Intention to Use</td>
<td>15.3833</td>
<td>3.60810</td>
<td>-.638</td>
<td>.115</td>
<td>.016</td>
<td>.229</td>
</tr>
</tbody>
</table>

Source: This study

Levene’s Test of the Homogeneity Assumption

The assumption of equal variances is often referred to as the homogeneity of variance assumption. (Huck, 2004). Levene’s test was conducted to examine the homogeneity assumption to evaluate the means difference independent variable regarding dependent variable. If the observed significance level is smaller than .05, the researcher rejects the null hypothesis that the population variances are equal (Norusis, 2003).

An estimate of strength for any ANOVA through $n^2$ (eta squared)

Tabachnick and Fidell (2001) said that an estimate of strength of association is available for any ANOVA through $n^2$ (eta squared). The $n^2$ is used to explain a measure of effect size. The $n^2$ reflects the proportion of variance in the dependent variable explained by the independent variable (Huck, 2004). According to Cohen and Cohen (1975), .01 is classified as small effect, .06 is classified as medium effect and .14 is classified as large effect.
Age and Perceived Usefulness

A one-way analysis of variance was conducted to explore the impact of age on perceived usefulness. The independent variable was age. The result of means and standard deviations were reported in Table 7-18. The dependent variable was perceived usefulness. Subjects were divided into three groups according to their age (Group 1: 16-34 years; Group 2: 35-54 years; Group 3: 55 years or above). Levene’s test was conducted to examine the homogeneity assumption to evaluate the means difference between age regarding perceived usefulness (Table 7-19). Since the significance of the result is greater than 0.05, the variances are equal and the assumption is justified. Therefore, all necessary assumptions are valid and the ANOVA method can be used. It should be noted that the test is not intended to determine whether the importance of the factors vary according to age, it just tests whether intention to use has a significant difference in the means. There was a statistically significant difference at the p<0.05 level in perceived usefulness for the three age groups [F(2,451)= 6.956, p=0.001]. Despite reaching statistical significance, the actual difference in mean scores between groups was small. The effect size, calculated using eta squared, was 0.03 (Table 7-20). The means and standard deviations showed that there was significant difference in the means between older and younger users regarding perceived usefulness. In this research question, the observed significance, which indicated the variances between groups were homogeneous. Details are shown as follow:

Table 7-18 – Descriptive Statistics for Perceived Usefulness in Different Age Groups

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Number of Respondents</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-34</td>
<td>237</td>
<td>27.6414</td>
<td>0.353</td>
</tr>
<tr>
<td>35-54</td>
<td>153</td>
<td>27.0458</td>
<td>0.392</td>
</tr>
<tr>
<td>55 or above</td>
<td>64</td>
<td>24.9375</td>
<td></td>
</tr>
</tbody>
</table>

Source: This study

Table 7-19 – Test of Homogeneity of Variances

<table>
<thead>
<tr>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.835</td>
<td>2</td>
<td>451</td>
<td>0.434</td>
</tr>
</tbody>
</table>

Source: This study
Table 7-20 – Results of ANOVA Test on Age and Perceived Usefulness

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>369.450</td>
<td>2</td>
<td>184.225</td>
<td>6.956</td>
<td>0.001</td>
</tr>
<tr>
<td>Within Groups</td>
<td>11944.945</td>
<td>451</td>
<td>26.485</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12313.394</td>
<td>453</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: This study

From the table (Table 7-20), the test is significant $F(2,451)=6.959$, $p=0.001$. Since the p-value is less than 0.05, it indicates that the difference between means is significant between the age groups. To investigate where the differences are, the Fisher Least Significant Different (LSD) post-hoc test is used, the results are shown as follow.

Table 7-21 – Post-hoc LSD Test for Differences between Age Groups

<table>
<thead>
<tr>
<th>Age Range (I)</th>
<th>Age Range (J)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-34</td>
<td>35-54</td>
<td>E-59560</td>
<td>2.70385</td>
<td>3.72497</td>
<td>E-505</td>
</tr>
<tr>
<td>16-34</td>
<td>55 or above</td>
<td>E-505</td>
<td>2.10825</td>
<td>0.76612</td>
<td>E-505</td>
</tr>
<tr>
<td>16-34</td>
<td>55 or above</td>
<td>E-505</td>
<td>2.10825</td>
<td>0.76612</td>
<td>E-505</td>
</tr>
<tr>
<td>35-54</td>
<td>55 or above</td>
<td>E-505</td>
<td>2.10825</td>
<td>0.76612</td>
<td>E-505</td>
</tr>
<tr>
<td>55 or above</td>
<td>16-34</td>
<td>E-505</td>
<td>2.10825</td>
<td>0.76612</td>
<td>E-505</td>
</tr>
</tbody>
</table>

Source: This study

Post-hoc comparisons using Turkey HSD test (Table 7-21) indicated that the mean score for Group 3 ($M=24.9375$, $SD=0.59$) was significantly different from Group 1 ($M=27.6414$, $SD=0.353$) and Group 2 ($M=27.0458$, $SD=0.392$). The results show that there are significant differences (at the 0.05 level) in the means between age 55 or above and both 16-34 and 35-54 age ranges (see highlighted).
Age and Perceived Ease of Use

A one-way analysis of variance was conducted to explore the impact of age on perceived ease of use. The independent variable was age. The dependent variable was perceived ease of use. Subjects were divided into three groups according to their age (Group 1: 16-34 years; Group 2: 35-54 years; Group 3: 55 years or above). The result of means and standard deviations were reported in Table 7-22. Levene's test was conducted to examine the homogeneity assumption to evaluate the means difference between age regarding perceived ease of use (Table 7-23). Since the significance of the result is greater than 0.05, the variances are equal and the assumption is justified. Therefore, all necessary assumptions are valid and the ANOVA method can be used. It should be noted that the test is not intended to determine whether the importance of the factors vary according to age, it just tests whether intention to use has a significant difference in the means. There was a statistically significant difference at the p<0.05 level in perceived ease of use for the three age groups \( F(2,451) = 166.995, p=0.000 \). Despite reaching statistical significance, the actual difference in mean scores between groups was large. The effect size, calculated using eta squared, was 0.4 (Table 7-24). The means and standard deviations showed that there was significant difference in the means between older and younger users regarding perceived ease of use. In this research question, the observed significant, which indicated the variances between groups were homogeneous. Details are shown as follow:

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Number of Respondents</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-34</td>
<td>237</td>
<td>20.4810</td>
<td>4.237</td>
</tr>
<tr>
<td>35-54</td>
<td>153</td>
<td>19.5294</td>
<td>4.252</td>
</tr>
<tr>
<td>55 or above</td>
<td>64</td>
<td>10.0469</td>
<td>3.194</td>
</tr>
</tbody>
</table>

Source: This study

<table>
<thead>
<tr>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.955</td>
<td>2</td>
<td>451</td>
<td>0.053</td>
</tr>
</tbody>
</table>

Source: This study
Table 7-24 – Results of ANOVA Test on Age and Perceived Ease of Use

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>5649.068</td>
<td>2</td>
<td>2824.534</td>
<td>166.995</td>
<td>0.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>7628.142</td>
<td>451</td>
<td>16.914</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13277.209</td>
<td>453</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: This study

From the table (Table 7-24), the test is significant $F(2,451)=166.995$, $p=0.000$. Since the $p$-value is less than 0.05, it indicates that the difference between means is significant between the age groups. To investigate where the differences are, the Fisher Least Significant Different (LSD) post-hoc test is used, the results are shown as follow.

Table 7-25 – Post-hoc LSD Test for Differences between Age Groups

<table>
<thead>
<tr>
<th>Age Range (J)</th>
<th>Age Range (I)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-34</td>
<td>35-54</td>
<td>E- 95160</td>
<td>0.57935</td>
<td>E- 067</td>
<td>E- 9545</td>
</tr>
<tr>
<td>35-54</td>
<td>16-34</td>
<td>-0.95160</td>
<td>0.61223</td>
<td>E- 067</td>
<td>E- 0513</td>
</tr>
<tr>
<td>55 or above</td>
<td>16-34</td>
<td>10.43414</td>
<td>0.61223</td>
<td>E- 067</td>
<td>E- 0513</td>
</tr>
<tr>
<td>55 or above</td>
<td>35-54</td>
<td>E- 57935</td>
<td>0.61223</td>
<td>E- 067</td>
<td>E- 0513</td>
</tr>
</tbody>
</table>

Source: This study

Post-hoc comparisons using Turkey HSD test (Table 7-25) indicated that the mean score for Group 3 (M=10.0469, SD=3.194) was significantly different from Group 1 (M=20.4810, SD=4.237) and Group 2 (M=19.5294, SD=4.252). The results show that there are significant differences (at the 0.05 level) in the means between age 55 or above and both 16-34 and 35-54 age ranges (see highlighted).
Age and Intention to Use

A one-way analysis of variance was conducted to explore the impact of age on intention to use. The independent variable was age. The dependent variable was intention to use. Subjects were divided into three groups according to their age (Group 1: 16-34 years; Group 2: 35-54 years; Group 3: 55 years or above). The result of means and standard deviations were reported in Table 7-26. Levene’s test was conducted to examine the homogeneity assumption to evaluate the means difference between age regarding perceived ease of use (Table 7-27). Since the significance of the result is greater than 0.05, the variances are equal and the assumption is justified. Therefore, all necessary assumptions are valid and the ANOVA method can be used. It should be noted that the test is not intended to determine whether the importance of the factors vary according to age, it just tests whether intention to use has a significant difference in the means. There was a statistically significant difference at the p<0.05 level in perceived ease of use for the three age groups \[F(2,451)=118.27, \ p=0.000\]. Despite reaching statistical significance, the actual difference in mean scores between groups was large. The effect size, calculated using eta squared, was 0.34 (Table 7-28). The means and the standard deviations showed that there was significant difference in the means between older and younger users regarding intention to use. In this research question, the observed significant, which indicated the variances between groups were homogeneous. Details are shown as follow:

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Number of Respondents</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-34</td>
<td>237</td>
<td>16.4937</td>
<td>2.932</td>
</tr>
<tr>
<td>35-54</td>
<td>153</td>
<td>15.8235</td>
<td>3.016</td>
</tr>
<tr>
<td>55 or above</td>
<td>64</td>
<td>10.2188</td>
<td>2.693</td>
</tr>
</tbody>
</table>

Source: This study

<table>
<thead>
<tr>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.184</td>
<td>2</td>
<td>451</td>
<td>0.832</td>
</tr>
</tbody>
</table>

Source: This study
Table 7-28 – Results of ANOVA Test on Age and Intention to Use

| Source: This study |

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2028.899</td>
<td>2</td>
<td>1014.450</td>
<td>118.270</td>
<td>0.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>3868.413</td>
<td>451</td>
<td>8.577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5897.313</td>
<td>453</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the table (Table 7-28), the test is significant $F(2,451)=118.27$, $p=0.000$. Since the p-value is less than 0.05, it indicates that the difference between means is significant between the age groups. To investigate where the differences are, the Fisher Least Significant Different (LSD) post-hoc test is used, the results are shown as follow.

Table 7-29 – Post-hoc LSD Test for Differences between Age Groups

| Source: This study |

<table>
<thead>
<tr>
<th>Age Range (I)</th>
<th>Age Range (J)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-34</td>
<td>35-54</td>
<td>-0.67014</td>
<td>0.41257</td>
<td>0.000</td>
<td>-1.3844 - 0.0441</td>
</tr>
<tr>
<td>16-34</td>
<td>55 or above</td>
<td>-0.60478</td>
<td>0.43599</td>
<td>0.000</td>
<td>-1.3844 - 0.0441</td>
</tr>
<tr>
<td>35-54</td>
<td>16-34</td>
<td>-0.67014</td>
<td>0.41257</td>
<td>0.000</td>
<td>-1.3844 - 0.0441</td>
</tr>
<tr>
<td>35-54</td>
<td>55 or above</td>
<td>-0.60478</td>
<td>0.43599</td>
<td>0.000</td>
<td>-1.3844 - 0.0441</td>
</tr>
</tbody>
</table>

Post-hoc comparisons using Turkey HSD test (Table 7-29) indicated that the mean score for Group 3 ($M=10.2188$, $SD=2.693$) was significantly different from Group 1 ($M=16.4937$, $SD=2.932$) and Group 2 ($M=15.8235$, $SD=3.016$). The results show that there are significant differences (at the 0.05 level) in the means between age 55 or above and both 16-34 and 35-54 age ranges (see highlighted).
7.5 Summary

The chapter included research questions which used correlation, multiple regression and ANOVA statistical analyses to evaluate the relationship between different variables and to examine if there are any differences between older and younger library users towards the perceptions of using library technology. Based on the research model, the statistical analyses were summarized in Table 7-30.

As shown in the correlation analysis, among thirteen variables, perceived ease of use is the most important variable in relation to users' intention to use library technology. Moreover, it is found that subjective norms is not influential in determining intention to use while user training appears to be not influential in determining perceived ease of use. Also, multiple regression was conducted to find out factors that can predict intention to use, perceived usefulness and perceived ease of use.

Moreover, one-way ANOVA was conducted to examine if there was any differences between older and younger library users towards perceived usefulness, perceived ease of use and intention to use library technology. The results showed that the differences of age affect perceived usefulness, perceived ease of use and intention to use significantly. That is, there were significant differences in means of older and younger users regarding perceived usefulness, perceived ease of use and intention to use library technology. It is found that older users are less likely to accept library technology.

Detailed conclusion of the results as well as the limitations and implication of this study are shown in the next chapter.
Table 7-30 – Research Summary

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Construct(s)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is correlation between two variables</td>
<td>Intention to use and Perceived usefulness, perceived ease of use, subjective norms, task-technology fit, perceived behavioural</td>
<td>Supported: All (with positive relationships) apart from the following not supported.</td>
</tr>
<tr>
<td></td>
<td>Perceived Usefulness and Perceived ease of use, relevance, system reliability, user training</td>
<td><strong>Not supported:</strong> Intention to use and Subjective norms</td>
</tr>
<tr>
<td></td>
<td>Perceived Ease of Use and Accessibility, level of navigation, level of understanding, terminology, domain knowledge, user training</td>
<td>Perceived Ease of Use and Level of navigation, level of understanding of terminology, user training</td>
</tr>
<tr>
<td>Factors that can predict intention to use</td>
<td>perceived usefulness, perceived ease of use, subjective norm, task-technology fit and perceived behavioural control</td>
<td>Accepted: perceived ease of use, perceived usefulness, perceived behavioural control</td>
</tr>
<tr>
<td></td>
<td>Perceived ease of use, relevance, reliability and user training</td>
<td>Rejected: subjective norm, task-technology fit</td>
</tr>
<tr>
<td>Factors that can predict perceived usefulness</td>
<td>perceived ease of use, relevance, reliability and user training</td>
<td>Accepted: Relevance, Reliability, perceived ease of use, user training</td>
</tr>
<tr>
<td>Factors that can predict perceived ease of use</td>
<td>accessibility, level of navigation, level of understanding of terminology, domain knowledge and user training</td>
<td>Accepted: Accessibility, domain knowledge, level of navigation</td>
</tr>
<tr>
<td></td>
<td>Level of understanding of terminology, user training</td>
<td>Rejected: Level of understanding of terminology, user training</td>
</tr>
<tr>
<td>At least two means are the same for each age group</td>
<td>Perceived usefulness</td>
<td>Accepted: No Difference between Group 1 and 2</td>
</tr>
<tr>
<td>Group 1: 16-34 years</td>
<td>Perceived ease of use</td>
<td>Rejected: Difference between Group 1 and Group 3; Group 2 and Group 3</td>
</tr>
<tr>
<td>Group 2: 35-54 years</td>
<td>Intention to use</td>
<td></td>
</tr>
<tr>
<td>Group 3: 55 years or above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: This study
After both qualitative and quantitative analysis, the final model is shown as follow (Figure 7-7). Two constructs result demonstrability and computer self-efficacy were excluded in the final model after focus group interviews. It is suggested since using library technology in public libraries is voluntary and many users go to the public library for leisure use, therefore, result demonstrability of using library technology is not their main concern. Moreover, it is believed that nowadays nearly all Hong Kong public library users have got certain knowledge of computer and related technology use, computer self-efficacy is nearly an insignificant factor. Therefore, these two constructs are to be deleted in the revised model.

Also, level of navigation, level of understanding of terminology, subjective norm and task-technology fit are deleted in the final model. It is because the quantitative research result shows that subjective norm and task technology fit cannot predict users intention to use library technology, while level of navigation, level of understanding of terminology and user training cannot predict perceived ease of use.

Figure 7-7–Revised Integrated Technology Acceptance Model for Library Technology

![Diagram of Revised Integrated Technology Acceptance Model for Library Technology]

Source: This Study
Chapter Eight

Conclusion

8.1 Introduction

The aim of this research is to investigate factors that can affect public library users to use library technology. This is of major importance since all public libraries in Hong Kong increased their ability to deliver their services by electronic means. By increasing the use of library services, public libraries can reduce their costs and focus their resources on the other areas such as enriching the library collection. Moreover, public libraries can enhance their efficiency by providing more electronic services. This has been studied by finding the factors that individuals consider when evaluating these services.

Previous research has focused upon the use of the different technological systems within private sectors, such as for retail purchases and online shopping. These studies have predominantly considered the demographic characteristics of users against non-users (Eastlick and Lotz, 1999). Such research provides some insight into the types of individuals that use electronic services, and why they use it.

Although there are already studies that investigate why people adopt technology the focus is mainly upon factors that influence the attitudes that people develop towards technology, with perceived usefulness and perceived ease of use being the most common factors (Davis 1989). Also, most of the applications have been towards the adoption of provided technology in the workplace, such as the use of MS Access in a working environment. This research focuses on a wide range of users' acceptance towards the technology provided by Hong Kong Public Libraries, which is a public services provider.

The research focuses upon the aspects that would motivate users to obtain library services, identifying factors that can affect users' adoption of library technology. Previous technology acceptance literature has been used to identify factors that affect user evaluations of, and hence decisions about technology usage for service delivery. As the outcome of this study fourteen variables were identified from previous work which was shown to be reliable measures for accepting the attitudes towards technological
services. These factors were modifications of the original factors which can affect the adoption of other means of technology.

The test results showed that nearly all factors are correlated with intention to use library technology. Within these factors, perceived ease of use and perceived usefulness were significant predictors of usage. The study also posits that relevance and system reliability are the fundamental determinants of perceived usefulness while accessibility and search domain knowledge are the fundamental determinants of perceived ease of use. This supports the results obtained for the attitude models that only capture 50% of the usage intention, and that success modifications have only increased this percentage incrementally (Legris et al 2003).

The conclusion is useful to library managers in public libraries that provide technological services and to researchers who are studying user acceptance of information systems. The present study proposed a research model that integrated the antecedents of user beliefs to provide a better understanding of factors influencing user acceptance of library technology. This model provides a theoretical framework to explain user acceptance of a technological system based on user perceptions. Furthermore, the results differ from some of the published literature in that perceived ease of use did not emerge as important from the results. This may be because previous applications were applied to employees in the private sectors whom may have to know related technology at a high level, rather than to that of public users.

In addition, the results indicated a significant difference in intention to use library technology according to the age of respondents. This confirms previous market-research based studies as well as the recent research done by Gilbert et. Al. (2004) who have investigated whether technology acceptance varies with age in a government services setting. It is found that older participants have been more reluctant to use new technology. Apart from intention to use, the researcher in this study tests whether there is an age difference towards perceived usefulness and perceived ease of use and similar results were found.

Therefore, significant insight has been gained through this thesis into both the key factors that predict intention to use library technology and the differences that occur in perceived usefulness, perceived ease of use and intention to use library technology according to age.
A summary of the significant findings, the managerial implications that these results provide, the limitations of the study, and how the work can be built upon in future research, is described in the following sections.

Based on the findings obtained in the present study, the following conclusions are drawn.

1. Both perceived ease of use and perceived usefulness have significant effects on intended use of library technology. However, perceived ease of use has a stronger effect on user acceptance than perceived usefulness. It is suggested that the library must be aware of whether the technological system is easy to use or not.

2. Another two factors, perceived behavioral control and task-technology fit also have significant effects on the intention to use library technology.

3. Relevance, system reliability and perceived ease of use all have significant effects on perceived usefulness.

4. User training does not have a significant effect on perceived ease of use. The result calls for the need to re-examine the effectiveness of user training in the context of library technology.

5. Accessibility is a major determinant of perceived ease of use in the context of library technology, while the other two factors; level of navigation and domain knowledge are also important for perceived ease of use. Considering that user training does not positively affect users' perceived ease of use, modifying the other two factors could be an effective way to help users' perceptions of ease of use.

6. Subjective norm does not affect users' intention to use library technology. The non-significant effect of subjective norm on intention to use shows that that users use library technology in a voluntary nature.

**8.2 Implications for practice**

Hong Kong Public Libraries keep implementing different library technology in order to better serve their users and reduce their operational costs. In this study, factors that affect users' acceptance of library technology were explored and introduced in an integrated and acceptance structure. The unified perspective focuses users' attention on factors that influence users' intention to use different library technology. In this study, library users
were influenced mostly by perceived ease of use and perceived usefulness. This implies that advertising and promotion should emphasize how easy to use; and how useful those technologies are.

This study found that although Hong Kong is a highly social society, users are not affected by others in their daily life when they adopt one technological system. Therefore, public libraries have no need to be aware of whether users’ acceptance of technology can be amplified through the social influence on people or not. However, as shown in the descriptive statistic, users’ referrals still play an important role in introducing library technology though it cannot influence adoption directly.

This study also shows that user perceived importance placed on use training is insignificant to predict perceived ease of use. It is suggested that public libraries should re-examine and re-structure their user training sections and practices. They should organize training sections that can really let library users to understand how to use library technology. Training sessions could be conducted in the computer center where computers are provided to each participant to practice. Additionally, more promotion is needed in order to attract users to attend different training. Moreover, well-defined and illustrated user instruction guidelines should be provided in order to let users easily understand how to use one technology. Library staff could also actively promote users the way of use different library technology on the floor according to their needs.

8.3 Managerial implications

There are a number of implications for public library managers of the results obtained in this research, which impact on many areas of their work, such as corporate strategy, marketing, information technology and operations. These implications are all centred on the understanding gained of the factors used to evaluate service delivery through library technology and the factors that are most important in terms of predicting intention to use that technology.

Strategically, public libraries could initially focus upon the factors that affect users’ acceptance of library technology. It is found that the users place concern more on perceived ease of use than perceived usefulness, although perceived usefulness also plays an important role on users’ intention to use library technology. This indicates that whether
the systems are easy to use and also whether they are useful are major areas of concern for this relatively new approach to deliver library services. The strategic aim could be to develop a user-friendly system, and that the technological services and information provided should be both current and accurate. Since users are also concerned about reliability and security of the system, public libraries must make sure they can protect users’ privacy and that the technological system should provide reliable information.

In order to increase the awareness and rate of library service adoption, the public libraries could initially offer services that are more likely to be required by younger library users (age 16-34 and age 35-54), since it is shown that older library users (above 55 years of age) have less intention to use library technology than other age groups. Examples of this could be promoting the use self-check terminals and online databases in junior and youth libraries. Also, more education should be given to younger library users on using those technologies since they will be the majority users in the future.

Moreover, to increase older users acceptance of using library technology, the public libraries could promote to the older users (above 55 years or above) on how to use those technological services provided by the public library.

For the marketing perspective, the demographic information shows that most of the respondents know library technology through library promotion (such and posters and leaflets) as well as family and friends. Also, souvenirs could continuously be given to those who use technological services during the promotion period. Apart from giving souvenirs, a library can also think of other methods to attract users to use electronic services. For example, they can attract more users to use self-check terminals by extending the due date.

In most situations, public libraries distributed information about usefulness and the convenience benefits of using library technology. However, this study found out that apart from the factors of being useful, the provided information could focus also on other factors such as screen design and display and giving assurances to address the concerned reliability. In terms of developing the electronic and online means of library services, the library should focus on using very secure mechanisms to hold personal data. The libraries should ensure that personal information cannot be obtained by others. Also, the screen and other navigating function should be designed and displayed in a nice and comfortable way, in that it should be clear and easy to look at without a need to add any unnecessary features;
or trying to make it very stylish, since these aspects were not a very significant factor of perceived ease of use.

In addition, public libraries should concentrate on how to delivery their technology in a highly accessible way. It is suggested that they could subscribe more electronic resources which can be available for remote access. Also, the libraries should increase more services that are available for online booking and reservation such as online booking for discussion rooms, closed stack book, workstations in the Computer and Information Centre and a place in the toy library. By doing that, users can save time and money, it can also avoid them from traveling all the way to book for a seat or keep calling on the telephone. They could also know if some services are fully booked in a particular period such as Sunday or afternoons during the weekdays. In order to support remote users, apart from telephone enquiry, it could be beneficial to make an online chat room service which is available on the web page where users can access to get help on demand. By doing this, users can chat with duty librarians and supporting staff and get help at any stage while they are using library web services or online databases. However, level of demand would need to monitored closely in order to provide a worthwhile service.

Operationally, public libraries which provide services through electronic means will need to ensure that the information they display on the website is relevant, accurate and up-to-date, in order to provide a high level of information quality. There needs to be well-organized processes to ensure that the level of information quality is maintained. Library managers should keep reviewing different systems and databases and make sure they can provide information that is needed by the public users. For example, library users should keep checking on the quality and accessibility of all electronic databases. They can also frequently evaluate different systems and databases in order to maintain the consistency of services provide across the whole network. It may be essential to provide a list of links to the databases according to their subjects so that users can easily recognize the relevance of the databases to their field of interest.

Overall, by considering the factors identified in this study, the potential take-up rate will be increased, this can avoid the risk of spending resources on running an underused electronic service. By making better use of resources in this way, the public libraries will not only be able to better meet the target usage, but also be making better use of their overall resources
i.e. using the resources on where they are really needed, such as enriching library stock and improving other information technology. This is a key aspect of delivering value for money for the taxpayers which is a fundamental component that is always reviewed by the Hong Kong Government.

The results in this study can also help public libraries to measure and evaluate the level of services that is being provided, since information technology could be developed around the identified factors. This would give a better indication of service quality than standard approaches, such as SERVQUAL, which are based upon the service received from individuals interacting with employees, which is not applicable where self-service is being used.

8.4 Limitations

External validity

There are aspects of the research that may limit the interpretation of the results. Firstly, the data was all collected from three libraries. The data collected cannot represent all public library users in Hong Kong. The demographic analysis of the respondents (in terms of age and education level) indicated that they are not themselves representative of the population. For example, the respondents from upper age range were far less than the other age groups.

Furthermore, due to the small number of respondents aged over 55, the significance of the results for the variance of perceived usefulness, perceived ease of use and intention to use relative to age requires validation from further study. This is important for the public libraries since they have to ensure that all library users have equal access to their electronic services.

Other factors

There are a number of other factors that affect the usage of technology that have been identified in other studies. This study just selects factors that may affect users' intention to use library technology. However, there are still other factors which can explain more of the variance in the intention to use library technology that may not be included in this study.
These additional factors include computer efficacy, culture, gender, education and experience in using library technology.

**Methodology**

The majority of previous studies have been able to use specific applications and have been able to measure actual usage. Since it is difficult to measure the actual usage of different types of library technology, actual usage had to be replaced with intention to use, which is a general statement that an individual would consider using the service. It is questionable whether intention to use could replace actual usage, and therefore the predictors of usage may not be as strong as the results indicate.

**Research instrument**

The research instrument went through a rigorous set of iterations before the final questionnaire was developed. Although new scales were developed using factor analysis, these scales require further validation through additional research in order to support the results for reliability and validity.

There is a possibility that the respondents did not fully comprehend what was meant by library technology, which would affect the validity of the results. Although explanatory notes were provided in the questionnaire and were carefully refined through the pilot study in order to clarify what the subject was, there is no guarantee that it was fully understood.

Furthermore, fairly high means were obtained for all of the questions, which may in part be down to acquiescence in that there were no reverse questions on the instrument. However, this was accepted since reverse questions were found to be confusing, and resulted in incorrect responses.

**Data collection process**

The sampling process is taken place at three public libraries in Hong Kong and the differences between these three libraries were assumed away. The researcher assumed that no difference exists between the users in the three libraries as they provide similar services
and technologies. However, there are actually differences between the sample population since Tsuen Wan Public Library is located in residential area, City Hall Public Library is located in a financial and commercial district while the target readers of Hong Kong Central Library are the whole population in Hong Kong.

**Analysis**

A significant amount of data is required for factor analysis in order to be effective in identifying the underlying constructs that characterize the data variance. Kline (1997) suggested a sample size of 100 has been found to be sufficient in many applications, although a larger sample size is recommended. In this study, the sample size was already far over the recommended minimum limit (at 462).

However, there is always a concern with factor analysis over the interpretation of the factors regarding the arbitrary choice of the loadings that indicate a significant correlation with that factor. In this study, a cut-off value of 0.3 was used for a moderate loading. However, questions can be raised as to how significant a loading of 0.28 is. The factor analysis was just exploratory and further validation of the scales is needed.

In addition, parametric tests were used for hypothesis testing because the Likert scales used in the research instrument was considered as an interval scale which is often done in numerous behavioural research and similar studies reviewed in the literature. However, if this assumption is not valid, then non-parametric tests should be used, which make it more difficult to reject the null hypotheses than with parametric tests.

**8.5 Recommendations and future work**

There are a number of ways in which the work published within this dissertation can be exploited further. It falls into two categories: work that seeks to confirm or validate aspects of this research, and work that builds upon and extends the results obtained in this study.

For work that seeks to confirm or validate aspects of this research:
Firstly, the fifteen constructs identified in this research were all original constructs that were identified from a review of the literature. Therefore, further study is recommended to investigate whether other factors emerge. More qualitative as well as quantitative analysis could be performed in order to identify other aspects that individuals may feel are important. These could be adding new factors that require scales to be developed. It is also important to ensure that no problems of collinearity are obtained between the factors.

Secondly, many of the items that currently define each scale were originally developed for different factors. Whilst the reliabilities increased in comparison to the original factors, there is scope for further improvement. Therefore, further research is needed to validate the current scales. It is recommended that the factors can be re-analysed to search for new items that could be added to the current scale and better questions that could be asked in order to obtain people’s attitudes towards library technology. By adding additional questions, a more reliable scale may be developed.

Thirdly, an issue encountered when developing the questionnaire is to be able to adequately explain what library technology actually meant, and to convey the instructions that the attitude questions were intending to obtain the respondents views on the relative importance of each item. The researcher adopts a scenario-based approach whereby examples of library technology are shown to participants on the first page of the questionnaires. This enables the context to be more realistic, which should improve the results obtained and such approach was successfully used by other researchers such as Dabholkar (1996). However, it still could not ensure whether the respondents really understand different types of library technology that were shown in the pictures. Further research approaches should be investigated to improve this problem.

Since the process of translating and validating an instrument is a complex process, future research is suggested to investigate the Chinese instrument and to validate it for future implementation. Also, more research is encouraged to validate the instrument and refine it to fit with Chinese culture.

According to this research, subjective norm does not have a significant effect on users’ intention to use library technology. Previous studies reported that the influence of subjective norm on behavioural intention attenuates as the user’s experience with one
technological system increases (Venkatesh and Davis, 2000). There are also studies that show that gender differences have been found in the influence of subjective norm on user acceptance. It is found that women are more motivated by subjective norm at the initial stage of system adoption than men (Venkatesh and Morris, 2000). Since the influence of subjective norm on gender is not investigated in this study, further research can be pursued to investigate how gender influences the effect of subjective norm on intention to use library technology.

Although subjective norm does not directly affect intention to use, it may exert a positive influence on user beliefs about utility of library technology. Therefore, further investigation could also be made on this factor which may affect perceived usefulness and perceived ease of use.

The results of this study show that users perceived importance placed on user training does not have a significant effect on perceived ease of use. These results warrant further investigation in relation to various methods of training and their respective effectiveness. Additional research could be conducted to develop training methods that can bring positive impact on user beliefs about users’ perceived ease of use.

For work that builds upon and extends the results obtained in this study:

In previous research, a number of other factors such as computer efficacy, culture, personal experiences and innovativeness have been identified to influence the intention to use library technology. This research has identified factors that affect users’ intention to use library technology. It is proposed that the consideration of this aspect with previous work would provide further insight into why people choose to adopt technology. It is recommended that this work be extended so as to combine the approach with the previous related work.

Also, the results of this study extended the body of knowledge by providing a set of variables that explained a significant portion of variance in behavioural intention. The understanding of the relationships and interactions of these variables still needs further exploration. Based on the results of this study, it is still in need of more research in the technology acceptance domain. More emphasis should be placed on the performance of library technology as it is a main indicator in influencing users’ intention to use.
This study identified a significant result on intention to use according to age. The result may also vary when it applies for gender, with reasons for adoption varying according to whether a person is a young male or a middle-aged female, for example. Research into variation with age and gender may results in a segmentation of expectations that library managers could use to modify their advertising materials and target specific groups to increase services usage. Previous Technology Acceptance Model based research has identified differences in the antecedents to adoption according to age and gender (Morris and Venkatesh 2000). Although this work was set in a workplace context, the principles could be applied here. A further recommendation is to identify different factors that vary according to a number of variables such as education level and previous experiences towards technology.

More studies are recommended to investigate the variation of users' attitude according to the type of service being delivered. Attitudes towards using different library technology may vary according to the complexity of the service and the concern of system security attached to it by the individual. This would be important to library managers in developing future plans for which services to initially offer through electronic means. For example, if one particular service was too complicated to use, then it may not be correct to make this one of the initial services, since take-up may be low. This consideration would help to develop a general implementation and useful plan in order to maximize service adoption.

In addition, it is suggested that users consider more on perceived ease of use than perceived usefulness i.e. people's concerns about the ease of using one system than how useful it is. They may not use one system if it is difficult to use, even if the system is useful to them. However, this may change over time whereby once the technological system is improved and is easy to use, then perceived usefulness will become the primary predictors for intention to use. This is an aspect that library managers need to be aware of in order to modify both their promotional materials and the content of their user guides.

Since this study is the use of a one-shot sample and cross-sectional design, it provides only a single picture to compare the results. Therefore, additional research that provides a longitudinal inspection with multiple samples over an extended interval would provide additional information that correlates the various measures of effectiveness over time. Longitudinal research is treated as a better method in exploring different factors affecting users' acceptance of technology in a long run. Such issues call for more longitudinal
research and cross-disciplinary research to explore different constructs to accommodate different library technologies as well as newly added technology. The research here used intention to use, instead of actual usage. It is suggested that the construct intention to use should be replaced by actual usage. However, actual usage is a construct that needs resources and time to explore, but more research on actual usage should be made. It would provide further insight to study the usage reasons for users to use library technology, such as the use of self-check terminals. This would help to validate whether the factors identified are relevant to actual system usage. Further research can also be done after the implementation of RFID technology.

Moreover, in order to generalize the findings of this study, more research is encouraged on other technologies in different public sectors in Hong Kong. Additional research is also needed to determine what factors mediate the relationship between intention to use and actual use of technology, whilst this study has been performed in the context of the public sector, application to the other public organizations and private sectors would be beneficial to test the differences between the two domains.

8.6 Summary

In summary, the study performed here has provided insight into the issue of why public library users would decide to adopt library technology, addressed by investigating the factors used to evaluate such technological services. The results have demonstrated how different factors are considered before users adopt one technological service, which is of significant managerial importance in developing plans for encouraging system usage.

The model in this study was an integrated model which uses constructs from various previous models, this supports the strong influence of this construct and its inclusion in future research. The study found that perceived ease of use is the major predictor, which reflects that one system being easy to use is an important factor for intention to use. On the other hand, two variables were found insignificant to affect users’ intention to use library technology in this study. They are user training and subjective norms.

This study developed and validated a new Chinese instrument which was used for measuring the major factors affecting library users in their intention to use library
technology. The instrument provides the foundation for additional research in Hong Kong and China related to the technology acceptance domain.

This study also tested the differences between users in respect to their age in using library technology. It demonstrated how the adoption of the library technology varies with age, while older users have less intention to use library technology compared with younger users. There are other aspects that need to be considered that may also generate similar results, such as gender and personal experiences.

Library technology is emerging as a strong tool for public libraries to provide library services to their users with lower costs and higher efficiencies. This thesis has provided a sound basis for future work. By combining previous models with the insight gained here, and by further considering the variation of attitudes with different aspects, a deeper understanding into why individuals would use library technology could be developed. Such understanding would significantly help public library managers in developing their approaches to increase the usage of their technological services.
Chapter Nine

Reflective Diary

The researcher’s reflective diary includes her experiences during the period of studying the Doctor of Business Administration (DBA) programme and how these experiences impacted and improved her work performance. This diary is divided into three parts:

Part I - Reflection based on the taught modules;

Part II - Reflection based on the research process;

Part III - Impact on the researcher’s work performance.

The DBA programme has impacted the researcher in conducting the research and also her work in her job. The researcher has improved her English oral and written communication skills at work and also when doing her research. Also, there is a great improvement in time management since she had to produce good quality assignments before deadline. By doing this, the researcher can have a better time planning for her projects at work.

In addition, the researcher gains the ability of reviewing others’ research work as academic and conference papers in the context of conceptual underpinnings and the philosophical view of one's study, the analytical view of the literature, the research methods, the epistemology and assumptions associated with methodology and the way when a researcher organizing conclusion and implication. Since the researcher is working as a reference librarian, the skill of reviewing others’ research work helps the researcher a lot when performing her job duty. By learning this skill, the researcher can make better judgment when deciding which academic databases is worth to subscribe since it could involves a lot of money.

Apart from problem-solving skills, the researcher has gained the skills about conceptualizing, finding issues and directions, definitions, exposition and critical insight. Also, being a DBA student, the researcher has got a sense of confidence in terms of rational thought and the range of its applicability.
Part I: Reflection based on the taught modules

Philosophical Underpinnings of Research Methods

The module “Philosophical Underpinnings of Research Methods” provides the researcher the overall concept of the research process, different research designs, insights into epistemological and ontological underpinnings of research, difference between inductive and deductive approaches, concepts relating to theory building, propositions and how to set hypotheses, sample size, and also ways of integrating qualitative and quantitative approaches.

This module has influenced researcher’s ability to have the overview of both qualitative and quantitative methods and their appropriateness to apply them to different research topics. The content of the module has helped the researcher to reflect critically on the research concepts and terminologies used in general. The module enhances the researcher’s understanding and application of research based concepts.

Qualitative Module

The qualitative module is very useful for the researcher as it is an acquisition of knowledge that researcher has not seen it before. As a result, it enables the researcher to understand those philosophical aspects of phenomenological techniques and their description such as discourse analysis, text analysis, cognitive mapping, argument maps, event sequence analysis, integration of qualitative approaches in research design. The researcher has learnt different research designs such as case study and action research as well as other research techniques such as how to carry out focus groups and interviews. It let the researcher to understand the work of other's qualitative research. This module has helped the researcher to run the first part of the research study which was using qualitative focus group method.

Moreover, the researcher also gets the concept and understanding of the use of Computer-Assisted Qualitative Data Analysis Software (CAQDAS), such as NUD*IST and Nvivo.

After finishing the module, the researcher is able to take a critical and defensible perspective in the choice of research method and to be able to apply methods rigorously.
Quantitative Module

The quantitative module is very useful for the researcher since quantitative research method is adopted in the second part of the researcher's dissertation. Apart from the concept of quantitative research design, the researcher also learnt the statistical techniques and assumptions used in the quantitative research method, such as the statistical aspect of central tendency, variation and how normality and skewness affects statistical application as well as other statistical techniques such as correlation, multiple regression and ANOVA.

This module let the researcher to be able to use quantitative research methods for data collection, and understand the issues involved in the use of quantitative approach. Moreover, the researcher learns how to develop questionnaire and the use of different types of research questions. The researcher also learns how to use the statistical package SPSS which is a need in conducting the data analysis chapter.

After doing the assignment of quantitative module, the researcher knows how to carry out a small-scaled quantitative research in a real world setting. It also let the researcher to be aware the practical issues and problems which need to be thought through the design phase.

Critical Evaluation

The critical review module provides researcher a deeper understanding when reviewing or studying the research literature. The researcher learns to appreciate in-depth analysis, evaluative judgement, understanding of complexity and managerial issues, developing critical perspective in the assessment academic literature, proposal and reports. The assessment component provides opportunity to demonstrate skills acquired via this module need the researcher to review two academic journal articles. The researcher then learns to review articles from the perspective of examining the justification, conceptual underpinning, methodological approaches, criticality, research evaluation, addition to knowledge, logic, adequacy and extent of findings, clarity and style of storyline and communication, which researcher uses to do her literature review in this research study. This module enables the researcher to view different articles faster than before and also she can easily catch the main point within one paragraph.
Since the researcher needs to produce different booklets before organizing subject talk, she needs to make a lot of background study about different speakers. After finishing this module, the researcher is able to review the speakers' academic publications and understand the conceptual underpinning of their work.

**Research Planning and Proposal Writing**

The research planning and proposal writing module helps the researcher in developing her research proposal with practical relevance, and presented an opportunity to demonstrate and conceptualise the design of a research project for the dissertation via the assessment exercise. It serves as a platform to write an acceptable proposal for the dissertation that included objectives, justification, data collection, proposed analysis and schedule of activities.

For the researcher, this module is useful in having an overall understanding of the research project and activities for rest of the DBA studies. The insights gained from this module have been useful for the researcher in writing her research proposal and other proposals at work.

**Part II: Impact from Research Component**

When choosing the research topic the researcher reviewed lots of articles and other resources, she observed her working environment and discussed with her supervisors before finding a proposed topic. Once the topic was selected, she started to make a good quality proposal. After the proposal was approved, the researcher focused on making a doctoral research.

**Seminars:**

**Literature Review**

The researcher collected literature relating to various aspects of technology acceptance, different technology acceptance models and different types of library technology features from a variety of secondary sources. During the process of doing the literature review, the researcher reviewed a large number of articles regarding to different technology acceptance models and to figure out elements which could apply to the model of the user acceptance of
library technology in Hong Kong. Moreover, the researcher also reviewed articles on the development of library technology in order to provide more background information on library sector in the literature review.

Apart from printed literature, the researcher also reviewed quality literature from different web resources since they could provide more up-to-date information. The researcher believes that a strong literature base is crucial to a solid dissertation, it is helpful in the long run and could offer insights about the subject which can enable the researcher to work more efficiently.

This was a significant experience for the researcher to understand the practical feasibility of research pursuits to be undertaken in the DBA programme. The researcher learnt to think logically and to make a critical review of different articles. Also, she was able to write her literature review in an appropriate manner. When reviewing other’s articles, the researcher was able to understand the struggle and limitations that others have encountered.

Also, since the researcher is a reference librarian, she could practice more on information searching as she had to practically do her own research instead of helping other users to find information for their research. Therefore, the researcher could actually come across and understand all the problems and difficulties her users may have encountered. The experience of finding information for the literature review can help her to provide better services to her users. Moreover, she can practice more on using different online databases. Not only understanding their functions, but also their strengths and weaknesses and how much they can do.

Methodology

Methodology had always been important throughout the dissertation process. The seminar on methodology provided an opportunity to receive a feedback on the proposed framework of relationship between different constructs towards users’ intention to use library technology, and as a result the new model for the technology acceptance of library technology was modified.

Also, it provided clarity in conceptualizing in order to decide the use of mixed method research which is a combination of qualitative and quantitative research methods.
Moreover, the researcher learnt to decide specific hypotheses, statistical techniques, sampling and constraints of the methods. Because of this experience, the researcher could have a better planning and could think in a more structured way before doing other work.

In addition, the researcher knows how to conduct focus group interviews and quantitative survey. Since nowadays the district councils in Hong Kong can involve a lot in public libraries’ activities in their own districts and regular meetings are held, the experience of conducting focus group interviews helps the researcher to improve her communication skills and organizing skill. By doing quantitative survey, the researcher gains relevant experience and can be able to assist the library to conduct a small-scaled survey in the future.

Results

The researcher described results that obtained from data analyses in the form of descriptive, hypotheses testing, correlations and multiple regression and ANOVA. A good amount of work had been completed in this phase. The result was reboots and the feedback was positive. It also provides useful implication for the public library sector in Hong Kong.

Dissertation writing

The researcher feels that the dissertation writing phase is the most rewarding part of the doctoral process. During the whole process of dissertation writing, the researchers received quick and valuable responses from her supervisors. Valuable aids were made to all parts of the dissertation, starting from literature review to data analysis. Moreover, the researcher learnt to produce well-prepared presentations before each workshop in order to have better communication with the supervisor. It can also improve the researcher’s presentation skill since part of her job duty is to conduct user education sessions and to provide training sessions for new recruited library assistants and officers.

This is a rigorous part of the programme that required the researcher putting all pieces of the research process together. The researcher learnt to provide structured writing for the dissertation and organized different chapters. The researcher received valuable comments time by time, and suggestions were incorporated to different parts of the dissertation. This
can also help the researcher to produce well-organized users' resources guides and library newsletters.

The researcher enjoyed criticality of constructive feedback and efficiency of the supervisors during the write up process. It was a pleasant learning experience. It has proved to be an efficient method for doing research projects and writing reports. The researcher also learns to have good time management which was very useful to her personal work.

Part III: Impact on the researcher's work performance

The researcher is working in the Hong Kong Public Library System which is part of the Hong Kong Government's Leisure and Cultural Services Department. The Public Libraries in Hong Kong provide a network of 66 static libraries and 10 mobile libraries. The Library collection has 12 million items in different formats. This public libraries system serves a population of 7.1 million in Hong Kong with an annual circulation over 60 million, while more than half of the population in Hong Kong are registered borrowers.

The Hong Kong Central Library is a 12-storey high building and is the biggest library facility among the Hong Kong Public Libraries System. The researcher is a reference librarian in the Hong Kong Central Library which is noted for its most extensive reference collections.

Being a supervisor of more than 60 people, which includes library officers and assistants, there is a need for the researcher to improve her management skill. By taking the DBA course, she can think logically and can think critically for both internal and external matters around her work.

During the research process, the researcher came across a lot of difficulties when finding different information. This challenging experience enables her to not only meet but exceed customer expectation by providing information that is consistent, accurate and comprehensive. The experience helps her to remind her staff to provide higher standard answer to users' enquiries. This improves the overall effectiveness of quality customer service operations.

Moreover, public libraries highly emphasize the marketing of information services. Extension activities, library visits, newsletters, customer liaison meetings etc, are all well
developed means for promotion. Individual libraries are requested to submit annual business plans and proposals for developing and marketing the services, their achievements of the plans will be evaluated at the end of the proposing period. The proposal writing which is needed in the DBA programme enhances the researcher's proposal writing skills and also makes better planning in her proposal at work.

When working in the public library, the researcher has trained many new-coming library officers and library assistants. Apart from giving briefing sessions, she supervises staff and has to write appraisal reports, she has to prepare induction training checklist for library assistants, distribute their office work and operate the human resources management system. She also acts as a chairman of Recruitment Board for employing library officers and library Assistants. The whole DBA programme makes the researcher becomes more mature in terms of logical and critical thinking, therefore it is easier for her to handle different situations regarding to human resources management.

Apart from retrieving usage statistics, the public libraries have to conduct user survey in order to assess information needs of users. The research methods of public libraries are diversified, like use of statistical records, questionnaires, reader survey, public consultation and customer liaison meeting. The quantitative research findings rely on statistical software for analysis. Therefore, the use of SPSS enables libraries to process and analyze information in more sophisticated ways. Before studying this programme, the researcher does not know SPSS and is not sensible to all the statistical reports at work, she mainly rely on the technical officer to compile the statistical findings and send it to district councils. After taking the DBA programme, the researcher knows how to use SPSS and gains certain statistical knowledge. The researcher can understand the statistical findings and can take a final look of those findings in order to avoid mistakes. Moreover, she can help to compile the report herself when the technical officer is on leave.

During the DBA programme, the researcher took part in conducting the survey of the usage of periodicals in order to maximize usage and avoid wastage. The researcher employed the knowledge that she has learnt in the programme, she led the project and guided the teammates to use SPSS in order to compile a small-scaled statistical report. It ended up the project run more efficiently and the statistical result was more accurate.
Since public librarians have to answer reference enquiries, lead library team members, handle conflict and complaint and dealing with difficult customers, good communication and inter-personal skills are recognized as essential tool for building up good relation with the public and for providing effective services. The DBA programme improves the researcher both communication and inter-personal skills, her performance at work has improved after finishing the programme. Apart from the overall grading, the grading of her ‘communication skills’ has also increased in her appraisal report.

In addition, the literature review process has made the researcher to do a lot of structured reading of library development and involve in electronic discussion groups to keep up-to-date with the development of library technology. This becomes a habit of the researcher, it made the researcher to understand more about her professional environment and improve her work. As mentioned in the earlier section, the literature review process makes the researcher to evaluate different online databases more efficiently so that she have a clear idea when choosing different online databases to subscribe.

Summary

Overall, the researcher has learnt a lot from all parts of the DBA programme. As the researcher at a government department, all the skills she learnt in the DBA programme could help her to sharpen her management decisions. The experiences gained have impacted researcher’s daily work as well as her research study which was described in sections above. It also influences researcher’s personal attitude. The researcher learnt not to be discouraged when hitting the roadblock. By understanding the limitations inherent in the problem, she learnt how to overcome the situation. In addition, the researcher gained a better interpersonal skill when she interacts with others. Her study as well as her performance at work receives appreciation by colleague ad supervisors. Moreover, the researcher is able to produce a well-defined research work.

After studying the programme, the research has learnt a lot of knowledge. However, the programme also makes the researcher realize that there is a lot more to learn. In order to perform more professional responsibilities that arise in the future, it is for sure that the researcher will enrich her knowledge by taking all relevant education and doing more research regarding to the technology development of public libraries so that the researcher can undertake her role more effectively.
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Appendix A

A separate form with questions about background information of respondents such as age, education level, income status, experience and things related to the study are collected from each participant before the discussion starts.

Focus group questions

1. Think back to the past several years. Could you identify any changes about the library technology in Hong Kong?

2. Could you please describe the recent library technology that you know?

3. Do you use any of these library technologies?

4. How do users perceive library technological services compared to traditional services?

5. Could you tell me the factors that make you use the library technology?

FOLLOW UP:

Knowledge of search domain
Terminology
Accessibility
Reliability
Result demonstrability
Task-technology fit

Computer self-efficacy
Level of navigation
User training
Relevance
Subjective Norm
Perceived Behavioural Control

6. Could you tell me factors that affect one to adopt and use library technology as an individual?

7. Could you tell me about the users' attitude and behaviour toward using library technology?

8. What kind of strategies the library should use to change users attitude towards using library technology?

9. What the library can do to help the individuals to accelerate the adoption of library technology?
10. Which of those mentioned is most influential?

11. The public libraries are trying to adopt and motivate the users to use library technology. What advice do you have for this?
### Focus Group Registration Form

**Background Information**

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**How often do you use the services provided by the Hong Kong Public Libraries?**

- Rarely (Less than once a month)
- Sometimes (1 to 2 times a month)
- Frequently (Once a week)
- Always (Almost Daily)

**How often do you use the following technologies provided by the Hong Kong Public Libraries?**

- Online Databases
- E-book
- Library Websites
- Online Public Access Catalogue (OPAC)
- Self-check terminals
- MMIS (Digital Library System)

- Rarely (Less than once a month)
- Sometimes (1 to 2 times a month)
- Frequently (Once a week)
- Always (Almost Daily)

**Please provide contact details for follow-up action if necessary (Optional)**

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Appendix C: Instruments proposed in this study

**Relevance**
The resources of the library website and online databases relate well to what I want.
The library website and online databases have enough resources for my search.
The quality of output I get from online database is high.
The results shown in the online public access catalogue (OPAC) and online databases are relevant to my study / work.

**Reliability**
System stability is an important issue for me when I use library technology.
Quick response of the library technological system is an important issue for me.
Data security is an important issue for me when I use library technology.
Privacy of information is an important issue for me when I use library technology.

**User Training**
It is important for the public libraries to provide user education sessions on the use of e-books and online databases.
It is important for the public libraries to provide user training on technology use.
It is important for the library to provide self training materials such as user manuals and online help for users who use library technology.

**Accessibility**
Library technology is highly accessible
My access to library technology is unrestricted.
It is important for the library to provide additional channels such as website and telephone to access library services

**Level of navigation**
It is essentials that the commands of different library technological systems are well depicted by buttons and symbols.
It is essentials that the layout of the screens of library technological systems is clear and consistent.
It is easy to navigate through the menus on the library website.
It is easy to read the information displayed on the library technological systems.

**Level of understanding of Terminology**
I understand most of the terms used throughout different systems of library technology.
It is essentials that the use of terms is consistent throughout different library technologies.
I feel confident understanding terms / words relating to library technology.

**Knowledge of Search Domain**
I am familiar with the subject domain that I search with online public access catalogue (OPAC) and online database. I am knowledgeable in how to search with an online public access catalogue (OPAC) and online database.

**Perceived Usefulness**
Library technology improves my effectiveness in searching information and using library services. Using library technology enables me to save time. I would find library technology useful. The library services nowadays (with library technology) are more convenient than traditional services. Using library technology would make it easier for me to do my work / study.

**Perceived Ease of Use**
I find library technology easy to use. Using library technology does not require a lot of mental effort. My interaction with library technology is clear and understandable. I find it easy to get the library technology to do what I want to do.

**Subjective Norm**
My friends think that I should use library technology. My family thinks that I should use library technology. People who influence my behaviour think that I should use library technology.

**Task Technology Fit**
All in all, library technology is satisfactory in meeting my needs. The technology provided by the library meet my needs adequately.

**Perceived Behavioural Control**
At home, I have the resources necessary to access to library website. I feel comfortable using library technology on my own. I feel confident about my knowledge and ability to use different library technologies.
**Intention to Use**

I intend to use library technology as often as I need.
I intend to continue to use library technology in the future.
I intend to use library technology whenever it is available.
Appendix D:

QUESTIONNAIRE

Dear respondent,

The purpose of this questionnaire is to investigate users’ acceptance of library technology, which includes Online Databases, Hong Kong Public Library website, Self-check Terminals, Multi-media Information System (MMIS), Online Public Access Catalogue and Smart ID card for library services.

Based on your experience as a user in public library services, please complete this brief questionnaire which tries to measure your opinion regarding technological use in Hong Kong Public Libraries by analyzing your perceptions of the technological services provided by the library. Your participation in this research is voluntary. However, all your responses and participation are important in the research process.

The survey questionnaire is divided in two sections. The first part is demographic information and the second part covers the use of library technology. It should take approximately 10 minutes to complete both parts.

Please indicate the level of agreement with each statement by circling the number that corresponds to your answer. For example, circle 1 if “strongly disagree” and 7 if “strongly agree”. You can also circle number 4 for neutral to show some intermediate feeling. For those questions related to demographic information, please just tick the appropriate box.

The questionnaire is solely conducted for academic purpose and all your answers will remain strictly confidential. Also, the information provided will not be used for any commercial activity.

If you have any questions concerning the research study, please call me at (+852) 9277 7288 or e-mail me at kareni827@excite.com.

Thank you for your participation.

Karen Chan
Section 1  Demographics

The questionnaire is focusing on the use of library technology for library services and information searching.

Please answer the following questions about your demographics. Please choose one item that reflects your response.

1. What gender are you?
   □ Male         □ Female

2. How old are you?
   □ 16-34 years  □ 35-54 years  □ 55 or above

3. What is your education level?
   □ Primary      □ Secondary / High School  □ Post-secondary / Higher education
   □ University Degree □ Master or above

4. How often do you use the services provided by the Hong Kong Public Libraries?
   □ Rarely (Less than once a month)
   □ Sometimes (1 to 2 times a month)
   □ Frequently (Once a week)
   □ Always (Almost Daily)

5. Please indicate all items you might use. (Multiple Selections)
   □ Online Databases          □ Hong Kong Public Library website
   □ Self-check Terminals       □ Multi-media Information System (MMIS)
   □ Online Public Access Catalogue □ Smart ID card for library services

6. How often do you use any of the above technologies provided by the Hong Kong Public Libraries?
   □ Rarely (Less than once a month)
   □ Sometimes (1 to 2 times a month)
7. Do you access to the library website for library services at home such as checking library catalogue, reserving and renewing library materials?

☐ Yes       ☐ No

8. If yes, how often is it?

☐ Rarely (Less than once a month)
☐ Sometimes (1 to 2 times a month)
☐ Frequently (Once a week)
☐ Always (Almost Daily)

9. How do you learn to use library technology? (Multiple Selections)

☐ Introduced by family and friends
☐ Mass Media
☐ Library promotion (e.g. Posters, leaflets, resources guides)
☐ Word-of-mouth

10. Will you recommend library technology to your friends and family?

☐ Yes       ☐ No
Section 2

The following statements are about your perceptions related to library technology. You are required to fill out questions in the form of a short statement accompanied by a scale. Please indicate your level of agreement with each of these statements and circle the number that best describe your opinion.

All questions have 1 to 7 scale where:

1=Strongly disagree, 2=Moderately Disagree, 3=Neutral (Neither Disagree Nor Agree), 4=Slightly agree, 5=Moderately Agree, 6=Strongly Agree

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<thead>
<tr>
<th>Relevance</th>
<th>Stronger Disagree</th>
<th>Strongly Agree</th>
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<td>1. The resources of the library website and online databases relate well to what I want.</td>
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<td>2. The library website and online databases have enough resources for my search.</td>
<td>1 2 3 4 5 6 7</td>
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<td>3. The quality of output I get from online databases is high.</td>
<td>1 2 3 4 5 6 7</td>
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<td>4. The results shown in the online public access catalogue (OPAC) and online databases are relevant to my study / work.</td>
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<th>Reliability</th>
<th>Stronger Disagree</th>
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<td>5. System stability is an important issue for me when I use library technology.</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>6. Quick response of the library technological system is an important issue for me.</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>7. Data security is an important issue for me when I use library technology.</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>8. Privacy of information is an important issue for me when I use library technology.</td>
<td>1 2 3 4 5 6 7</td>
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<th>User Training</th>
<th>Stronger Disagree</th>
<th>Strongly Agree</th>
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<tr>
<td>9. It is important for the public libraries to provide user education sessions on the use of e-books and online databases.</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>10. It is important for the public libraries to provide user training on technology use.</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>11. It is important for the library to provide self-training materials such as user manuals and online help for users who use library technology.</td>
<td>1 2 3 4 5 6 7</td>
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</table>
Accessibility

12. Library technology is highly accessible.

13. My access to library technology is unrestricted.

14. It is important for the library to provide additional channels such as website and telephone to access library services.

Level of Navigation

15. It is essential that the commands of different library technological systems are well depicted by buttons and symbols.

16. It is essential that the layout of the screens of library technological systems is clear and consistent.

17. It is essential that users can easily navigate through the menus on the library website.

18. It is essential that readers could easily read the information displayed on the library technological systems.

Level of understanding of Terminology

19. I understand most of the terms used throughout different systems of library technology.

20. It is essential that the use of terms is consistent throughout different library technologies.

21. I understand different terms/words relating to library technology.

Knowledge of Search Domain

22. I am familiar with the subject domain that I search with online public access catalogue (OPAC) and online database.

23. I am knowledgeable in how to search with an online public access catalogue (OPAC) and online database.

Perceived Usefulness

24. Library technology improves my effectiveness in searching information and using library services.

25. Using library technology enables me to save time.

26. I would find library technology useful.

27. The library services nowadays (with library technology) are more convenient than traditional services.
28. Using library technology would make it easier for me to do my work/study.

**Perceived Ease of Use**

29. I find library technology easy to use.
30. Using library technology does not require a lot of mental effort.
31. My interaction with library technology is clear and understandable.
32. I find it easy to get the library technology to do what I want to do.

**Subjective Norm**

33. My friends think that I should use library technology.
34. My family thinks that I should use library technology.
35. People who influence my behaviour think that I should use library technology.

**Technology**

36. All in all, library technology is satisfactory in meeting my needs.
37. The technology provided by the library meet my needs adequately.

**Perceived Behavioural Control**

38. At home, I have the resources necessary to access to library website.
39. I feel comfortable using library technology on my own.
40. I feel confident about my knowledge and ability to use different library technologies.

**Intention to Use**

41. I intend to use library technology as often as I need.
42. I intend to continue to use library technology in the future.
43. I intend to use library technology whenever it is available.

Thank you very much for your valuable time and effort.
For any questions regarding this survey, please e-mail the researcher, Karen Chan, at karen827@excite.com.

**Request for research result**

If you would like to have an electronic copy of the analysis of the data, please write your e-mail address.

E-mail address

________________________________________

**Raffle**

If you are interested in entering the random drawing of HK$100 dollar supermarket gift certificate, please fill in your name and you mail address here. (This is optional).

Name: ________________________________

Mail address:

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<th>Types of Library technology</th>
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<td><strong>MMIS Digital Library System</strong></td>
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<td>- Access to more than 1.4 million pages of digital images and documents such as Hong Kong newspapers, posters, maps, etc.</td>
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<td>- Provide audio and video-on-demand services</td>
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<th><strong>Web Public Access Catalogue</strong></th>
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<td>- Bilingual systems</td>
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<td>- Search for library materials</td>
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<tr>
<td>- Display borrower's records</td>
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<td>- Renewal and reservation of library materials</td>
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<th><strong>Online Databases</strong></th>
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<td>- Collections of electronic information on one or more related topics.</td>
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<tr>
<td>- Bibliographic in nature, may contains full-text, numerical, images, sound, or audio</td>
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<td>- Remote access is also available for some of the databases.</td>
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<th><strong>Smart ID card for library services</strong></th>
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<td>- Use for borrowing library materials and reservation of computer terminals</td>
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<th><strong>Self-check Terminal</strong></th>
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<td>- Self-help borrowing and renewal services</td>
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<th><strong>Library Website</strong></th>
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<td>- <a href="http://www.hkpl.gov.hk">www.hkpl.gov.hk</a></td>
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<tr>
<td>- Online reservation and renewal of library materials</td>
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<tr>
<td>- Access library e-newsletter, online databases and e-books.</td>
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<tr>
<td>- Display borrowers’ records</td>
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<tr>
<td>- 24 hour service available for readers to access a wide range of electronic information and services.</td>
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Appendix E: Mind maps of focus groups findings

Mind map of focus groups findings

factor x (number of times being mentioned)