INFORMATION LITERACY INSTRUCTION IN BUSINESS SCHOOLS

INFORMATION LITERACY INSTRUCTION IN BUSINESS SCHOOLS:

Factors Affecting the Adoption of Online Library Resources by Business Students

by

LORNE D. BOOKER, B.A., H.B.Comm., M.Sc.Mgt.

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AUTHOR: Lorne D. Booker, Ba., H.B.Comm., M.Sc.Mgt.

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ABSTRACT

The overall goal of this dissertation is to predict and explain how information literacy instruction (ILI) influences the adoption of online library resources (OLRs) by business students. This dissertation has two other important goals. First, this dissertation aims to assess the efficacy of active ILI and passive ILI. Second, this dissertation seeks to examine the role that OLR self-efficacy and OLR anxiety play in influencing ILI learning outcomes and the adoption of OLRs.

To achieve these goals, a theoretical model was developed that integrates research on ILI outcomes and technology adoption. To test this model, a web-based survey was developed and administered to 337 business students at McMaster University.

This dissertation makes several important contributions to theory. First, the findings from the analysis of the structural equation model confirm that the Technology Acceptance Model is an appropriate tool for studying the adoption of OLRs. Second, the findings indicate that amount of ILI is not a significant predictor of the adoption of OLRs. Third, though the amount of ILI was not found to be a predictor of OLR self-efficacy or OLR anxiety in the quantitative analysis, results from the qualitative analysis suggest that ILI increases self-efficacy and reduces anxiety. Fourth, the findings suggest that OLR self-efficacy and OLR anxiety are significant determinants of the adoption of OLRs where OLR self-efficacy was the strongest determinant of the adoption of OLRs. Last, consistent with Bandura's social cognitive theory, OLR self-efficacy and OLR anxiety were found to be significantly negatively correlated; a partial mediation effect of OLR anxiety on the relationship between OLR self-efficacy and the perceived ease of use of OLRs was supported.

This dissertation makes a contribution to practice by revealing that instructors should focus on delivering higher quality ILI rather than higher amounts of ILI. In particular, training interventions should be designed to promote OLR self-efficacy among business students, especially among students who have received the least amount of ILI.

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LIST OF ABBREVIATIONS AND SYMBOLS

AACSB	The Association to Advance Collegiate Schools of Business
ACRL	Association of College and Research Libraries
ALA	American Library Association
IL	Information Literacy
ILI	Information Literacy Instruction
OLR	Online Library Resource
OLRs	Online Library Resources
OLR Anxiety	Online Library Resource Anxiety
OLR Self-Efficacy	Online Library Resource Self-Efficacy
PLS	Partial Least Squares
SAILS	Standardized Assessment of Information Literacy Skills
TAM	Technology Acceptance Model

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CHAPTER 1: INTRODUCTION

"Whatever else you bring to the 21st century workplace, however great your technical skills and however attractive your attitude and however deep your commitment to excellence, the bottom line is that to be successful, you need to acquire a high level of information literacy. What we need in the knowledge industries are people who know how to absorb and analyze and integrate and create and effectively convey information—and who know how to use information to bring real value to everything they undertake."

Anthony Comper, President of the Bank of Montreal, in his speech to the 1999 graduating class at the University of Toronto (ACRL 2003)

1.1 Information Literacy in Business

Information is a vital resource for businesses and organizations today. As such, the ability of organizational workers to find, retrieve, analyze and use information, both effectively and efficiently, is seen as a necessary set of skills for employees to have. Collectively, these abilities are known as information literacy (IL) skills.

Business schools recognize the explicit need to train their students how to locate, access, and interpret information from a wide variety of information sources. They know that their students will need to utilize information for knowledge-building and decision-making purposes after they graduate. Importantly, business schools recognize that in today's Internet-enabled world, many of these information sources are in electronic form. For that reason, business schools are placing more emphasis on training their students to be proficient at utilizing information technology tools that provide access to electronic information sources; many such sources are available to business students through the university's online library resources (e.g., databases, indexes, journal suites, online catalogues, library web sites).

The importance of information to businesses is easy to understand when it is recognized that information and decision making are intertwined. People are only able to make informed decisions when they have relevant and accurate information available to them. In the same manner, businesses are only able to make effective decisions on an ongoing basis when their information processes are able to supply information regularly and cost effectively. Information is the fuel for effective decision making. As such, it behooves

business schools and organizations to train and educate their students and employees to become information literate.

People are deemed to be information literate when they have "the ability to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ACRL, 2006). The teaching of information literacy skills is called information literacy instruction (ILI). In business schools, ILI is usually tied to instruction on the use of Online Library Resources (OLRs).

OLRs are defined here as the content stored in digital library repositories and the information systems that allow people to search and retrieve that content. OLRs include any items accessible by electronic means through academic library web sites, as well as the technology that makes those items accessible. Examples of OLRs include the online library catalogue, the library web site itself, electronic books, electronic journals and articles, online magazines, online newspapers, theses and dissertations in electronic form, and electronic databases such as *Business Source Complete*, *Factiva*, and *Web of Science*.

1.2 Research Problem

Though business schools are keen to offer ILI to their students, the best way to go about this is unclear. Several factors that influence student learning outcomes of ILI in business schools have been identified, but more research is needed to demonstrate and validate the causality of these factors (Detlor et al., 2011). Of particular interest is the influence of the active mode of ILI on learning outcomes. The active mode of instruction seeks to make students active participants in the learning process by having them engage in activities that require the use of higher order thinking skills such as analysis, synthesis and evaluation. Some examples of activities commonly used in active instruction include reading, writing, analyzing and discussing. Since the goal of active instruction is to develop the skills of the student, it has been identified as an appropriate strategy for ILI (Allen, 1995). Active instruction is not defined explicitly. Instead, it is usually explained by contrasting it with the passive mode of instruction. The passive mode is typified by the traditional lecture-based mode of instruction familiar to most university students where the instructor conveys information to the students who passively listen to the lecture and look at slides. The passive

mode of instruction seeks to impart knowledge to students. Little research has been conducted that compares the efficacy of active ILI with the efficacy of passive ILI in influencing learning outcomes.

One of the learning outcomes of ILI is the adoption of OLRs (Detlor, Booker, et al., 2010). Universities have invested large sums of money to obtain and maintain OLRs. In 2008 academic libraries in the United States spent approximately $1 billion on subscriptions to electronic serials and $133.5 million on electronic books, serial backfiles, and other electronic materials (Phan et al., 2009). Yet, many students eschew the use of OLRs in favour of less credible but easier to find internet-based resources (P. M. Davis & Cohen, 2001; Grimes & Boening, 2001; Metzger et al., 2003; Thompson, 2003). Although the adoption of OLRs by students is considered to be important, the factors that influence the adoption of OLRs are not well understood. Previous studies have investigated the adoption and use of library web sites and digital libraries – not OLRs specifically. Most of these investigations focused on technical aspects of the system interface (Hong et al., 2002; Ramayah, 2006). Only a few looked at individual differences such as self-efficacy (Ramayah & Aafaqi, 2004) or investigated the effects of individual differences, personality traits, and system characteristics on digital library use (Nov & Ye, 2008). One examined the influence of service functionality and task functionality on satisfaction and intention to use an academic library web site (Heinrichs et al., 2007). None examined the influence of instruction on OLR adoption. More specifically, none of the previous studies have assessed the efficacy of active and passive modes of ILI on the adoption of OLRs. In fact, there has been a call for research that identifies which training method is most effective at influencing the adoption of technology (Viswanath Venkatesh & Bala, 2008).

Of interest in this domain are OLR self-efficacy and OLR anxiety. Self-efficacy and anxiety are outcomes of instruction and determinants of technology adoption. OLR self-efficacy is defined here as an individual's beliefs in his/her capabilities to organize and execute the courses of action required to use online library resources. Self-efficacy is of interest in an educational setting because it influences the tasks that people pursue, the level of effort they put into tasks, and their perseverance in the face of setbacks or obstacles. OLR anxiety is defined here as fear or apprehension felt by an individual when using OLRs or

when contemplating the use of OLRs. Anxiety is important in an education context because people with high levels of anxiety avoid the source of their anxiety, they are more inclined to quit in the face of obstacles or setbacks, and they are distracted by the need to cope with their anxiety and with their self-deprecating thoughts. Although self-efficacy and anxiety are regarded as determinants of instructional outcomes, they can also be viewed as outcomes themselves. Effective instruction is believed to boost the self-efficacy of students and reduce their level of anxiety. In addition to their role in education, self-efficacy and anxiety are regarded as important determinants of technology adoption. High levels of self-efficacy with a technology foster higher rates of technology adoption in contrast high levels of anxiety are associated with lower levels of technology adoption. Little is known about which mode of instruction has the stronger influence on increasing self-efficacy and decreasing anxiety. It is not known how ILI, OLR self-efficacy and OLR anxiety interact to influence the adoption of OLRs. Specifically, it is not known whether the influence of ILI on the adoption of OLRs is mediated through OLR self-efficacy or OLR anxiety.

Given the above, this dissertation seeks to answer the following high-level research question:

- What is the impact of ILI on the adoption of OLRs by business students?

1.3 Epistemological Approach

This dissertation is founded on the post-positivist theoretical perspective. The post-positivist perspective is based on the assumptions that knowledge is conjectural (not absolute), that research is a process of making claims and then challenging them, that data, observation and rationality shape knowledge, that researchers strive to develop correct explanatory statements, and that objectivity is an essential component to rational inquiry (Creswell, 2003). In the post-positivist view, knowledge is advanced by developing theory, collecting data to test the theory, and then either refuting or refining theory based on the collected data. In keeping with the post-positivist approach, this dissertation makes use of deductive logic, quantitative data gathering and statistical analysis.

1.4 Theoretical Approach

This dissertation makes use of triangulation of theory by combining the Library and Information Sciences and Information Systems perspectives to explain how ILI influences the adoption of OLRs. The Library and Information Sciences perspective frames the use of OLRs as an outcome of instruction. The key challenge from the Library and Information Sciences perspective is to determine which instruction technique most effectively brings about the desired learning outcome. The Information Systems perspective frames the problem as a problem of technology adoption. From the Information Systems perspective the key challenge is to determine which factors most strongly determine the adoption of technology. This dissertation combines these approaches. This dissertation investigates ILI as an antecedent to OLR adoption. The findings from both fields are applied to the research questions.

1.5 Methodological Approach

This dissertation seeks to answer the research questions by developing and testing a research model that draws on previous research on ILI and technology adoption to explain how ILI influences the adoption of OLRs by business students. In order to test this model, a survey instrument was developed and administered online to 337 undergraduate Commerce students at McMaster University. The resulting data were analyzed using Partial Least Squares (PLS).

1.6 Theoretical and Practical Contributions

From a theoretical perspective, this study seeks to contribute to our knowledge of ILI and technology adoption in two ways. First, this dissertation adds empirical evidence to the body of literature on ILI outcomes. Second, it contributes empirical evidence to the body of literature on the antecedents of technology adoption. Specifically, it provides evidence on the role of instruction in promoting the adoption of technology.

From a practical perspective, this dissertation strives to provide guidance to instructors on how to design their ILI sessions. Instructors will be able to use the results of this dissertation to find the right mix of active instruction and passive instruction for their ILI

sessions. Also, this dissertation seeks to contribute to practice by evaluating OLR self-efficacy and OLR anxiety as ILI outcomes. In short, this dissertation provides empirical evidence that IL instructors can use to conduct better ILI practice.

1.7 Organization of the Dissertation

This dissertation is organized as follows. Chapter 1 (this chapter) introduces the research problem, the methodological approach, and the theoretical and practical importance of the proposed study. Chapter 2 provides a literature review and definitions of major theoretical constructs. Chapter 3 presents a theoretical model derived from the literature review that explains the adoption and use of OLRs, and identifies the study's research question and hypotheses. Chapter 4 describes, in detail, the methodology used to assess the theoretical model; specifically, data collection and analysis techniques are discussed. Chapter 5 presents the analysis of the data and the assessment of the theoretical model. Chapter 6 presents the discussion and conclusion of the study.

CHAPTER 2: LITERATURE REVIEW

"Few executives yet know how to ask: What information do I need to do my job? When do I need it? From whom should I be getting it?"

Peter F. Drucker (1992)

The purpose of this chapter is to review the literature on topics related to information literacy instruction and technology adoption. It is expected that a review of the literature on these topics will provide a general understanding of how ILI influences the adoption of OLRs. In this chapter the literature pertaining to information literacy, technology adoption, self-efficacy and anxiety is examined.

This chapter is organized as follows. Section 2.1 provides an introduction to information literacy. It explains why information literacy skills are important. Section 2.2 discusses information literacy instruction. It describes some of the outcomes of ILI then it examines active and passive instructional techniques and ILI. Section 2.3 discusses the adoption of OLRs. The technology acceptance model (TAM) is described and research that has applied the technology acceptance model in the context of libraries is summarized. Section 2.4 provides the theoretical background for OLR self-efficacy. Self-efficacy is described as a determinant of performance and as a desirable training outcome. Then the role that self-efficacy plays in promoting the adoption of technology is presented. Section 2.5 discusses OLR anxiety. ORL anxiety is defined. The impact of anxiety on technology adoption is described.

2.1 What is Information Literacy?

In the context of business, information literacy skills have been defined as "the ability to effectively and efficiently access and evaluate information for problem solving and decision making" (Hawes, 1994). A more general definition is provided by the American Library Association which defines information literacy as a set of abilities that enable people to "recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information" (American Library Association, 1989). Information

literacy skills have been described as the "foundation for the development of higher-level thinking and evaluative skills" (Orr et al., 2001) and are believed to foster deep rather than surface learning (Bruce, 2004). Information literacy is a keystone to academic attainment and lifelong learning (Kurbanoglu, 2003) and is deemed to be essential to success in school, the workplace, and our personal lives (Gross & Lathama, 2007). Those who do not have information literacy skills are deemed to be on the disadvantaged side of the digital divide. Consequently, information literacy is viewed by some "a practical necessity and a moral right" (Bawden, 2001, p. 232). In business, information literacy is key to reducing information overload (Edmunds & Morris, 2000). Information literacy skills facilitate knowledge management (O'Sullivan, 2002). Information literacy is the foundation of evidence-based practice (Kaplan Jacobs et al., 2003). Information literacy has been described as the meta-competency of the knowledge economy (Lloyd, 2003).

Unfortunately, most people do not possess adequate information literacy skills. What is worse, most people do not know that their information literacy skills are inadequate (Gross & Lathama, 2007). This fact is demonstrated by their information seeking habits. Typically, people use the most convenient method to quickly find any related information they need (Urquhart & Rowley, 2007). Most people prefer to use the Internet when they need information (Dewald, 2005; A. M. Johnson & Rader, 2001). If people evaluate information from web sites at all, they are evaluating it superficially (Grimes & Boening, 2001). The information they find is usually of low quality and low relevance. As a result most people will achieve a superficial understanding of their topic and will devise less than ideal solutions to their problems.

It is not just the general population that needs better information literacy skills. Even students have a need for better skills. For example, a recent study of freshmen at a Florida university found that 45 percent of a sample of the freshman class were non-proficient in using information literacy skills (Gross & Lathama, 2007). The inadequacy of information literacy skills is apparent in other ways. Since the proliferation of information and communication technologies, instructors have noticed an increase in the use of unfiltered information from popular sources and a dramatic decline in the use of credible peer-reviewed sources (P. M. Davis, 2003). If students are evaluating web sources at all, then they are

evaluating them superficially (Grimes & Boening, 2001). What is worse is that many students are plagiarising information directly from the Internet. For instance, in a study involving fifty-four institutions across North America, 33 percent of graduate business students admitted to committing plagiarism by using small amounts of material from a variety of Internet sources and shaping them into a complete assignment without citing their sources (McCabe et al., 2006).

A number of authoritative standards for information literacy exist. Most of them are supported by national institutions of librarians. In North America, the Association of College and Research Librarians is the recognized authority on topics related to IL (ACRL, 2000). Although there is some variation among national standards, they all seem to agree upon the main attributes of information literacy. The IL skill sets have been categorized effectively by Project SAILS[1]. Project SAILS categorizes the information literacy skill sets into eight categories as follows;

1. **Develop a Research Strategy.** Developing a research strategy involves identifying a need for information, framing a research question, selecting a topic, identifying sources of information and determining whether the information retrieved meets the information need. The development of a research strategy is triggered when a need for information is identified. In an academic setting the need for information is usually recognized when a student is given an assignment. For the student, the development of a strategy begins with the identification of a research topic. The development of a research strategy continues with the identification of a research question. The research question has to be refined and framed. If the question is too broad or too narrow then the scope of the question has to be adjusted. Once the research question has been framed appropriately, the student must identify appropriate sources of information. Information that has been accessed must be managed. How each of these tasks is to be managed is part of the research strategy.

[1] Standardized Assessment of Information Literacy Skills (SAILS) Project (see https://www.projectsails.org/abouttest/skillsets.php?page=aboutTest).

2. **Select Finding Tools.** Selecting finding tools is about choosing indexes, databases, and collections. In order to select finding tools an information literate person has to be knowledgeable about sources of information. The student has to be able to use his/her knowledge about information sources to select sources of information that are suited to the information problem. To make good choices of information sources, information literate people are able to distinguish among general and subject-specific sources, between indexes, databases, collections of databases, and gateways, and between library catalogues and periodical indexes. Information literate people are able to identify resources that are appropriate to the research topic, recognize the scope of the topics covered by a resource, and understand the period of time covered by a resource.
3. **Searching.** Searching is about using the search features of information resources (such as OLRs) to locate information. To search effectively, it is necessary to understand how to use a controlled vocabulary and how to use subject- or discipline-related terminology. It is also necessary to know how to use Boolean logic to construct a search query, how to perform nested searches, how to truncate a search, and how to narrow or broaden a search. Searching also involves identifying appropriate sources by examining footnotes and references from other sources.
4. **Using Finding Tool Features.** An information literate person is able to use the help functions, basic and advanced search functions, field searches etc. of information sources.
5. **Retrieving Sources.** Retrieving sources is about obtaining information sources after they have been identified and located. Traditionally this meant using a call number to locate a printed item on a library shelf. In the context of OLRs, retrieving sources usually means downloading an article or its citation file from a database. It includes using services, such as RACER, to obtain documents from other universities. In some cases it may be necessary to retrieve documents from microfilm, video or audio files.
6. **Evaluating Sources.** An information literacy person is able to evaluate information sources before relying upon them. That is, information literate people are able to assess a retrieved article for its point of view and bias. The credibility of the

credentials of the author or authoring institution, and the currency of information provided.

7. **Documenting Sources.** Documenting sources relates to citing sources appropriately by knowing which citation styles are accepted by various groups, selecting an appropriate citation style, citing different types of sources (journal articles, books, book chapters etc.) correctly and consistently.
8. **Understanding Economic Legal and Social Issues.** The final Project SAILS information literacy category involves understanding when it is legal to use information. For instance, an information literate person understands issues related to intellectual property, copyright and fair usage. He/she understands ethical issues related to the use of information. These issues include censorship and freedom of speech. Also, an information literacy person understands when it is necessary to pay for information.

Information literacy emerged as a topic of research interest in the 1980s (Bruce, 2000). Since then interest in IL has grown considerably (Nazim & Ahmad, 2007). In fact, research in IL has continued to increase from 1999 to 2008 (Aharony, 2010). Research into IL can be categorized into four categories: i) miscellaneous (including keywords such as decision making, involvement, barriers, and quality of life); ii) healthcare (including keywords like chronic disease, health products, nurses and medical terminology); iii) education (including keywords such as teaching/learning strategies, curriculum, teaching methods etc); and iv) technology (including keywords like internet, technology, and information systems) (Aharony, 2010).

2.2 Information Literacy Instruction

The urgent need for information literacy skills creates a strong need for information literacy instruction. In the business school context, this view is substantiated by several researchers who describe the critical importance of ILI for business students and the need for more instruction (Cooney & Hiris, 2003; Hawes, 1994). Research has linked ILI with beneficial outcomes in many business disciplines. Lombardo & Miree (2003) reported that undergraduate business students perceived print resources to be more convenient and easier to

use after receiving ILI. Students reported that they used print resources more often after receiving ILI. Students were also less inclined to believe that a single source of information is sufficient to provide all the information needed. Rutledge & Maehler (2003) found that a special help session improved Marketing students' skills at performing an information search and at conducting research. Roland and Wu (2004) found that an hour and fifteen minute long ILI session enhanced Management Information Systems students' confidence with course activities and lead to higher standards in research. Cunningham & Anderson (2005) reported that Accounting students' research skills and familiarity with publications improved as the result of an ILI session. Atwong & Heichman-Taylor (2008) reported that Marketing students perceived that they gained knowledge about sources of marketing information, and were able to retrieve and apply information for problem solving in marketing as a result of receiving ILI. Bowers et al. (2009) found that a workbook and research paper based ILI approach enhanced business students' perceptions of their communications skills, research skills and composition skills. Several psychological, behavioural, and benefit outcomes have been identified and validated for business students who receive ILI; research is needed that investigates the causal relations among these learning outcomes (Detlor et al., 2011) in a systematic and valid manner (Julien & Boon, 2004). Previous research has not investigated the adoption of OLRs as an outcome of ILI. This area of inquiry requires attention.

Another area that warrants further investigation is the application of active learning techniques to ILI. Active instruction is an approach to teaching that is founded on the belief that instruction is more effective when students are active participants in the learning process. Although active learning has not been precisely defined (Michel et al., 2009; Morgan et al., 2005) several characteristics can be identified that are common to most active instructional strategies (Bonwell & Eison, 1991, p. 2). Active instruction requires students to do more than passively listen to information that is presented to them. Instead, students are asked to engage in activities such as reading, writing, analyzing and discussing. Also, students are typically asked to engage in activities that require the use of higher order thinking skills such as analysis, synthesis and evaluation. Active instruction places an emphasis on having students explore their attitudes and feelings. The student's role is not the only role that changes in active instruction; active instruction transforms the role of the instructor as well. The role of

the instructor is not just to convey information like it is in traditional instruction. Instead, the goal is to develop the skills of the students. Examples of active instructional techniques include in-class discussions, debate, demonstrations, think-pair-share, small group work, cooperative projects, role-playing, brainstorming, peer teaching, student generated questions, and cooperative learning. Active instruction includes experiential learning, problem-based learning, participative learning, and cooperative learning (M. Prince, 2004).

Active instruction is often described by contrasting it with passive instruction. It is the form of instruction that is associated with traditional classroom learning. Passive instruction views learning as a process of acquiring knowledge. Students are viewed as empty vessels into which knowledge is poured. The instructor's job is to communicate principles and conclusions distilled from management literature (Whetten & Clark, 1996). Passive instruction is associated with traditional classroom instruction. The teacher communicates information verbally and supplements the verbal instruction with text presented on a blackboard or on powerpoint slides. The purpose of teaching is to enable students to get good marks on examinations.

Since the goal of active instruction is to improve the skills of students, it should not be surprising that active instruction has been identified as an appropriate strategy for library instruction. Several articles have described how active instruction techniques can be used in the library (Allen, 1995; Drueke, 1992; Francis & Kelly, 1997; Lorenzen, 2001; Ridgeway, 1989). The problem is that very little substantive evidence has been provided to support the efficacy of active instruction over lecture-based techniques. Most studies that have been undertaken have had methodological limitations. For example, Warmkessel & Carothers (1993) found that pairing is an effective instructional setting for ILI, but they did not quantify their findings nor were they able to compare the results of their revised instruction with their previous lecture-based methods. Cook et al. (1995) compared ILI using co-operative learning with lecture-based ILI. They found that the majority of students preferred cooperative learning but these researchers were not able to measure the students' mastery of course material. Consequently, these researchers were not able to associate cooperative learning with learning outcomes. Dabbour (1997) reported the results of an initiative to utilize active ILI at California State University in San Bernardino: 86 percent of students found the worksheet

exercises to be valuable; 85 percent found the small group work to be valuable; but only 64 percent found the discussions to be valuable. Dabbour was not able to compare the results of the active ILI sessions with the results of the passive ILI offered previously. A study by Julien and Boon (2004) reported that students prefer ILI that includes hands-on practice but they did not study active ILI specifically.

In most of the studies cited above where evidence was proffered, an active component was added to existing library instruction and the students were asked about their level of satisfaction with active ILI. In each case, the respondents indicated that they preferred active ILI over passive lecture-based ILI. However, only one compared the outcomes of active ILI with passive ILI. None attempted to model the influence of the two modes of ILI on learning outcomes. None modeled the influence of these two modes of instruction on the adoption of OLRs. There is a need for research with quantitatively compares the efficacy of active ILI with the efficacy of passive ILI.

2.3 Online Library Resource Adoption

One of the key outcomes of ILI is the ongoing use of OLRs. In the Information Systems discipline, the decision to use a technology on an ongoing basis is referred to as technology adoption. In this section, the technology adoption model is introduced. Then, studies that have investigated the influence of training or instruction on technology adoption are examined. After that, studies that have examined the adoption of library related technologies are presented. The purpose of this section is to provide the theoretical basis for a model of the influence of ILI on OLR adoption.

The Technology Acceptance Model (TAM) is the most widely used model for expaining and predicting the adoption and use of an information or computer technology. TAM has many characteristics that make it popular. First of all, TAM is simple (Legris et al., 2003) yet robust (King & He, 2006). It consists of only four validated constructs. The relationships between the constructs have been well established. Second, TAM is versatile. It has been used to predict the adoption and use of a wide range of technologies including eCommerce (Huang, 2008), email agents (Serenko, 2008), eLearning tools (Chang & Tung, 2008; Martinez-Torres et al., 2008), ERP systems (Amoako-Gyampah & Salam, 2004; Bueno

& Salmeron, 2008), mCommerce (Wong & Hsu, 2008), online auctions (Stern et al., 2008) and wireless technologies (S. H. Kim, 2008). Finally, TAM is adaptable and customizable. It can be extended by adding variables from several sets of extensions. These extensions have been referred to as contextual factors, prior factors, and factors from other theories (King & He, 2006; Wixom & Todd, 2005). All of these features – simplicity, versatility, extensibility - make TAM well suited to the study of the adoption and use of online library resources.

TAM has its theoretical foundations in the fields of social psychology and information systems. Social psychology provides a widely studied general theory for predicting and explaining behaviour called the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1973, 1980; Fishbein & Ajzen, 1975). TRA was designed to "explain virtually any human behaviour" (Ajzen & Fishbein, 1980, p. 4). It is most commonly used to predict and influence behaviour (Sheppard et al., 1988). TRA posits that attitudes and subjective norms influence an individual's intention to perform a behaviour (Fishbein & Ajzen, 1975, p. 16). Behavioural intention is the primary determinant of that behaviour. The TRA model is presented in Figure 2-1 below.

Since TRA is a general model it must be contextualized to a specific intention and corresponding behaviour relevant to the domain under investigation (Ajzen & Fishbein, 1980, p. 79). TAM contextualizes TRA within the information systems discipline to explain and predict computer technology usage behaviour (F. D. Davis, 1986, p. 26; F. D. Davis et al., 1989). The earliest form of TAM built upon the Theory of Adoption and Diffusion of Technology from the study of information systems. Davis integrated the previous research on technology adoption and use, and utilized it within the framework of TRA.

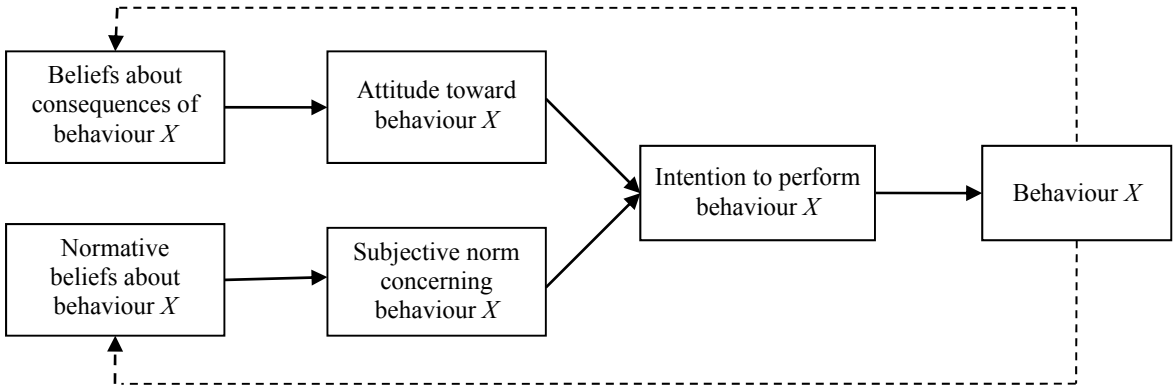

Figure 2-1: Theory of Reasoned Action (Fishbein, 1975, p. 16)

TRA is recognizable in the original TAM model (see Figure 2-2). A few changes are apparent, however. External variables such as self-efficacy and anxiety are included as predictors of technology adoption. The beliefs constructs are more specific. TAM uses beliefs about the perceived ease of use and perceived usefulness of a system to predict a user's attitude toward using the system. Attitudes are then used to predict intentions. Specific intentions and attitudes are identified. The intention construct becomes intention to use a technology. It is used to predict the actual use of the technology.

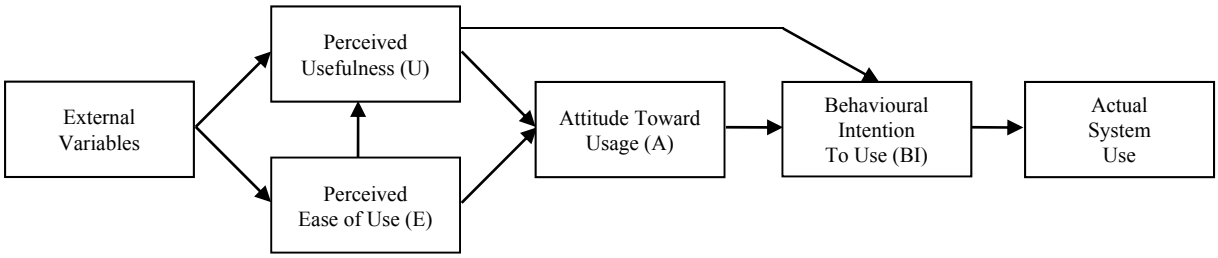

Figure 2-2: Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989)

Later studies that used TAM found that attitude is a poor indicator of intention to use (Bagozzi et al., 1992). Consequently, attitude toward a technology is rarely used. As a result, TAM consists of only four constructs: perceived ease of use, perceived usefulness, intention to use, and actual use of an information technology (see Figure 2-3 below). The definitions of the constructs are well recognized. For example, perceived usefulness is defined as "the

degree to which a person believes that using a particular system would enhance his or her job performance" (F. D. Davis, 1986, 1989), and perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort."

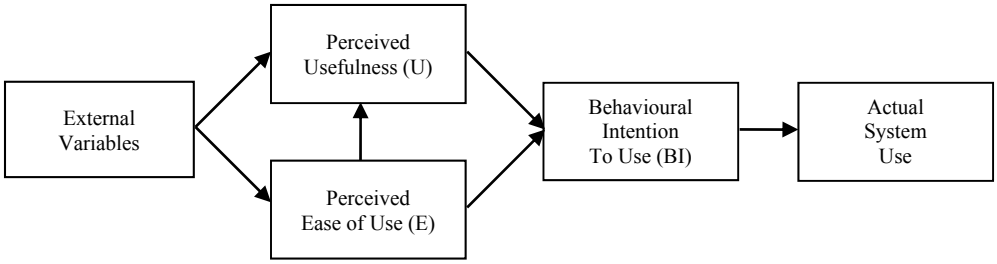

Figure 2-3: Revised Technology Acceptance Model

TAMs versatility, extensibility and customizability is derived from the addition of external variables to the model as predictor variables. This feature enables researchers to add individual level external variables such as self-efficacy and anxiety to the TAM. Researchers can include individual differences in their model to better predict and explain the adoption of technology by individuals.

Overall, TAM is a very useful model for predicting and explaining the adoption of technologies. Although the work that has done on TAM could fill volumes, there are opportunities for more work to be done. Legris et al. (2003) conducted a meta-analysis of TAM and reported that there are several gaps in TAM research. TAM accounts for little more than 40% of the variance in use. Significant factors are missing from the model. Organizational dynamics need to be taken into account in TAM. Consequently, they suggested that TAM needs to be integrated into a broader model which would include social change processes and the adoption of innovation model. This view is supported by Venkatesh & Balla (2008). They presented a research agenda on interventions for the latest variant of TAM. Among their recommendations, they assert that future TAM research should investigate the effectiveness of training in influencing technology adoption. Venkatesh & Balla recommended that the influence of modes of instruction on technology adoption should be examined.

To date, no research has been undertaken that investigates ILI as a predictor of the adoption of OLRs. In fact, few studies have previously attempted to examine the adoption

and use of OLRs. Of these, several are based on TAM; only a handful of studies have utilized self-efficacy or anxiety constructs. These studies are described below.

Hong et. al (2002) studied the influence of two individual differences characteristics (computer self-efficacy and knowledge of search domain) and three system characteristics (relevance, terminology, screen design) on the adoption and use of digital libraries. Using TAM as a theoretical basis, individual differences were posited to influence perceived ease-of-use and the system characteristics were posited to influence both perceived usefulness and perceived ease of use. Computer self-efficacy was found to be significantly associated with perceived ease of use, though the path coefficient was small. TAM was found to be very appropriate for the study of the adoption and use of digital libraries. Perceived ease of use and perceived usefulness were found to be significant antecedents of intention to use OLRs.

Thong et. al (2002) conducted a separate study that used TAM to predict the adoption and use of digital libraries. Three sets of endogenous variables were utilized. The endogenous variables included interface characteristics (terminology, screen design, and navigation), organizational context (relevance, system accessibility, and system visibility), and individual differences (computer self-efficacy, computer experience, domain knowledge). All of the predictors of perceived ease of use, including computer self-efficacy, were found to be significant. Perceived usefulness was found to have the strongest influence upon a person's intention to use an OLR. As with the Hong et. al (2002) study, the use of TAM to predict the adoption and use of digital libraries was strongly supported.

In another study, Heinrichs et al. (2007) developed three models of academic library web site use. Each model utilized four constructs – perceived ease-of-use, perceived usefulness, task functionality, and service functionality – to predict a user's level of satisfaction with academic library use, and a person's intention to use the academic library. Of the three models, only their dual mediation model had adequate fit indices. Perceived ease of use was found to have a strong and significant relationship with satisfaction. Similarly, perceived usefulness was found to have a strong positive relationship with intention to use.

In a recent project, Nov & Ye (2008) studied the role that resistance to change plays in the adoption and use of digital libraries. They studied the direct effects that individual differences (computer anxiety, computer self-efficacy, and resistance to change) and system

characteristics (screen design and relevance) have on perceived ease of use. All of the proposed antecedents, including computer self-efficacy and computer anxiety, were significantly related with perceived ease of use. Computer anxiety had the strongest relationship with perceived ease of use, however, the relationship was negative. The resistance to change personality trait was found to influence perceived ease of use.

In a study conducted at four universities in the United States, Kim (2010) studied the role that assistance for system use, subjective norm, and academic role played in influencing the adoption of university library web site resources. The results varied by level of study. The hypotheses that subjective norm increases the perceived usefulness of library web site resources and intention to use were supported. As hypothesized, assistance for systems use was positively correlated with perceived ease of use. The study reported differences among undergraduate, graduate, and doctoral students.

Ramayah and Aafaqi (2004) examined the role of self-efficacy in e-library usage among students in a university in Malaysia. They used the technology adoption model as the basis for their study. Self-efficacy was found to have a direct effect on perceived ease of use, perceived usefulness, and e-library usage.

Each of the aforementioned studies approached the adoption and use of digital libraries as a strictly technological phenomenon. All the studies tested a user's self-efficacy toward using computer technology. None utilized antecedents tailored to OLRs nor tested a user's self-efficacy or anxiety with OLRs. Further, none tested the influence of information literacy instruction on the adoption and use of OLRs.

2.4 Online Library Resource Self-Efficacy

Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Self-efficacy is not a universal phenomenon that applies to every situation nor is it a phenomenon for which a general measure can be used. An individual can have a high level of self-efficacy in one domain and a low level of self-efficacy in another domain. For example, some people enjoy high levels of self-efficacy regarding their ability to repair an automobile but low levels of self-efficacy regarding their ability to write a sonnet. Since self-efficacy is unique to each

domain, "scales of perceived self-efficacy must be tailored to the particular domain of functioning that is the object of interest" (2006, pp. 307-308). Consequently, a measure of self-efficacy that is specific to OLRs must be employed. OLR self-efficacy is defined here as an individual's beliefs in his/her capabilities to organize and execute the courses of action required to utilize OLRs.

The primary role of self-efficacy is as a factor in motivation. Self-efficacy influences motivation in several ways. Self-efficacy influences the choices of activities that people engage in, the amount of effort people expend in working toward completing a task or achieving a goal and how long they persist in their efforts, and their emotional reactions (Bandura, 1986, pp. 393-395). People avoid tasks or situations that they believe are beyond their abilities but they are often quick to undertake activities that they feel they are capable of handling. The problem is that negative self-image can be inaccurate and cause people to avoid enriching experiences. People who have high self-efficacy will continue their efforts when obstacles or adverse conditions arise. People who are beset with self-doubts reduce the amount of effort they expend or give up. People with low self-efficacy expend effort in self-referential misgivings. They are prone to stress and they divert their attention away from the task at hand.

Given the attributes of self-efficacy that were just described, it should not be surprising that self-efficacy has been found to play an important role in determining performance outcomes and success in learning. Stajkovic & Luthans (1998) conducted a meta-analytic review of research articles that studied the relationship between self-efficacy and work performance and found a significant correlation. Kurbanoglu (2009) studied the influence of self-efficacy on students performance with IL tasks. Kurbanoglu found that low levels of self-efficacy may discourage students from using their information literacy skills effectively. Self-efficacy has been found to be a strong predictor of performance in a variety of academic activities (Moos & Azevedo, 2009; Multon et al., 1984). Matheiu & Martineau (1993) reported that self-efficacy levels recorded half-way through a training intervention contributed to performance improvement and was positively related with affective training reactions. Mitchell et al. (1994) studied the role that self-efficacy plays in learning complex tasks. Mitchell et al. concluded that self-efficacy is a good initial predictor of performance on

a complex task but it becomes less important once skills are well learned. This relationship between self-efficacy and performance appears to be true whether the self-efficacy existed before the training was provided or whether the self-efficacy was developed during training (Salaas & Cannon-Bowers, 2001).

Since self-efficacy has a strong impact on performance, it should not be surprising that improvement in self-efficacy is a desirable learning outcome. Several studies have examined the influence of training on self-efficacy, especially computer training on computer self efficacy. Martocchio & Webster (1992) studied the effects of feedback on self-efficacy. They found that positive feedback during software training increased software efficacy beliefs. Torkzadeh & Van Kyke (2002) studied the influence of training on Internet self-efficacy and computer user attitudes. The training received significantly increased a student's internet self-efficacy. In another study, Schwoerer et al. (2005) examined the influence of training on general self-efficacy and specific self-efficacy among new employees. Both general and specific self-efficacy were influenced by training but specific self-efficacy was also influenced by pre-training motivation, training self-efficacy, and performance expectancy. In each case, training was found to increase domain specific self-efficacy.

An area that has not received a lot of academic attention is the relationship influence of active instruction on self-efficacy. Yet, active instruction seems ideally suited to the development of self-efficacy. In order to understand the potential role that active instruction plays in developing self-efficacy, it is necessary to examine the factors that promote self-efficacy. Self-efficacy can be developed through four sources: i) performance accomplishments; ii) vicarious experience; iii) verbal persuasion; and iv) physiological states (Bandura, 1977). Performance accomplishments provide personal mastery experiences that change a person's self-cognitions. Vicarious experience occurs when a person is able to witness the performance of others perform a task. If another person is able to achieve the task then the task seems to be more easily accomplished. Verbal persuasion convinces students that they can achieve the task. It provides a short-term solution to self-doubting thoughts. Physiological states refer to emotional arousal. Self-efficacy is decreased when people feel fear or anxiety. Active instructional techniques target many of the factors that influence self-efficacy. Active instructional techniques are designed to engage students in tasks and

activities. Many of these tasks provide students with performance accomplishments. In-class demonstrations, peer teaching, and cooperative learning provide vicarious experiences. It is recommended that instructors provide verbal encouragement when using active instruction. Usually, instructors try to get students to provide verbal encouragement to each other as well. Given these facts, it seems sensible that active instruction should be effective at promoting self-efficacy. This view has been substantiated in several studies. For example, Gist et al. (1989) conducted a field experiment to assess the impact of two training approaches (behaviour modelling approach and tutorial approach) on software self-efficacy and performance using computer software among university managers. As expected, the participants in the modeling condition (video-based) group scored higher than participants in the tutorial (software-based) group in the test of software self-efficacy. In another study, Piccoli et al. (2001) compared the efficacy of web-based virtual learning environment with traditional classroom instruction in teaching basic information technology skills. Students who had received instruction via the web-based virtual learning environment had significantly higher computer self-efficacy than students who received lecture-based instruction. Huey-Wen Chou (2001) studied the effects of training method, anxiety, and gender on computer self-efficacy using a field-experiment design methodology. The behaviour-modeling training method was superior to lecture-based instruction in influencing learning performance and computer self-efficacy. In each of these studies, students who received active instruction demonstrated higher increases in self-efficacy than students who received lecture-based instruction only.

The final role of self-efficacy that needs to be examined for this study is as a predictor of the acceptance of computer-based technologies. This role has been found to be significant in a wide variety of studies. For example, Hasan (2006) studied the effects of general- and system-specific computer self-efficacy (CSE) beliefs on IS acceptance. Hasan found that system specific CSE had a stronger effect on perceived usefulness but general CSE had a stronger effect on perceived ease of use. Both forms of CSE were predictors of technology acceptance. In a later study, Hasan (2007) found that CSE had significant direct effects on perceived usefulness and perceived ease of use. Hsu & Chiu (2004) studied the role of self-efficacy in electronic service adoption. Web-specific self-efficacy was found to be a predictor

of intention to use e-services and e-service usage. Hu et al. (2003) examined technology acceptance by school teachers and found that computer self-efficacy was a strong and significant determinant of perceived ease of use and intention of use.

2.5 Online Library Resource Anxiety

OLR anxiety has not been studied before but two closely related forms of anxiety have been studied. First, computer anxiety – defined as the "fear or apprehension felt by an individual when using computers, or when considering the possibility of computer utilization" (M. Maurer & Simonson, 1984) – has been studied quite extensively. Second, library anxiety – defined as "negative feelings about using an academic library" (Van Scoyoc, 2003) – has received quite a bit of attention. Since people are known to be anxious about using computers and since people are known to be anxious about using libraries, it is natural to expect that people will be anxious about using online library resources. Given these definitions, OLR anxiety is defined here as a marked and persistent fear cued by the use of OLRs or the anticipated use of OLRs which causes the use of OLRs to be avoided or endured with anxiety or distress.

Both library anxiety theory and computer anxiety theory are too broad to be applied directly to the phenomenon of OLR anxiety. Library anxiety has been identified as having five dimensions - barriers with staff, affective barriers, comfort with the library, knowledge of the library, and mechanical barriers. Barriers with the staff refer to the students' perception that the library staff are unapproachable. Affective barriers refer to students perceptions that their library skills are inadequate. Comfort with the library is the perception that the library is a safe and comfortable working environment. Knowledge of the library relates to the students' familiarity with the library. Mechanical barriers refers to the students beliefs that they can use library equipment like photocopiers and printers. Computer anxiety has been found to have three dimension including anxiety, computer liking, and confidence (Loyd & Gressard, 1984). These dimensions relate to computer use generally not OLR specifically.

Since OLR anxiety has not been studied before, there is no way to know with certainty how people will respond to it. However, a compelling image can be formed by examining the research on computer anxiety theory and library anxiety theory. Computer anxiety has been

found to result in the avoidance of computers, excessive caution with computers, negative remarks about computers, effort to cut short use of computers (M. Maurer & Simonson, 1984), lowered expectations of performance, lowered confidence, unpleasant body sensations, negative evaluations, debilitating thoughts, and longer times to complete tasks (Heinssen et al., 1987). Students who are high in computer phobia are less likely to maximize their use of computers (Mcilroy et al., 2007). Beckers et al. (2006) conclude that a threshold effect may be at work in the relationship between computer anxiety and performance. The level of anxiety has to become sufficiently severe before it degrades performance. Library anxiety is typified by "ruminations, tension, fear, feelings of uncertainty and helplessness, negative self-defeating thoughts, and mental disorganization" (Jiao et al., 1996, p. 152). It can be expected that people who experience OLR anxiety may make negative remarks about using OLRs, they may take longer to complete tasks, or they may minimize the time they spend using OLRs. In stronger cases, they may experience bodily sensations such as sweaty palms and heart palpitations. It is expected that some people experience feelings of helplessness or uncertainty, or intrusive self-doubting thoughts while using or while contemplating the use of OLRs. OLR anxiety will cause students to divert their attention away from the task at hand and toward coping with their anxiety.

Given the expected symptoms of OLR anxiety, it is expected that OLR anxiety will act as a barrier to academic success. This has been found to be true of library anxiety. Library anxiety is a barrier to academic success (Jiao et al., 1996; Mellon, 1986). It can prevent people from beginning or continuing a library search (Mellon, 1986), and it can discourage students from undertaking a research proposal thus impairing their academic achievement (Onwuegbuzie, 1997). Many students who have library anxiety experience interfering thoughts during the search process (Kuhlthau, 1988). If library anxiety is a barrier to academic success then it is likely that OLR anxiety will be a barrier to academic success.

Computer anxiety has been found to be a barrier to the adoption of technology. Most studies report that technology users who have a high level of anxiety towards a technology tend to have lower ease of use perceptions. For example, Compeau & Higgins (1995) found a significant negative correlation between computer anxiety and computer use. Venkatesh (2000) viewed computer anxiety and computer self-efficacy as anchoring constructs that play

a critical role in shaping perceived ease of use – especially among users who have limited experience with a system. Venkatesh found a negative correlation between computer anxiety and perceived ease of use at all three time periods measured.

Another role for anxiety that warrants examination is as a mediator of the relationship between self-efficacy and technology adoption. Bandura (1986) conceptualized self-efficacy and anxiety as reciprocal determinants of one another but it is not possible to model reciprocal relationships in structural equation models. Instead, another device must be used to model the combined influence of these two constructs. A mediating relationship is a good option for depicting the relationship between these two constructs.

To summarize, IL skills are important to the success of business students. Consequently, ILI is of importance for business instructors. This chapter has identified several gaps in current research related to ILI and OLR adoption that warrant further investigation. First, the efficacy of active instructional techniques for ILI should be examined more fully; the research studies that have investigated active ILI have not used effective measures of ILI outcomes. Second, OLR adoption has not been investigated as an outcome of ILI; yet, librarians are dismayed to find that students prefer to use the internet for their class assignments. Third, self-efficacy has been studied as a predictor of technology adoption and as an outcome of instruction, but it has not been investigated as a mediator of the influence of instruction on technology adoption. Fourth, anxiety has been studied as a deterrent to technology adoption, but OLR anxiety has not been studied as a barrier to OLR adoption.

CHAPTER 3: THEORETICAL MODEL

This chapter presents a theoretical model of the influence of ILI on the adoption of OLRs by business students. A set of research questions and hypotheses are then presented. The model integrates two theoretical perspectives in order to explain the adoption of OLRs. Research from the Library and Information Sciences literature is used to model the outcomes of ILI. Similarly, research from the Information Systems literature on the antecedents of technology adoption is used to model the adoption of OLRs. In the model, ILI is used as an antecedent to the adoption of OLRs. The model makes use of two intermediate variables – anxiety and self-efficacy. These two variables have been studied in the context of libraries (library anxiety) and computer use (computer anxiety and computer self-efficacy). Research from both areas was used to build the model. Importantly, in the model, each of the relationships between ILI and its outcomes is used to assess the effectiveness of active instruction and passive instruction. The proposed model is put forward as a lens with which to analyze the research question and hypotheses presented within the chapter.

3.1 Research Questions

Recall that Chapter 1 presented the following high level research question: "What is the impact of ILI on the adoption of OLRs by business students?" Based on the literature review, the high level research question presented in Chapter 1 is broken down into the following six research questions:

RQ1: *How well does ILI influence OLR adoption? How well do active ILI and passive ILI influence the adoption of OLRs?*

RQ2: *How well does ILI influence OLR self-efficacy and OLR anxiety? How well do active ILI and passive ILI influence OLR self-efficacy and OLR anxiety?*

RQ3: *How well do OLR self-efficacy and OLR anxiety predict OLR adoption?*

RQ4: *How well does TAM explain OLR adoption?*

RQ5: *How do OLR self-efficacy and OLR anxiety mediate the relationships between OLR adoption and its determinants?*

RQ6: *How do demographic factors influence OLR adoption?*

3.2 Theoretical Model

To investigate these research questions the following model was derived (see Figure 3-1). The relationships among the constructs used in the model were based on empirical evidence from the literature review. The purpose of the model is to predict and explain how the amount of ILI received by business students influences their intention to use OLRs. The model uses the Technology Acceptance Model as its foundation. TAM is represented in the model by three constructs - perceived usefulness, perceived ease of use and intention to use OLRs – and three paths.

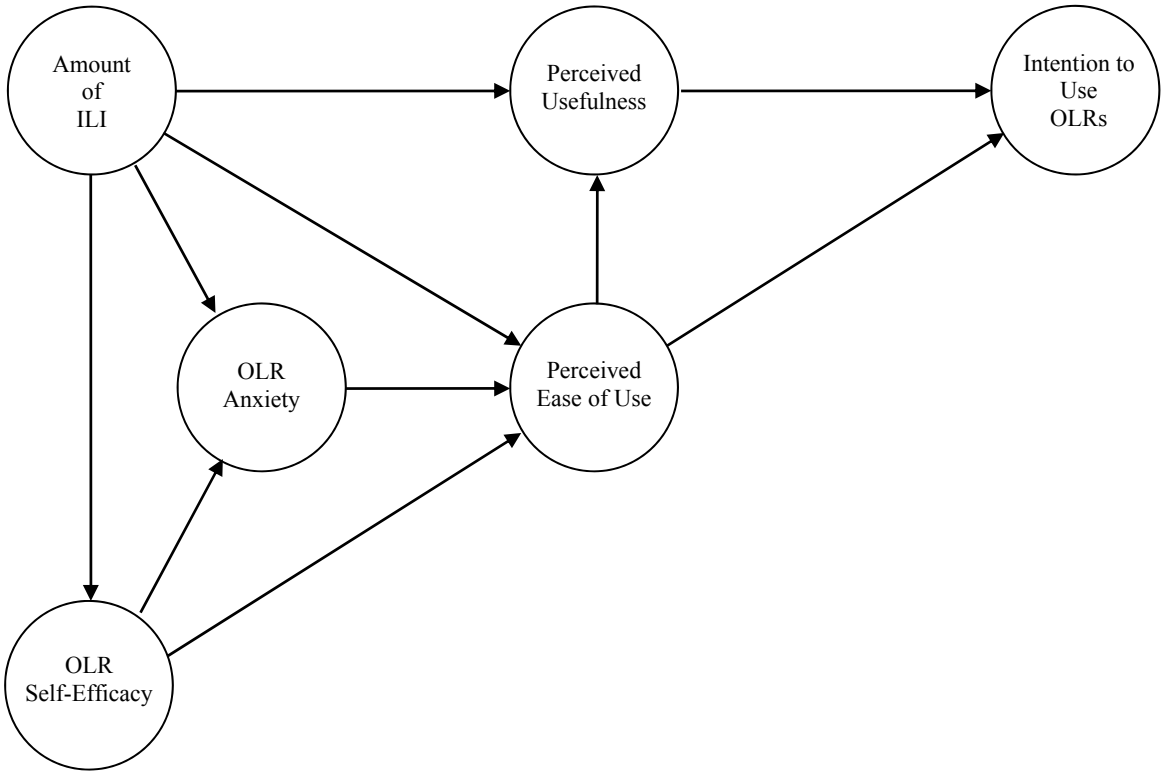

Figure 3-1: Theoretical Model of the Impact of Information Literacy Instruction on Online Library Resource Adoption

In the model, amount of ILI is an exogenous variable that is used to explain and predict the intention to use OLRs by business students. Amount of ILI exerts its influence in

the model in three ways. First, amount of ILI influences OLR adoption directly by virtue of its relationship with perceived usefulness and perceived ease of use. This association is based on the expectation that ILI will make students more aware of the benefits of OLRs which will improve student perception of the usefulness of OLRs. Similarly, familiarity with OLRs gained through ILI should cause students to perceive OLRs easier to use. Second, amount of ILI influences OLR adoption indirectly by virtue of its influence on OLR anxiety and OLR self-efficacy. Previous research has described anxiety reduction and self-efficacy improvement as important instructional outcomes. Since anxiety and self-efficacy have been shown to be important constructs related to computer use and library use, it is worthwhile to explore the role that amount of ILI plays in influencing them. Amount of ILI may influence the adoption of OLRs by influencing the level of self-efficacy and anxiety experienced by business students while using OLRs. Third, in the model, amount of ILI affects OLR self-efficacy and OLR anxiety to influence OLR adoption. Self-efficacy and anxiety are important outcomes of instruction but they are also important determinants of the success of instruction. The success of instruction may be influenced by the level of self-efficacy and anxiety of the student.

An important objective of this dissertation is to assess the efficacy of active ILI and passive ILI for each of the three roles that amount of ILI plays in the model. It was noted in the literature review that active instruction has often been found to be effective for teaching skills such as IL skills. It was pointed out that more quantitative analysis is needed to verify the efficacy of active ILI techniques. It is also worth noting that the influence of ILI on OLR anxiety and on OLR self-efficacy, may be very different for active instruction than it is for passive instruction. Conceptually, active instruction is ideally suited to the development of self-efficacy.

In the next section, the hypotheses are presented and the rationale behind each hypothesis is discussed.

3.3 The Study's Hypotheses

The following figure (Figure 3-2) illustrates the study's hypotheses. These hypotheses are structured in a way to help answer the study's six research questions. In the sections that

follow, the research questions are restated and the hypotheses that have been developed to answer them are presented.

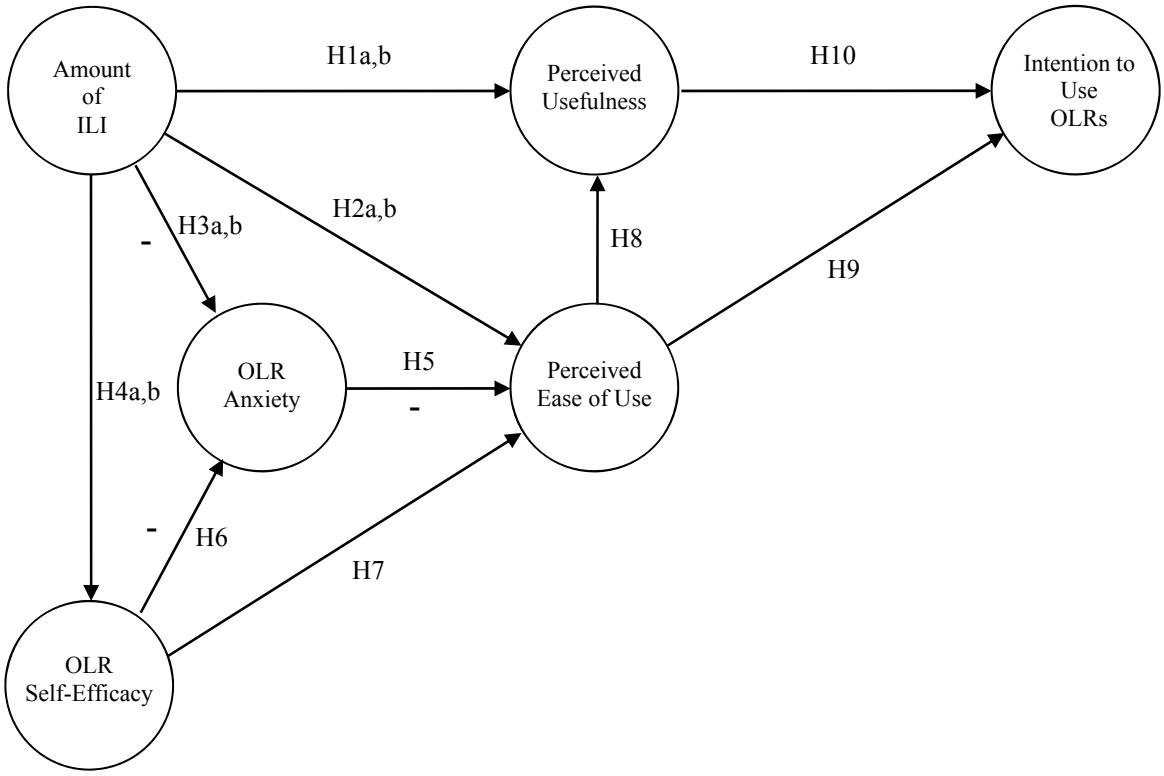

Figure 3-2: Theoretical Model of the Impact of Information Literacy Instruction on Online Library Resource Adoption (with hypotheses)

3.3.1 The Influence of ILI on OLR Adoption

The **first research question** (RQ1) aims to examine the relationship between the amount of ILI received and the adoption of OLRs by business students. In the research model, ILI exerts its influence on OLR adoption through perceived ease of use of OLRs and perceived usefulness of OLRs. These relationships make intuitive sense. It is natural to expect that instruction that is designed to facilitate the use of a technology will cause students to perceive the technology easier to use. After business students have been trained to use OLRs, they should find OLRs easier to use. For example, they should find it easier to develop and execute search strategies, and to find and retrieve information from OLRs, once they have

developed information literacy skills. The relationship between amount of ILI and perceived usefulness should seem sensible as well. It should be natural to expect that students will perceive a technology to be more useful after they have been shown all of the benefits that the technology provides. For example, when students have been shown all of the features of OLRs, and all of the information contained in the various databases, they should find OLRs more useful. The research model presents these ideas as relationships between amount of ILI and the perceived usefulness of OLR (H1), and between amount of ILI and the perceived ease of use of OLR (H2).

Although the relationships between amount of ILI and perceived usefulness of OLRs, and between amount of ILI and perceived ease of use of OLRs, seem intuitive, the empirical evidence to support these relationships is limited. A study by Detlor et. al. (2010) found that ILI resulted in increased perception among business students that library databases contain relevant, authoritative, high quality information. The authors also reported that business students' perceptions of the quantity and quality of OLRs improved. These findings were confirmed in a study by Serenko et al. (2010). They reported that ILI resulted in improved perceptions of the value of OLRs and improved grades.

In order to assess the relationship between ILI and the perceived usefulness of OLRs, and in order to assess the efficacy of active ILI, it is hypothesized that:

H1: *The amount of ILI received will have a positive direct effect on the perceived usefulness of OLRs.*

- **H1a:** *The amount of active ILI received will have a positive direct effect on the perceived usefulness of OLRs.*
- **H1b:** *The amount of passive ILI received will have a positive direct effect on the perceived usefulness of OLRs.*

The evidence to support the relationship between ILI and the perceived ease of use of OLRs is provided by many of the same studies just mentioned plus a few more. Lombardo & Miree (2003) investigated the impact of library instruction on business students perceptions and use of library resources. The business students reported that the library instruction decreased their frustration while using library databases and increased their perception of the convenience of library databases. Julien et al. (2009) reported that students agree that ILI lead

to a reduction in effort to find information. Interviewees reported that convenience was increased, information was easier to find, and information took less time to find as a result of the ILI they received. Detlor et al. (2010) analyzed interviews conducted at three business schools and found that ILI resulted in a reduction in effort and time to find information.

Thus, it is hypothesized that:

H2: *The amount of ILI received will have a positive direct effect on the perceived ease of use of OLRs.*

H2a: *The amount of active ILI received will have a positive direct effect on the perceived ease of use of OLRs.*

H2b: *The amount of passive ILI received will have a positive direct effect on the perceived ease of use of OLRs.*

3.3.2 The Influence of ILI on OLR Self-Efficacy and OLR Anxiety

The **second research question** (RQ2) aims to examine the influence of amount of ILI on OLR anxiety and OLR self-efficacy. Previous research within the Information Systems and Library and Information Sciences disciplines has found that training reduces anxiety levels. Igbaria & Chakrabarti (1990) examined the relationship between computer anxiety, computer use, and a variety of other factors. They found that computer training programs significantly decreased the level of computer anxiety experienced by their students. Later, Igbaria (1993) conducted a study on the determinants of user acceptance of computer technology and found that computer experience and user training had the strongest negative correlation with computer anxiety. Prince & Helms (1993) studied the influence of training on library-use anxiety among students in a capstone business strategy course and found that post-semester library-use anxiety was significantly lower than pre-instruction library-use anxiety. Martocchio (1994) studied the effect of computer training on computer anxiety by measuring computer anxiety before a training intervention and then measured computer anxiety again after training intervention. Martocchio found that people who viewed skills as acquirable experienced a significant decrease in computer anxiety as a result of computer training but students who viewed their ability as a fixed entity did not. Ayersman (1996) investigated the impact that computer instruction, learning style and gender have on computer

anxiety. Ayersman used a paired t-test to compare pre-treatment computer anxiety with post-treatment computer anxiety and found significant reductions in computer anxiety resulting from computer instruction. More recently, Detlor et al. (2010) conducted an exploratory study of factors affecting student learning outcomes of ILI. A large portion of interviewees reported that their level of confidence increased, and their level of anxiety using OLR decreased. Serenko et al. (2010) investigated the outcomes of ILI and concluded that ILI decreased OLR anxiety among business students.

Active instructional techniques have been touted as an effective technique for reducing the level of anxiety experienced by students when they use electronic library databases. Mark & Jacobson (1995) wrote an article entitled "Teaching Anxious Students Skills for the Electronic Library" in which they argued that active learning techniques are well suited to anxious students. In another paper, the same authors stated "we believe that it is possible to lessen the effects of library anxiety and computerphobia on students by changing the way we teach about new information sources" (Jacobson & Mark, 1995). These assertions have been supported in a paper by Detlor et al. (2010) who found that active instruction reduced anxiety and increased self-efficacy.

Based on these findings, it is hypothesized that:

H3: *The amount of ILI received will have a negative direct effect on OLR anxiety.*

- **H3a:** *The amount of active ILI received will have a negative direct effect on OLR anxiety.*
- **H3b:** *The amount of passive ILI received will have a negative direct effect on OLR anxiety.*

Instruction has been theorized to improve a student's self-efficacy (Gist, 1987). This view has been supported by research conducted in a wide range of research areas. For example, Torkzadeh & Van Dyke (2002) studied the influence of training on internet self-efficacy and found that training significantly improved internet self-efficacy. Ertmer et al. (1994) studied the influence of computer experience gained in a supportive classroom environment and found that the technology specific self-efficacy increased significantly for all three technologies tested. Ren (2000) investigated the impact of library instruction on

electronic information search self-efficacy and found that electronic information search self-efficacy was significantly higher after receiving library instruction. Monoi et al. (2005) assessed the influence of ILI on online searching self-efficacy by administering a test before and after a one-credit online research skills course. They reported that the students' self-efficacy were significantly higher at the end of the course.

Previous research demonstrates that instructional methods are not equal in their influence upon self-efficacy. Evidence for this is provided by studies that investigated the influence of computer training on computer self-efficacy. For example, Gist et al. (1989) compared the influence of two types of instruction – computer-based tutorial versus behavioural modeling ("show" versus "show and tell") – on software self-efficacy. They found that the behavioural modeling method significantly increased task specific self-efficacy but the tutorial approach lowered self-efficacy. Chou (2001) compared the effects of traditional lecture-based instruction approach to computer training with a behavior modeling approach and found that the behavior modeling approach yielded higher levels of computer self-efficacy. Piccoli et al. (2001) compared the efficacy of training in a virtual learning environment with traditional learning environments for basic information technology skills. They found that training in the virtual learning environment lead to higher levels of computer self-efficacy but they were not able to determine whether the increase in computer self-efficacy was caused by the time spent engaged with a computer technology or caused by the higher level of interactivity enabled by the virtual learning environment.

Based on these findings, it is hypothesized that:

H4: *The amount of ILI received will have a positive direct effect on OLR self-efficacy.*

H4a: *The amount of active ILI received will have a positive direct effect on OLR self-efficacy.*

H4b: *The amount of passive ILI received will have a positive direct effect on OLR self-efficacy***.**

3.3.3 OLR Self-Efficacy and OLR Anxiety as Antecedents to OLR Adoption

The **third research question** (RQ3) pertains to the influence of OLR anxiety and OLR self-efficacy on OLR adoption. As discussed in Chapter 2, the use of technology often results in strong negative emotions. These negative emotions are often modeled as a deterrent to technology adoption. Anxiety forces technology users to cope with the anxiety they are experiencing thereby diverting attention away from the task at hand. Similarly, self-deprecating thoughts interrupt technology users and divert cognitive energy away from the task of using a computer. Also, anxiety discourages technology users from persisting in using a technology long enough to master its use. These diversions reduce users' perceived ease of use of an information system.

Empirical support for the detrimental effect of anxiety on technology adoption comes mostly from studies on computer anxiety. Igbaria & Iivari (1995) tested a model of the determinants and consequences of self-efficacy in the context of computer usage. In their model, they presented computer anxiety as a consequent of computer self-efficacy and as an antecedent of TAM constructs. They found that computer anxiety directly affected perceived ease of use and had significant total effects on perceived usefulness and usage. Saade & Kira (2007) tested the influence of anxiety in mediating the impact of experience using technology on the perceived ease of use of the technology. They assessed the role of anxiety using two technologies: computers and the internet. The results for both technologies showed that the expected mediation effect did not occur because the relationship between experience and anxiety did not exist. The relationship between anxiety and perceived ease of use was negative and significant for both technologies. Venkatesh (2000) conducted a longitudinal study and found computer anxiety to be significantly negatively related with perceived ease of use at each point of measurement. Nov & Ye (2008) found evidence for the deleterious effect of computer anxiety on the perceived ease of use of digital libraries.

Based on this evidence, it is expected that business students who experience anxiety while using OLRs, or while contemplating the use of OLRs, will have lower perceptions of the ease of use of OLRs:

H5: *OLR anxiety will have a negative direct effect on the perceived ease of use of OLRs.*

The second part of the third research question pertains to the role that self-efficacy plays in the adoption of OLRs. In technology adoption models, the influence of OLR self-efficacy on technology adoption is usually depicted as a relationship between OLR self-efficacy and the perceived ease of use of the technology in question. This relationship is based on the belief that people who enjoy high expectations of mastery of the skills needed to use a technology will more likely perceive the technology easy to use.

The relationship between self-efficacy and anxiety is easy to conceptualize but difficult to model. Self-efficacy and anxiety are conceptualized in social cognitive theory as reciprocal determinants of each other (Bandura, 1986): self-efficacy acts upon anxiety and anxiety acts upon self-efficacy. Each variable can exert an influence on the other depending on which variable acts as a stimulus. That sort of relationship is difficult to model because structural equation modeling techniques do not allow bidirectional relationships. In order to model the relationship, researchers have to try to determine which variable will act as the stimulus under the conditions of their study.

It should not be surprising then that the relationship between self-efficacy and anxiety has been modeled with self-efficacy as a determinant of anxiety and also with anxiety as a determinant of self-efficacy. For example, in their seminal work on computer self-efficacy, Compeau & Higgins (1995) modeled computer self-efficacy as an antecedent to anxiety. Igbaria and Ivari (1995) took a similar stance in their study of the effects of self-efficacy on computer usage. They found a very significant negative correlation between computer self-efficacy and computer anxiety. By contrast, a number of studies have modeled anxiety as causing a reduction in self-efficacy. Thatcher & Perrewe (2002) reported a direct, negative relationship between anxiety and self-efficacy, while Johnson (2005) reported a weaker but significant correlation. A more curious model was created by Johnson & Marakas (2000). They used a unique model in which anxiety caused self-efficacy, which in turn caused a second anxiety variable. Anxiety was found to be a strong significant predictor of computer self-efficacy and computer self-efficacy was found to be a strong significant predictor of the second anxiety variable.

Since OLR self-efficacy and OLR anxiety are reciprocal determinants the issue when modeling the relationship between them is in determining which of the two acts on the other. In the case of this model it is expected that students will have higher levels of OLR anxiety early on. The key factor in determining which of the two constructs (OLR self-efficacy or OLR anxiety) influences the other is ILI. It is expected that ILI will have a stronger influence on OLR self-efficacy and that it is the increase in self-efficacy which brings about a reduction in anxiety. Consequently, it is hypothesized that:

H6: *OLR self-efficacy will have a negative direct effect on OLR anxiety.*

The relationship between self-efficacy and the perceived ease of use of technology is well established. Agarwal et al. (2000) investigated the relationship between general and computer specific self-efficacy. They found a strong significant relationship between self-efficacy relating to the use of Windows 95 & Lotus 123 and the perceived ease of use of these technologies. Venkatesh (2000) studied the determinants of perceived ease of use and found computer self-efficacy to be a strong determinant of perceived ease of use. Hu et al. (2003) examined the acceptance of Microsoft PowerPoint by school teachers. In their study, they measured the influence of computer self-efficacy on perceived ease of use at the commencement of training and at the end of training. Computer self-efficacy was found to be a strong determinant of perceived ease of use at both times. Yi & Hwang (2003) examined the effect of motivational variables including application specific self-efficacy on technology acceptance. They found that application-specific self-efficacy had a significant effect on ease of use. Ong et al. (2004) studied factors affecting the acceptance of e-learning technologies by engineers. In their model, they used computer self-efficacy to predict perceived usefulness, perceived ease of use, and perceived credibility of e-learning. Computer self-efficacy was found to have its strongest relationship with perceived ease of use. Yuen & Ma (2008) explored teachers acceptance of e-learning technology. Their results showed that computer self-efficacy predicted perceived ease of use of e-learning technology. Hong et al. (2002) conducted a study on the determinants of user acceptance of digital libraries. They found a significant relationship between computer self-efficacy and the perceived ease of use of digital libraries. Nov & Ye (2008) studied the role that user personality plays in influencing

the use of digital libraries. They found that computer self-efficacy significantly influenced the perceived ease of use of digital libraries. Thong et al. (2002) studied the influence of interface characteristics, organizational setting, and individual differences (including computer self-efficacy) on the acceptance of digital libraries by users. They found support for the relationship between computer self-efficacy and perceived ease of use. Ramayah & Aafaqi (2004) examined the role of self-efficacy in e-library usage via perceived ease of use. They found that self-efficacy directly influenced perceived ease of use.

In each of these studies, the relationship between computer self-efficacy and perceived ease of use was strong and significant. However, when computer self-efficacy was used as an antecedent to the perceived ease of use of digital libraries, the magnitude of the relationship was weaker but still significant. It is possible that diminished strength of the relationship identified in the studies related to digital libraries is due to the fact that the measure of self-efficacy used was not tailored to digital library technologies. It is likely that the magnitude of the relationship between self-efficacy and perceived ease of use will be greater when a more specific measure of self-efficacy is used. Thus, it is suggested that:

H7: *OLR self-efficacy will have a positive direct effect on the perceived ease of use of OLRs.*

3.3.4 The Application of the Technology Acceptance Model to OLR Adoption

The **fourth research question** (RQ4) pertains to the applicability of TAM to the adoption of OLRs. The Technology Acceptance Model is represented in the research model by three constructs: perceived usefulness, perceived ease of use, and intention to use OLRs. Recall that perceived ease of use refers to a person's expectation that using a particular system will be free of effort. The degree of effort needed to use a system will influence a person's perception of the usefulness of the system (H8) and their intention to use the system (H9). Perceived usefulness is the degree to which a person believes that using a particular system will enhance his or her performance. If a system will enhance a person's performance then he or she will be more likely to want to use that system (H10).

These relationships are well supported by a large number of studies. A meta-analysis of TAM examined these relationships from 88 peer-reviewed papers and reported the average correlations for each of the core TAM relationships (King & He, 2006). These relationships have also been supported in the context of library web site use. Perceived ease of use has been found to have a significant direct effect on perceived usefulness (Ramayah & Aafaqi, 2004; Thong et al., 2002); perceived ease of use has been found to have a significant direct effect on behavioural intention (Ramayah, 2006; Thong et al., 2002); and perceived usefulness has been found to have a significant impact on behavioural intention (Thong et al., 2002).

Missing from the model is the actual use construct. Behavioural intention is generally so strongly associated with actual use that there is very little need to measure use. The relationship between intention to use and actual use has been well supported by previous studies that employ TAM or TRA. Subsequently, many studies decline to employ the actual use construct in their models. For example, in a meta-analysis of TAM studies, Legris (2003) reported that 10 out of 22 studies did not measure system use at all. Based on these findings, the following are hypothesized:

H8: *Perceived ease of use will have a positive direct effect on the perceived usefulness of OLRs.*

H9: *Perceived ease of use will have a positive direct effect on the intention to use OLRs.*

H10: *Perceived usefulness will have a positive direct effect on the intention to use OLRs.*

3.3.5 Mediation Relationship Between ILI, OLR Self-Efficacy and OLR Anxiety

The **fifth research question** (RQ5) addresses the possible mediation effects between ILI, OLR self-efficacy, and OLR anxiety. Three mediation effects are hypothesized.

First, it is hypothesized that OLR anxiety will mediation the influence of ILI on the adoption of OLRs (H11). This hypothesis is based on the view that anxiety acts as an impediment to training. In the literature review, it was mentioned that students who experience high anxiety have to divert a portion of their attention to coping with their negative emotions, tend to avoid the use of the technology that causes these feelings, and when they do use the technology, they do not persist as long as others. Since anxiety has been

found to be a important factor in the use of libraries and computers, the impact of ILI should not be considered without considering the role that anxiety plays in impeding learning.

Second, it is hypothesized that OLR self-efficacy will mediation the influence of ILI on the adoption of OLRs (H12). The effectiveness of instruction may depend on the level of self-efficacy of students. For example, it has been theorized that higher levels of self-efficacy facilitate behavioural, cognitive, and motivational engagement (Linnenbrink & Pintrich, 2003). This view has been supported by empirical research. Gist et al. (1989) hypothesized that trainees who have high self-efficacy will be motivated to participate in training and may obtain more benefit from instruction provided as a result. They found support for their view in the form of significant interaction effects between pre-training computer self-efficacy and instruction on post-training software self-efficacy.

Third, it is hypothesized that OLR anxiety will mediate the relationship between OLR self-efficacy and the perceived ease of use of OLRs (H13). It was mentioned earlier that anxiety and self-efficacy have a reciprocal relationship. Consequently, the relationship with these variables and their dependents should be assessed with both variables taken together.

Based on this rationale, it is hypothesized that:

H11: *OLR anxiety will mediate the relationship between information literacy instruction and perceived ease of use.*

H12: *OLR self-efficacy will mediate the relationship between information literacy instruction and perceived ease of use.*

H13: *OLR anxiety will mediate the relationship between OLR self-efficacy and perceived ease of use.*

3.3.6 Demographic Factors

The **sixth research question** (RQ6) is directed toward understanding the role that demographic characteristics play in OLR adoption. Demographic variables are of interest because they allow instructors to identify subpopulations who are at risk of failing to benefit from the instruction provided. Once identified, such subpopulations can be studied and appropriate training interventions can be designed.

Previous studies have identified differences in levels of anxiety and self-efficacy for subpopulations identified on the basis of gender (Durndell & Haag, 2002; Hasan, 2003; Vekiri & Chronaki, 2008), academic achievement (Lim, 2001; Zimmerman et al., 1992), and year of study (Jiao & Onwuegbuzie, 1997; Jiao et al., 1996; Mizrachi & Shoham, 2004). These variables have been studied in the context of computer use (Compeau & Higgins, 1995; Igbaria & Chakrabarti, 1990) and library use (Van Kampen, 2004) but they have not received adequate attention in the context of OLRs.

Five hypotheses which relate to research question are posited in the paragraphs which follow. The first two hypotheses are non-directional (they predict a relationship but do not predict the nature of the relationship) and the remaining three hypotheses are directional (the predict a relationship and they predict the nature of the relationship). Directional hypotheses are preferred over non-directional hypotheses because they are more stringent than non-directional hypotheses. However, directional hypotheses are not always appropriate. Directional hypotheses are used when a great deal is already known. Non-directional hypotheses are more common in exploratory studies where there is not enough evidence to support directional hypotheses.

The first demographic variable that is investigated in this dissertation is gender. Gender was selected because differences have been identified in the level of anxiety experienced by men and women when using a library and when using a computer. Interestingly, the trends in anxiety levels are opposite for these two technologies: when working with libraries, males tend to have higher levels of anxiety than females (Jiao et al., 1996); but when working with computers females tend to have higher levels of anxiety than males (C. Chou, 2003; Joiner et al., 2007). Consequently, it is difficult to predict how gender will influence OLR anxiety. However, it is natural to expect that gender differences will exist. Consequently, the following non-directional hypothesis is posed;

H14: *Gender will influence levels of OLR anxiety.*

The same observation can be made with regard to gender and OLR self-efficacy. Males and females enjoy different levels of computer self-efficacy. Most of the gender differences that have been identified with regard to self-efficacy relate to computer self-

efficacy. While developing their computer self-efficacy scale, Murphy et al. (1989) found that efficacy expectations are much higher for males in some areas of efficacy. Brosnan (1998) studied the impact of computer anxiety and computer self-efficacy on performance. They found that gender predicted higher levels of self-efficacy (with males having higher self-efficacy). Busch (1996) investigated the role that gender, group composition, and self-efficacy have on cooperation and giving or getting task related help. He found that females have significantly lower levels of computer self-efficacy. Durndell & Haag (2002) conducted a study of East European computer users and found that males had higher levels of self-efficacy. Hasan (2003) studied the influence of eight types of computer experience on computer self-efficacy and concluded that gender differences in computer self-efficacy may be partially attributable to differences with programming languages. Vekiri & Chronaki (2008) studied gender issues in technology use. They confirmed that males had more positive self-efficacy and value beliefs about computers than females. Again the gender differences for library skills appear to be opposite. Usluel (2007) studied the impact of information and communication technology usage on the information literacy self-efficacy of student teachers. Usluel found that male student teachers enjoy a higher level of self-efficacy in using information technologies but females had higher levels of self-efficacy with all of the other information literacy self-efficacy sub-dimensions.

Since it is reasonable to expect gender differences in OLR self-efficacy and since it is not possible to know the nature of the gender differences in advance the following non-directional hypothesis is advanced:

H15: *Gender will influence levels of OLR self-efficacy.*

Year of study refers to the year of the program in which a student is enrolled. It is a proxy measure of a student's level of academic experience in his or her academic program. It is expected that academic experience will be accompanied by library experience, and that library experience will reduce a student's level of anxiety using OLRs. This correlation has been born out in the brick and mortar library environment (Jiao et al., 1996). Freshmen have reported having higher amounts of library anxiety than seniors. As their library skills and

their year of study increase, their anxiety declines (Mech & Brooks, 1995). Computer anxiety has a similar relationship with computer experience (C. Chou, 2003).

H16: *Levels of OLR anxiety will decline with year of study.*

Generally speaking, experiences of mastery increase self-efficacy. As students progress in their undergraduate education, their level of OLR self-efficacy will increase. It has been found that information literacy self-efficacy increases with year of study (Kurbanoglu et al., 2006). Freshmen have reported having lower levels of confidence in their library abilities than seniors (Mech & Brooks, 1995).

H17: *Levels of OLR self-efficacy will increase with year of study.*

Prior research has shown that high levels of academic achievement are associated with higher levels of library anxiety (Jiao et al., 1996; Onwuegbuzie & Jiao, 2004). The reason for this surprising correlation has not been satisfactorily explained. It has been speculated that students with higher grades may be less likely to ask for help from others (Jiao et al., 1996). Thus, they do not get help from librarians or friends. Without that help, their levels of anxiety remain high. Also, it has been noted that students who are self-motivated tend to have higher levels of library anxiety (Onwuegbuzie & Jiao, 1998). The correlation between academic achievement and library anxiety may mask a correlation between self-motivation and anxiety.

H18: *Levels of OLR anxiety will be higher for students with higher levels of academic achievement.*

To test these hypotheses, a survey was designed and administered. The following chapter describes the design of the survey instrument, the data collection process and the data analysis method.

CHAPTER 4: RESEARCH METHODOLOGY

This chapter outlines the methodology used to address the research questions and test the hypotheses posed in Chapter 3. Specifically, this chapter describes the methods used to develop and validate the survey instrument, and to gather and analyze the research data.

4.1 Instrument Design

The data for this study were collected using a web-based survey. Web-based surveys have several advantages that make them ideal for this dissertation. First, web-based surveys are typically *much faster* to administer than paper based surveys. It takes time to print questionnaires and to stuff and label envelopes. After the questionnaires have been mailed, it can take weeks to get a response. When the responses are collected, they have to be coded into a computer. By contrast, web-based surveys can be distributed by sending an invitation letter to everyone on an electronic distribution list. Alternately, the address to the survey can be placed on a web-site, forum, wiki, blog or any other electronic resources. The speed with which web-based surveys can be administered makes them ideal for pilot testing surveys. Web-based surveys are also *less expensive*. Paper based surveys require money to be spent on printing, postage, and stationary. Web-based surveys require researchers to invest some time on data entry. Also, web-based surveys do not require researchers to invest time or money on data entry for the survey results. A study of academic web-based surveys reported that web-based surveys were estimated to cost half as much to administer as paper-based surveys (Lefever et al., 2007). Further, web-based surveys also have the advantage of being media rich. They can utilize sound, graphics, and they can be personalized. This affords the researcher a wider range of options of questions that can be asked. Last, web-based surveys have the additional advantage of providing additional information about the respondent. For example, the computer can be programmed to record information about the completion time of the survey. Web-based surveys can also capture the respondent's IP address which can be used to find the respondent's physical location.

4.1.1 Operationalization of Constructs

Recall that the theoretical model consisted of six constructs: 1) amount of information literacy instruction; 2) OLR anxiety; 3) OLR self-efficacy; 4) perceived usefulness; 5) perceived ease of use; and 6) intention to use OLRs. The measurement of these constructs is discussed below.

The first construct employed in this dissertation is **amount of information literacy instruction**. In order to measure information literacy instruction the following steps were taken. First, a list of courses that contain an information literacy component was compiled. This list was created based on the knowledge of a business professor. Then it was refined by the chief business librarian. Next, interviews were undertaken with instructors or librarian instructors who taught the information literacy component of each class. Each instructor or librarian was asked to indicate the percentage of time spent in active and passive instruction for each of the information literacy skills. A score was calculated for each information literacy skill for each class.

The categories of information literacy skills used in this dissertation were based on the project SAILS assessment categories of skills. The SAILS categorization of the information literacy standard was selected over the information literacy standards listing because the SAILS categorizations provided an applied interpretation of the information literacy standards. The information literacy standards are too abstract to have direct practical application. Also, the SAILS assessment standards were authoritative. To begin with, the SAILS assessment tool is based on the ACRL standards. The SAILS standard is endorsed by the Association of Research Libraries (Project SAILS, 2009). In fact, the Association of Research Libraries entered into a partnership agreement with Kent State University and Project SAILS in January of 2003 (Project SAILS, 2009).

An instrument was designed to measure the amount of information literacy instruction received in each of the SAILS categories identified above. The students were presented with a list of pre-identified classes that had an information literacy instruction component (see Table 4-1 below). Students respondents were asked to identify which courses they had taken and the year in which they took the courses. The students responses were used to calculate the

amount of ILI they received in the following way. First, a business librarian provided a breakdown of the minutes spent teaching each of the IL competencies in each of the IL classes in each year. The information was decomposed into minutes of active ILI with each IL competency and minutes of passive ILI with each ILI competency. The information was used to create a table was created that represented the amount of ILI received for each ILI competency in each class. Third, the table was used to translate the students' self-report of the ILI courses they had taken into a measure of the minutes of instruction they received with each IL competency. For example, if students indicated that they took two IL classes then the total minutes of instruction provided with each IL competency in each class were added to provide an overall amount of ILI received with each ILI competency. Finally, each student's index score was determined by calculating his or her time spent in instruction for each of the information literacy skills for each of the classes. Then, the total time spent in instruction for each of the information literacy skills was calculated by totaling the amount for each class. The total minutes of ILI received for each IL competency was averaged to provide an overall score. The calculation was repeated to obtain measures of active ILI and passive ILI.

Table 4-1: Information Literacy Instruction

Information Literacy Instruction. Calculated Score						
Instructions: The following is a list of courses / sessions at the DeGroote School of Business where library instruction was given by librarians. Identify those courses / sessions (and the year in which they were taken) where you attended the library instruction.						
COURSE/ SESSION	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Comm 1PA0 *"Orientation to Undergraduate Business"*						
Comm 1E03 *"Business Environment and Organization."*						
Comm 2MA3 *"Introduction to Marketing"*						
Comm 2KA3 *"Information Systems in Business"*						
Comm 3MC3 *"Applied Marketing Management"*						
Comm 4SA3 *"International Business"*						
Library Orientation Session						
Refworks						
Career Resources (in conjunction with Career Services in Gilmore Hall).						

The second construct used in this dissertation is **OLR anxiety**. OLR anxiety is the fear or apprehension felt by an individual when using OLRs or when considering the use of OLRs. Since OLR anxiety is a new construct, the researcher was unable to identify a pre-existing instrument that captured a user's anxiety using OLRs. The existing instruments used to capture computer anxiety, internet anxiety and library anxiety were deemed to be inappropriate for this study as they did not have adequate face validity. The scales for measuring library anxiety are too broad to suit the purpose of this dissertation. Bostick's Library Anxiety Scale measures dimensions of library anxiety that relate to the use of the physical library – barriers with staff, comfort with the library, knowledge of the library, mechanical barriers – but does not measure anxiety with OLRs specifically (Bostick, 1992). Bostick's scale was updated by Van Kampen's to include included comfort with using technology but it to includes measures of anxiety using the physical library (Van Kampen, 2004). Also, her scale was developed for students enrolled in a Ph.D. program not for undergraduate students. Scales have been developed to assess computer anxiety (Compeau & Higgins, 1995; Heinssen et al., 1987) but theses scales address anxiety with computer use generally not OLRs specifically. Consequently, a new instrument was devised to capture OLR anxiety. The method used to capture OLR anxiety was slightly different from the method used to capture anxiety in other studies. Instead of measuring the different aspects of anxiety such as fear, apprehension, hesitation or intimidation as typically done in other studies, this study assessed the anxiety associated with a specific set of library skills. Seven skills were identified from the SAILS information literacy test and from the information literacy standards. A question was designed to capture a respondent's level of anxiety with each of these specific skills.

Table 4-2: Online Library Resource Anxiety Scale

Scale Items. 7-item Likert scale (strongly agree / strongly disagree)	
Instructions: **When using online library resources, I feel anxious…**	
Item ID	**Question**
OLAX01	**... When I select online library resources** (e.g., when I need to select specific online library resources to use, such as the library web site, library catalogue or databases such as *Business Source Complete* to find the information that I need)**.**
OLAX02	**…When I use online library resource features** (e.g., when I need to use the various functions within a specific online library resource, such as the library web site, library catalogue or database such as *Business Source Complete* to find the information that I need).
OLAX03	**…When I search for information using online library resources** (e.g., when I need to conduct an advanced search, use subject headings, etc).
OLAX04	**…When I retrieve information from online library resources** (e.g., when I need to extract and acquire information from an online library resource, such as journal articles books etc.).
OLAX05	**…When I evaluate the information I retrieve from online library resources** (e.g., when I need to assess the relevance, reliability, validity, bias and timeliness of the information I retrieve from online library resources).
OLAX06	**…When I assess citations of the information I retrieve from online library resources** (e.g., when I need to decipher the reference of the information I retrieve from online library resources to see if the information pertains to a book, a book chapter, or a journal article).
OLAX07	**…When I deal with the economic, legal & social issues surrounding the use of online library resources** (e.g., when I need to consider the issues around the use of the information I retrieve from online library resources such as copyright, privacy, and censorship).

The third construct used in this dissertation was **OLR self-efficacy.** OLR self-efficacy is an individual's beliefs in one's capabilities to organize and execute the courses of action required to utilize OLRs. The instrument used to measure OLR self-efficacy was developed by following the advice of Albert Bandura. Bandura's guide to developing self-efficacy scales indicates that the construction of a self-efficacy scale requires "a good conceptual analysis of the relevant domain of functioning" (2006, p. 310). Bandura also points out that self-efficacy is multi-faceted. Consequently, self-efficacy scales should reflect the multiple dimensions of the issue under consideration. In the case of OLR self-efficacy, the domain of skills required has been well established in the information literacy standards. In addition, Bandura points out that the tasks should represent a graduation of challenge or impediments. The information literacy skills range from simple skills (such as searching for documents and retrieving them) to higher order thinking skills (such as evaluating sources and understanding social issues

associated with the use of information). The respondents are presented with a specific set of tasks and then they were asked to assess their level of confidence in their ability to perform the tasks. The tasks were based on the categories of information literacy skills presented by the Project SAILS team.

This dissertation departs from the normal practice of measuring self-efficacy in one important way. This study does not employ a unipolar ten point scale. Instead, a seven-point Likert type scale was used. The two approaches have similar psychometric properties (T. J. Maurer & Andrews, 2000). Maurer & Pierce (1998) undertook a study in which they compared the Likert scale with the ten-point unipolar scale and found that the two measures provided similar reliability and error variance, equivalent levels of predictions, and similar factor structures. Maurer & Pierce concluded that the 10-point scale offered no advantages. The Likert scale has advantages for this study, however, since the other measures used in this study use Likert type scales statistical analysis is enhanced. Table 4-3 presents the seven-item Likert scale used to capture OLR self-efficacy.

Table 4-3: Online Library Resources Self-Efficacy Scale

Scale Items. 7-item Likert type scale (strongly agree / strongly disagree)	
Instructions: **When using online library resources, I believe I have the ability to …**	
Item Identifier	**Question**
OLSE01	**…select online library resources** (e.g., select specific online library resources to use, such as the library web site, library catalogue or a database like *Business Source Complete* to find the information that I need)**.**
OLSE02	**…use online library resource features** (e.g., use the various functions within a specific online library resource, such as the library web site, library catalogue, or a database like *Business Source Complete* to find the information that I need).
OLSE03	**…search for information using online library resources** (e.g., when I need to conduct an advanced search, use subject headings, etc.).
OLSE04	**…retrieve information from online library resources** (e.g., extract and acquire information from an online library resource, such as a journal article, book, etc.).
OLSE05	**…evaluate the information I retrieve from online library resources** (e.g., assess the relevance, reliability, validity, bias and timeliness of the information I retrieve from online library resources).
OLSE06	**…assess citations of the information I retrieve from online library resources** (e.g., decipher the reference of the information I retrieve from online library resources to see if the information pertains to a book, a book chapter, or a journal article).
OLSE07	**…deal with the economic, legal & social issues surrounding the use of online library resources** (e.g., consider the issues around the use of the information I retrieve from online library resources such as copyright, privacy, and censorship).

The instruments used to measure technology acceptance constructs were developed by Davis (1989). When Davis first proposed the measurement instruments for perceived usefulness and perceive ease of use for his dissertation, the instruments consisted of fourteen questions (F. D. Davis, 1986, pp. 84-85) but he managed to refine the instrument down to ten questions each. When Davis published his work in a journal article, he managed to further reduce the scales to six items each. Today, perceived usefulness and perceived ease of use are measured using instruments that consist of four questions each.

The instruments used to capture the technology acceptance model constructs are not universal. They have to be contextualized to the study in which they are employed. For this study, the questions had to be modified to capture the adoption and use of OLRs. The questions used to capture the perceived usefulness, perceived ease of use, and intention to use OLRs are presented in Table 4-5 and Table 4-6 below.

Table 4-4: Perceived Ease of Use

7-item Likert type scale (strongly agree / strongly disagree)	
Instructions: Please state your level of agreement with the following statements.	
Item ID	**Question**
PEOU01	My interaction with online library resources is clear and understandable.
PEOU02	Interacting with online library resources does not require a lot of mental effort.
PEOU03	I find online library resources easy to use.
PEOU04	I find it easy to get online library resources to do what I want them to do.

Table 4-5: Perceived Usefulness

Perceived Usefulness of Online Library Resources	
Instructions: Please state your level of agreement with the following statements.	
Item ID	**Question**
PU01	Using online library resources improves my academic performance.
PU02	Using online library resources increases my productivity in my course work.
PU03	Using online library resources enhances my effectiveness in my course work.
PU04	I find online library resources useful for my course work.

Table 4-6: Intention to Use OLRs

Intention to Use Online Library Resources	
Instructions: Please state your level of agreement with the following statements.	
Item ID	**Question**
BI01	Given that I have access to on online library resources, I intend to use them for my coursework in the future.
BI02	Assuming that I have access to online library resources, I predict that I will use them for my coursework in the future.

4.1.2 Demographic Variables

This study used four demographic variables to better understand the effect of ILI, OLR anxiety, and OLR self-efficacy on the adoption and use of OLRs: 1) gender, 2) year of study, 3) concentration of study, and 4) academic achievement.

The first variable was measured by asking the participants "What is your gender?" (male or female). **Gender** can be understood in terms of a biological categorization or in terms of socially constructed roles, behaviours, activities, and attributes. It is noted that gender can be conceptualized as a continuous variable ranging from feminine to masculine. For this study, gender was captured using a dichotomous measure anchored at the extremes of the continuum. This approach was taken to facilitate comparability with previous studies.

The second demographic variable measured the student's **year of study** by asking "In what year of study are you?" (1st year, 2nd year, 3rd year, 4th year or higher).

The third demographic variable was **concentration of study**. The question used to measure concentration of study asked students "In what area do you plan to major or concentrate your business studies?" (Accounting, Finance, General Management, Human Resources, Information Systems, Marketing, Operations Research, Strategy, Not listed, Undecided). Concentration of study was measured using a nominal scale.

The fourth demographic variable was **Academic Achievement**. It was measured with the question "How well do you typically perform academically at university?" (In the A- to A+ range, In the B- to B+ range, In the C- to C+ range, In the F to D+ range). Academic performance was measured on a four-point ordinal scale.

4.1.3 Open-Ended Questions

Although the hypotheses developed for this study are well supported by previous research, the novelty of the OLR anxiety and OLR self-efficacy constructs made the results of the quantitative analysis sufficiently different from other studies to warrant further examination. Open-ended questions enable researchers to capture the points of view of the respondent without predetermining the points of view by selecting response categories in advance (Patton, 1990, p. 24). Two qualitative questions were designed for each of the constructs to facilitate the interpretation of the quantitative results. The questions were kept broad in order to give respondents the greatest latitude in interpreting the questions and shaping their responses. The questions related to OLR anxiety are presented in Table 4-7 below.

Table 4-7: Online Library Resources Anxiety Open-Ended Questions

Comment on your response to the above question so that the researchers can better understand the context surrounding your level of anxiety using online library resources. For example, if you experience anxiety using online library resources, what is it that causes you to be anxious? If you are not anxious using online library resources, why is this so?
How did the library instruction you received from the librarians affect your level of anxiety using online library resources? For example, did the library instruction increase your anxiety? decrease it? have no effect? Explain.

Also, two qualitative questions were used to aid the interpretation of the quantitative results regarding OLR self-efficacy. They are presented in Table 4-8 below. Since the phenomenon studied in the proposed research project was new, it was expected that the qualitative data would clarify the patterns found in the quantitative data.

Table 4-8: Online Library Resources Self-Efficacy Open-ended Questions

Comment on your response to the above question so that the researchers can better understand the context surrounding your level of comfort and confidence using online library resources. For example, if you are (un)comfortable and (un)confident using online library resources, explain why this is so?
How did the library instruction you received from the librarians affect your level of comfort and confidence using online library resources? For example, did the library instruction increase your comfort and confidence levels? decrease them? have no effect? Explain.

4.1.4 Pre-Testing and Face Validity Assessment

The survey instrument was pre-tested using PhD students, librarians, a sessional lecturer, an academic expert on information literacy instruction, and non-business undergraduate students as participants. Twelve respondents participated in the pre-testing phase. The respondents were asked to provide their comments on the items within the instrument. The PhD students, undergraduate students and the sessional lecturer were asked to face validate the survey instrument. Specifically they were asked to comment on the clarity of the questions employed, the reading level required to read the questions, the ease of use of the survey, the appropriateness of the response formats, and the time taken to complete the survey. The librarians and the academic expert were asked to assess both face validity and content validity. They were asked to assess whether the entire domain of the constructs were represented by the questions utilized in the survey.

Based on the feedback of the participants, some minor editing was performed: a repeated adjective was removed; a heading was altered slightly; and an introductory paragraph was refined. Several respondents found the wording of one of the items to be awkward. Since the wording of the item exactly mirrors the wording of the established instrument, it was decided to retain the wording.

4.1.5 Ethics Clearance

Clearance was obtained from the Research Ethics Board to collect data from human subjects. The research certificate of ethics clearance to involve human participants in research is presented in Appendix A.

4.2 Data Collection

A survey instrument was used to collect data for this dissertation. A survey is a "means of gathering information about the characteristics, actions, or opinions of a large group of people, referred to as a population" (Tanur, 1982). Laypeople often mistake the scientific instrument that is used to capture data for a survey. A survey is much more. A survey is the systematic process for gathering structured data and for analyzing the data that is gathered (de Vaus, 1990; Pfleeger & Kitchenham, 2001). Surveys have the advantage of providing structured data that is amenable to statistical analysis, that can be generalized to a larger population, and can be administered in a timely manner (Rea & Parker, 1992).

It is usually prohibitively expensive to survey an entire population. Instead, it is often expedient to sample a scientifically selected subpopulation (Rea & Parker, 1992, p. 107). Statistical techniques are then used to make inferences about the entire population based on the characteristics of the sample. The following sections describe the proposed manner in which the sample used in this study was selected.

4.2.1 Study Setting and Participants

Before a sample can be drawn, the target population must first be defined (Kitchenham & Pfleeger, 2002). Ideally, the target population should consist of people who can answer the survey questions. Additionally, the target population should consist of people

to whom the survey results apply. The population that the survey is drawn from should be consistent with the population of interest (Henry, 1998).

For this study, the target population for this study was all undergraduate business students at the DeGroote School of Business at McMaster University in Hamilton, Ontario, Canada. This target population was ideally suited to the study of the adoption and use of OLRs by business students. The study setting is described below.

Students at the DeGroote School of Business (DeGroote) at McMaster University form a representative sample of business students to investigate. DeGroote is accredited by the Association to Advance Collegiate Schools of Business (AACSB) and offers programs at the undergraduate, graduate and PhD levels. At the time of data collection, the DeGroote School of Business had 2,120 full-time and 179 part-time undergraduate students, 223 full time and 122 part-time masters students, and 34 full-time and 2 part-time doctoral students. DeGroote and its business library, the Harold Adams Innis Business Library, are committed to improving information literacy instruction for business students.

DeGroote has access to excellent OLRs. In 2008, the Association of College and Research Libraries awarded the McMaster libraries the Excellence in Academic Libraries Award (ACRL, 2008). McMaster university libraries have nearly 1.465 million print monograph titles, 369,000 electronic monographs, and nearly 66,000 electronic serials in 2008-2009 (Office of Institutional Research and Analysis, 2010, p. 17). The academic and research activities of DeGroote are supported by the Harold Adams Innis Library. It holds 18,000 monographs and provides access to over 4,300 online journals and magazines related to business (McMaster University, 2010).

4.2.2 Respondent Selection

The statistical techniques used need to represent the sampling frame from which the data is drawn. A basic assumption behind sampling theory is that "the frame is an accurate representation of the population to which we want to generalize" (Tanur, 1982, p. 303). Therefore, it is necessary to ensure that the sampling frame is a representative subset of the population that is to be represented. At the heart of these statistical techniques is the requirement that each person in the population has a known (Fowler, 1995, p. 21) non-zero

probability of being included in the sample (Kitchenham & Pfleeger, 2002). Consequently, the choice of sampling frame and the method of selecting the respondents is very important in survey research. The sampling frame for this study was all DeGroote undergraduate students.

4.2.3 Respondent Recruitment

Respondent recruitment was guided by Dillman's tailored design survey method (Dillman, 1978) but adapted it for the modern era. Dillman recommends sending an initial invitation followed by several rounds of follow up invitations. The Dillman method encourages researchers to provide incentive prizes and to ensure that communications are written in a personable manner.

Respondent recruitment consisted of an incentive prize, mass emails, promotional posters, and in-class presentations. The incentive prize consisted of one hundred randomly distributed $50 prizes. The main recruitment method consisted of a series of mass emails sent to all undergraduate business students at DeGroote. The initial email message sent out is presented in Figure 4-1. Three follow up emails were sent out at one week intervals. Promotional posters were placed in the lobby of the DeGroote School of Business, in the basement outside the DeGroote classrooms, in the Innis Library, and outside the undergraduate business student lounge. Permission to post the posters was obtained from the student union and from the research ethics department. The promotional poster is presented in Appendix B – Recruitment Poster. Class presentations were made in several sections of an undergraduate class to recruit participants. A post was made on the library's Twitter account. The library's Twitter posts appear on their web page.

Invitation to Commerce Students to Fill Out a Web-based Survey for a Research Study on Library Instruction at Business Schools

You are invited to fill out a web-based survey for a study concerning your experience at McMaster receiving library instruction given by business librarians.

As an incentive, *up to 100 participants who complete the survey will receive a $50 gift certificate for the Titles Bookstore on campus*.

The survey will take about 20 minutes to complete.

This survey is only open to persons 18 years of age or older who are currently enrolled full-time in either Business I, the Honours Commerce Program, or the Commerce Program at the DeGroote School of Business at McMaster University.

For more information about this project and to start the actual survey, please visit: <*link to information sheet/consent form posted on the web*>.

Figure 4-1: Survey Recruitment Letter

4.3 Data Analysis Method

This dissertation relies primarily on quantitative data and quantitative data analysis. However, it supplements the quantitative data analysis with qualitative data analysis of the open-ended questions to provide an insight into the results of the quantitative analysis. The data analysis methods are detailed below.

4.3.1 Quantitative Analysis

This dissertation makes use of Structural Equation Modelling (SEM) to analyze the theoretical model presented in Chapter 3. SEM are "multivariate techniques combining aspects of multiple regression (examining dependence relationships) and factor analysis (representing unmeasured concepts with multiple variables) to estimate a series of interrelated dependence relationships simultaneously" (Gefen et al., 2000, p. 72). SEM has several advantages over first generation techniques like principle components analysis, factor analysis, discriminant analysis, and multiple regression. First, SEM allows researchers to model relationships among multiple predictor and criterion variables (Chin, 1998a). Next,

SEM enables researchers to measure latent (unobservable) variables. Finally, SEM allows researchers to assess the measurement models and structural models simultaneously. Thus measurement errors can be analyzed as part of the model. These attributes enable researchers to answer a set of interrelated research questions in a single, systematic, comprehensive analysis (Gefen et al., 2000). Consequently, SEM is well suited to modelling complex processes such as technology acceptance (Gefen et al., 2000).

Researchers have two methods of SEM analysis to choose from. Researchers can use covariance-based SEM or they can use partial least squares-based SEM. PLS was chosen over covariance-based SEM because PLS supports exploratory research and the data distribution assumptions of PLS are less stringent than the assumptions behind covariance-based SEM (Anderson & Gerbing, 1988). Also, PLS is capable of assessing indirect effects such as the ones in hypotheses 11-13 (Chin et al., 2003).

4.3.2 Sample Size Requirements

This study aimed to achieve a statistical power of 0.80. The statistical power of a test depends on the significance level that the researcher is striving to achieve (e.g., $\alpha = 0.05$), the sample size (N), and the population effect sizes (J Cohen, 1992). The sensitivity of the statistical techniques also needs to be considered (K. Murphy, 2002, p. 121).

With this statistical power goal in mind, a required sample size was determined. Chin & Newsted (Chin & Newsted, 1999) recommend using either Cohen's power tables (J Cohen, 1977) or Green's (1991) approximation to those tables to find the sample size needed to achieve a specified level of statistical power. Green's tables are calculated based on an alpha of 0.05 and a power of 0.80 for multiple regression. The tables allow researchers to base their calculation on expected effect size. Cohen recommends that researchers identify effect sizes based on R^2 values (small $R^2 = 0.02$; medium, $R^2 = 0.13$; large, $R^2 = 0.26$). Based on this, the required sample size for this study with a regression with four predictors was calculated to be 610 for small sized effects, 81 for medium sized effects, and 35 for large sized effects. If perceived ease of use was taken as a composite and medium effect sizes were expected then a minimum sample size of 81 is required. Thus, it was determined that a sample size of 100 was sufficient for all but the smallest of effect sizes.

Note that an effective sample size has to be reduced to account for the power of mediation tests. That is, the effective size of the study has to be reduced to account for mediation effects (Frazier et al., 2004). The calculation is based on the relationship between the predictor and the mediator. It is calculated by the formula (N $(1 - r_{xm}^2)$) using N as the sample size and r_{xm} as the correlation between the variables. For example, if this study had 300 usable responses and the correlation between a predictor variable and a mediator variable were 0.30 then the effective sample size would be (300 $(1\text{-}0.30^2)$) 273. Given this, the adjusted sample size of 100 was determined to be more than adequate for medium effect sizes.

4.3.3 Qualitative Analysis

The open-ended questions are analyzed using the qualitative analysis method of inquiry. The qualitative method of inquiry is often used for generating new theories or hypotheses, for achieving a deeper understanding of an issue. Qualitative inquiry seeks to provide an in-depth account of a phenomenon. Often new perspectives are gained through qualitative analysis. Since in-depth accounts are difficult to express numerically qualitative research relies on text-based descriptions. Qualitative research seeks to obtain a subjective understanding of events. Effort is made to interpret and understand the meaning assigned to events. Since bias is an important part of the meaning we assign to things it not avoided. Instead, care is taken to recognize and articulate the bias that is present. Qualitative researchers use inductive logic. They start with observations then they try to derive general principles from them. In the qualitative approach data collection and data analysis is intertwined. The analysis of observations can be used to guide the researcher to examine phenomenon or aspects of the phenomenon that had not been examined before.

Qualitative research methods use different knowledge claims, strategies of inquiry, data collection, data and data analysis methods from quantitative research (Creswell, 2003, p. 179). Examples of qualitative strategies of inquiry include ethnographies, case studies, interpretive practice, grounded theory, and participatory action research (Denzin & Lincoln, 2005, p. vi). The data collection techniques used to enact these strategies of inquiry include interviews, oral history, biographical research, focus groups, participant observation, video,

text analysis and image analysis (Marshall & Rossman, 2006, p. vi; Seale et al., 2004, p. v). The data that is gathered from these data collection techniques can take the form of interview transcripts, audio recordings, field notes, videos, images, and documents. The data analysis process usually involves writing and the identification of themes through coding. Coding involves finding patterns, developing categories. The purpose of qualitative data analysis is to derive an explanation, interpretation or understanding from the raw data.

Grounded theory is used as the strategy of inquiry to guide the qualitative analysis. Strategies of inquiry "connect researchers to specific approaches and methods for collecting and analyzing empirical materials" (Denzin & Lincoln, 2003, p. xv). Grounded theory was originally defined very broadly by Glaser and Strauss as "the discovery of theory from data" (1967, p. 1). Glaser defines grounded theory as "a general methodology of analysis linked with data collection that uses a systematically applied set of methods to generate an inductive theory about a substantive theory" (Glaser, 1992, p. 16). Grounded theory includes theoretical sampling, systematic coding, and attaining conceptual density

This dissertation makes use of content analysis as its qualitative analysis technique. Content analysis has been defined as "any technique for making inferences by objectively and systematically identifying specified characteristics of messages" (Holsti, 1969, p. 14). Content analysis is used to identify the attributes or characteristics of messages (Carney, 1972, p. 25). Researchers search through documents, recordings or videos and search for words or concepts. Then they quantify the presence, meaning and relationships between words and concepts. The documents are coded by identifying and categorizing words, sentences or themes. The codes are then analyzed using either conceptual analysis or relational analysis. Conceptual analysis – also known as thematic analysis - focuses on identifying concepts of importance and then tallying and quantifying their presence (Braun & Clarke, 2006). Conceptual coding can require the use of a purpose developed dictionary or translation rules when concepts are not expressed explicitly. Relational analysis – also called semantic analysis – focuses on identifying relationships between concepts. Then it proceeds to identify relationships between concepts. This dissertation will utilize conceptual analysis. The goal is to quantify concepts not to develop theory.

Since qualitative data analysis is informed by the data in a dynamic and interactive manner the methods used to code and analyze the data for this dissertation are not predetermined. Since they are not predetermined before the data analysis occurs they will be discussed in the chapter on data analysis - Chapter 5.

CHAPTER 5: DATA ANALYSIS AND RESULTS

5.1 Descriptive Survey Results

As described above, the data for this dissertation were collected using a survey instrument where four mass emails were sent out approximately one week apart as a means of recruiting participants. A breakdown of the percentage of responses received from each email blast is provided in Figure 5-1. Almost half of the responses came as a result of the first email blast. The second reminder generated almost a quarter of the responses.

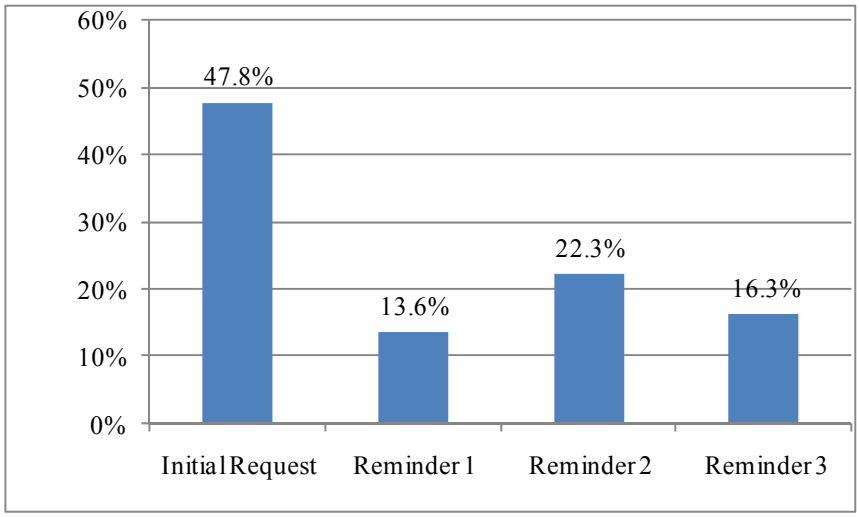

Figure 5-1: Percentage Breakdown of Responses Received

A total of 410 responses were gathered. After removing records with missing data, outliers, patterned responses, illogical responses, duplicate responses and inappropriate responses to reversely worded items, 337 records remained. A response rate of 16.4 percent was achieved (i.e., 337 / 2,049). A count of responses received by selected dates is presented in Table 5-1.

Table 5-1: Count of Survey Responses by Phase

Phase	Cumulative Responses	Number of responses
Initial Invitation	161	161
Reminder 1	46	207
Reminder 2	75	282
Reminder 3	55	337
Total	337	337

Note that the effective sample size exceeds the sample size requirements identified in Chapter 3.

5.2 Participant Demographics

Demographic information regarding gender, year of study, and focus of studies was gathered. The demographic information is presented in Table 5-2, Table 5-3 and Table 5-4.

Table 5-2: Demographic Statistics for Gender

	Sample		Population		
Gender	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Δ %**
Male	167	49.6%	1225	55.8%	6.2 %
Female	169	50.1%	969	44.2%	-5.9 %
Total	336	99.7%	336	100.0%	-0.3 %

Table 5-3: A Comparison of Sample and Population Demographics

	Sample		Population		
Year of Study	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Δ %**
First	85	25.2 %	558	26.6%	1.4 %
Second	79	23.5 %	570	27.2%	3.7 %
Third	107	31.7 %	571	27.2%	-4.5 %
Fourth	65	19.3 %	400	19.0%	-0.3 %
Prefer Not to Say	1	0.3 %	0	0%	-0.3 %
	337	100 %	2,099	100 %	0.0 %

Table 5-4: Demographic Statistics for Concentration of Studies

Categories	Frequency	Percentage
Accounting	118	35 %
Finance	69	20.5 %
General Management	8	2.4 %
Human Resources	25	7.4 %
Information Systems	4	1.2 %
Marketing	64	19 %
Operations Research	2	0.6 %
Strategy	0	0 %
Not Listed	1	0.3 %
Undecided	46	13.6 %
Total	337	100 %

The demographics from the sample were compared with student demographic information from DeGroote[2] in order to assure that a representative sample had been drawn. Table 5-2 compares the proportion of males and females in the sample with the proportion in the population. Males are overrepresented in the sample and females are underrepresented. The comparison is presented in Table 5-3. The table compares the proportion of respondents in the sample from each year level with the proportion of students from the population in each year level. In the final column of the table, the percentage proportion of each year level is compared. Only minor differences were observed between the sample and the population from which it was drawn. The sample is a fair representation of DeGroote.

[2] Enrolment figures for DeGroote were obtained from the Office of Institutional Research and Analysis document entitled "Total Undergraduate Headcount by Faculty & Level as at November 1, 2005-2006 to 2009-2010." This document is available from http://www.mcmaster.ca/avpira/statistics/headcount_undergrad0509.html. Information regarding the distribution of students by gender was provided by Ben Chapdelaine, the Manager of Undergraduate Programs, Academic Programs Office, DeGroote School of Business.

5.3 SEM Results

Recall that the overarching goal of this dissertation is to investigate the influence of information literacy instruction on the adoption of OLRs by business students. A theoretical model was proposed based on a set of statements of correlations between variables. In the section that follows the theoretical model is tested using the collected data.

The examination proceeds in two steps. First, the measurement model was assessed for validity and reliability. Then the structural model was assessed. SmartPLS[3] and Predictive Analytic Software 18 (PASW 18) were used to undertake the examination. SmartPLS is a software application that enables the user to perform path modelling with latent variables using the partial least squares method (Ringle et al., 2005). SmartPLS was developed by a team from the University of Hamburg School of Business. Predictive Analytic Software 18 (PASW 18) was the name assigned to version 18 of the venerable Statistical Package for the Social Sciences (SPSS). PASW is a software application used for statistical analysis. It is distributed by SPSS.

5.3.1 Common Method Bias

Method bias "is the difference between the measured score of a trait and the trait score that stems from the rater, instrument, and/or procedure used to obtain the score" (Burton-Jones, 2009, p. 448). Stated differently, common method bias is a form of systematic error that occurs when two or more constructs are measured using the same measurement method (Podsakoff et al., 2003). When a common method or setting is used to measure items, a portion of the variability shared between each variable may be caused by the measurement method, and not the true relationship between variables. Consequently, common method bias can cause the covariation or correlation between constructs to be overstated. Common method bias can cause false conclusions to be reached.

Since the data employed here was obtained using a single survey instrument in a single setting, common methods bias needed to be assessed. In order to detect common

[3] Smart PLS is available as a free download from http://www.smartpls.de/forum/

method bias, Harman's one-factor test was undertaken (Podsakoff & Organ, 1986). Under Harman's one-factor test, an exploratory factor analysis was conducted. If common method bias is present, then all indicators will load on a single factor or a general factor, and that factor will account for the majority off the variance (Malhotra et al., 2006). An exploratory factor analysis was undertaken on 28 items. The two items used to capture the Behavioral Intention construct were not entered into the analysis because they are the ultimate dependent items in the model and because they were expected to correlate heavily with perceived usefulness and perceived ease of use. Six items with an eigenvalue of greater than one emerged from the analysis (see Table 5-5). The first factor model explained only 33.698% of the variance. The six factors explained a cumulative total of 76.37 % of the variance. No single factor emerged that accounted for the majority of the variance. Consequently, it is concluded that common method bias was unlikely to be a concern for this study.

Table 5-5: Exploratory Factor Analysis

Component	Initial Eigenvalues	Percentage of Variance Explained	Cumulative Percentage of Variance
1	9.435	33.698 %	33.698 %
2	3.885	13.874 %	47.573 %
3	3.586	12.806 %	60.379 %
4	1.929	6.890 %	67.269 %
5	1.378	4.923 %	72.192 %
6	1.170	4.178 %	76.370 %

5.3.2 Non-response bias

When the response rate to a survey is low, it is necessary to test for non-response bias. Non-response bias can occur when there are systematic differences between people who respond to surveys and people who do not respond surveys. When the differences between responders and non-responders are correlated with the criterion measure, non-response bias occurs (Fox & Tracy, 1986, p. 9). Since the results of the survey cannot be generalized to the target population, the external validity of a study can be compromised.

This dissertation uses the linear extrapolation method to test for non-response bias. Extrapolation methods are based on the principle that respondents who answer less readily (late respondents) will be similar to non-responders (Armstrong & Overton, 1977). Thus, if

there is a significant difference between early responders and late responders that difference can be extrapolated to non-responders and it can be concluded that a non-response bias is present. The linear extrapolation method can be used when data is gathered in successive waves (Filion, 1975). Since the data collection method used in this study made use of four waves of invitations the linear extrapolation method can be used.

The linear extrapolation method was accomplished in two steps. First, a dummy variable was created to represent each wave of data collection. Then, each response was assigned a code according to the wave of data collection that the response was received with. Second, a MANOVA was undertaken using the dummy variable as a fixed factor. The MANOVA test was undertaken in PASW 18 using the Analyze→General Linear Model→Multivariate command. The multivariate test (see Table 5-6) revealed that a significant difference exists between early responders and late responders. The test of between-subject effects indicates that significant differences are present for the total amount of ILI received variable and for the amount of passive ILI received variable (see Table 5-7). The MANOVA post-hoc analysis for total amount of ILI received and amount of passive ILI received revealed that there were significant differences between each wave of respondents on the amount of passive ILI received. Specifically, four homogenous subsets exist which correspond with the four waves of data collection (see Table 5-8). The respondents from the first wave of data collection received the least amount of passive instruction. Each successive wave of respondents received more passive ILI than the prior wave. These results suggest there may be a non-response bias based on the amount of passive ILI received. Non-responders may have received high levels of passive ILI.

The problem with extrapolating these values in a linear fashion is that there is a maximum amount of passive ILI that a business student can receive. Thus, it is not possible to conclude that students who have received more than the maximum amount of passive ILI are at risk of not being represented in the sample. The maximum amount of passive ILI received by any student in the sample was 81.5. Many of those 33 are represented in the 67.5 average figure.

Table 5-6: Non-Response Bias MANOVA Multivariate Test

	Value	F	Hypothesis *df*	Error *df*	Sig.
Pillai's Trace	0.892	19.295	21	957	0.000
Wilk's Lamda	0.163	38.221	21	910	0.000
Hotelling's Trace	4.802	72.190	21	947	0.000
Roy's Largest Root	4.732	215.659	7	319	0.000

Table 5-7: Non-response Bias MANOVA Test of Between–Subjects Effects

Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Total Amount of ILI	58693.759	3	19564.856	62.204	0.000
Amount of Active ILI	1483.169	3	494.390	3.348	0.019
Amount of Passive ILI	77769.545	3	25923.182	360.370	0.000
OLR Anxiety	5.974	3	1.991	1.256	0.289
OLR Self-Efficacy	2.594	3	0.865	0.966	0.409
Perceived Ease of Use	8.252	3	2.751	2.163	0.092
Perceived Usefulness	2.639	3	0.880	0.8001	0.494
Behavioural Intention	4.610	3	1.537	1.158	0.326

Table 5-8: Non-response Bias MANOVA Test Homogeneous Subsets for Amount of Passive ILI

		Subset			
Data Collection Wave	**N**	**1**	**2**	**3**	**4**
1	157	29.2419			
2	43		47.8372		
3	72			57.2734	
4	55				67.4652
Significance		1.000	1.000	1.000	1.000

5.3.3 Descriptive Statistics

The distribution of a set of data can be described using statistics for the mean, standard deviation, skewness, and kurtosis. The mean and standard deviation are important because they describe the central tendency and spread of the data. Skewness and kurtosis are

also important because they measure departures from the normal distribution of data. Since normality is a requirement for many statistical tests – especially the F and t statistics – departures from normality may cause statistical tests to be invalidated.

Skewness is a measure of the symmetry (or asymmetry) of a distribution (Meyers et al., 2006). Skewness can be positive, negative, or undefined. A positive skew occurs when the tail on the right side of a distribution is longer than the tail on the left side of a distribution. Negative skew occurs when the tail on the left side of a distribution is longer than the tail on the right side of a distribution. Skewness scores of zero indicate a perfectly symmetric distribution. Large skewness scores reveal asymmetric distributions.

Kurtosis (from the Greek word κυρτός meaning bulging) is a measure of the "peakedness"or "flatness" of a distribution (Hair et al., 2010, p. 71). A distribution with high kurtosis (a leptokurtic distribution) has a sharp peak and long flat tails. While a distribution with low kurtosis (a platykurtic distribution) has a rounded peak and shorter thinner tails. A negative kurtosis score indicates that the distribution is leptokurtic while a positive kurtosis score indicates that a distribution is platykurtic. A skewness score within +/- 1 is considered adequate by many statisticians (Meyers et al., 2006, p. 50).

The descriptive statistics for the construct indicators are presented in Table 5-9 and the descriptive statistics for the constructs are presented in Table 5-10. In each table, the mean, standard deviation, skewness, and kurtosis statistics are shown. Several of the indicators exceed the 1.0 threshold for skewness (OLRS1, OLRS3, and PU4) and kurtosis (OLRS1, OLRS2, OLRS3, PU4). The same is true of several of the construct statistics. These departures from the normal distribution are not alarming in the context of this study. This study employs a large sample size. When sample sizes greater than 200 are used, departures from normality have less influence on the results of statistical tests (Hair et al., 2010, p. 71). Also, the partial least squares method is robust against departures from normality (Chin & Newsted, 1999; Gefen et al., 2000). So, the skewness and kurtosis scores do not violate the assumptions of the statistical methods used in this study.

Note that z-scores can be calculated for skewness by dividing the score for skewness by the standard error of skewness, and for kurtosis by dividing the score of kurtosis by the standard error of kurtosis. The resulting scores can be compared with known values of the z-

distribution. For example, a value greater than1.96 would be significant at $p < 0.05$, a value of 2.58 would be significant at $p < .01$, and a value of 3.29 would be significant at $p < 0.001$. The problem with the use of z-scores is that as sample sizes get larger, the standard error gets smaller. Consequently, even small deviations from normality will result in significant z-scores. Thus, for samples larger than 200, z-scores should not be used. The z-scores for skewness and kurtosis were not employed in this dissertation for that reason.

Table 5-9: Descriptive Statistics for the Construct Indicators

			Skewness		Kurtosis	
Indicator	**Mean**	**St. Dev.**	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**
OLRA1	3.07	1.44	0.703	0.133	-0.193	0.265
OLRA2	3.07	1.40	0.645	0.133	-0.323	0.265
OLRA3	3.14	1.45	0.589	0.133	-0.333	0.265
OLRA4	3.13	1.50	0.640	0.133	-0.305	0.265
OLRA5	3.28	1.51	0.492	0.133	-0.471	0.265
OLRA6	3.49	1.56	0.381	0.133	-0.680	0.266
OLRA7	3.43	1.56	0.381	0.134	-0.692	0.268
OLRS1	5.55	1.08	-1.075	0.133	1.890	0.265
OLRS2	5.48	1.08	-0.983	0.133	1.353	0.265
OLRS3	5.57	1.07	-1.041	0.133	1.590	0.265
OLRS4	5.53	1.10	-0.933	0.133	0.971	0.265
OLRS5	5.32	1.14	-0.776	0.133	0.841	0.265
OLRS6	5.13	1.20	-0.630	0.133	-0.045	0.266
OLRS7	5.00	1.25	-0.473	0.134	-0.023	0.267
PEOU1	4.37	1.51	-0.287	0.133	-0.764	0.265
PEOU2	5.16	1.13	-0.702	0.133	0.165	0.265
PEOU3	5.12	1.28	-0.820	0.133	0.532	0.265
PEOU4	4.94	1.37	-0.685	0.133	-0.137	0.265
PU1	5.19	1.19	-0.612	0.133	0.571	0.265
PU2	5.20	1.21	-0.661	0.133	0.288	0.265
PU3	5.33	1.12	-0.813	0.133	0.901	0.265
PU4	5.50	1.22	-1.039	0.133	1.391	0.265
BI1	5.73	1.19	-0.957	0.133	0.686	0.266
BI2	5.75	1.18	-0.918	0.133	0.608	0.266

Table 5-10: Descriptive Statistics for the Constructs

			Skewness		Kurtosis	
Constructs	**Mean**	**St. Dev.**	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**
InstrAvg	58.52	22.08	0.048	0.133	-0.535	0.265
OLRAAvg	3.23	1.26	0.359	0.134	-0.356	0.268
OLRSAvg	5.37	0.95	-0.797	0.134	1.309	0.268
PEOUAvg	4.89	1.13	1.133	-0.544	0.049	0.268
PUAvg	5.30	1.05	1.048	-0.904	1.513	0.268
BIAvg	5.73	1.15	1.151	-0.890	0.620	0.268

5.3.4 Measurement Model

As mentioned earlier, the analysis of the measurement model was undertaken to assess the reliability and validity of the measurement model. To be effective, measurements must be reliable and valid. In simple terms, reliability means that an instrument will consistently measure something; validity means that it will measure what it is intended to measure (Spector, 1992, p. 6). The sections that follow describe the procedures that were undertaken to assess the reliability and validity of the measurements used in this study.

5.3.5 Measurement Reliability

Measurement reliability refers to the proportion of variance attributable to the true score of the latent variable (DeVellis, 1991, p. 24). The measurement reliabilities of the constructs were evaluated using Cronbach's α, composite reliability, and average variance extracted (AVE). The results are presented in Table 5-14.

Cronbach's α is a measure of the proportion of variance among a group of indicators that is attributable to a common factor (Cronbach, 1951). Cronbach's α provides an index score that ranges from 0 to 1. The α for a good scale should be greater than 0.8, meaning that 80 percent of the variance among the indicators is common. The α for each of the scales used in this study exceeds 0.8.

Composite reliability is similar to Cronbach's α. It is designed to assess the same form of reliability: internal consistency reliability. Like Cronbach's α. Composite reliability provides an index score. The difference is that Cronbach's α assumes that all of the indicators have the same reliability, while composite reliability does not. Consequently, the results for

the two indexes are different and the standards for evaluating them are a little different. For confirmatory research, composite reliabilities should be greater than 0.7. With respect to this study, all values were greater than 0.9, which provides further evidence that the measurement instruments used in this study are reliable.

AVE measures the amount of variance captured by the indicators in relation to the amount of variance due to measurement error (Fornell & Larcker, 1981). AVE should be greater than 0.5 (Chin, 1998b, p. 321). With respect to the data collectd for this study, all AVE scores for the measures used exceeded the 0.5 threshold.

The Cronbach's α, composite reliability, and average variance extracted values exceeded the recommended thresholds. Therefore, the measurements used for this study exhibited adequate internal consistency reliability.

Table 5-11: Cronbach's α, Composite Reliability, AVE and Square-Root of AVE

	OLRS	OLRA	PEOU	PU	BI
α	0.916	0.930	0.878	0.906	0.944
Composite Reliability	0.933	0.943	0.915	0.934	0.973
AVE	0.669	0.705	0.730	0.780	0.947
Sqrt-AVE	0.818	0.840	0.854	0.883	0.973

5.3.6 Measurement Validity

Validity refers to the extent to which the interpretation derived from a measurement procedure or the inferences made on the basis of measurement are correct (Pedhazur & Pedhazur, 1991, p. 31). Construct validity refers to the operationalization of theory. Construct validity is the extent to which the operational measure reflects the phenomenon being studied and the extent to which the measures can be interpreted in terms of the theoretical constructs being used (Calder et al., 1982; Netemeyer et al., 2003, p. 71). In SEM, two forms of validity are usually assessed: convergent validity and discriminant validity. These forms of validity are defined and tested in the sections that follow.

Convergent validity is the degree to which multiple measures of the same construct demonstrate agreement or convergence (Bryant, 2000, p. 113). Convergent validity is attained when multiple measures of an item represent the same underlying construct. Such measures should be strongly and significantly correlated. Convergent validity was assessed by the

method prescribed by Gefen and Straub (2005). When t-values of indicator loadings exceed 1.96, the convergent validity of the constructs is established. The t-values for the indicators used in this study are presented in Table 5-12 below. In each case the t-values exceeded 1.96 by a healthy margin. The relationships of the indicators with their constructs were significant at the 0.0001 level. This demonstrates that each construct possessed convergent validity.

A second test of convergent validity was undertaken using the AVE value presented in Table 5-14 below. In order to exhibit adequate convergent validity, the AVE of a construct must be greater than 0.5. In other words, the construct must account for more than half of the variance of its indicators. For this study, the AVE was greater than 0.7. Consequently, the data was deemed to exhibit adequate convergent validity.

A third test of convergent validity was undertaken using the corrected item-to-total correlation. This correlation is a measure of the extent to which a measurement item is correlated with the remaining items in a set (Netemeyer et al., 2003, p. 144). Items with low item-to-total correlation are candidates for deletion from a scale or measure. In practice, there are a variety of decision rules regarding the cut-off point for items to be retained in a scale. Robinson (1991, p. 13) regards an item-to-total correlation of .30 or better as acceptable but a cut-off value of .50 is often used in practice (Obermiller & Spangenberg, 1998; Tian et al., 2001). The item-to-total correlations for the measures used in this study are presented in Table 5-12. All of the item-to-total correlations exceeded .50.

Table 5-12: Estimated Loadings for the Total Set of Measurement Items

Item	Mean	Std. Dev.	Loading	Error	Item-total correlations	t-value
AILI						
OLRA1	3.08	1.44	0.863	0.078	0.807	11.499
OLRA2	3.09	1.41	0.879	0.076	0.810	14.384
OLRA3	3.14	1.45	0.885	0.079	0.823	15.228
OLRA4	3.13	1.49	0.899	0.081	0.849	14.024
OLRA5	3.29	1.51	0.852	0.082	0.819	13.479
OLRA6	3.48	1.56	0.750	0.086	0.738	6.550
OLRA7	3.42	1.56	0.736	0.086	0.722	6.287
OLRS1	5.55	1.07	0.854	0.059	0.801	20.618
OLRS2	5.47	1.08	0.887	0.059	0.842	20.135
OLRS3	5.57	1.08	0.863	0.058	0.794	20.094
OLRS4	5.53	1.10	0.881	0.060	0.819	19.171
OLRS5	5.32	1.14	0.845	0.062	0.807	19.115
OLRS6	5.15	1.19	0.739	0.066	0.738	11.308
OLRS7	5.00	1.24	0.622	0.069	0.673	6.042
PEOU1	4.37	1.51	0.708	0.082	0.610	7.436
PEOU2	5.16	1.13	0.864	0.061	0.745	20.997
PEOU3	5.12	1.28	0.910	0.070	0.789	23.187
PEOU4	4.94	1.37	0.900	0.075	0.788	24.554
PU1	5.19	1.19	0.846	0.065	0.747	26.010
PU2	5.20	1.21	0.909	0.066	0.829	28.643
PU3	5.33	1.12	0.921	0.061	0.850	34.577
PU4	5.50	1.22	0.854	0.066	0.725	21.391
BI	5.73	1.19	0.975	0.065	0.874	48.046
BI	5.75	1.18	0.971	0.064	0.874	66.063

Discriminant validity is the extent to which measures of different concepts are distinct (Bryant, 2000, p. 114). Discriminant validity was assessed using the method prescribed by Gefen and Straub (2005). They state that two procedures are used to assess discriminant validity. The first procedure is to examine the item loadings to construct correlations. In order to compare the item loadings to construct correlations, a table of loadings and cross loadings was prepared. The loadings of each indicator with its factor (construct) were compared to its cross-loadings with other factors (constructs). They are presented in Table 5-13 below.

All indicators loaded heavily on their own factor except OLRS7. A closer examination revealed that OLRS7 represented the student's self-efficacy with assessing the ethical use of

information. Since the business librarians reported that they did not provide instruction on the ethical use of information, and since this investigation focuses on the influence of information literacy instruction, it is reasonable to remove the OLRS7 indicator from the OLR self-efficacy construct. The remaining items loaded highly on their factors (constructs). Table 5-13 portrays the loadings and cross loadings prior to OLRS7 being removed. The same pattern of loadings and cross loadings was evident after OLRS7 was removed.

Table 5-13: Matrix of Loadings and Cross Loadings

	AILI	OLRA	OLRS	PEOU	PU	BI
AILI	**1.000**	0.025	0.022	-0.026	-0.071	-0.081
OLRA1	0.059	**0.863**	-0.312	-0.342	-0.198	-0.299
OLRA2	0.044	**0.879**	-0.349	-0.387	-0.224	-0.316
OLRA3	0.060	**0.885**	-0.386	-0.406	-0.202	-0.276
OLRA4	0.074	**0.899**	-0.316	-0.396	-0.199	-0.246
OLRA5	-0.001	**0.852**	-0.347	-0.315	-0.181	-0.252
OLRA6	-0.107	**0.749**	-0.243	-0.270	-0.132	-0.180
OLRA7	-0.039	**0.735**	-0.262	-0.243	-0.139	-0.203
OLRS1	-0.005	-0.381	**0.855**	0.564	0.452	0.434
OLRS2	-0.003	-0.333	**0.888**	0.555	0.409	0.359
OLRS3	0.002	-0.350	**0.863**	0.517	0.403	0.436
OLRS4	-0.001	-0.370	**0.881**	0.575	0.407	0.458
OLRS5	0.112	-0.310	**0.845**	0.531	0.377	0.330
OLRS6	-0.009	-0.231	**0.739**	0.457	0.389	0.292
OLRS7	0.0428	-0.142	**0.622***	0.351	0.302	0.234
PEOU1	0.0572	-0.218	0.359	**0.707**	0.227	0.080
PEOU2	-0.050	-0.415	0.616	**0.884**	0.525	0.425
PEOU3	-0.018	-0.382	0.557	**0.910**	0.475	0.378
PEOU4	-0.036	-0.333	0.554	**0.900**	0.498	0.330
PU1	0.020	-0.125	0.398	0.433	**0.846**	0.515
PU2	-0.109	-0.207	0.432	0.540	**0.907**	0.572
PU3	-0.064	-0.209	0.452	0.481	**0.922**	0.630
PU4	-0.049	-0.227	0.412	0.419	**0.855**	0.718
BI	-0.078	-0.291	0.452	0.390	0.700	**0.975**
BI	-0.080	-0.301	0.429	0.364	0.649	**0.971**

Note: * removed item.

The second procedure to assess discriminant validity is the AVE analysis (Gefen & Straub, 2005). The AVE analysis is performed by comparing the square root of the AVE with the correlation between the construct and every other construct. The square root of the AVE

has to be much larger than the correlations with the other constructs (Fornell & Larcker, 1981). Unfortunately, there are no definitive guidelines to indicate how much larger the square root of the AVE has to be. A table of correlations between constructs is presented at the top of Table 5-14. The square root of the AVE is presented on the diagonal where the column and row for each construct intersects with itself.

The Cronbach's alpha, composite reliability and AVE versus construct correlation figures are presented in Table 5-14. In each case, the square root of the average variance extracted is much larger than the correlations of the construct with the all of the other constructs. Therefore, the data passed the second test of discriminant validity.

Table 5-14: Cronbach's α, Composite Reliability, AVE and Square-Root of AVE

	OLRS	OLRA	PEOU	PU	BI
OLRS	0.818*				
OLRA	-0.388	0.840*			
PEOU	0.630	-0.415	0.854*		
PU	0.417	-0.254	0.537	0.883*	
BI	0.401	-0.302	0.422	0.727	0.973*
α	0.916	0.930	0.878	0.906	0.944
Composite Reliability	0.933	0.943	0.915	0.934	0.973
AVE	0.669	0.705	0.730	0.780	0.947

* Note that the diagonal elements are the square roots of AVE. The off-diagonal elements represent correlations between constructs.

5.3.7 Structural Model

The previous section assessed the validity and reliability of the measurement instruments used. This section tests the validity of the structural model and the hypotheses that the structural model was designed to evaluate. The structural model is presented in Figure 5-2.

The assessment of the structural model consists of an examination of the R^2 of the endogenous latent variables, estimates of the path coefficients, the effect size f^2, and an assessment of the predictive relevance Q^2 and q^2 (Henseler et al., 2009).

SmartPLS version 2.0.M3 was used to assess the structural model. The structural equations in PLS are calculated using OLS multiple regression. Consequently, they are

interpreted in the same manner as the standardized beta coefficients of ordinary least squares. The beta coefficients for each path are presented in Figure 5-2 and in Table 5-15 below.

The significance of the path coefficients was assessed using the bootstrapping technique. Bootstrapping is a computer-based method for assessing the accuracy of statistical estimates (Efron & Tribshirani, 1998, p. 10). Bootstrapping repetitively re-samples with replacement in order to create an estimate of the distribution of a statistic (Mooney & Duval, 1993, p. 1). PLS uses bootstrapping to create a bootstrapping distribution for each path coefficient. The mean and a standard error can be calculated from the bootstrapping distribution. The mean and standard error allow a *t*-value to be calculated (Henseler et al., 2009, p. 306) which can be used to estimate the significance of the path coefficients (Chin, 1998b, p. 320).

To run the bootstrapping procedure in PLS two figures are needed. First, the number of cases must be entered. This figure is set to equal the sample size. Next, the number of resamples must be selected. This number should be greater than 100, but greater than 200 is preferable. Since larger numbers of re-samples lead to more reasonable estimates of standard error (Tenenhaus et al., 2005), the bootstrapping procedure was undertaken with 700 samples. The *t*-statistics and *p*-values are presented in Table 5-15 below. Five of the hypotheses were supported and five were not supported.

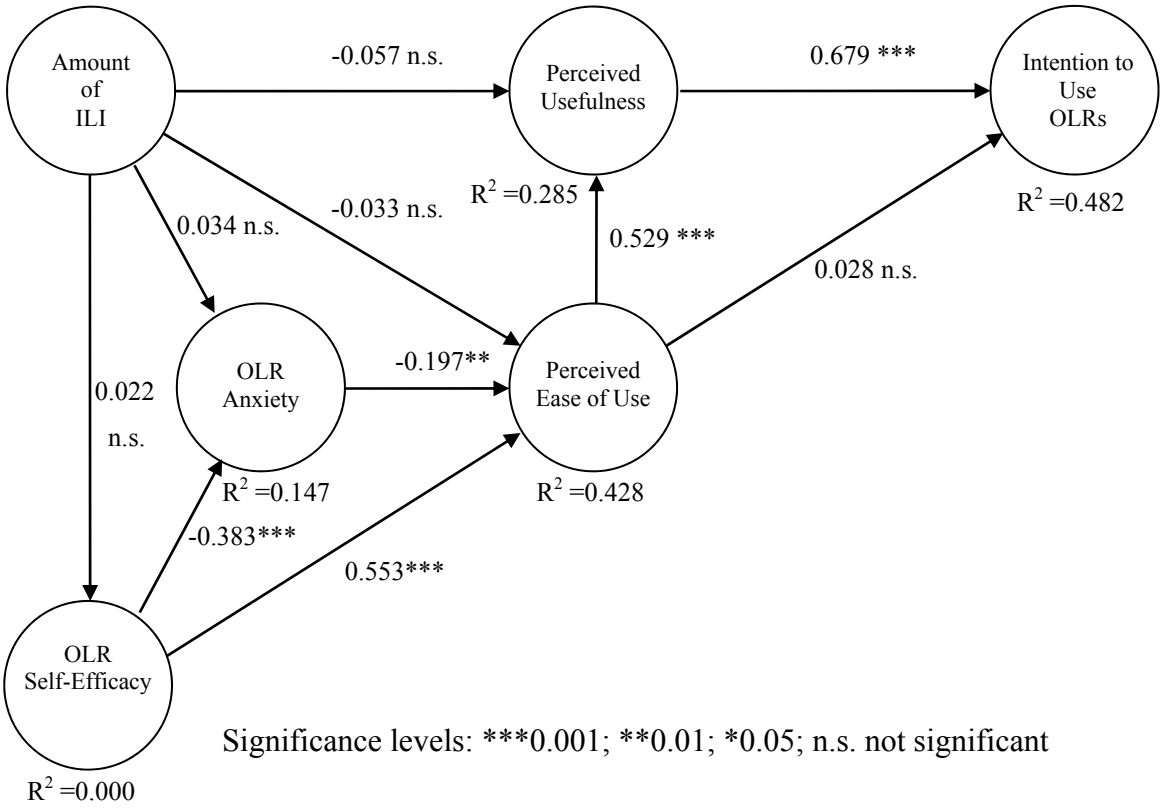

Figure 5-2: Structural Model Results

Table 5-15: Summary of Findings of Support for Hypotheses (Amount of ILI Overall)

Hypothesis	Path	Beta	Standard Error	t-statistic	p-value	Validation
H1	AILI → PU	-0.057	0.056	1.262	0.207	not supported
H2	AILI → PEOU	-0.033	0.057	0.456	0.180	not supported
H3	AILI → OLRA	0.034	0.060	0.424	0.671	not supported
H4	AILI → ORLS	0.022	0.057	0.390	0.696	not supported
H5	OLRA → PEOU	-0.197	0.067	2.938	0.003	supported
H6	OLRS → OLRA	-0.383	0.066	5.782	<0.0001	supported
H7	OLRS → PEOU	0.553	0.044	14.304	<0.0001	supported
H8	PEOU → PU	0.529	0.049	10.699	<0.0001	supported
H9	PEOU → BI	0.028	0.058	0.501	0.616	not supported
H10	PU → BI	0.679	0.050	13.424	<0.0001	supported

The PLS model was run two more times in order to assess the efficacy of active instruction and passive instruction. The results of the model are presented in Figure 5-3 and Figure 5-4. The *t*-statistics and *p*-values are presented in Table 5-15 and Table 5-17.

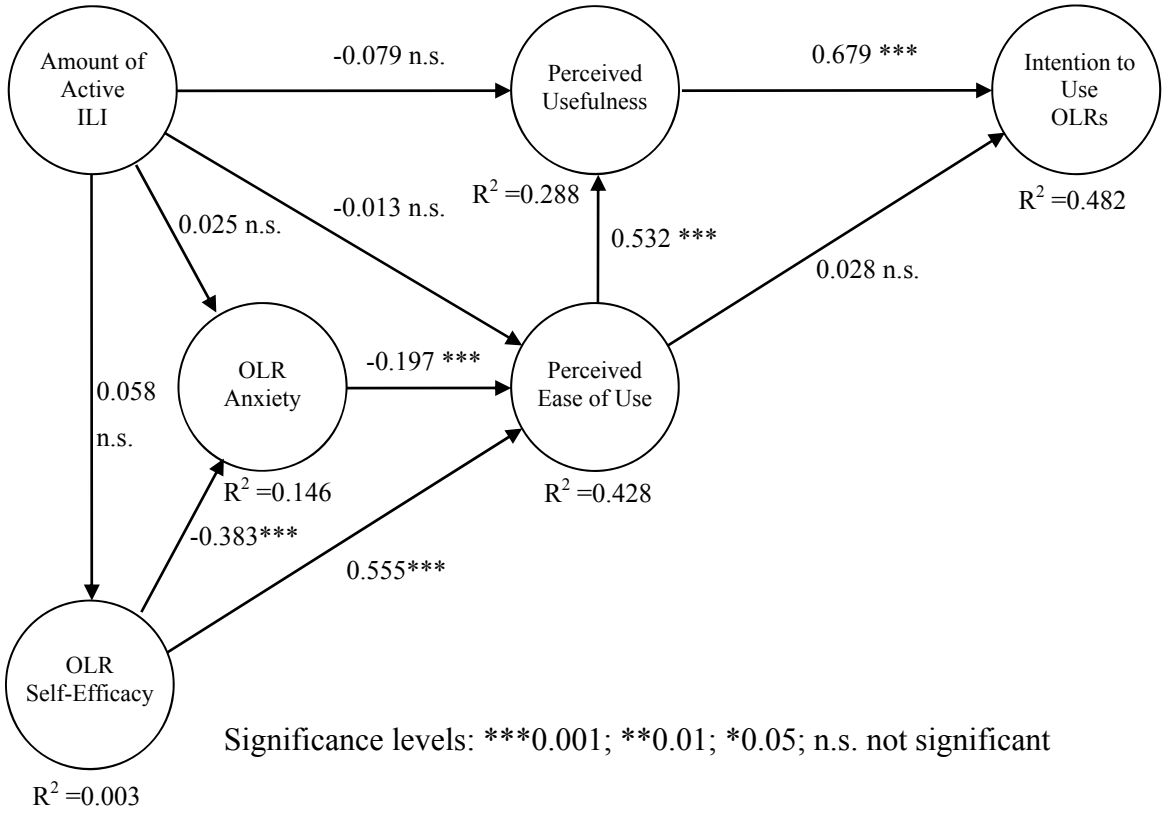

Figure 5-3: Structural Model Results for the Influence of Active ILI

Table 5-16: Summary of Findings of Support for Hypotheses (Amount of Active ILI)

Hypothesis	Path	Beta	Standard Error	t-statistic	p-value	Validation
H1a	AILI → PU	-0.079	0.046	1.232	0.218	not supported
H2a	AILI → PEOU	-0.013	0.040	0.823	0.411	not supported
H3a	AILI → OLRA	0.025	0.052	0.647	0.518	not supported
H4a	AILI → ORLS	0.058	0.054	0.407	0.684	not supported

None of the hypothesized relationships between amount of active ILI and the dependent variables were supported.

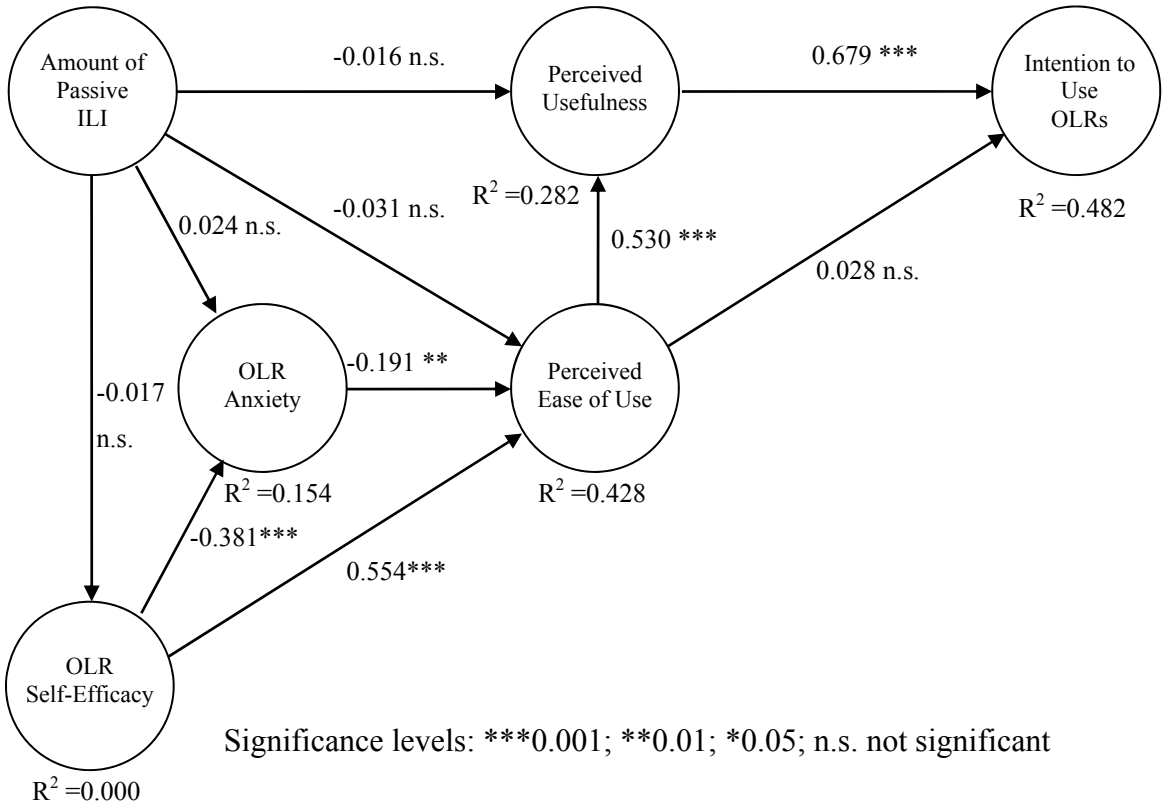

Figure 5-4: Structural Model Results for the Influence of Passive ILI

Table 5-17: Summary of Findings of Support for Hypotheses (Amount of Passive ILI)

Hypothesis	Path	Beta	Standard Error	*t*-statistic	*p*-value	Validation
H1b	AILI → PU	-0.016	0.048	0.325	0.745	not supported
H2b	AILI → PEOU	-0.031	0.040	0.726	0.468	not supported
H3b	AILI → OLRA	0.024	0.049	0.478	0.632	not supported
H4b	AILI → ORLS	-0.017	0.057	0.295	0.768	not supported

None of the hypothesized relationships between amount of passive ILI and the dependent variables were supported.

5.3.8 Effect sizes

The predictive power and quality of a structural model can be evaluated further by assessing the impact of individual constructs. The contribution of the independent variables on the *R*-squared of the dependent variables is assessed by calculating the effect size (f^2). Chin (1998b) provides the following formula for calculating effect size:

$$f^2 = (R^2\text{included} - R^2\text{excluded}) / (1 - R^2\text{included})$$

In the formula above, R^2 included is the R^2 of the dependent variable when the independent variable is included in the model, and R^2 excluded is the R^2 of the dependent variable when the independent variable is not included in the model. The resulting f^2 value is assessed using Cohen's (1988, pp. 477-478) guidelines for effect sizes – 0.02 (small), 0.15 (medium), 0.35 (large).

The impacts of the independent variables on the dependent variables is presented in Table 5-18 through Table 5-20. Table 5-18 reveals that information literacy instruction had no impact on OLR anxiety. The same table reveals that OLR self-efficacy had a medium-sized effect on OLR anxiety. Moving to perceived usefulness in Table 5-19, it can be seen that information literacy instruction had no influence on the perceived usefulness of OLRs while perceived ease of use had a large impact. Table 5-20 shows that OLR self-efficacy had a large impact on the perceived ease of use of OLRs and OLR anxiety had a small impact but amount of ILI had no impact. Perceived usefulness had a large effect on intention to use OLRs but perceived ease of use had none.

Table 5-18: Effect Sizes of Antecedents to OLR Anxiety

R^2 (included) = 0.147	AILI	OLRS
R^2 (excluded)	0.146	0.001
f^2	0.001	0.171
Effect	none	medium

Table 5-19: Effect Sizes of Antecedents to Perceived Usefulness

R^2 (included) = 0.285	AILI	PEOU
R^2 (excluded)	0.281	0.005
f^2	0.005	0.391
Effect	None	Large

Table 5-20: Effect Sizes of Antecedents to Perceived Ease of Use

R^2 (included) = 0.428	AILI	OLRS	OLRA
R^2 (excluded)	0.427	0.170	0.395
f^2	0.001	0.451	0.057
Effect	none	large	small

5.3.9 Saturated Model

In order to investigate the possible existence of relationships that were not included in the original model, a saturated model was made and tested. The saturated model contained 15 paths. Ten of those paths were in the original model, five of the paths were new. The betas, *t*-values, and *p*-values for the original relationships are presented in Table 5-21 below. The figures for the new paths are presented in Table 5-22 below.

Of the five new paths that were tested, three were significant. OLR self-efficacy was found to have a strong significant path coefficient with perceived usefulness and also with behavioral intention. These results are consistent with previous research. For example, Ong et al.(2004) found that computer self-efficacy had a significant positive effect on perceived usefulness. In another example, Hu et al.(2003) found a strong and significant relationship

between computer self-efficacy and behavioral intention. The remaining new paths were found to be non-significant.

Most of the existing relationships remained consistent in the two models. Only two path betas notably changed. The beta for the relationship between perceived ease of use and perceived usefulness was weaker in the saturated model, but the relationship remained significant. The beta for the relationship between perceive ease of use and behavioral intention was changed from positive to negative, but remained near zero and remained non significant. All of the conclusions regarding the hypotheses remained the same between the two models.

The model has satisfactory explanatory power. The R^2 for the behavioral intention construct was 0.482. That means that the model explains 48% of the variance in students' intention to use OLRs.

Table 5-21: Summary of Findings for Saturated Model for Original Hypothesized Relationships

Hypothesis		Non-Saturated Model				Saturated Model				
Hyp.	**Path**	**Beta**	**t-value**	**p-value**	**Val.**	**Beta**	**t-value**	**p-value**	**Val.**	**Δβ**
H1	AILI → PU	-0.057	1.262	0.207	rej.	-0.067	1.286	0.199	rej.	-0.010
H2	AILI → PEOU	-0.033	0.456	0.180	rej.	-0.033	0.472	0.637	rej.	0.000
H3	AILI → OLRA	0.034	0.424	0.671	rej.	0.034	0.455	0.649	rej.	-0.000
H4	AILI → ORLS	0.022	0.390	0.696	rej.	0.021	0.390	0.697	rej.	-0.001
H5	OLRA → PEOU	-0.197	2.938	0.003	supp.	-0.197	3.137	0.002	supp.	0.001
H6	OLRS → OLRA	-0.383	5.782	<0.0001	supp.	-0.382	5.987	<0.0001	supp.	0.001
H7	OLRS → PEOU	0.553	14.304	<0.0001	supp.	0.553	14.773	<0.0001	supp.	0.000
H8	PEOU → PU	0.529	10.699	<0.0001	supp.	5.589	5.589	<0.0001	supp.	0.060
H9	PEOU → BI	0.028	6.640	<0.0001	supp.	-0.114	1.894	0.059	rej.	-0.086
H10	PU → BI	0.679	13.424	<0.0001	supp.	0.642	11.131	<0.0001	supp.	0.037

Table 5-22: Summary of Findings for Saturated Model for New Relationships

Link	Beta	T-value	P-value	Validation
AILI - BI	0.912	1.375	0.170	not supported
OLRA - PU	0.656	0.626	0.531	not supported
OLRA - BI	3.530	2.628	0.004	supported
OLRS - PU	3.310	8.315	<0.0001	supported
OLRS - BI	3.367	7.793	<0.0001	supported

5.3.10 Demographic Variables

Recall from chapter three that several demographic and contextual variables were discussed. In order to test the influence of these variables on the model, four control models were created. Each model used the original model as its basis. The control variable was entered into the model and paths were created leading from the control variable to the original variables. For each control model, the variance explained for each variable was compared to the variance explained in the original model. The R^2 for each model are presented in Table 5-23 below.

Table 5-23: Impact of Control Variables on R^2

	Amount of ILI	OLR Anxiety	OLR Self-Efficacy	Perceived Ease of Use	Perceived Usefulness	Intention to Use OLRs
Uncontrolled Model	0.000	0.154	0.000	0.428	0.285	0.482
Gender	0.061	0.158	0.003	0.431	0.291	0.487
Academic Performance	0.017	0.155	0.002	0.429	0.291	0.484
Year of Study	0.201	0.165	0.003	0.431	0.285	0.482
Concentration of Studies	0.003	0.159	0.001	0.437	0.287	0.487

A visual inspection of the R^2 for each of the models reveals that there was very little difference between the models. The R^2 for behavioural intentions changed very little which indicates that the explanatory value of each model was similar. This reveals that the control variables had little influence on the variance explained. The most notable exception was the impact of year of study on amount of ILI received.

The path coefficients for the paths between the control variables and the model constructs were also examined. The results are presented in Table 5-24.

Table 5-24: Impact of Control Variables on Model Constructs

		AILI	OLRA	OLRS	PEOU	PU	BI
Gender	Beta	0.061	0.060	-0.055	-0.048	0.083	0.070
	t-value	1.106	1.187	1.058	1.093	1.799	1.754
	p-value	0.269	0.236	0.290	0.275	0.072	0.080
	Validation	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Academic Performance	Beta	0.129	0.034	-0.037	0.016	-0.080	0.044
	t-value	2.393	0.637	0.689	0.443	1.537	1.478
	p-value	0.017	0.524	0.491	0.658	0.125	0.140
	Validation	sign.	n.s.	n.s.	n.s.	n.s.	n.s.
Year of Study	Beta	0.448	-0.116	0.056	-0.055	0.017	-0.023
	t-value	10.755	2.101	0.917	1.257	0.311	0.544
	p-value	0.000	0.036	0.359	0.209	0.755	0.586
	Validation	sign.	sign.	n.s.	n.s.	n.s.	n.s.
Concentration of Studies	Beta	-0.057	0.067	-0.025	-0.093	0.049	0.071
	t-value	1.052	1.257	0.461	2.178	1.109	1.759
	p-value	0.293	0.209	0.645	0.030	0.268	0.079
	Validation	n.s.	n.s.	n.s.	sign.	n.s.	n.s.

Only four of the path coefficients were significant. First, academic performance had a significant relationship with amount of ILI received. This suggests that the amount of ILI received had a significant impact on academic performance. However, the difference in R^2 for amount of ILI is slight. This suggests that the influence of amount of ILI on academic performance is statistically significant but weak. Second, year of study had a strong and significant relationship with the amount of information literacy instruction received. That finding makes intuitive sense. ILI is provided throughout the curriculum of the business school where the sample was drawn. So, it is natural for amount of ILI to be correlated with year of study. Third, year of study is negatively related to OLR anxiety. This suggests that students' anxiety decreased as they progressed through their academic careers. Finally, concentration of studies was significantly correlated with perceived ease of use. The change

in R^2 for the perceived ease of use variable was not dramatic when concentration of studies was added to the model. This suggests that the relationship was weak but significant.

5.4 Mediation Results

Recall that three mediation effects were hypothesized (H11 – H13). Mediation occurs when the cause-effect relationship between a predictor variable and a criterion variable occurs through an intervening variable. When the intervening variable accounts for all of the influence of the predictor variable on the criterion variable the relationship is said to be fully mediated. When the direct path of influence from the predictor variable to the criterion variable is reduced but not brought to zero when the intervening variable is introduced into the model the relationship is said to be partially mediated. Mediation relationships are of interest because they go beyond simply describing correlations to explain how processes work (Preacher & Hayes, 2008). The hypothesized mediation effects were tested using Baron and Kenny's classic method, the Sobel test and PLS.

Baron and Kenny's (Baron & Kenny, 1986) method of assessing mediation effects consists of four steps and three regression equations (see Figure 5-5). The first step is to establish that the predictor variable is significantly correlated with the criterion variable (path c). This step ensures that the relationship between the independent variable and the dependent variable is significant. Then, the relationship between the predictor and the mediating variable must be established (path a). Next, it must be shown that the mediator is significantly correlated with the criterion variable (path b). Finally, the relationship between the independent variable and the dependent variable should be significantly decreased after controlling for the mediating variable.

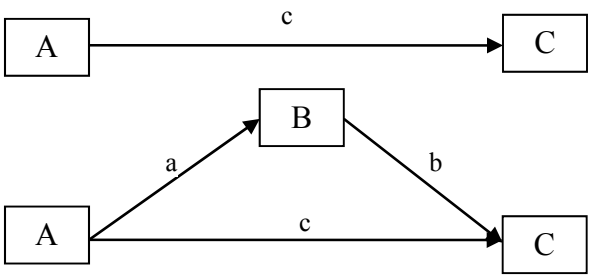

Figure 5-5: Baron and Kenny's (1986) Method for Assessing Statistical Mediation

The three hypothesized mediation effects were assessed using Barron and Kenny's four-step method. The results are presented in Table 5-25. First, it was hypothesized that OLR anxiety would mediate the relationship between amount of ILI and the perceived ease of use of OLRs. The values for step 1 and 2 reveal that the predictor variable was not significantly related to the criterion variable or the mediator variable. Consequently, the first hypothesized mediation effect was not supported. Second, it was hypothesized that OLR self-efficacy would mediate the relationship between amount of ILI and perceived ease of use. The results for the second hypothesized mediation effect were the same as for the first. Neither the criterion variable nor the mediator variable were significantly related to the predictor variable. Third, it was hypothesized that OLR anxiety would mediate the relationship between OLR self-efficacy and perceived ease of use of OLRs. The first step showed that the independent variable was significantly related to the dependent variable. The second step showed that the independent variable was significantly related to the mediator variable. Third, the mediator variable was significantly related to the dependent variable after controlling for the independent variable. Finally, the relationship between OLR self-efficacy and perceived ease of use of OLRs dropped from 0.687 to 0.602 after the mediator variable was included. This indicates that the relationship between OLR self-efficacy and perceived ease of use is partially mediated by OLR anxiety.

Table 5-25: Assessment of Mediation using Baron and Kenny's Four Step Method

	Hypothesis 11		Hypothesis 12		Hypothesis 13	
	AILI→OLRA→PEOU		AILI→OLRS→PEOU		OLRS→OLRA→PEOU	
	beta	Sig.	beta	Sig.	beta	Sig.
Step 1	-0.002	0.410	-0.002	0.410	0.687	0.000
Step 2					-0.518	0.000
Step 3					-0.163	0.000
Step 4					0.602	0.000

One of the weaknesses of Baron and Kenny's method is that it does not assess the significance of the indirect path. Also, Baron and Kenny's method is very conservative. It sometimes incorrectly reports that a mediation effect does not exist when it does. Consequently, Baron and Kenny's method is often supplemented with the Sobel Test (Sobel, 1982). Sobel used the multivariate delta method to derive the asymptotic variance of the indirect or mediated effect (MacKinnon et al., 1995). The Sobel test is a product of coefficients test. It is undertaken by conducting two regression analyses. First, a regression is undertaken with the independent variable predicting the dependent variable. Second, a regression is undertaken with the independent variable and mediating variable predicting the dependent variable. The Sobel test assesses the significance of the mediation by taking the intervening variable effect (the Beta of the first regression multiplied by the Beta of the second regression) and dividing it by the standard error (MacKinnon et al., 2002). The result of the calculation is compared to the standard normal distribution. The two-tailed test is undertaken to test the hypothesis that the mediated effect equals zero (Preacher, 2010). The results of the Sobel test are presented in Table 5-26. The Sobel test is calculated using the equation presented in Equation 1 below (Preacher, 2010).

Equation 1: Sobel Test Equation

$$z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$$

Table 5-26: Results of the Sobel Test [4]

	Path	*a*	*b*	s_a	s_b	Test Statistic	Std. Error	*p*-value
H11	AILI→OLRA→PEOU	0.003	-0.333	.003	.043	-0.991	0.001	0.321
H12	AILI→OLRS→PEOU	0.000	0.687	.002	.051	0.000	0.001	1.000
H13	OLRS→OLRA→PEOU	-0.518	-0.163	.066	.040	3.616	0.023	0.000

The results of the Sobel test are similar to those results of Baron and Kenny's method. The hypothesized mediation effects between amount of ILI and perceived ease of use were not supported. The hypothesized mediation effect of OLR anxiety on the relationship between OLR self-efficacy on perceived ease of use was supported.

Finally, PLS was used to assess the mediation effects. In order to perform the mediation analysis a simple model was created that depicted a relationship between the independent variable and the dependent variable (see Table 5-27). Then, a second model was created that included the mediator variable (see Table 5-28). The two models were tested by using PLS. The path betas and R^2 were recorded. The *t*-values were used to assess the significance of the relationships.

Table 5-27: PLS Mediation - Simple Model

		Independent → Dependent		
	Path	Beta	*t*-value	R^2
H11	AILI→OLRA→PEOU	-0.100	0.808	0.010
H12	AILI→OLRS→PEOU	-0.100	0.808	0.010
H13	OLRS→OLRA→PEOU	0.623	14.753	0.388

[4] The Sobel test was undertaken using the online calculator provided by Kristopher J. Preacher at http://people.ku.edu/~preacher/sobel/sobel.htm

Table 5-28: PLS Mediated – Mediated Model

		Independent → Dependent		Independent → Mediator		Mediator → Dependent		R^2
	Path	Beta	*t*-value	Beta	*t*-value	Beta	*t*-value	
H11	AILI→OLRA→PEOU	-0.013	0.241	0.027	0.443	-0.409	7.276	0.167
H12	AILI→OLRS→PEOU	-0.037	0.933	0.023	0.418	0.624	14.058	0.389
H13	OLRS→OLRA→PEOU	0.549	10.255	-0.382	5.975	-0.196	3.201	0.422

The results demonstrate that the R^2 of the mediated model was higher than the simple model. The mediated model explains more of the variance of perceived ease of use of OLRs than the simple model. Also, the path beta for the OLR self-efficacy → perceived ease of use of OLRs path was small after the mediator variable was introduced. This indicates that 0.074 (i.e., 0.623 – 0.549) of the relationship beta for the relationship between self-efficacy and perceived ease of use was accounted for by OLR anxiety.

The results of the mediation analysis are summarized in Table 5-29. Hypotheses 11 and 12 were not supported. Hypothesis 13 was supported.

Table 5-29: Summary of Findings for Mediation Effects

Hyp.	**Path**	**Beta**
H11	AILI→OLRA→PEOU	Rejected
H12	AILI→OLRS→PEOU	Rejected
H13	OLRS→OLRA→PEOU	supported

5.5 Open-Ended Question Results

The coding method used here is based on the procedures recommended by Strauss and Corbin (1990). Coding begins with descriptions. We label objects or items according to their qualities or characteristics. The next step of coding is conceptual ordering. It begins with categorizing data into mutually exclusive and collectively exhaustive categories across multiple dimensions according to their attributes. This is a sense making process. The researcher makes sense of the data by organizing it according to a classification scheme. The data are compared to one another and sorted or ranked according to their attributes. Insights and theories emerge when categories are related to one another according to a theoretical

framework. Coding then consists of identifying the attributes of data, assigning labels to the attributes, categorizing the data according to their attributes, and relating data to one another according to their attributes.

After data has been coded it can be summarized and analyzed. Common methods of data analysis for content analysis include frequency counts, associations, correlations, cross-tabulations, clustering and contextual classification (Krippendorff, 1980).

Recall that research question two asked "How well does ILI influence OLR self-efficacy and OLR anxiety? How well do active ILI and passive ILI influence OLR self-efficacy and OLR anxiety?" The open-ended questions were designed to explore research question two in greater depth. The questions are intended to elucidate the respondents' level of anxiety, level of self-efficacy, and the effect of ILI on anxiety and self-efficacy. Content analysis is used here to analyze the responses to the four open-ended questions.

The first question posed to the respondent was the following: "Comment on your response to the above question so that the researchers can better understand the context surrounding your level of anxiety using online library resources. For example, if you experience anxiety using online library resources, what is it that causes you to be anxious? If you are not anxious using online library resources, why is this so?" Most of the respondent's began their response by revealing their current level of anxiety. The responses were coded into four categories: "no anxiety," "some anxiety," "anxiety," and "strong anxiety."

The second open-ended question asked "How did the library instruction you received from the librarians affect your level of anxiety using online library resources? For example, did the library instruction increase your anxiety? decrease it? have no effect? Explain." The responses were categorized into six categories "no effect", "reduced anxiety somewhat", "much reduced anxiety", "increased anxiety", and "no response."

The questions relating to OLR anxiety were analyzed using frequency counts and cross-tabulations. A cross-tabulation of current level of OLR anxiety with effects of ILI on OLR anxiety is presented Table 5-30.

Table 5-30: Cross-Tabulation - Effects of ILI on OLR Anxiety

	Effect of ILI on Anxiety (Count / Percentage)							
Level of OLRAnxiety	**No effect**	**Reduced anxiety somewhat**	**Reduced anxiety**	**Much reduced anxiety**	**Increased Anxiety**	**No response**	**Total (count)**	**Total (%)**
No anxiety	35 34.3%	4 3.9%	59 57.8%	3 2.9%	1 0.9%	26	128	59%
Some anxiety	9 19.6%	5 10.9%	32 69.6%	0 0.0%	0 0.0%	21	67	31%
Anxiety	5 26.3%	2 10.5%	10 52.6%	1 5.3%	1 5.3%	2	21	9.5%
Strong anxiety	0 0.0%	0 0.0%	1 100%	0 0.0%	0 0.0%	0	1	0.5%
Total	49 29.2%	11 6.5%	102 60.7%	4 2.4%	2 1.2%	49	217	100%

The analysis of the open-ended questions reveals that anxiety is commonly experienced by business students. Although only 41 percent of respondents commented that they currently experience anxiety, a majority of the remaining 59 percent reported that their anxiety had been reduced as a result of ILI. This indicates that they had previously experienced anxiety. When the respondents who previously experienced OLR anxiety were added to the respondents who currently experience OLR anxiety, the proportion of respondents who experienced OLR anxiety rises to (155 / 217) 71.4 percent. In other words, a large majority of business students experience OLR anxiety during their career at business school.

The analysis of the open-ended questions strongly indicates that ILI effectively diminishes OLR anxiety. Only 29.2% of the comments indicated that ILI had no effect on anxiety. The majority of respondents (69.6 percent) indicated that ILI reduced their level of OLR anxiety (60.7 percent), much reduced their level of OLRA (2.4 percent), or somewhat reduced their level of OLR anxiety (6.5 percent). Some representative excerpts are provided below. The survey responses contain an abudance of excerpts similar to the ones below.

> *"Before receiving instruction from the librarians I was not aware of the amount of resources available for use at the library when completing essential assignments. After receiving instructions by the librarians I became more capable at accessing these resources which decreased my anxiety over the assignments that needed to be completed for my courses."*

"The instruction decreased my anxiety because they gave me the knowledge to be successful."

"I am not anxious because I feel well informed about how to use the technology given to me and how to properly assess by findings."

"It definitely decreased my anxiety. I feel a lot more comfortable using the online sources."

The respondents were invited to comment on their anxiety or to identify the source of their anxiety. Some respondents commented in general terms about being overwhelmed by the level of complexity of OLRs. Other respondents stated that they were generally comfortable using OLRs, but felt anxiety with conducting specific tasks or activities. Most respondents were able to identify a specific task that made them anxious. Some students were able to identify several tasks that made them anxious. The tasks that they identified are presented in Table 5-31**.** Many of the sources of anxiety identified can be categorized as information literacy skills. It is interesting that the respondents were able to be comfortable or confident with some information literacy skills, while experiencing anxiety with others. This suggests that the anxiety students feel while performing each of the ILI tasks are distinct phenomena.

Table 5-31: Selected Sources of Anxiety

Task or Activity	Count
Searching	19
Citing sources	14
Evaluating sources	7
Academic dishonesty or plagiarism	6
Selecting databases	5
Too much information / too complex	5
Selecting keywords	2

Next, the questions related to OLR self-efficacy were analyzed. These questions were similar to the questions related to OLR anxiety. The first question asked "Comment on your response to the above question so that the researchers can better understand the context surrounding your level of comfort and confidence using online library resources. For

example, if you are (un)comfortable and (un)confident using online library resources, explain why this is so?" Most respondents answered by revealing their current level of comfort or confidence. Their responses were labeled and classified into the following categories: "not confident", "somewhat confident", "not fully confident", "confident", or "very confident."

The second question asked "How did the library instruction you received from the librarians affect your level of comfort and confidence using online library resources? For example, did the library instruction increase your comfort and confidence levels? decrease them? have no effect? Explain." Their responses were coded and classified into the categories "no effect", "someone increased OLR self-efficacy", "Increased OLR self-efficacy", or "greatly increased OLR self-efficacy."

The responses to the questions related to OLR self-efficacy were analyzed using frequency counts and cross-tabulations. The results are presented in Table 5-32.

Table 5-32: Effects of ILI on OLR Self-Efficacy

	Effect of ILI on Self-Efficacy						
Level of OLRS	**No Effect**	**Somewhat Increased OLR Self-Efficacy**	**Increased OLR Self-Efficacy**	**Greatly Increased OLR Self-Efficacy**	**No Response**	**Total (Count)**	**Total (%)**
Not confident or not comfortable	4	0	6	0	11	21	11.0%
Somewhat confident or somewhat comfortable	0	1	0	0	1	2	1.0%
Not fully confident or not fully comfortable	1	0	14	0	9	24	12.6%
Confident or Comfortable	14	3	77	1	36	131	68.6%
Very confident or very comfortable	2	0	7	0	4	13	6.8%
Total Percentage of Total	21 (16.2%)	4 (3.0%)	104 (80.0%)	1 (0.8%)	61	191	

Most respondents (75.4%) commented that they felt confident/comfortable or very confident/comfortable using OLRs. Their responses to the second open-ended question indicate that they did not always feel confident. The majority of those who commented (80%) felt that ILI either increased or greatly increased their level of OLR self-efficacy.

The written comments call into question the results of the quantitative model. The quantitative model found no statistical correlation between amount of ILI, OLR self-efficacy and OLR anxiety. Yet, the written comments strongly support the influence of ILI on OLR self-efficacy and on OLR anxiety. It is possible that the cross-sectional nature of the design used in this study does not adequately capture the phenomenon under study.

5.6 Post Hoc Analysis Results

The revelation that none of the hypothesized correlations between amount of ILI received and other constructs in the model were supported was surprising and counterintuitive. Further analysis was undertaken to understand the nature of the relationship between ILI, anxiety, OLR self-efficacy and OLR adoption. To advance that effort, the data set was sub-divided in three different ways. First, the data set was divided into quartiles based on the total amount of ILI received. Second, the data set was divided into quartiles based on the amount of active ILI received. Third, the data set was divided into quartiles based on the amount of passive ILI. Then the research model was retested using the data from the first and fourth quartiles. The details of the quartiles are presented in Table 5-32, and the results of the analysis are presented in Table 5-34 below. Statistically significant relationships are shaded in grey.

Note that 93 students did not receive any active ILI. Note also that it was difficult to break active ILI into equal segments. Many students took the same active ILI classes. As a result, too many students received the same amount of active ILI. It was not practical to divide students who received the same amount of instruction into separate categories.

Table 5-33: Details of the Quartile Datasets

Quartile	Minutes of ILI	Number of Records	Minutes of Passive ILI	Number of Records	Minutes of Active ILI	Number of Records
First	0 – 41.5	84	0 – 29.2	85	0 - 10	70
Second	42 – 59.9	85	29.3 – 44.2	84	11 - 18	50
Third	60 – 74.4	84	44.3 – 59.7	83	18.1 - 24	77
Fourth	74.5 – 112.6	84	59.8 - 82	85	25 - 49	47

Table 5-34: Path Betas and t-values for Selected Data Subsets using the Hypothesized Model

	Total		Q1		Q4	
	Beta	t-value	Beta	t-value	Beta	t-value
AILI-PU						
Total AILI	-0.062	1.397	0.004	0.067	0.046	1.046
Active AILI	-0.076	1.360	0.043	0.905	0.050	1.007
Passive AILI	-0.025	0.498	-0.110	1.997	0.103	2.251
AILI-PEOU						
Total AILI	-0.041	0.949	-0.037	1.196	-0.045	1.154
Active AILI	0.023	0.541	-0.067	1.792	-0.181	4.278
Passive AILI	-0.035	0.792	-0.044	0.989	-0.129	3.386
AILI-OLRA						
Total AILI	0.050	0.964	-0.061	1.257	0.156	2.729
Active AILI	0.004	0.077	0.047	1.024	0.198	4.223
Passive AILI	0.059	1.089	-0.205	4.125	0.123	2.477
AILI-OLRS						
Total AILI	-0.010	0.177	-0.156	2.941	0.131	2.867
Active AILI	0.042	0.793	0.065	1.014	-0.036	0.691
Passive AILI	-0.042	0.710	-0.105	2.051	0.014	0.316
OLRS-OLRA						
Total AILI	-0.379	5.414	-0.641	16.077	-0.104	1.379
Active AILI	-0.380	5.267	-0.549	9.939	-0.357	8.311
Passive AILI	-0.378	5.303	-0.594	18.479	-0.206	3.087
OLRA-PEOU						
Total AILI	-0.197	5.782	-0.189	3.074	-0.241	3.815
Active AILI	-0.197	3.043	-0.084	0.157	0.067	1.177
Passive AILI	-0.191	3.029	-0.009	0.492	-0.213	3.189
OLRS-PEOU						
Total AILI	0.553	14.304	0.653	12.167	0.589	11.190
Active AILI	0.555	10.150	0.614	11.204	0.594	16.052
Passive AILI	0.554	9.756	0.670	17.252	0.540	9.957

The first thing that becomes apparent is that passive ILI impairs the perceived usefulness of OLRs among students who have received the least amount of passive ILI yet, it increases the perceived usefulness of OLRs for students who have received the most ILI. Another trend that becomes apparent is that the perceived ease of use of OLRs was reduced for students who received the most active ILI and the most passive ILI. Perplexingly, when

active ILI and passive ILI are combined (i.e., when total ILI is examined), the influence of ILI on the ease of use of OLRs is not statistically significant. Another interesting trend emerges when the influence of ILI on OLR anxiety is examined. Passive ILI reduced anxiety among students who received the least instruction. Yet, ILI increased the anxiety of students who received the most instruction. This finding is contrary to expectations. Another interesting finding is that passive instruction reduced OLR self-efficacy among students who received the least amount of passive ILI. It was expected that ILI would increase OLR self-efficacy. It is possible that passive instruction undermines the students' sense of mastery of the use of OLRs early on. In fact, when total amount of ILI received is examined ILI reduced OLR self-efficacy for students with the least amount of instruction but it increased self-efficacy for students with the most instruction. It may be that it takes time for ILI to increase self-efficacy. It is also odd that passive ILI reduced OLR anxiety and reduced OLR self-efficacy for students with the least instruction. Typically, anything that bolsters self-efficacy reduces anxiety and vice versa. It is odd that passive ILI reduces anxiety and self-efficacy concurrently.

5.7 Summary

The goal of this chapter was to outline the findings of this dissertation. Results were attained through quantitative and qualitative analysis. In this chapter, the administration of the survey instrument was described, the demographics of the sample were described, the theoretical model was analyzed, open-ended questions were analyzed and a post-hoc analysis was undertaken. This chapter presented a set of findings of the influence of the amount of ILI on the use and adoption of OLRs. These findings are discussed in the next chapter.

CHAPTER 6: DISCUSSION AND CONCLUSION

6.1 Introduction

Recall that the overall purpose of this dissertation was to predict and explain how ILI influences the adoption of OLRs by business students. Chapter 2 reviewed the literature on topics related to ILI, technology adoption, self-efficacy and anxiety. Chapter 3 refined the overarching research question into a series of research questions and hypotheses. The chapter provided a rationale for, and gave theoretical support for, each of the proposed hypotheses. A theoretical model of the influence of ILI on the adoption of OLRs was developed. Chapter 4 provided a methodology to gather and analyze the research data. Chapter 5 presented the results of the data analysis.

This present chapter explains the results of the data analysis and reflects on how the results relate to prior findings in the literature and how well the results support the model developed in chapter 3. As such, the goal of this chapter is fourfold: 1) to answer the dissertations's research questions; 2) to outline the study's theoretical and practical contributions; 3) to discuss the study's strengths and limitations; and 4) to suggest directions for future research.

6.2 Answers to Research Questions

Recall that this dissertation set out to answer the high level research question "What is the impact of ILI on the adoption of OLRs by business students?" The high level research question was sub-divided into six detailed research questions. In this section, the answers to each of these six research questions are discussed. The research questions and their associated hypotheses are presented first, followed by a discussion of the study's results.

6.2.1 The Influence of ILI on OLR Adoption

RQ1: *How well does ILI influence OLR adoption? How well do active ILI and passive ILI influence the adoption of OLRs?*

The first research question pertains to the role that ILI plays in influencing the adoption of OLRs by business students. The influence of the two modes of instruction, active instruction and passive instruction, are also addressed. Two hypotheses and four sub-hypotheses were based on the first research question. The results are summarized in Table 6-1.

Table 6-1: Summary of Findings Related to Research Question One

Hypothesis	Validation
H1: The amount of ILI received will have a positive direct effect on the perceived usefulness of OLRs.	not supported
H1a: The amount of active ILI received will have a positive direct effect on the perceived usefulness of OLRs.	not supported
H1b: The amount of passive ILI received will have a positive direct effect on the perceived usefulness of OLRs.	not supported
H2: The amount of ILI received will have a positive direct effect on the perceived ease of use of OLRs.	not supported
H2a: The amount of active ILI received will have a positive direct effect on the perceived ease of use of OLRs.	not supported
H2b: The amount of passive ILI received will have a positive direct effect on the perceived ease of use of OLRs.	not supported

These hypotheses were exploratory in nature. No previous studies have provided quantitative evidence on the influence of ILI on OLR adoption. Rather, these hypotheses were based on recent qualitative studies. These hypotheses were intended to verify and quantify the results of the qualitative studies.

As per Table 6-1, Hypothesis 1 and Hypothesis 2 were not supported. It was expected that students would perceive OLRs to be more useful after they had received ILI. It was also expected that students would find OLRs easier to use after they had been instructed how to use them. The findings of this study did not support either expectation. When ILI was measured in terms of the amount of instruction received, the relationships between the amount of ILI and perceived usefulness (β = -0.057, p-value = 0.207) and between the amount of ILI and perceived ease of use (β = -0.033, p-value = 0.180) were weak and

insignificant. These findings do not align with previous research by Lombardo & Miree (2003), Julien et. al. (2009), Detlor et. al. (2010), and Serenko et al. (2010). Lombardo & Miree (2003) reported that ILI reduced frustration and increased perception of convenience among business students. Julien et. al. (2009), Detlor et. al. (2010), and Serenko et al. (2010) found that ILI reduced the amount of effort that business students had to put into finding resources and reduced the amount of time needed to find resources.

As per Table 6-1, hypothesis 1a, hypothesis 1b, hypothesis 2a, and hypothesis 2b were not supported. This set of hypotheses was intended to evaluate the effectiveness of active ILI and passive ILI. When the amount of ILI was sub-divided into active ILI and passive ILI and the theoretical model was subjected to PLS analysis, neither active nor passive ILI were significant predictors of perceived ease of use of OLRs. Active ILI was not a strong or significant predictor of perceived usefulness (β = -0.079, p-value = 0.218) nor perceived ease of use of OLRs (β = -0.013, p-value = 0.411), and neither was passive instruction (β = -0.016, p-value = 0.745; β = -0.031, p-value = 0.468).

The results of the quartile analysis show that amount of ILI was negatively related with perceived ease of use of OLRs for students who received the most active ILI (β = -0.181, p-value = 4.278) and also for students who received the most passive ILI (β = -0.129, p-value = 3.386). These results are contrary to expectations and are contrary to the results reported in previous research. It may be that the increased knowledge of OLRs provided by high amounts of ILI enables students to make mental comparisons with search engines like Google.

The results of the quartile analysis also reveal that amount of ILI is negatively related with perceived usefulness of OLRs amoung students who have received the least amount of ILI (β = -0.110, p-value = 1.997) yet amount of ILI is positively related with perceived usefulness of OLRs for students with the highest amount of passive ILI (β = 0.103, p-value = 2.251). It may be that the kinds of assignments being done by first-year students do not require the use of OLRs but the assignments done by upper year students require the use of OLRs

6.2.2 The Influence of ILI on OLR Self-Efficacy and OLR Anxiety

RQ2: *How well does ILI influence OLR self-efficacy and OLR anxiety? How well do active ILI and passive ILI influence OLR self-efficacy and OLR anxiety?*

The second research question explores the influence that amount of ILI received has on OLR self-efficacy and OLR anxiety. The results of the data analysis for the hypotheses related to research question two are summarized in Table 6-2.

Table 6-2: Summary of Findings Related to Research Question Two

Hypothesis	Validation
H3: The amount of ILI received will have a negative direct effect on OLR anxiety.	not supported
H3a: The amount of active ILI received will have a negative direct effect on OLR anxiety.	not supported
H3b: The amount of passive ILI received will have a negative direct effect on OLR anxiety.	not supported
H4: The amount of ILI received will have a positive direct effect on OLR self-efficacy.	not supported
H4a: The amount of active ILI received will have a positive direct effect on OLR self-efficacy.	not supported
H4b: The amount of passive ILI received will have a positive direct effect on OLR self-efficacy**.**	not supported

As per Table 6-2, hypothesis three was not supported. Hypothesis three addressed the role that amount of ILI plays in reducing OLR anxiety. It was expected that business students would experience less anxiety when using OLRs, or when contemplating the use of OLRs, after they had received training on how to use OLRs. No relationship was found between amount of amount of ILI received and OLR anxiety ($\beta = 0.034$, p-value = 0.671). This finding does not align with the conclusions reached by Igbaria & Chakrabarti (1990), Igbaria (1993), Prince & Helms (1993), Martocchio (1994), Ayersman (1996), Detlor et al. (2010), and Serenko et al. (2010). The studies just mentioned found that computer training was effective at reducing computer anxiety, that library instruction was effective at reducing library anxiety, and that ILI was effective at reducing OLR anxiety.

The results of a quartile analysis show that ILI has a different influence on students who have the least amount of ILI than it has on students who have the most amount of ILI. Passive ILI reduces OLR anxiety for students with the least amount of passive instruction (β = 0.205, p-value = 4.125). Yet, instruction increased OLR anxiety for students who had the highest amount of each form of ILI (total ILI β = 0.156, p-value = 2.729).; active ILI β = 0.198, p-value = 4.223; and passive ILI β = 0.123, p-value = 2.477). It is possible that the influence of ILI on OLR anxiety is masked when students who have received the least amount of ILI are examined at the same time as students who have received the most amount of ILI. The first finding confirms the expectation that ILI reduces OLR anxiety for students with the least amount of instruction. The finding that ILI increases OLR anxiety for students with the most instruction is contrary to expectations.

As per Table 6-2, Hypothesis four was not supported. It assessed the relationship between amount of ILI and OLR self-efficacy. It was expected that instruction on the use of OLRs would increase students' belief in their capability to organize and execute the courses of action required to use OLRs. That expectation was not supported. The path between amount of ILI and OLR self-efficacy was not significant (β = 0.022, p-value = 0.696). Once again the hypothesized relationship between amount of ILI and its outcomes did not correspond with the findings from previous other studies. Previous studies found that training has been found to improve internet self-efficacy (Torkzadeh & Van Dyke, 2002), information searching self-efficacy (Ren, 2000), and online searching self-efficacy (Monoi et al., 2005).

Curiously, the results of a quartile analysis indicate that total ILI was negatively correlated with OLR self-efficacy for students who received the least amount of total ILI (β = -0.156, p-value = 2.941) and for students who received the least amount of passive ILI (β = -0.105, p-value = 2.051). It is possible that ILI made students aware of how much there is to know about using OLRs. OLRs self-efficacy was positively associated with ILI among students who received the highest amounts of total ILI (β = 0.131, p-value = 2.867).

As per Table 6-2, Hypothesis 3a, Hypothesis 3b, Hypothesis 4a and Hypothesis 4b were not supported. These hypotheses were intended to evaluate the effectiveness of active instruction and passive instruction in influencing OLR anxiety and OLR self-efficacy. When the model was run using amount of active instruction as the predictor, the relationship with

OLR anxiety was weak and insignificant (β = 0.025, p-value = 0.518); when the model was run using amount of passive instruction as the predictor, the results were very similar (β = 0.024, p-value = 0.632). When active instruction was used to predict an increase in OLR self-efficacy, the path representing the relationship was weak and insignificant (β = 0.058, p-value = 0.684); when amount of passive instruction was used to predict increases in OLR self-efficacy, the results were also weak and insignificant (β = -0.017, p-value = 0.768). Neither active ILI nor passive ILI was a significant predictor of OLR anxiety or OLR self-efficacy.

It is noteworthy that the results for all of the hypotheses that relate amount of ILI to its outcomes (H1, H2, H3, H4, H1a, H1b, H2a, H2b, H3a, H3b, H4a, and H4b) do not align with the results of previous research. The perplexing dissonance between the findings of this study and the findings of previous studies is resolved when one considers the responses to the open-ended questions. When the business students were asked how the ILI they received influenced their anxiety, and comfort and confidence when using OLRs, almost 70 percent of respondents indicated that ILI reduced their level of OLR anxiety, and 80 percent felt that ILI increased their level of OLR self-efficacy. These results indicate that the hypothesized relationships between ILI and OLR self-efficacy and between ILI and OLR anxiety ought to have been supported. It is likely that the problem resides with the measure of ILI used. This dissertation used amount of ILI received as its measure of ILI. It is likely that amount of ILI received is not the determining factor that influences ILI outcomes. It is likely that another attribute of ILI, or set of attributes of ILI, influence ILI outcomes. One possible attribute of instruction is provided by Ertmer et al. (1994) who suggested quality of instruction may be more important than amount of instruction in influencing self-efficacy. The results of a study by Serenko et al. (2010) support this view. Serenko et al. used perceived quality and satisfaction with ILI as their measure of ILI. Their model was well supported.

6.2.3 OLR Self-Efficacy and OLR Anxiety as Antecedents to OLR Adoption

RQ3: *How well do OLR self-efficacy and OLR anxiety predict OLR adoption?*

Research question three seeks to examine the influence that OLR self-efficacy and OLR anxiety have on the adoption of OLRs. This study extends previous research on

computer self-efficacy, computer anxiety and library anxiety by employing measures of self-efficacy and anxiety that are specific to OLRs.

Table 6-3: Summary of Findings Related to Research Question Three

Hypothesis	Validation
H5: OLR anxiety will have a negative direct effect on the perceived ease of use of OLRs.	supported
H6: OLR self-efficacy will have a negative direct effect on OLR anxiety.	supported
H7: OLR self-efficacy will have a positive direct effect on the perceived ease of use of OLRs.	supported

As per Table 6-3, hypothesis five was supported. Hypothesis five evaluated the influence of OLR anxiety on perceived ease of use of OLRs. It was expected as OLR anxiety increased, students would have to dedicate attention to coping with their emotional responses. Consequently, it was expected that students who have higher levels of OLR anxiety would be less inclined to perceive OLRs to be easy to use. The results of the analysis reveal that the relationship between OLR anxiety and the perceived ease of use of OLR was negative and significant (β = -0.197, p-value = 0.003). This finding is consistent with prior research conducted by Igbaria & Iivari (1995), Saade & Kira (2007), Venkatesh (2000) and Nov & Ye (2008). Recall that Igbaria and Iivari conducted a study of the determinants of technology adoption. They found that anxiety had a detrimental effect on the perceived ease of use of computer technology. Venkatesh employed a longitudinal study and confirmed that anxiety had a detrimental impact on the perceived ease of use of computer technologies. Nov & Ye found that computer anxiety had a deleterious influence on the perceived ease of use of digital libraries. This dissertation confirms that the OLR anxiety has a detrimental influence on the perceived ease of use of OLRs. However, the effect size analysis shows that the influence of OLR anxiety on perceived ease of use of OLRs is small ($f^2 = 0.057$).

As per Table 6-3, hypothesis seven was supported. Hypothesis seven was directed toward examining the relationship between OLR self-efficacy and the perceived ease of use of OLRs. It was expected that as students' beliefs in their capability to execute the courses of action needed to use OLRs increased, their perceptions of the ease of use of OLRs would

improve. The results of the analysis reveal a strong positive relationship between OLR self-efficacy and the perceived ease of use of OLRs (β = 0.553, p-value <0.0001). This finding supports a large body of research that found that people who enjoy higher levels of comfort and confidence using technology tend to perceive the technology to be easier to use. This finding confirms research by Hong et al. (2002) who found that computer anxiety was positively associated with the perceived ease of use of digital libraries, and by Thong et al. (2002) who found support for the same association. The results of this study confirm that OLR self-efficacy is a predictor of the perceived ease of use of OLRs. The results of the effect size analysis demonstrate that OLR self-efficacy had a large effect on the perceived ease of use of OLRs (f^2 = 0.451). In fact, of all the antecedents of the perceived ease of use of OLR self-efficacy was by far the strongest.

As per Table 6-3, H6 was supported. Hypothesis six was designed to evaluate the relationship between OLR self-efficacy and OLR anxiety. Bandura's social cognitive theory describes self-efficacy and anxiety as reciprocal determinants of each other. In this study, self-efficacy was modeled as influencing anxiety because it was expected that over time training and experience would increase students' self-efficacy, which would reduce their level of anxiety. The analysis revealed that the relationship between OLR self-efficacy and OLR anxiety is negative and significant (β = -0.383, p-value <0.0001). The results of this study confirm the findings of Compeau & Higgins (1995), Igbaria and Ivari (1995), Thatcher & Perrewe (2002), Johnson (2005), and Johnson & Marakas (2000). The result of the effect size analysis reveal that OLR self-efficacy had a medium sized effect on OLR anxiety (f^2 = 0.171).

6.2.4 The Application of the Technology Acceptance Model to OLR Adoption

RQ4: *How well does TAM explain OLR adoption?*

The purpose of this question was to confirm the utility of the Technology Acceptance Model in predicting and explaining the adoption of OLRs. Three core constructs of TAM were used: perceived ease of use of OLRs, perceived usefulness of OLRs and intention to use OLRs. The results of the data analysis are summarized in Table 6-4.

Table 6-4: Summary of Findings Related to Research Question Four

Hypothesis		Validation
H8:	Perceived ease of use will have a positive direct effect on the perceived usefulness of OLRs.	supported
H9:	Perceived ease of use will have a positive direct effect on the intention to use OLRs.	not supported
H10:	Perceived usefulness will have a positive direct effect on the intention to use OLRs.	supported

As per Table 6-4, hypothesis eight and hypothesis ten were supported but hypothesis nine was not. Perceived ease of use of OLRs was found to have a strong significant relation with the perceived usefulness of OLRs (β = 0.529, p-value <0.0001). Similarly, perceived usefulness of OLRs was found to have a strong significant effect on intention to use OLRs (β = 0.679, p-value <0.0001). Interestingly, the hypothesized relationship between perceived ease of use of OLRs and the intention to use OLRs was not significant (β = 0.028, p-value 0.616). Thus, H9 was not supported. This finding suggests that the relationship between perceived ease of use of OLRs and intention to use OLRs is mediated completely by perceived usefulness of OLRs. This finding is consistent with the results of a meta-analysis on TAM conducted by King & He (2006). They reported that out of 67 studies in their study that reported the results of the core TAM model, 30 found the ease of use –> behavior intention path to be insignificant. King & He also reported that "the major effect of EU is through U rather than directly on BI" (King & He, 2006, p. 746).

This study found TAM to be a useful lens for studying the adoption of OLRs. This finding is consistent with the conclusions reached by Hong et al. (2002) and Thong et. al (2002) who used TAM to assess student adoption of digital libraries.

6.2.5 Mediating Relationships Between ILI, OLR Self-Efficacy and OLR Anxiety

RQ5: *How do OLR self-efficacy and OLR anxiety mediate the relationships between OLR adoption and its determinants?*

The purpose of research question five was to investigate the possible mediating effects between amount of ILI, OLR self-efficacy, and OLR anxiety. It is possible that instructional techniques influence OLR adoption by virtue of their influence on self-efficacy and anxiety.

Table 6-5: Summary of Findings Related to Research Question Five

Hypothesis	Validation
H11: OLR anxiety will mediate the relationship between information literacy instruction and perceived ease of use	not supported
H12: OLR self-efficacy will mediate the relationship between information literacy instruction and perceived ease of use	not supported
H13: OLR anxiety will mediate the relationship between OLR self-efficacy and perceived ease of use.	supported

As per Table 6-5, hypothesis 13 was supported but hypothesis 11 and hypothesis 12 were not. These hypotheses assessed the role of OLR self-efficacy and OLR anxiety as mediators. OLR anxiety and OLR self-efficacy were hypothesized to mediate the relationship between amount of ILI and perceived ease of use of OLRs in hypotheses 11 and 12. It was expected that the influence of amount of ILI on perceived ease of use of OLRs was through its influence on OLR self-efficacy and OLR anxiety. Next, OLR anxiety was hypothesized to mediate the relationship between OLR self-efficacy and perceived ease of use of OLRs in hypothesis 13. The mediation effects were tested using Baron and Kenny's four-step method, the Sobel test, and PLS. The first two hypotheses (H11 and H12) were not supported. The direct relationship between ILI and perceived ease of use was not significant. Consequently, it was not possible for the relationship to be mediated by either OLR self-efficacy nor OLR-anxiety. The final hypothesized mediation effect (H13) was supported. The results of Baron and Kenny's four step approach reveal that the conditions for mediation were met. The independent variable (OLR self-efficacy) was significantly correlated with the dependent variable (perceived ease of use) and the mediator variable (OLR anxiety). When the independent variable and the mediator variable were regressed on the dependent variable (perceived ease of use of OLR), the beta for the relationship between OLR self-efficacy and perceived ease of use of OLRs dropped from 0.687 to 0.602. This indicates that OLR anxiety

partially mediates the relationship between OLR self-efficacy and OLR anxiety. The results of the Sobel test indicate that the mediation effect is significant (p-value < 0.001). The mediation effect was confirmed using PLS. When a simple model was constructed with OLR self-efficacy predicting perceived ease of use of OLRs, the R^2 for the model was 0.388. When OLR anxiety was added to the model as a mediator, the R^2 for the model increased to 0.422. In other words, the mediated model explained more of the variance in perceived ease of use of OLR than the simple model. Also, the beta for the path between the independent variable (OLR self-efficacy) and the dependent variable (OLR anxiety) dropped from 0.623 in the simple model to 0.549 in the mediated model. This indicates that a portion of the influence of OLR self-efficacy on perceived ease of use of OLRs is through OLR anxiety.

The author of this study is not aware of any previous research that has assessed OLR anxiety as a mediator of the relationship between OLR self-efficacy and the perceived ease of use of OLRs.

6.2.6 Demographic Influences

RQ6: *How do demographic factors influence OLR adoption?*

Research question six was directed toward identifying demographic groups or sub-populations who are at risk of not benefiting from ILI. Identifying such groups may allow instructors to design specific interventions to assist such users. The results of the analysis are summarized in Table 6-6.

Table 6-6: Results of Hypotheses Related to Research Question Six

Hypothesis	Validation
H14: Gender will influence levels of OLR anxiety.	Not supported
H15: Gender will influence levels of OLR self-efficacy.	Not supported
H16: Levels of OLR anxiety will decline with year of study.	Not supported
H17: Levels of OLR self-efficacy will increase with year of study.	Not supported
H18: Levels of OLR anxiety will be higher for students with higher levels of academic achievement.	Not supported

As per Table 6-6, none of the hypothesized relationships (H14-H18) were supported. The influence of the demographic variables was assessed by modeling the demographic variables as control variables. The demographic variables were found to cause significant changes in R^2 for only four variables. Of these, only one of the changes in R^2 was large enough to be of interest. Year of study was significantly associated with amount of ILI ($\Delta R^2 = 0.201$, $p < 0.001$). Although this relationship was statistically significant; it is not of practical significance. Since ILI is provided during each year of instruction the finding that there is a positive relationship between amount of ILI and year of study could be deduced using commonsense.

6.3 Research Contribution

A number of theoretical and practical contributions are offered that may be of interest to instructors and researchers interested in ILI.

6.3.1 Theoretical Contributions

This study makes a important contributions to theory. First, the study developed and tested a theoretical model of the influence of ILI on the adoption of OLRs. Previous research has investigated the outcomes of ILI or the antecedents of technology adoption. To the best of the researcher's knowledge, no previous studies have integrated the two theoretical perspectives. This study is the first to model OLR adoption as an outcome of ILI.

Importantly, the findings from the analysis of the structural equation model confirm that the Technology Acceptance Model is an appropriate tool for studying the adoption of OLRs.

Second, the findings indicate that amount of ILI is not a significant predictor of the perceived usefulness and perceived ease of use OLRs. Further, the results of this study indicate that amount of ILI is not an effective way of capturing the influence of ILI on self-efficacy and self-anxiety.

Third, though the amount of ILI was not found to be a predictor of OLR self-efficacy or OLR anxiety in the quantitative analysis, results from the qualitative analysis suggest that ILI increases self-efficacy and reduces anxiety.

Fourth, the findings suggest that OLR self-efficacy and OLR anxiety are significant determinants of the adoption of OLRs where OLR self-efficacy was the strongest determinant of the adoption of OLRs. Self-efficacy and anxiety have frequently been used as antecedents to technology adoption. The results of this study show that OLR self-efficacy and OLR anxiety are predictors of the adoption of OLRs.

Last, consistent with Bandura's social cognitive theory, OLR self-efficacy and OLR anxiety were found to be significantly negatively correlated. Social cognitive theory asserts that self-efficacy and anxiety are reciprocal determinants of each other. Yet, these two variables are rarely modelled as antecedents of one another in TAM models. Further, a partial mediation effect of OLR anxiety on the relationship between OLR self-efficacy and the perceived ease of use of OLRs was supported. Thus, this study confirms that the reciprocal deterministic nature of this relationship can be modelled as a mediating relationship.

6.3.2 Practical Contribution

The conclusion that amount of ILI is not an effective measure of the impact of ILI on its outcomes has an important practical implication. From an IL instructor's perspective, the finding suggests that the quantity of instruction may not be as important in achieving instructional outcomes as attributes such as quality of instruction. Professors, librarians and instructors should concentrate their efforts on increasing the effectiveness of instruction rather than the amount of instruction.

The findings from this study also reveal that OLR anxiety and OLR self-efficacy are real phenomenon. The results of the open-ended questions reveal that 41 percent of students currently experience OLR anxiety and 71.4% of respondents indicated that they either experience OLR anxiety currently or had succumbed to OLR anxiety in the past. Although 80 percent of people who felt comfortable using OLRs indicated that the ILI they had received reduced their anxiety and increased their self-efficacy, there is an opportunity to improve training performance with respect to OLR anxiety and OLR self-efficacy. Thus, it is suggested that IL instructors make a conscious effort to increase OLR self-efficacy and reduce OLR anxiety by designing training interventions that specifically address OLR self-efficacy and OLR anxiety. Strategies and techniques for increasing self-efficacy should be developed (Saleh, 2008).

6.4 Limitations of the Study

Although this study makes several practical and theoretical contributions, it has several limitations which should be acknowledged.

First, this dissertation, like most information systems research, makes use of a cross-sectional data. Cross-sectional data cannot be used to establish causation. Instead, causation was established by relying on existing theory (specifically TAM) and findings from previous ILI studies. Future research should make use of longitudinal research design to verify the results of this study.

The second limitation of this dissertation is that the research participants were drawn from a single academic institution. Consequently, the generalizability of the findings are limited by the extent to which the students of the institution are representative of business students in general. The large sample size of the study increases the likelihood that the results are of the study are generalizable to other business schools and to other nations. Also, this study was focused on information literacy among business students. Before the results of this analysis can be generalized to other academic disciplines, the results should be replicated in other disciplines. Before the results of this study can be generalized to other countries the results should be replicated other countries.

The third limitation is that the quantitative and qualitative data were gathered from the same respondents. Ideally, respondents should provide either quantitative data or qualitative data, but not both. The quantitative and qualitative data were collected at the same time and from the same respondents to ensure that the both data collection methods would receive a high response rate.

The fourth limitation of this study is the timing of the measurements. Technology adoption research has been criticized for making use of retrospective surveys (Viswanath Venkatesh et al., 2003). The measurements of user reactions are taken after the adoption decision has already been made, rather than during the adoption process. This dissertation is limited by this common limitation.

The fifth limitation of this dissertation was that it did not isolate the influence of active instruction from the influence of passive instruction. Although not all students received active instruction, those students who received active instruction also received passive instruction. Consequently, this dissertation is not able to isolate the influence of active instruction from the influence of passive instruction. It is possible that the advantages of active instruction identified here are only realized when active instruction is used in conjunction with passive instruction.

The sixth limitation of this study is that it measured intention to use OLRs rather than actual use of OLRs. The practice of using intention to use as the final endogenous variable in TAM studies, rather than actual use, has been a favourite topic for discussion among information systems researchers. Recently, Turner et al. (2010) conducted a meta-analysis of TAM studies in order to study the association between TAM constructs and actual use. They found that the average proportion of success per study was 0.90 for the association between behaviour intention and actual use.

The seventh limitation of this study is that it made use of subjective measures of OLR self-efficacy and OLR anxiety.

The final limitation of this study is the possible presence of non-response bias. The results of the linear extrapolation analysis revealed that students who received the least amount of passive ILI were most likely to respond in the first wave of data collection and that

students who received the least amount of passive ILI were most likely to answer in the last wave of data collection. This finding suggests that there is a risk that students who have received the most passive ILI may have declined to respond to the survey. Consequently, the findings reported here may not generalize to those students.

Despite the limitations identified above, this dissertation has provided several theoretical and practical contributions. None of the limitations detract from the rigorous methodology employed. This dissertation made use of a sizable data set of 337 records drawn from the population of interest. The sample came from students from all concentrations of study (majors) and all undergraduate year levels.

6.5 Directions for Future Research

Several avenues of research may be identified as a result of this dissertation. The first relates to the measurement of ILI. Since amount of instruction is not a predictor of successful instructional outcomes, researchers should focus their efforts on determining the factors of ILI that cause the intended learning outcomes. Researchers would be wise to build on the work of Serenko et al. (2010) by investigating perceived quality and satisfaction with ILI as antecedents to OLR adoption. Attention should be paid also to the determinants of ILI quality.

There is an opportunity for research to be undertaken that employs either a longitudinal design or an experimental design. A longitudinal design is needed to overcome the limitations associated with the use of cross-sectional design. An experimental design would enable researchers to isolate the influence of active ILI from the influence of passive ILI.

Another avenue for future research relates to OLR anxiety. OLR anxiety is a new construct. Consequently, it has not been studied extensively. As with all forms of anxiety, it would be worthwhile to determine whether OLR anxiety is a trait anxiety (a relatively stable individual difference that makes a person prone to anxiety) or a state anxiety (a transitory subjective emotional state). Identifying the nature of OLR anxiety would enable instructors to design appropriate interventions.

A fourth avenue of research relates to the dimensionality of OLR anxiety. Previous research has investigated the nature of library anxiety, and other research has investigated the nature of computer anxiety. OLRs have the characteristics of computers and libraries. Future research should investigate OLR anxiety in order to determine whether it is a single homogenous phenomenon or multi-dimensional phenomenon. For instance, is the anxiety that students feel when using OLRs related to the technological component of OLRs, the library component of OLRs, or both?

The fifth and sixth avenues of research relate to the influence of ILI techniques on OLR self-efficacy. In Chapter 2 it was mentioned that self-efficacy can be influenced by social persuasion. It was also mentioned that some forms of active instruction are group-based or interaction-based. The efficacy of group-based instructional methods in developing OLR self-efficacy ought to be studied.

The sixth avenue of research was inspired by Marakas et al. (1998). They speculated that the training needs of people with low self-efficacy might differ significantly from the training needs of people with high self-efficacy. Future studies should compare the efficacy of ILI techniques for students with low self-efficacy with the efficacy of ILI techniques for students with high self-efficacy.

Finally, future researchers should subject their samples to the linear extrapolation method for detecting non-response bias in order to confirm that students who receive the most passive ILI are less inclined to respond to library instruction surveys.

6.6 Conclusion

This dissertation aimed to achieve several goals. The overarching goal of this dissertation is to predict and explain how ILI influences the adoption of OLRs by business students. The next goal is to evaluate the efficacy of two modes of instruction, active ILI and passive ILI, in influencing OLR adoption. Another goal is to evaluate the role of OLR self-efficacy and OLR anxiety in influencing the adoption of OLRs. OLR self-efficacy and OLR anxiety have been identified as instructional outcomes and as predictors of the adoption of technology. To achieve these research goals, a set of research questions was drafted and a set of hypotheses were derived. A theoretical model was developed that embodied the research

hypotheses. Then, a survey instrument was developed and administered. Finally, the data collected from the survey were used to assess the theoretical model and hypotheses.

APPENDIX A: ETHICS APPROVAL FORM

The Ethics clearance certificate from the McMaster University Research Ethics Board is presented below.

McMaster Research Ethics Board

McMaster University

Inspiring Innovation and Discovery

McMaster University Research Ethics Board (MREB)

c/o Office of Research Services, MREB Secretariat, GH-305/H, e-mail: ethicsoffice@mcmaster.ca

CERTIFICATE OF ETHICS CLEARANCE TO INVOLVE HUMAN PARTICIPANTS IN RESEARCH

Application Status: New ☐ **Addendum** ☑ **Project Number** 2007 091

TITLE OF RESEARCH PROJECT:

Assessing Learning Outcomes of Information Literacy Instruction at Canadian Business Schools

Faculty Investigator (s)/ Supervisor(s)	Dept./Address	Phone	E-Mail
B Detlor	Business	23949	detlorb@mcmaster.ca
Student Investigator(s)	**Dept./Address**	**Phone**	**E-Mail**

The application in support of the above research project has been reviewed by the MREB to ensure compliance with the Tri-Council Policy Statement and the McMaster University Policies and Guidelines for Research Involving Human Participants. The following ethics certification is provided by the MREB:

☑ The application protocol is approved as presented without questions or requests for modification.

☐ The application protocol is approved as revised without questions or requests for modification.

☐ The application protocol is approved subject to clarification and/or modification as appended or identified below:

COMMENTS AND CONDITIONS: Ongoing approval is contingent on completing the annual completed/status report. A "Change Request" or amendment must be made and approved before any alterations are made to the research.

amendment approved Aug 27

Reporting Frequency: **Annual:** Jun-19-2010 **Other:**

Date: Jun-19-2007 **Co-Chairs, Dr. D. Maurer, Dr. B. Pawluch:**

Acting Vice-Chair, Dr. R. Storey:

B. Pawluch for Daphne Maurer

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APPENDIX B: RECRUITMENT POSTER

The poster used to recruit participants for the study is presented below.

What is in your Inbox ($50)?

Business Students!

Enter our survey for a chance to win

1 of 100

$50 gift certificates

Look in your inbox for an invitation to complete our survey

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