AN EMPIRICAL EXAMINATION OF FACTORS AFFECTING ADOPTION OF AN ONLINE DIRECT SALES CHANNEL BY SMALL AND MEDIUM-SIZED ENTERPRISES

By

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August 20, 2007
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Abstract

In the past few decades, IS researchers studying the adoption and diffusion of information technologies have proposed dozens of adoption factors. The co-existence of an overwhelmingly large number of factors in multiple influential theories without a common structure has limited the usefulness of innovation adoption research. Furthermore, existing IT innovation adoption theories tend to focus on factors of a specific adoption dimension while neglecting those of others.

Building upon Rogers’ Paradigm of the Adoption of an Innovation by an Individual within a Social System (Rogers, 1962, p306), this study proposes a simple but comprehensive theoretical adoption framework, which classifies adoption factors in three dimensions: Decision Entity (DE: an individual or an organization), Decision Object (DO: the information technology to be adopted), and Decision Context (DO: the environment where a decision is made). Adoption process is essentially a decision-making process. The outcome of such a process is a decision (to adopt or not to adopt), which is made by a DE on a specific DO in a particular DC. Factors in any of the three dimensions, the DE, DO, and DC, may impact the adoption decision that the DE makes.

I operationalize the general adoption classification framework through an empirical investigation of critical factors underlying the adoption and use of the online direct sales channel (ODSC) by small and medium-sized enterprises (SMEs). Building
upon, and synthesizing, major existing IT adoption and diffusion theories, I propose a research model on the impacts of a series of DE, DO and DC factors on an SME’S behavioral intention to embrace ODSC. Those include perceived relative advantage and perceived ease of use (DO factors), risk tolerance, resource availability, and expertise in the Internet (DE factors), and perceived competitive pressure (DC factor).

To test the model of ODSC adoption by SMEs, I develop and administer an Internet-based survey to a sample of SMEs in the State of Ohio of the United States. Structural Equation Modeling (SEM) is to be used to analyze the goodness of fit of the model. Other parameters will also be analyzed to test a series of hypotheses in the model.

This study contributes to the IT adoption literature in the following ways: first, the classification model provides a simple but robust framework for categorizing existing factors identified in previous IS adoption studies. It will also be useful for guiding the identification of new factors in future IS adoption studies. Second, the research model on the adoption of ODSC by SMEs, which is proposed and empirically tested in this study, will not only enhance our knowledge of SMEs’ adoption of ODSC, but also improve our understanding of SMEs’ adoption and use of IS innovations in general. Third, the measures that I have adapted from other studies or developed and validated for this study may be useful for future studies of adoption and diffusion of IS innovation, particularly the adoption of Internet related technologies.

This study will have significant implications for practice as well. The examination of ODSC adoption among SMEs provides empirical evidence regarding what drives the adoption and use of ODSC among SMEs, which in turn, will help facilitate better decision-making by managers of electronic market service providers, e-
commerce system developers, and policy-makers of relevant governmental agencies to stimulate the use of ODSC among SMEs. The study will also enhance SMEs’ knowledge of what other SMEs are thinking about and doing with ODSC, which will eventually influence their own decision in the future on the use of ODSC

1. Introduction

1.1 SMEs’ Contributions to Economies

There is no universally accepted definition for SMEs. European Union defines an SME as an independent company with fewer than 250 employees and either an annual turnover not exceeding €40 million or a balance sheet not exceeding €27 million (EU). A small firm has a maximum of 50 employees, and maximum turnover of 7 million ECU or balance sheet total of 5 million ECU. A micro enterprise has a maximum of ten employees.

However, in the US, the Small Business Administration (SBA) defines small businesses as firms with less than 500 employees (SBA Office of Advocacy, 2006). Recently, it revised its size standards recently to match them to industries as defined by the North American Industrial Classification System (NAICS), as well as to establish criteria based on revenue. But the size maximum for most sectors remains 500 employees.

Different researchers have chosen their own focus of firm size of SMEs. For instance, Santarelli and D’Altri (2003) focus on a group of firms with fewer than 100
employees for their SME Internet diffusion study. But Johnston and Wright (2004) use a working definition of SMEs as fewer than 500 people. Because our sample is from the US, and also because 500 has been used in many other studies, I focus our studies on firms less than 500 employees, though I acknowledge, as other researchers (e.g., Johnston and Wright, 2004) that significant differences may exist between a micro, small, and medium-sized enterprises.

Small and medium-sized enterprises have become an increasingly important contributor to nearly every economy. In the UK, SMEs employ 70% of the workforce (Notman 1998). In Ireland, SMEs (companies with fewer than 250 employees) make up 99.4% of all enterprises (Forfás 1999). In EU as a whole, more than 90% of the total number of European Union (EU) businesses are comprised of Small enterprises, accounting for 25% of EU turnover; more than 90% of the total European enterprise population (16 million businesses) are of very small size employing fewer than 10 people (Dutta and Evrard, 1999). In China, 158,234 (87%) of 181,557 industrial enterprises are small-scale enterprises. Those enterprises produced 4,545,897,000,000 (41%) of 11,077,648,000,000 total gross outputs (National Bureau of Statistics of China, 2003). In Asia-Pacific region as a whole, nearly 72% of all private sector enterprises are micro-enterprises representing 20% of private sector employment. Asia-Pacific Economic Cooperation (APEC) describes SMEs “a seed bed for entrepreneurship and growth…an alternative to unemployment, and … a means of alleviating poverty” (APEC, 2002). According to the UN, SMEs account for more than 90% of all jobs, sales, and value-added in developing countries; in developed countries, they account for over 50% of these measures (UN, 1992).
In the U.S., SMEs play a crucial role in American economy. While emphasizing the importance of small businesses, the Small Business Administration (SBA) Office of Advocacy cites the following statistics (SBA Office of Advocacy, 2006a).

**Small firms**

- Represent 99.7 percent of all employer firms.
- Employ half of all private sector employees.
- Pay more than 45 percent of total U.S. private payroll.
- Have generated 60 to 80 percent of net new jobs annually over the last decade.
- Create more than 50 percent of nonfarm private gross domestic product (GDP).
- Supplied more than 23 percent of the total value of federal prime contracts in FY 2005.
- Produce 13 to 14 times more patents per employee than large patenting firms. These patents are twice as likely as large firm patents to be among the one percent most cited.
- Are employers of 41 percent of high tech workers (such as scientists, engineers, and computer workers).
- Are 53 percent home-based and 3 percent franchises.
- Made up 97 percent of all identified exporters and produced 28.6 percent of the known export value in FY 2004.

Despite their substantial contribution to economies, SMEs have been ironically neglected in the literature (Tambunan, 2005). While there is a large body of literature
examining the adoption and diffusion of IS innovations of larger firms, studies focused on small firms are underrepresented and they rarely appear in major IS journals. However, there is much that remains important but unknown regarding SMEs’ adoption and use of IS innovations. This study intends to contribute to the knowledge of what drives SMEs’ adoption and use of Internet based selling activities.

1.2 E-commerce and its impact on SMEs

In recent years, one of the most fundamental shifts in the way companies conduct businesses is the increased use of the Internet (Gale Group, 2005). This type of business, usually known as e-business, e-commerce, or I-commerce (for Internet commerce), refers to buying, selling, and supporting products and services on the Internet (Gibbs et al., 2003). Based on the parties involved, E-commerce can be categorized into B2B (Business to Business), B2C (Business to Consumer), and C2C (Consumer to Consumer). Companies across almost all industries and business sectors have tried to explore the potentials of the increasingly globalized E-business technologies to gain customize base, integrate business processes and improve relationships with suppliers, resellers and customers. “If they do not,” as Kaefer and Bendoly (2003) put it, “those competitors that do make use of such technologies threaten to outpace them in efficiency gains and hence jeopardize their market position.”

This study focuses on the selling aspect of Internet-based e-commerce, whose complete process includes online advertising, online order processing, online order tracking, online payment, and online post-purchase customer service. A firm is
considered to be selling online if it carries out at least the first two activities online, that is, advertising and online order processing. Based on the parties involved, E-commerce is usually categorized into B2B (Business to Business), B2C (Business to Consumer, and C2C (Consumer to Consumer). In the present study I do not differentiate B2B and B2C; instead, I am interested only in whether firms use or intend to use the Internet as their sales channels.

The bursting of the Internet bubble has led some to question the very value of the Internet (Barua, Konana, Whinston, and Yin, 2001; The Economist, 2001, p. 7) despite the fact that the potential impact of e-commerce on firms’ marketing strategies may become even more important in the years to come (Santarelli and D’Altri, 2003). Researchers have consistently argued that E-commerce is likely to contribute to sustained competitive advantages through extended market reach (Barua et al; Porter, 2001), enhanced differentiation (Porter, 2001) and cost efficiency (Barnes et al. 2003; Boyer and Olson 2002; Frohlich and Westbrook 2002; Porter, 1985, 2001; Power and Sohal 2002; Presutti 2003; Quayle 2003; Soliman and Janz 2004; Zank and Vokurka 2003). Recent work has also demonstrated that the use of Internet and e-commerce technologies improves a firm’s supply chain management (SCM). Examples include improved lead times (Hauguel and Jackson 2001; Power and Sohal 2002; Quayle 2003; Zank and Vokurka 2003), speedier deliveries (Barnes et al. 2003; Boyer and Olson 2002; Frohlich and Westbrook 2002), improved communication and coordination among supply chain members (García-Dastugue and Lambert 2003; Lancioni et al. 2003; Zank and Vokurka 2003), and reduced lost shipments and shipper claims (Lancioni et al. 2003).
The Internet and e-Commerce technologies have provided small and medium-sized enterprises (SMEs) with further opportunities to overcome their constraints in size, resources and competitive scope (such as segment and geographic areas served) and compete with larger firms across the world. They offer them an affordable way to communicate with customers and business partners, advertising to and accessing local, national, and even global markets, taking and tracking orders electronically, accepting electronic payments, and providing online-based customer service. The Internet's reach has enabled SMEs to find new customers without being constrained by geography or the size of the customer (barua et al 2001). Essentially, such technologies have leveled off the playing field to enable SMEs to compete with larger firms.

The literature has revealed a variety of advantages that e-commerce may bring to SMEs. Santarelli and D’Altri, (2003) demonstrated how SMEs can adopt and use e-commerce as a way to reduce distributive costs and to increase the number of potential customers. Dewan (2000) states that e-commerce technologies enable SMEs to gather information about buyers’ preferences and customize their products and prices accordingly with limited costs. Lohrke, Franz, Franklin, and Frownfelter-Lohrke (2006) found that an SME can enhance its market position through strategic use of E-commerce to improve its relationships with customers through Internet-mediated communication and customer service; Internet's far greater geographic reach makes it possible for SMEs to find new customers without being constrained by geography, size of the customer, and financial limit of the firm. By selling on the Internet, SMEs can establish direct customer contact and reduce reliance on channel intermediaries for product distribution or customer support. Some researchers (Hamill and Gregory, 1997; Lituchy and Rail, 2000;
Nieto, and Fernández, 2006) argue that the use of the Internet can even enhance an SME’s global competitiveness.

Caskey et al. (2001) used two general business trends to explain the opportunities brought to SMEs by e-commerce. The two trends are: (a) concentration upon core competencies, and (b) tighter co-operation among the firms within a supply chain. The first trend reflects a shift in the balance between the cost of controlling economic activity within a firm and the cost of co-coordinating activities between firms, usually referred to as hierarchy costs and transaction costs (Coase 1937). The emerging Internet and e-commerce technologies have more effectively addressed the costs of co-operation between firms (transaction costs), and thus made outsourcing more attractive. Such technologies shifted the equilibrium between co-ordination costs and transaction costs in favor of SME participation as the costs of cooperation decrease in relation to the costs of co-ordination activities within a large firm, buying from outside firms becomes more attractive (Caskey, Hunt and Browne, 2001). The second trend impacts cooperation and coordination between producers and suppliers after their relationship is established. With better information, producers can produce goods that better serve customers’ needs at lower costs and thus benefit both suppliers and producers. The two business trends have helped bring SMEs more outsourced business opportunities, and an easy and affordable channel to find and cooperate with customers, suppliers, and business partners.

Given the benefits brought to SMEs by the Internet and the fact that adoption of e-commerce technologies remain rudimental level, it is very important to examine factors underlying the adoption and use of the Internet among SMEs ((Lohrke, Franklin, and Frownfelter-Lohrke, 2006).
1.3 Rationales of the Study

Innovation adoption is a process that includes activities leading to a decision to adopt and activities facilitating the use and continual use of the innovation (Damanpour, 1991). In the past two decades, IS researchers studying the adoption and diffusion of information technologies have proposed dozens of adoption factors. The co-existence of an overwhelmingly large number of factors in multiple influential theories without a common structure has limited the usefulness of innovation adoption research. Furthermore, existing IT innovation adoption theories tend to focus on factors of a specific adoption dimension while neglect those of others.

Building upon Rogers’ Paradigm of the Adoption of an Innovation by an Individual within a Social System (Rogers, 1962, p306), this study proposes a simple but comprehensive theoretical adoption framework, which categorizes adoption factors in three dimensions: Decision Entity (DE: an individual or an organization), Decision Object (DO: the information technology to be adopted), and Decision context (DO: the environment where a decision is made). Adoption process is essentially a decision-making process. The outcome of such process is a decision (to adopt or not to adopt), which is made by a DE on a specific DO in a particular DC. Factors in any of the three dimensions, the DE, DO, and DC, may impact the adoption decision that the DE makes.

I operationalize the general adoption framework through an empirical investigation of critical factors underlying the adoption and use of the online direct sales channel (ODSC) by small and medium-sized enterprises (SMEs). I focus my study on
SMEs for an important reason, which is that systematical and empirical examination of factors underlying SMEs’ adoption and use of ODSC is lacking, though such examination is critical for understanding SMEs’ organizational behavior toward the use of the Internet as a distributional channel.

Despite the opportunities brought to SME by e-commerce technologies, organizations have not necessarily rushed towards adopting online sales (March and Ngai, 2006). The extent of adoption of the Internet varies from those embracing e-commerce and using it strategically to transform their businesses, to those unwilling to adopt even the most basic e-commerce technologies (Hawkins and Prencipe 2000, in Beach). While some SMEs have adopted minimal E-commerce technologies, many others have started to get connected to the Internet, to build company web sites, and to advertise their products and services online. Only a small portion of those firms have moved further to adopt more advanced E-commerce technologies for real-time online trade and transactions. Kula and Tatoglu (2003) find that most SMEs use the Internet only for the purpose of gathering of business information and product search. Dholakia and Kshetri (2004) examined Internet adoption using a three-stage model – pre-adoption, adoption (web site ownership) and routinization (use web for e-commerce applications). Their study demonstrates that while about 51% of SMEs owns business websites only about 15% of SMEs sells on the Internet. Houghton and Winklhofer (2004) point out, that although website adoption within SMEs is widespread, the number offering e-commerce activities is still declining or static

According to a report from the Gale Group (2005), a leader of e-research, 60% of the firms selling directly online reported an average 45% increase in Internet sales from
2003 to 2004 and three out of four of them are expected to increase Internet sales again this year. However, the same report reveals that, although nearly all firms have a Web presence today, many, particularly SMEs, are still not selling over the Internet. Examining factors that drive some SMEs to adopt ODSC while leaves others unaffected by the potential benefits from ODSC will be useful for both business managers and researchers.

Despite the contribution of SMEs to an economy and the potential impact of e-commerce on SMEs, attention to SMEs’ use of e-commerce technologies are underrepresented in existing innovation adoption and diffusion studies. Further, most of the existing studies in the literature on SMEs’ use of e-commerce are conceptual papers or case studies; quantitative empirical studies which establish prediction models for e-commerce adoption among SMEs are lacking (To and Ngai, 2006). This paper intends to bridge the gap. Building upon, and synthesizing, major existing IT adoption and diffusion theories, I propose that DO factors, including relative advantage and ease of use, DE factors, including risk tolerance, resource availability, and expertise in the Internet, and an important DC factor, competitive pressure, significantly impact, directly or indirectly, an SME’s intention to adopt (for those that have not adopted) or continue to use (for those that have already adopted) ODSC. To test the model of ODSC adoption by SMEs, I developed and administered a survey to SMEs in a Midwestern state of the United States. Structural Equation Modeling (SEM) is used to analyze the goodness of fit of the model. Other parameters are also analyzed to test a series of hypotheses in the model.
1.4 Research Objectives

The main objectives of this study are:

1. To examine the overall level of adoption and usage of ODSC among SMEs in the US.

2. To propose a theoretical classification model of factors affecting IS adoption. The model suggests that IS adoption factors can be classified in three categories: decision entity (DE) factors, decision object (DO) factors, and decision context (DC) factors. The model is not merely useful for the classification of existing factors identified in the literature, but also helpful in identifying factors in future IS adoption studies.

3. To propose and empirically test a behavioral model of ODSC adoption by SMEs, which is an operationalized case of the classification framework. The model identifies three DE factors, expertise, resource slack, and risk propensity, two DO factors, perceived relative advantage and perceived ease of use, and one DC factor, competitive pressure, that affect the adoption of ODSC among SMEs.

4. To discuss the managerial implications of findings of the research

1.5 Implications of the study

This study contributes to the IT adoption literature in the following ways: first, the classification model provides a simple but robust framework for categorizing existing
factors identified in previous IS adoption studies. It will also be useful for guiding the identification of new factors in future IS adoption studies. Second, the research model on the adoption of ODSC by SMEs, which is proposed and empirically tested in this study, will not only enhance our knowledge of the pattern of SMEs’ adoption of ODSC, but also improve our understanding of SMEs’ adoption and use of IS innovations in general. Most influential frameworks for technology adoption and diffusion, such as the Technology Acceptance Model (TAM), UTAUT, and IDT, tend to emphasize primarily on technology factors (or DO factors) and are commonly used in explaining individual adoption of technologies. The model of ODSC adoption by SMEs contributes to the literature by incorporates adoption factors in all the three adoption dimensions, DE, DO and DC; also, it focuses on organizational adoption behavior. Third, the measures that I have adapted from other studies or developed and validated for this study may be useful for future studies of adoption and diffusion of IS innovation, particularly the adoption of Internet related technologies.

This study has significant implications for practice as well. The examination of ODSC adoption among SMEs provides empirical evidence regarding what drive the adoption and use of ODSC among SMEs, which in turn, will help facilitate better decision-making by managers of electronic market service providers, e-commerce system developers, and policy-makers of relevant governmental agencies to simulate the use of ODSC among SMEs. The study will also enhance SMEs’ knowledge of what other SMEs are thinking about and doing with ODSC, which will eventually influence their own decision in the future on the use of ODSC.
2. Literature Review

2.1 Theory Development

2.1.1 Adoption Factor Classification Model

In the past two decades, IS researchers studying the adoption and diffusion of information technologies have proposed dozens of adoption factors. The co-existence of an overwhelmingly large number of factors in multiple influential theories without a common structure has limited the usefulness of innovation adoption research. Some researchers have realized the problem and attempted to categorize those factors. For example, Lefebvre and Lefebvre (1996) classified their adoption factors into two types: internal factors and external factors. Wang and Cheung (2004) categorize the Internet adoption factors that they identify into three categories: environmental factors, organizational factors, and managerial factors. Damanpour (1991) indicates that organizational innovation is subject to influences by three categories factors, including the individual, organizational, and environmental factors. While those categorization schemes somehow help organize the factors the researchers identify for a particular study, most of them are not able to conveniently cover all factors proposed in the literature.

But the Paradigm of the Adoption of an Innovation by an Individual within a Social System, which was proposed by Rogers (1962, p306), encompasses a robust adoption factor classification model. The paradigm states that the adoption of an
innovation by an individual contains three divisions: antecedents (factors present in the situation prior to the introduction of an innovation), process (information sources as stimuli), and results (adoption or rejection of the innovation). Antecedents include factors pertaining to actor’s identity and perceptions of the situation while process covers factors related to perceived characteristics of the innovation (figure 1).

Figure 1: Paradigm of The Adoption of An Innovation by an Individual Within a Social System
Source: Rogers, 1962, p306

However, Rogers’ paradigm was not intended as an adoption factor classification model. Instead, it is a complex paradigm emphasizing factors in different stages of adoption—factors prior to adoption, factors as stimuli during the adoption process of the adoption, and the consequences (accept/reject) of the adoption process.

Building upon Rogers’ paradigm discussed above, this study proposes an adoption factor classification model (figure 2), which classifies adoption factors into three dimensions: Decision Entity (DE: an individual or an organization), Decision Object (DO: the information technology to be adopted), and Decision Context (DO: the
situation where a decision is made). An innovation adoption process is essentially a
decision-making process. The outcome of such a process is a decision (to adopt or not to
adopt), which is made by a DE on a specific DO in a particular DC. Factors in any of the
three dimensions, the DE, DO, and DC, may impact the adoption decision that the DE
makes.

Figure 2: Adoption Factor Classification Model
DE: Decision Entity
DO: Decision Object
DC: Decision Context

While acknowledging heavy credit to Rogers’ paradigm, the adoption factor
classification model proposed in this study has the following original contributions.

• First, Rogers’ paradigm emphasizes the overall stages and sequence of adoption,
  but my classification model is intended primarily to establish a classification
  model that is simple but robust enough to embrace the adoption factors identified
  in the past few decades. While Rogers clearly classified Actor’s Identity and
  Perception of the Situation as Antecedents (factors presence prior to the
introduction of the innovation), and Perceived Characteristics of the Innovation as the Process factors, I would argue that such sequence among those factors do not necessarily exist. A decision entity (individual or organization) is more likely to make an adoption decision by simultaneously taking into consideration its own attributes (DE factors), the attributes of the technology (DO factors) and the context formed by different players such as competitors, distributors, and customers (DC factors).

- While Rogers’ paradigm is limited to the adoption of an innovation by an individual, the classification model proposed in the present study intends to extend Rogers’ paradigm to the adoption of innovations by organizations. Factors related to the organization’s adoption of innovation, such as DE factors like firm size, industry, resources, organizational expertise, organizational risk propensity, DC factors like reseller influence, competitor pressure, customer pressure, are now all important parts of the model.

- Finally, Rogers' paradigm is purely theoretical. In Rogers' own words, he proposed the theoretical paradigm simply in hope of stimulating future researchers to "give greater attention to the basic theoretical framework upon which future diffusion research might be designed" (p307). The present study contributes to Rogers' theory by providing it with empirical evidence.

2.1.1.1 Decision Object

“What the technology offers determines an organization’s intention to use it”
Attributes of the decision object, or the technology under consideration for adoption, undoubtedly determine whether a decision entity, either an individual or an organization, will adopt and use it. Commonly discussed attributes of the decision object include usefulness, ease of use, relative advantage, risks, security, cost, and so on. Although in many studies, such attributes are measured via the DE’s perceptions, the focus of them is still on the DO.

Multiple DOs may fall in a class of DOs. For example, if we treat cell phone or Bluetooth as a DO in an adoption decision, then wireless technologies is the class they fall in. Being a DO or a class is relative. Wireless technologies, for instance, can also be treated as a DO, which is in the class of telecommunication technologies. DOs in the same class are likely to have some attributes in common and thus they may share similar sets of adoption factors.

In an IS adoption study, researchers need to decide precisely what is the decision object. Once the DO (a technology or a group of technologies) is determined, only attributes of the DO (not of its class or another technology in the same class) should be examined. For instance, if online payment systems are the decision object, then attributes of online ordering systems should not be included in the study, though both of them are e-commerce technologies.

2.1.1.2 Decision Entity

“What an organization is determines what it does”
Decision entity (DE) refers to an individual or an organization that is faced with an innovation adoption decision. Given the same situation, DEs different in terms of industry, age, firm size, expertise, experience, resources, attitude toward the DO (AjKahneman and Tversky, 1979; Ajzen, 1991; Fishbein and Ajzen, 1975), risk propensity, innovativeness, leadership, globalization orientation, and so on may make totally different adoption decisions on the same technology.

2.1.1.3 Decision Context

“The situation where an organization is in determines what it does”

The decision context (DC) in this study refers to the situation in which an adoption decision is made. To be more specific, it is a context or situation shaped by the convergent influences of different players, which encourage or discourage a DE to make a specific adoption decision. DC overlaps heavily with a commonly used term, “environment.” I use DC in this study because I believe it clearly emphasizes the situation shaped by decision-relevant factors; yet “environment” is a more generic term that denotes all factors, whether relevant to the decision or not. The common factors that shape an organization’s adoption decision context include institutional influence, competitive pressure, and pressure from various business partners in a value chain, such as the suppliers, resellers, and customers.

2.1.1.4 Influence of Decision Object, Entity, and Context Factors on Adoption
In any given adoption setting, a different set of DE, DO, and DC factors influences the adoption of the given technology (figure 2). That is consistent with existing propositions in the literature that the nature and importance of antecedents of adoption are expected to vary across different adoption settings (Rogers, 1995; Plouffe, Hulland, and Vandenbosch, 2001). Of those factors, most of them fall purely in one of the three dimensions while occasionally some factors may be the result of interaction of two dimensions. For instance, job relevance, a factor proposed by Venkatesh et al. (2003), is the interaction of DE and DO attributes.

2.2 The Classification Model and Existing IS Adoption Theories

The Adoption Factor Classification Model (AFCM) is a simple but comprehensive classification framework that builds upon, synthesizes, and covers factors of existing technology adoption and diffusion theories. The following are a few examples (refer to table 1):
Theory of Reasoned Actions and Theory of Planned Behavior: Theory of Reasoned Actions (TRA) focuses on the impact of a DE factor, attitude, and a DC factor, subjective norm, on the DE’s behavioral intention to adopt the DO (Fishbein and Ajzen, 1975). Attitude toward the behavior is defined as the individual's positive or negative feelings about performing a behavior. It is determined through an assessment of one's beliefs regarding the consequences arising from a behavior and an evaluation of the desirability of these consequences. Formally, overall attitude can be assessed as the sum of the individual consequence x desirability assessments for all expected consequences of the behavior. Subjective norm is defined as an individual's perception of whether people important to the individual think the behavior should be performed. The contribution of the opinion of any given referent is weighted by the motivation that an individual has to comply with the wishes of that referent. Hence, overall subjective norm can be expressed as the sum of the individual perception x motivation assessments for all relevant referents. Ajzen (1991) extended TRA and proposed the theory of planned behavior (TPB) by introducing an additional factor, behavior control, to the model, which refers to the DE's perception of the difficulty of performing a behavior. Behavior control is a factor that can potentially stem from attributes of each of the three elements, DE, DO, and DC. Exploring the effect of relevant attributes of each of the three elements can yield more detailed information. For instance, a DE’s perception of behavior control may be linked to the DE’s personality, the effect of DC, or directly to the difficulty level of the DO. Overall, Both TRA and TPB emphasize the importance of DE and DC but downplays the importance of DO attributes in the intention toward DO.
Technology Acceptance Model: Technology Acceptance Model (TAM) is among the most influential models of adoption of IT innovations. It is essentially the adaptation of Theory of Reasoned Actions to be used in the IS field. TAM maintains that two DO factors, perceived usefulness and perceived ease of use, are the direct determinants of user behavioral intention to adopt a system, which is a mediator to actual adoption of the system (Davis, 1989). Perceived usefulness is also directly affected by perceived ease of use. While the two key constructs, perceived usefulness and perceived ease of use, proposed in TAM have been repeatedly validated in a series of empirical studies, the model has its limitation while explaining the adoption of specific technologies in specific situations. Thus, many attempts have been made to extend the model to fit in different technologies and different situations, by introducing factors from related models, by introducing additional or alternative belief factors, or by examining antecedents and moderators of perceived usefulness and perceived ease of use (Wixom and Todd, 2005).

In 2000, Venkatesh and Davis published their TAM2 in *Management Science*. TAM2 extended TAM by including social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) as determinants of perceived usefulness.

UTAUT: The Unified Theory of Acceptance and Use of Technology (UTAUT) was published by Venkatesh, Morris, Davis, and Davis (2003). The model holds that performance expectancy, effort expectancy, social influence, and facilitating conditions are key determinants of user behavioral intention to accept technology, and age, gender, experience, and voluntariness of use are moderators of those relationships. The UTAUT aims to explain user intentions to use an IS and subsequent usage behavior. The theory
maintains that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behaviour (Venkatesh et. al., 2003). Gender, age, experience, and voluntariness of use are posited to mediate the impact of the four key constructs on usage intention and behavior (Venkatesh et. al., 2003). The theory is developed through a review and consolidation of the constructs of eight models that earlier research had employed to explain IS usage behavior (theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of planned behavior/technology acceptance model, model of PC utilization, innovation diffusion theory, and social cognitive theory). Subsequent validation of UTAUT in a longitudinal study found it to account for 70% of the variance in usage intention (Venkatesh et. al., 2003).

Motivational Model: Based on Motivational Theory (Davis, Bagozzi, and Warshaw, 1992), the DE’s motivation, including extrinsic motivation and intrinsic motivation, drive the DE’s use of computer technologies. Extrinsic motivation is a motivation where performing a specific activity (for instance, the use of computers) is for some external motives, such as increased job performance, pay raise, or promotion. On the other hand, intrinsic motivation is a motivation in which one performs an activity simply because of the activity itself, such as the individual’s enjoyment in the activity.

Innovation Diffusion Theory: Innovation Diffusion Theory (IDT) segregates individuals into five categories in terms of their individual innovativeness and earliness in the adoption of a technology: innovators, early adopters, early majority, late majority, laggards (Rogers, 1995). It also proposes five factors of adoption of an innovation, all of which are essentially DO attributes: relative advantage, compatibility, trialability,
observability, and complexity (Rogers, 1995). Moore and Benbasat (1991) applied IDT to an IS context. They added some DO attributes, such as image and voluntariness, to Roger’s IDT theory and developed an eight-factor model on IS innovation adoption, which articulates that voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability are the key determinants of the adoption of computer technologies.

Social Cognitive Theory and Self-Efficacy Theory: Social cognitive theory provides a framework of relationships between an individual (the DE), the environment (the DC), and human behavior. The theory identifies human behavior as an interaction of personal factors (e.g., demographic factors, cognitive factors, and other personal factors), environment (such as social pressures and particular situational characteristics) and behavior (Bandura 1977). An individual chooses an environment and is influenced by the environment. Behavior in a given situation is affected by the environment and in turn affect environment. Behavior is affected by personal factors and at the same time affects those factors. Compeau and Higgins (1995) applied social cognitive theory to the context of computer utilization. They hypothesized and tested a series of relationships between environmental factors (others’ encouragement, others’ use, and others’ support), personal factors (computer self-efficacy and outcome expectations) and behavior (affect, anxiety, and usage).

Model of PC Utilization: Thompson and Higgins (1991) adapted the theory of interpersonal behavior proposed by Triandis (1980) to the context of PC use by knowledge workers in optional use environment. This theory suggests that perceived consequences (complexity, job fit, and long-term consequences), affect, social factors,
facilitating conditions, are the primary determinants of utilization of personal computers.

All those factors fall in the three dimensions of the classification model proposed in this study.
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Table 1: The Classification Model & IS Adoption Theories
The major IS theories that are discussed above identify a variety of factors affecting the adoption of IS innovation, either from an individual or an organization’s perspective. Each theory emphasizes factors of specific dimensions of the classification model while neglects those of others. The classification model proposed in this study can help synthesize multiple theories and establish a holistic view of adoption of a particular technology.

2.3 Review of Studies on SMEs’ Adoption of E-commerce

Extant research in e-commerce adoption among SMEs has formed a foundation for the research model I propose on the adoption of ODSC. As early as 1995, Iacovou, Izak, and Dexter proposed and tested a framework of EDI (electronic data interchange) adoption by small businesses, which identified three major factors that influence the EDI adoption practices of small firms. These factors include a DE factor, organizational readiness, which is related to the low levels of IT sophistication and resource availability of small firms, a DC factor, external pressures to adopt, which is associated with the weak market positions of small firms and the network nature of the technology, and a DO factor, perceived benefits, which concerns the limited impact of IT on small firms due to under-utilization and lack of integration.

Dandridge and Levenburg (2000) investigated the Internet use by 195 US micro enterprises (firms with fewer than 25 employees) and found that several DE factors, including firm size, intentions for growth in the next six months, including sales change, employment change and export plans influence those firms’ use of the Internet.
Based on multiple-case research, Levy, Powell, and Yetton (2001) developed and tested a model of strategic information systems (IS) investment in small and medium-sized enterprises (SMEs), which reveals that IS investment of an SMEs is a function of its strategic context, which consists of its strategic focus (cost reduction versus value added), and its market positioning (few versus many customers), both of which are essentially DE factors emphasizing the characteristics of an SME.

Sadowski, Maitland, and van Dongen (2002) applied a modified strategic use model to examine the extent of strategic use, which refers to the ability of businesses to recognize the strategic elements in the use of the Internet and then relate them to network formation in the specific user environment. The authors proposed that the extent of strategic use of the Internet by SMEs is linked to a DE factor, communication requirements, a DC factor, competitive pressure and a mixture of DE and DO factor, the support and incentives in the adoption process. Their empirical analysis based on data from 264 Dutch SMEs suggested that while the communication requirements have driven SMEs to adopt the Internet, other strategic determinants proposed, such as competitive pressure or support and incentives for adoption, hardly affects SMEs in their adoption of the Internet. Daniel and Grimshaw (2002) found that the use of e-commerce for responding to competitors (a DC factor), enhancing customer services, and improving relations with suppliers (a DO oriented factor) was driving the uptake by smaller businesses to a greater extent than by their larger counterparts. They also demonstrated that SMEs believed that they had achieved greater benefits from their e-commerce services than had the larger firms.
Based on the innovation adoption, organizations, and information systems (IS) implementation literature, Pflughoefl, Ramamurthy, Soofi, Yasai-Ardekani and Zahedi (2003) developed three models—partial-mediator, reduced partial-mediator, and mediator—on the relationships between “context-IT-use-benefit” (CIUB). These models propose that the extent of Web use by small businesses is driven primarily by organizations’ contextual characteristics and their IT infrastructure, all of which are essentially DE factors. Levy, M. and Powell (2003) conducted a case study of twelve SME cases, which indicates that SMEs’ recognition of the business value of the Internet (DO factor) and their attitude to business growth (DE factor) are key factors in determining Internet adoption strategies. Stunsfield and Granl (2003) identify three major factors affecting adoption of networked processes, which include a DO factor, perceived benefits, a De factor, organizational readiness and a DC factor, external pressure.

Based on data from 94 SMEs, Karakaya and Khalil (2004) found that three DE factors, namely company size, financial condition, and technological readiness, influence Internet adoption within SMEs. Built upon the technology acceptance model and other relevant research in the area, Grandon and Pearson (2004) find that four factors, a DE factor, organizational readiness, a DC factor, external pressure, and two DO factors, perceived ease of use, and perceived usefulness, influence electronic commerce adoption among SMEs.

A recent study (Levy, Powell, and Worrall, 2005) reveals that a DE factor, strategic intent, affects decisions on e-business investment among SMES. Those SMEs remaining in their existing markets are the least likely to invest e-commerce, because
Internet is not perceived as necessary for business growth. The study also demonstrated that product innovation rather than market penetration drives e-business.

Lately, To and Ngai (2006) proposed and empirically tested using survey data a prediction model on adoption of online retailing. The study revealed that a DO factor, relative advantage, two DC factors, competitive pressure and channel conflict and a DE factor, technical resource competence, are the key factors that affect an organization’s adoption of e-tailing. Using focus group methodology, Al-Qirim (2006) studied technological innovation factors affecting e-commerce adoption in small businesses (SMEs) in New Zealand. The study indicated that SMEs tend not to invest their scant resources on perceived risky advanced e-commerce initiatives. While DO factors like cost and compatibility were found not to hinder SMEs’ adoption of simple e-commerce technologies such as Web pages and e-mail, those factors have more significant effect on SMEs’ advancing e-commerce initiatives, such as adopting full-blown and interactive Websites.

2.4 Model of Determinants of ODSC Adoption by SMEs

Based on the literature I have reviewed above and the characteristics of ODSC, I propose that DE factors, including perceived relative advantage and perceived ease of use, DO factors, including resource slack, expertise, and risk propensity, and a DC factor, competitive pressure, will influence SMEs’ intention to adopt or continue to use ODSC.
2.4.1 DE Factors

Drawn upon earlier studies (Damanpour, 1987; Kim. 1980; Kimberly & Evanisko. 1981). Damanpour (1991) pointed out that organizational variables have been the most widely studied, and in many cases it pointed to the primary importance as determinants of innovation.

While studying the relationships between organization attributes, Ein-Dor and Segev, E. (1978) categorized organizational variables into three broad categories: 1) controllable variables, which include variables about size of organizations such as annual sales, work force, assets and market share, and Extra-organizational situation variables such as availability of trained manpower, availability of hardware, availability of software, and availability of decision techniques; 2) partially controllable variables, which include the psychological climate variables such as attitudes to information systems, perceptions of information systems, expectations from information systems and organizational resource variables such as size of budget and liquidity; 3) fully controllable variables such as responsible executive. In this study, I focus on the examination of the impact of three DE factors, expertise, resource slack, and risk, on SMEs’ behavioral intention to embrace ODSC.

2.4.1.1 Resource Slack

An organization’s resources include financial abilities, personnel competences, technical infrastructure, and so on, which are required to adopt and implement a particular
technology. The availability and flexibility of such resources points to the affordability of the organization in terms of money, hardware, software, and so on, to use the technology and thus will directly affect the organization’s intention to adopt the technology. As Rossner (1968: 615) put it, slack resources enable an organization to afford to explore new ideas in advance of an actual need, purchase innovations, bear the costs for innovations assimilation and absorb costs of failures.

Research has empirically demonstrated the relationship between slack resources and behavioral intention to adopt IS innovations. For instance, Damanpour (1991) finds that resource slack is positively associated to innovation adoption. Cragg and King’s study (1993) also reveals that an organization’s resources sufficiency impacts its IT related technology adoption.

Compared with larger organizations, SMEs have limited resources and thus resource availability and sufficiency will play an even more important role in innovation adoption. Resource slack results in expertise adequacy, which in turn, impacts the perception of an ease of use, a factor commonly believed to affect the adoption and use of information systems among SMEs (Cragg and King, 1993). Lee (2004) also finds direct relationship between an SME’s financial slack and its adoption of Internet technologies.

Based on the above analysis, I posit:

**Hypothesis 1a:** Resource slack will positively affect an SME’s perceived ease of use of ODSC.
Hypothesis 1b: Resource slack will positively affect an SME’s behavioral intention to adopt or continue to use ODSC.

2.4.1.2 Expertise

An organization’s knowledge about e-business or about information systems in general impacts its adoption of computer related technologies (Dubelaar, Sohal, and Savic, 2005). Numerous studies in the literature have linked knowledge and expertise to the adoption of innovations. For instance, a study conducted by Lucchetti and Sterlacchini (2004) indicates that a highly educated workforce is a key factor affecting the adoption of information and communication technologies. Dewar and Dutton (1986) find that technical knowledge is positively associated to innovation adoption: the greater the technical knowledge resources, the more easily can an organization rapidly capture new technical ideas and formulate procedures for their development and implementation.

Some recent studies have also found positive relationship between knowledge or expertise and e-commerce adoption among SMEs. Teo and Ranganathan (2004) demonstrate that SMEs tend to have difficulty developing expertise among their staff in e-commerce, which affects their adoption of e-commerce. Olson and Boyer (2003) reveals that education level of and annual training received by employees, both closely related to the knowledge or expertise of a small organization, impact its adoption of Internet purchasing.

Based on the above analysis and our belief that an SME’s employees’ level of expertise in the Internet may affect the its sensitivity and interest in the ODSC, I posit:
Hypothesis 2: Perceived expertise in the Internet positively affects an SME’s perceived ease of use of the online direct sales channel.

2.4.1.3 Risk Propensity

Risks have been a key concern for many Internet users, organizations as well as individuals. E-commerce must deal with security and privacy related data, such as customer data, commercial and payment transaction data, thus a sense of risk may somehow exist in every DE when they use e-commerce.

However, what affects a DE’s ODSC adoption decision may lie less in how much risks it perceive than in how tolerant it is to risks. While a risk-averse decision entity always prefers a riskless alternative to a risky alternative with the same expected utility value (Nau, 2003), a less risk-averse decision entity may not be affected as much by risks in their adoption decision.

Therefore, in this study I hypothesize that risk propensity will affect, both directly and indirectly, the adoption of ODSC among SMEs.

Hypothesis 3a: An SME’s risk propensity will positively affect its perception of relative advantage of the ODSC.

Hypothesis 3b: An SME’s risk propensity will positively affect its perceived ease of use the ODSC.
Hypothesis 3c: An SME’s risk propensity will positively affect its intention to adopt the ODSC.

2.4.2 DO Factors

2.4.2.1 Perceived Relative Advantages

Value oriented constructs, such as perceived usefulness (Davis, 1989), performance expectancy (Venkatesh et al., 2003), perceived economic values, relative advantage (Rogers, 1995), refer to the perception of current and future advantages, values, or benefits that a technology is likely to bring to an organization. The creation of true economic value, according to Porter (2001), refers to more than the physical products. It also refers to other attributes associated with the products and the servicing of the product. The most important attributes include quality, efficiency, and flexibility. A SME can achieve sustained competitive advantage only if it delivers superior outputs, because outputs are the primary source for generating future streams of economic returns and for sustained competitive advantage (Lado & Wilson 1995).

Relative advantage, a driver of adoption of many types of innovations, is described as “the degree to which an innovation is perceived as being better than the idea it supersedes” (Rogers, 1983, p. 213). It can be reflected in savings of time and effort, economic benefits, and decreases in discomfort and so on (Cragg and King, 1993).
Technologies create values; for e-business, such values are created by the ways in which transactions are enabled: efficiency, complementarities, lock-in, and novelty, and so on (Amit and Zott, 2001). Technology is rarely only for technology’s sake. E-commerce initiative is always business-driven not technology-led (Porter, 2001; Tang et al, 2003). Adopting E-commerce by simply reacting to emerging technological opportunities without a focus on the added value as the basis of strategy will not help a business achieve competitive advantages (Tang et al, 2003). That is the reason why real business values rather than the technical functionality, tend to be the focal point in SMEs’ decisions on e-business adoption.

The purpose of adopting an innovation is generally to improve the effectiveness and performance of the organization (Damanpour, 1991). Value-related constructs have been consistently tested to be positively related to SMEs’ adoption of technologies. For instance, Thatcher, (2002) found that practical business considerations, such as profitability and cost savings are the principal drivers behind B2B E-commerce adoption. Cragg and King (1993) suggested that an SME’s value proposition of a technology determines its intention to adopt it. Based on a survey among SMEs in the US, Lee (2004) found direct relationship between the relative advantage of IT use and the adoption of Internet technologies. With the above analysis, I posit,

*Hypothesis 4: Perceived channel advantage positively affects an SME’s intention to adopt or continue to use the ODSC.*
2.4.2.2 Perceived Ease of Use

Perceived ease of use (PEOU) refers to how hard a decision entity is willing to try and how much of an effort it is planning to exert in order to perform the behavior (Davis, 1989). Since perceived ease of use is proposed in the technology acceptance model (Davis 1989), an influential IS adoption theory, as a key determinant of IS adoption, it has been well examined in many studies. While research has consistently demonstrated that the other key determinant of IS adoption proposed in TAM, perceived usefulness, affects behavioral intention, it has mostly failed to do so regarding perceived ease of use (Gefen and Straub, 2000). Latest studies (e.g., Lee, 2004; Yu, Ha, Choi, and Rho, 2005; Mollenkopf, Rabinovich, Laseter, and Boyer, 2007) have mostly demonstrated that ease of use or effort construct has an indirect effect on behavioral intention, mediated by perceived usefulness or relative advantage. Based on this, I posit,

*Hypothesis 5: Perceived ease of use positively affects an SME’s perception of relative advantage of the ODSC.*

2.4.3 DC Factors

The decision context (DC) refers to the context or situation in which an adoption decision is made. In particular, the present study refers to it as an situation shaped by the influence of different players (e.g., customers, suppliers, business partners, and rivals), who (or whose activities) encourages or discourages an organization to make a specific adoption choice. The common influences that shape an organization’s adoption context include
governmental influences (e.g., tax incentives), institutional influence, competitive pressure, and pressure from various business partners in a value chain, such as the suppliers, resellers, and customers.

Abrahamson and Rosenkopf (1993) describes two common cited pressures, institutional pressure and competitive pressure, as “bandwagon pressure”:

“The sheer number of organizations adopting an innovation can cause a bandwagon pressure, prompting other organizations to adopt this innovation. Institutional pressure occur because nonadopters fear appearing different from many adopters. Competitive bandwagon pressures occur because many nonadopters fear below-average performance if many competitors profit from adopting.”

Institutional pressure is related to DE’s pursuit for “legitimacy” (DiMaggio and Powell, 1983). Institutional theorists have found that innovation adoption may not necessarily be totally benefit-driven; instead, it may just be the result of pursuit of conformity with a firm’s social and relational environment (DiMaggio and Powell, 1983). Through the pursuit of alikeness, or “Mimetic Isomorphism” (DiMaggio and Powell, 1983), an organization may choose or be compelled to adopt a technology that others in the institution (or community) have adopted. While institutional pressure, which is concerned with the influence of what other SMEs are doing with e-commerce, may affect an SME’s adoption of Internet related technologies, competitive pressures appears to be the factor that ultimately shapes the decision context of ODSC adoption among SMEs.
2.4.3.1 Perceived Competitive Pressure

A firm can either proactively adopt a new technology to establish competitive advantage or reactively adopt it under certain pressures (Beach, 2004). Proactive approach is associated with a firm’s strategic and tactical objectives and thus is more likely to contribute to a SME’s sustained competitive advantage. However, e-commerce adoption among SMEs appears to be driven more by reactive factors such as competitors’ pressure or pressure from more technologically advanced and commercially powerful customers. As Santarelli and D’Altri (2003) states it, when it comes to the adoption of Internet related technologies, SMEs tend to follow a “wait-and-see” attitude, and mostly focuses on the implementation of a defensive strategy; that is if the decision context does not exert sufficient pressure, they simply live without e-commerce. When the decision context exerts adequate pressures, SMEs will adopt e-commerce, not in order to gain competitive advantage but in order to compete effectively (Cragg and King, 1993). A study conducted by Clegg (2001) indicates that the majority of SMEs appear to be reactive in terms of e-commerce adoption.

Competitive pressure is the pressure on an organization arising from the threat of losing its competitive advantage (Abrahamson and Rosenkopf, 1993). Extant adoption literature has repeatedly found competitive pressure to be the driver behind SMEs’ adoption of Internet related technologies. For instance, Dubelaar, Sohal, and Savic (2005) find that an SME’s decision regarding adoption of e-business related technologies are influenced by its competitors’ activities. Barnes, Hinton, and Mieczkowska (2003)
suggest that e-commerce adoption and investments are driven mainly by a fear of being
left behind by competitors rather than by a desire to improve business process
performance. Zhu et al, (2004) also suggests that pressure from competitors could force a
SME to adopt E-commerce.

Dholakia and Kshetri (2004) had an empirical investigation on the factors that
impact small and medium enterprises (SMEs') involvement with the Internet, in terms of
ownership of a web site and use of the Internet for selling purposes. The study
demonstrates that competitive pressure influences both stages of Internet adoption.
Caskey, Hunt, and Browne (2001) reveal that competition from new e-businesses as well
as existing businesses is one of the key driving forces for SMEs in the food industry to
invest in e-business.

Competitive pressure can directly affect SMEs’ intention to embrace ODSC; it
may also indirectly impact SMEs’ intention through the mediation of perceived relative
advantage. The reasoning for the indirect effect is: when a serious competitive pressure
exists, an SME will view ODSC useful in gaining or maintaining its competitiveness, and
thus intends to adopt it. On the other hand, if no or little competitive pressure exists, then
the SME will see ODSC as not necessary (or useful) in gaining or maintaining its
competitiveness; that is, without competitive pressure, it is going to do fine with or
without ODSC; then why bother? Based on the above analyses, I posit:

*Hypothesis 6a: Perceived competitive pressure positively affects an SME’s
perception of relative advantage of the ODSC.*
Hypothesis 6b: Perceived competitive pressure positively affects an SME’s intention to adopt or continue to use the ODSC.

Summarizing the hypotheses formulated above, I propose a research model on adoption of ODSC by SMEs (figure 3).

![Diagram](image)

Figure 3: Model of Determinants of ODSC Adoption or Continual Use by SMEs
3. Research Methods

A web survey will be used to collect data for this study. The reasons for choosing web survey are threefold: first, compared with other forms of survey, such as mail survey, it is less expensive. Second, it is an increasingly important data collection mechanism with demonstrated effectiveness. For instance, Andrews, Nonnecke, and Preece (2003) show that web surveys are superior to email surveys in many aspects; while combined with email and offline media, they argued, web survey is an even more effective vehicle for data collection. Finally, web surveying has grown mature. Commercial web surveying software with sophisticated skip logics capable of handling complex survey questionnaires is readily available. Web surveying guidelines are abundant in the research methodology literature, which help researchers maximize the strength and minimize the weaknesses of a web survey.
Figure 4: An overview of phases of the Study.
3.1 Instrument Development

My development of the measurement instrument follows a procedure adapted from Churchill’s “procedure for developing better measures” (1979). My procedure includes two broad stages: Instrument creation & refinement and Pilot study (figure 4). The instrument creation and refinement consists of four sub-stages: Specifying construct domains and dimensions, generating item pool under dimensions, purifying survey items, pre-testing and revision of the online version of the instrument. The pilot stage includes the pilot study and the revision of the instrument based on feedback from the pilot study.

3.1.1 Instrument Creation and Refinement

3.1.1.1 Specifying Construct Domain & Dimensions

I conduct an expensive review of e-commerce literature, literature of IS innovation adoption and diffusion, and literature related to SME’s use of innovations to determine the constructs that need to be included in the research model. The review reveals that perceived usefulness and relative advantage, ease of use, competitive pressure, resource slack, knowledge/education/expertise of employees, and the risk propensity of SMEs are the key constructs that impact SME’s adoption of IS innovation, in particular, e-commerce related technologies. In-depth literature review also allows me to identify the major dimensions of each construct, which form the basis for the generation of survey question items.
3.1.1.2 Generating Item Pool under Dimensions

Initial survey questions are developed based on the findings of the literature review. A pool of questions for each construct is generated based on the dimensions of the construct. In order to increase the validity of the measurement instrument, some of the questions are adapted directly from survey questionnaires in earlier studies. For instance, the behavioral intention scales are adapted from Davis et al.’s TAM study (1989).

3.1.1.3 Purifying Survey Items

After the initial survey questionnaire is developed, a multi-stage guideline proposed by Andrews, Nonnecke, and Preece (2003) is followed to refine the instrument. The guideline includes four stages: Stage 1 involves a thorough review by knowledgeable experts to ensure question completeness, efficiency, relevancy, and format appropriateness. In Stage 2 involves a pre-test, which helps to ensure wording comprehensibility, interpretation consistency, logical sequencing, and overall positive impression from the look and feel of the survey. Stage 3 consists of a small pilot study that emulates all the procedures proposed by the main study. In stage 4, researchers conduct one last check using people who have no connection to the survey. The objective is to catch typos and errors that may have been inadvertently introduced during the last revision process.

In my study, I first conduct a series of expert reviews involved nine knowledgeable experts from different areas related to the survey questions. The major goal is to ensure the content validity of the survey questionnaire. Those experts include:
• Two Information Systems professors specialized in technology adoption

• One Operations Management professor specialized in decision theory

• One Marketing professor specialized in online marketing

• One general management professor

• Two small business experts—a director and a senior researcher from a Small Business Development Center, both of whom have extensive experience working with small and medium-sized enterprises

• Two doctoral students majored in information systems

The experts are asked to examine each question of the survey carefully and provide a critique of its content relevancy, wording, and structure. They are also asked to provide feedbacks on the survey as a whole regarding the completeness of its contents, order of question items, and its overall structure. The whole review and iteration process lasted five months from May to October 2006, in which a total of 24 discussion sessions were held and a total of 49 revisions of the questionnaires were generated until the final version is finalized for a pilot study.

3.1.1.4 Structure and Contents of Survey Questionnaire

The resulted survey questionnaire is comprised of three sub-questionnaires, which are intended for three different types of SMEs:
• Questionnaire A: for SMEs that have never sold their products or/and services on the Internet

• Questionnaire B: for SMEs that sold on the Internet in the past but has currently abandoned the online sales channel

• Questionnaire C: for SMEs that are currently selling their products or/and services on the Internet.

The three sub-questionnaires include slightly differently formatted (e.g. using different tenses while necessary) question items for the same constructs, which include behavioral intention to embrace ODSC, perceived relative advantage, perceived ease of use, perceived competitive pressure, resource slack, expertise, and risk propensity. To reduce participants’ effort and frustration level and ensure completion rate, I generally place questions under the same constructs together. However, in order to prevent participants from responding to the same block of questions with the same or similar answers, I intentionally shuffle some questions across constructs or reverse-score some scales. Also, to verify consistencies of the participants’ responses, I intentionally embed some redundant questions in the survey.

The survey is conducted on Websurveyor, an enterprise-level online data collection system. At the beginning of the survey, a general section is used to cover questions shared by all the three sub-questionnaires. The section includes questions on industry, geographic distance of customers, experience and expertise in Internet, and an index question on the firm’s e-commerce profile (never sold online, sold online in the past but has abandoned the online sales channel, currently selling online). Based on the
response to the index question the survey system will take the participant to an appropriate sub-questionnaire. I also implement skip logics in the survey system to make sure that every SME sees only questions relevant to it. Irrelevant questions are skipped. For instance, if an SME indicates in an earlier question that it does not have a website of its own, then any questions about selling on its own website will be skipped.

The survey concludes with a few questions about general information of the participating SME such as its size in terms of number of employees and the year it was founded and some information about the informant, such as his/her job title and email address, which is optional and only necessary if the participating SME is willing to receive a brief summary of the study.

3.1.1.5 Pre-testing of Survey Instrument

After the questionnaire is finalized it is loaded on the Websurveyor system. In order to make sure the survey is implemented appropriately on the survey system, four people (two professors in business administrations and two IS doctoral students) are invited to test-take the survey online. They are requested to report the time it takes to finish the survey and the appropriateness of the arrangement of questions (e.g., number of questions per page); they are also requested to pay some special attention to the index logics, skip logics and submission function of the survey.

The pre-testing proves useful. The reports from the four participants provides me with information about the approximate time the survey expects to take—which is about ten to fifteen minutes. That assures me that the length of the survey is appropriate. The
pre-testing feedbacks also help me locate and fix several errors with the skip logics and improve the look of the survey by rearranging the order and clustering of some of the questions,

3.1.2 Pilot Study

Survey piloting is the process of conceptualizing and re-conceptualizing the goals of the study, which ensures that the actual survey will go smoothly and important aspects are not left out (Oppenheim, 1992, p. 64). In order to gain feedbacks from SMEs on the questionnaire prior to the general survey, I conduct a small-scale pilot study in November 2006. The contents and procedure of the pilot study is identical with the general survey carried out later on, except that, in addition to the survey questions on the research, the pilot survey questionnaire includes questions exploring participants’ comments on the questionnaire, such as their comments about the length of the survey, the time it takes to complete the survey, the relevance of the contents, and the clarity and understandability of the questions. The participants are also encouraged to suggest any other important questions that the survey fails to include.

In the pilot study, thirty SMEs are randomly selected from the clients of one Small Business Development Center (SBDC). An invitation email message is emailed to each SME in the sample. The invitation message is the same as the one used in the general survey, except that the participating SMEs are informed that it is a pilot study. One week later, a reminder email message is emailed to the same sample of firms. The pilot study
ends one week after the reminder message is sent out. The results of the pilot study reveal the following information:

- Expected response rate: The invitation email was sent to 30 possible SME contacts. Five complete surveys were received, which yields a response rate of 17%. While the small sample cannot provide a reliable prediction of the response rate of the general survey, it at least offers an estimate.

- Length of time it may take to complete the survey: according to feedback from the pilot study, it takes an average of 10.6 minutes to complete the survey questionnaire, with the maximum of 15 minutes and minimum of 5 minutes. Thus the length seems reasonable. But while asked whether they felt the length of the survey was reasonable, two of the responses said “yes.” The structure of the survey may make it appear longer. Therefore, in the revision of the questionnaire, some blocks of questions are rearranged.

- Comprehensibility of the questions: when asked whether the questions are easy to understand, Informants of two SMEs complain about the redundant questions which are intentionally included to check consistency of responses. Thus, I reword and relocate the redundant questions to make them look less redundant.

- Internal consistency reliability: duplicated questions worded slightly differently are embedded throughout the survey to check the internal consistency reliability. Close examination of the responses demonstrates consistency in responses to those questions, but statistical analysis, such as Cronbach’s Alpha, cannot be calculated until the general survey because of the small size of pilot sample.
• Content validity: When asked whether the questions are relevant to SMEs’ decisions on selling online, three-fifths said yes, one-fifth said no, one-fifth raises concerns that firms that are already selling online will have to answer irrelevant questions. As a matter of fact, our survey has several sub-surveys. For firms that are already selling online, the systems will direct them to a different set of questions. Therefore, overall, the content validity of the instrument is good.

The results from the small-scale pilot study also lead to several minor modifications of wording and order of the question items. I also dropped a few intentionally embedded redundant questions due to the complaints from the participants in the pilot study in the final questionnaire.

3.2 Data Collection

After the questionnaire is revised based on the feedbacks from the pilot study, the study enters its general survey phase, which is intended to collect data from a large sample of SMEs to test the validity and reliability of the instrument and to test the research model and associated hypotheses proposed in the study.

The major data collection procedures are:
1. First, through an Internet research, I generate a list of business organizations whose main clients or members are expected be SMEs.

2. I telephone the leadership of the organizations, usually executive director, chairperson, or president, and ask for assistance to send in their own names an email invitation message to their clients or members. I ask them to email the invitation message in hope of leveraging their influence on their members so as to enhance the response rate.

3. Then I email those who agree to help an invitation message that they must use to invite their clients to the survey. The invitation message is formulated and phrased following the guidelines proposed by Dillman (2007). It concisely articulates the focus and importance of the research and then provides a hyperlink to invite potential participants to the survey. A one-week deadline is set for the participants to complete the survey.

4. Two days later, I either telephone or email the business organizations again to check whether they have emailed the invitation message. If not, I make every effort possible to contact them again to make sure they send the invitation out.

5. One week after an organization sends out the invitation message, I email it a ready-to-send reminder email message intended to remind those SMEs that have not taken the survey to do so. The reminder message gives the participants one more week to complete the survey. A few hours later, I follow up with a phone call to the organization to confirm whether it has received my email and to request it to help send the message out.
6. Two months later, I ask the organizations to send a third reminder message to their clients. The major purpose of this reminder message is to trigger some survey responses from late respondents. Such responses will be compared with earlier Reponses to test whether non-response bias exists in the study. Non-response bias will be further discussed in a later section.

3.2.1 Sample

The sample of the study is a collection of small and medium-sized enterprises in the state of Ohio of the United States. Although it is not a national sample, the findings of the study may be able to be generated to the population of US SMEs, because Ohio SMEs seem not significantly different from the overall US SMEs, at least in terms industry and firm size distributions (refer to Table 2).
<table>
<thead>
<tr>
<th>Industry Type</th>
<th>&lt;500 Employees</th>
<th></th>
<th>&lt;100 Employees</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of Employer Firms</td>
<td>Employment</td>
<td>Percent of Employer Firms</td>
<td>Employment</td>
</tr>
<tr>
<td></td>
<td>Ohio</td>
<td>US</td>
<td>Ohio</td>
<td>US</td>
</tr>
<tr>
<td>Total</td>
<td>98.3%</td>
<td>99.7%</td>
<td>49.3%</td>
<td>50.7%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0.2%</td>
<td>0.4%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Mining</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.1%</td>
<td>0.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>12.4%</td>
<td>12.5%</td>
<td>4.0%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>6.8%</td>
<td>5.1%</td>
<td>7.4%</td>
<td>5.4%</td>
</tr>
<tr>
<td>Whole sales trade</td>
<td>5.8%</td>
<td>5.9%</td>
<td>3.0%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Retail sales trade</td>
<td>11.9%</td>
<td>12.7%</td>
<td>5.2%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Transportation and warehousing</td>
<td>2.8%</td>
<td>2.8%</td>
<td>1.2%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Information</td>
<td>0.9%</td>
<td>1.3%</td>
<td>0.5%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>4.4%</td>
<td>4.2%</td>
<td>1.6%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Real estate, and rental and leasing</td>
<td>3.6%</td>
<td>4.7%</td>
<td>1.0%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Professional, scientific, and technical services</td>
<td>10.8%</td>
<td>12.3%</td>
<td>3.3%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Management of companies and enterprises</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Admin, support, waste mgt</td>
<td>5.3%</td>
<td>5.1%</td>
<td>2.8%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Educational services</td>
<td>1.1%</td>
<td>1.2%</td>
<td>1.1%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Health care and social assistance</td>
<td>9.6%</td>
<td>9.9%</td>
<td>7.1%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Arts, entertainment, and recreation</td>
<td>1.7%</td>
<td>1.8%</td>
<td>1.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Accommodation and food services</td>
<td>7.8%</td>
<td>7.6%</td>
<td>5.3%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Other services</td>
<td>12.9%</td>
<td>11.6%</td>
<td>4.2%</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

The business organizations that help email the survey invitations to their clients or members include Ohio Small Business Development Centers (SBDCs), Chambers of Commerce, and Economic Development Centers. I intentionally choose several types of organizations rather than use only SBDCs to send the invitation message in order to obtain a less biased and more widely representative sample, since SMEs associated with different types of organizations may have different characteristics.

The Informants of the participating SMEs that complete the survey are mostly owners or high-rank employees of the firms who, I assume are knowledgeable about their firms and are likely to provide relatively reliable and accurate responses to the survey. Table 3 is a summary of the profiles of the informants who provided information about their positions.

<table>
<thead>
<tr>
<th>Position of Informants</th>
<th>Number of Informants</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>46</td>
<td>22.9%</td>
</tr>
<tr>
<td>President and CEO</td>
<td>52</td>
<td>25.9%</td>
</tr>
<tr>
<td>Vice President</td>
<td>19</td>
<td>9.5%</td>
</tr>
<tr>
<td>CIO</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>CFO</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Director</td>
<td>17</td>
<td>8.5%</td>
</tr>
<tr>
<td>Manager/Supervisor</td>
<td>26</td>
<td>12.9%</td>
</tr>
<tr>
<td>Controller</td>
<td>4</td>
<td>2.0%</td>
</tr>
<tr>
<td>Administrator</td>
<td>4</td>
<td>2.0%</td>
</tr>
<tr>
<td>Treasurer</td>
<td>2</td>
<td>1.0%</td>
</tr>
<tr>
<td>Engineer</td>
<td>8</td>
<td>4.0%</td>
</tr>
<tr>
<td>Advisor/Consultant/Analyst</td>
<td>3</td>
<td>1.5%</td>
</tr>
<tr>
<td>Secretary</td>
<td>3</td>
<td>1.5%</td>
</tr>
<tr>
<td>Sales or Customer Representative</td>
<td>9</td>
<td>4.5%</td>
</tr>
<tr>
<td>Accountant</td>
<td>2</td>
<td>1.0%</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>2.0%</td>
</tr>
<tr>
<td>Total</td>
<td>201</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 3: Profiles of Informants
The survey received a total of 213 responses. Eight of them are from non-SMEs (with more than 500 employees) and thus are dropped in further analyses. Among the remaining 205 firms, which are all SMEs, 123 have never sold on the Internet, 4 claim to have sold on the Internet in the past but have abandoned such practice, and 78 claim to be selling online currently. As a comparison, among the eight larger firms that responded, one claims to have never sold online and all of the rest seven firms claim to be selling online currently.

<table>
<thead>
<tr>
<th>Type of SMEs</th>
<th>Number of SMEs</th>
<th>SMEs Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never sold online</td>
<td>123</td>
<td>60%</td>
</tr>
<tr>
<td>Sold online but abandoned the practice</td>
<td>4</td>
<td>2%</td>
</tr>
<tr>
<td>Currently selling online</td>
<td>78</td>
<td>38%</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4: ODSC Adoption among SMEs

The size distribution of the participating firms is shown in Table 5. The distribution is consistent with the data from the United States Small Business Administration (refers to Table 2). For instance, my data, just like those of SBA, show that around 95% all employer firms are below 100 employees. Such consistency is an indication that my sample is an unbiased sample, in terms of size distribution.
<table>
<thead>
<tr>
<th>Size Classification</th>
<th>Number of SMEs</th>
<th>Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;500 (to be dropped)</td>
<td>8</td>
<td>3.8%</td>
<td>3.8%</td>
</tr>
<tr>
<td>&gt;200 but &lt;=500</td>
<td>6</td>
<td>2.8%</td>
<td>6.6%</td>
</tr>
<tr>
<td>&gt;100 but &lt;=200</td>
<td>11</td>
<td>5.2%</td>
<td>11.7%</td>
</tr>
<tr>
<td>&gt;0 but &lt;=100</td>
<td>176</td>
<td>82.6%</td>
<td>94.4%</td>
</tr>
<tr>
<td>Undeclared</td>
<td>12</td>
<td>5.6%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td>213</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Size distribution (in terms of number of employees) of the participating firms

- Industry distribution

  Industry, No. of firms, %, Cumulative %

3.2.2 Missing Data

Questionnaire B (for SMEs that adopted ODSC and then abandoned it) receives only a few responses, which are not sufficient for statistical analysis, so I drop those responses. Regarding the responses to questionnaire A and Questionnaire C, I drop several returned questionnaires due to large number of incomplete responses. All the remaining returned questionnaires have provided responses to all or most of the survey questions. To keep those questionnaires that have missed a small number of questions, I follow the mean-person imputation procedures proposed by Hair et al. (1995) and Roth et al. (1999), in which, the mean value of a measure is used for a missing value. Roth et al. (1999) demonstrated that mean-person imputation procedure does not significantly bias subsequent data analysis.
3.2.3 Non-Response Bias

Nonresponse bias, or nonresponse error, refers to the bias that is caused by the differences in demographic or attitudinal variables between those who responded and those who did not respond (Sax, Gilmartin, and Bryant, 2003). Nonresponse bias may jeopardize the external validity of a survey, because when nonresponse bias exists, survey results can produce misleading conclusions that cannot be generalized to the entire population (Rogelberg & Luong, 1998).

A low response rate does not automatically signify that the data obtained from a survey are Biased (Dillman, 1991; Krosnick, 1999; Rogelberg and Stanton, 2007; Sax et al., 2003). Researchers must analyze whether their low response rates truly have a significant impact on conclusions drawn from the data; if no impact exists (Rogelberg and Stanton, 2007), or if respondent characteristics are representative of nonrespondents (Sax et al., 2003), then no non-response bias exists.

Non-response bias are likely to be an important issue when all of the following three problems occur (Dillman, 2007, pp10-11): 1) a significant number of participants in the survey sample do not respond to the survey questionnaire; 2) the participants that do not respond have different characteristics from those that respond; 3) the different characteristics are important in the study; in particular, they are related either to the dependent variable or to a variable that is correlated with the dependent variable.

Wave analysis is a standard technique for inferring the differences between respondents and non-respondents (Yip & Dempster, 2005). In Wave analysis, individuals
who respond later in the survey administration period (usually after significant coaxing) are used as a proxy of nonrespondents to be compared with early respondents to determine whether bias exists (Hutchinson, Tollefson, and Wigington, 1987; Johnson, Beaton, Murphy, and Pike, 2000; Smith, 1983; Stinchcombe, Jones, and Sheatsley, 1981). By notifying whether each survey is completed before the deadline, after an initial reminder message, after a second reminder message, and so on, responses from pre-deadline surveys can be compared with the late responders on the actual survey variables; if responses of late respondents differ significantly from those of earlier respondents, then it signifies that some level of non-response bias may exist (Rogelberg and Stanton, 2007); otherwise, there is no indication of nonresponse bias.

I follow the wave analysis procedure proposed by Armstrong and Overton (1977), through which I examine whether participating SMEs are significantly different from non-responding ones by comparing the responses of the SMEs (referred to as sample 1) that respond after the initial invitation email message or the first reminder message is sent out with responses of the SMEs (referred to as sample 2) that respond after the second reminder message is sent out. Because the second reminder message is sent out two months after sufficient coaxing of the initial invitation and the first reminder, characteristics of SMEs that respond after the second reminder may be arguably similar to nonrespondents. Therefore, if a t test reveals significant differences in any of the key attributes between the two samples, then there may be a response bias; otherwise, no evidence of non-response bias exists.
3.2.4 Common Method Bias

Common methods bias, sometimes known as methodological artifact, occurs when the research instrument used affect the subjects’ responses. In a survey questionnaire, if two questions that are to be tested for correlation are placed side-by-side, subjects may correlate the two questions, not because the two items are truly correlated but because they are placed together. For example, if a question about perceived usefulness and another about behavioral intention are placed side by side, the participant may automatically correlate the two questions to maintain cognitive consistency.

To minimize and examine the effect of possible common method bias, I placed the questions for the dependent variable, which is the behavioral intention, in different sections of the questionnaire. Because those questions load purely on the behavioral intention factor and not on other factors, the common method bias concern is relieved.

I also intentionally embed differently worded but semantically identical questions in the questionnaire (some of those questions are reverse scored). Analyses of those questions reveal very strong correlations, which further ease our concern of common method bias.
3.2.5 Scales and Measures

To ensure the validity and reliability, my scales are all built upon prior research. Some of the scales are adapted directly from established measures. Appendix A lists the constructs and scales.

*Perceived Relative Advantage:* unlike an individual who may adopt a technology for reasons other than economic reasons such as hedonic reasons, an organization adopts a technology ultimately in order to enhance its productivity and efficiency and eventually increase its profitability. I use three items to measure perceived value of ODSC. The first one is the perceived potential of ODSC to help increase the company’s overall revenue, the second is its potential to enhance the firm’s profitability, while the last item focuses on the ability of ODSC to improve commercial transaction efficiency, in particular, the efficiency of the ordering process.

*Perceived Ease of Use:* Adapted from Davis (1989), uses three-item scale to measure SME’s perception of effort required using an ODSC. The first item measures perceived ease of obtaining an e-commerce website, the second item captures perceived ease of training competent personnel to support an e-commerce system, and the last item focuses on the perception of effort needed to maintain an e-commerce website.

*Perceived Competitive Pressure:* Competitive pressure can be indicated in three aspects: most competitors sell online, online competitors are successful in selling online, and competitors are seizing market share. Therefore, I use three items based upon the three aspects to measure perceived competitive pressure.
**Perceived Expertise in the Internet:** An organization’s expertise is reflected in the expertise of its employees. Therefore, to measure an organization’s expertise I must measure the expertise of its employees. Because the expertise of managers of an organization may have more influence on the organization’s decision, including its decision in technology adoption, I use two separate items to measure the expertise of managers and expertise of other employees. The respondents of the survey are asked to rate the level of expertise of managers and other employees. 7 point Likert-Type scales are used in the rating: 1 represents novice, 7 represents experts, and the middle scale, 4, represents competent.

**Risk Propensity:** two items are used to measure an SME’s willingness to take risks. The items are straightforward: one item states that the firm is usually willing to take risks and the other item states that senior managers of the firm are willing to take risks. Seven point Likert-type scales are used: 1 indicates strongly disagree and 7 indicates strongly agree. Participants are asked to rate the extent to which they agree with the statements.

**Resource Slack:** a variety of resources are relevant to the building and use of ODSC. I measure an SME’s sufficiency in several resources: availability of a good business website, the availability of human resources to maintain an e-commerce website, and general resources which may include financial resources or any other resources need for the establishment and management of an e-commerce website. The three items are phrased in three statements in 7 point Likert-Type scale. Participants are asked about the extent to which they agree with the statements.
Behavioral Intention: adapted from Davis et al.’s TAM study (1989), measures an SME’s intention to adopt ODSC. A time window of two years is used. Participants are asked whether their firm will/intends/plans to embrace (adopt or continue to use) ODSC in the next two years.

3.3 Method of Statistical Analyses

3.3.1 Structural Equation Modeling

Structural Equation Modeling (SEM) will be used for data analysis. SEM is a powerful analytical tool that combines several statistical techniques, including factor analysis, path analysis, and multiple regression. It is more powerful than multiple regression because it takes into account the modeling of interactions, nonlinearities, correlated independents, measurement error, correlated error terms, multiple latent independents each measured by multiple indicators, and one or more latent dependents also each with multiple indicators (Garson, 2007).

The use of structural equation modeling has been rapidly growing in psychology and the social sciences (Segars and Grover, 1993). Its ability to simultaneously estimate multiple relationships among observed and unobserved variables makes it very helpful in data analysis involving complex models. Compared with other multivariate procedures, SEM has at least two other important advantages (Byrne, 2001): 1) it takes a confirmatory rather than an exploratory approach to data analysis. That means: research model is built on theory and then data are analyzed to estimate its fit to the model. 2)
Unlike other multivariate procedures that are unable to assess and correct for measurement errors, SEM provides explicit analysis of error variance parameters.

3.3.2 Measurement and Structural Models

A structural equation model is consisted of two parts: the measurement model, also known as the confirmatory factor model, and the structural model. The measurement model is concerned with relationships between unobserved measures and their latent constructs while the structural model specifies the causal relationships between the latent constructs, which are hypothesized based upon theories. The complete model (measurement model and structural model) I propose is presented in figure 5.

A confirmatory factor analysis will be run to examine the convergent and discriminant validities and internal consistency reliability of the measurement instrument. Then goodness of fit statistics will be examined to determine the fit of the data to the model that I have proposed. If the fit is satisfactory, parameters will be examined to test the hypotheses associated to the model. Otherwise, I will respecify and recalculate the parameters.
Figure 5: Measurement and Structural Model: SME’s Intention to Adopt or Continue to

Use ODSC

EXPT: Expertise in the Internet
RESO: Availability of resources required of ODSC
RT: Risk tolerance
COMP: perceived competitive pressure
ADV TG: perceived relative advantage
EASE: perceived ease of use
4. Results

4.1 Construct Validity

In addition to content validity we discussed earlier, the following construct validities and reliability of a measurement model must be examined to determine its adequacy: 1) reliability; 2) convergent validity of measured variables for a particular latent construct; and 3) discriminant validity of latent constructs (Hulland, 1999).

*Construct validity* refers to whether a scale measures the unobservable construct it intends to measure. Evaluation of construct validity requires examining the correlation of the measure being evaluated with other measures that have been validated in previous research or specified by theory. Construct validity can be broken down into two sub-categories: Convergent validity and discriminant validity. Convergent validity is the extent to which a measure correlates (converges) with other measuring methods that it should theoretically be correlated to. Discriminant validity is the extent to which a measure differs from (or diverge from) other measures that it should theoretically be not correlated with.

4.2 Internal Consistency Reliability

*Reliability* is the extent to which a measure can yield consistent results in repeated trials. In variance terms, it is the proportion of the “true” variances to the total variances of the data yielded by the test. \( R_{tt} = \frac{V(T)}{V(O)} \) where \( V(T) \) is the true variances while \( V(O) \) is
the observed total variances. Reliability does not imply validity. That is, a reliable measure is measuring something consistently, but not necessarily what it is supposed to be measuring. However, a valid test must be reliable.

Cronbach's $\alpha$ (alpha) is a commonly used test for internal reliability consistency. It measures the level of correlation among a set of test items and indicates the extent to which they can be treated as measuring a single latent variable.

### 4.3 Confirmatory Factor Analysis

Although the main concern of working with a full model is to assess the relationships among latent variables, it is critical that the measurement of each latent variable is psychometrically sound; therefore, an important preliminary step in the analysis of a full latent variable model is to test the validity of the measurement model prior to evaluating the structural model (Byrne, 2001, pp 145-147). Confirmatory Factor Analysis (CFA) is usually used to test the validity of the hypothesized measurement model.

### 4.4 Goodness of Fit

<table>
<thead>
<tr>
<th>Measures of Fit</th>
<th>Recommended Values (sources)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>$p\geq0.05$ (Segars &amp; Grover, 1993)</td>
<td></td>
</tr>
<tr>
<td>Chi-Square/df</td>
<td>$\leq2$ (Bollen, 1989)</td>
<td></td>
</tr>
<tr>
<td>NNFI</td>
<td>$\geq0.90$ (Hu &amp; Bentler (1995))</td>
<td></td>
</tr>
<tr>
<td>RMSEA</td>
<td>$\leq0.08$ (Browne &amp; Cudeck, 1992)</td>
<td></td>
</tr>
<tr>
<td>AIC &amp; CAIC</td>
<td>smaller AIC preferred, no recommended value</td>
<td></td>
</tr>
</tbody>
</table>

Table: Measures of Model Fit

### 4.5 Hypothesis Testing
<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>P-value</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a: Resource slack will positively affect an SME’s perceived ease of use of ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1b: Resource slack will positively affect an SME’s behavioral intention to adopt or continue to use ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2: Perceived expertise in the Internet positively affects an SME’s perceived ease of use of the online direct sales channel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3a: An SME’s risk propensity will positively affect its perception of relative advantage of the ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3b: An SME’s risk propensity will positively affect its perceived ease of use the ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3c: An SME’s risk propensity will positively affect its intention to adopt the ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4: Perceived channel advantage positively affects an SME’s intention to adopt or continue to use the ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5: Perceived ease of use positively affects an SME’s perception of relative advantage of the ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H6a: Perceived competitive pressure positively affects an SME’s perception of relative advantage of the ODSC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H6b: Perceived competitive pressure positively affects an SME’s intention to adopt or continue to use the ODSC.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table: Hypothesis Testing and Results

5. Discussion

5.1 Implications for Research and Practice

This study contributes to the IT adoption literature in the following ways: first, the classification model provides a simple but robust framework for categorizing existing factors identified in previous IS adoption studies. It will also be useful for guiding the identification of new factors in future IS adoption studies. Second, the research model on the adoption of ODSC by SMEs, which is proposed and empirically tested in this study, will not only enhance our knowledge of the pattern of SMEs’ adoption of ODSC, but also improve our understanding of SMEs’ adoption and use of IS innovations in general. Third, the measures that I have adapted from other studies or developed and validated for
this study may be useful for future studies of adoption and diffusion of IS innovation, particularly the adoption of Internet related technologies.

This study has significant implications for practice as well. The examination of ODSC adoption among SMEs provides empirical evidence regarding what drive the adoption and use of ODSC among SMEs, which in turn, will help facilitate better decision-making by managers of electronic market service providers, e-commerce system developers, and policy-makers of relevant governmental agencies to simulate the use of ODSC among SMEs. The study will also enhance SMEs’ knowledge of what other SMEs are thinking about and doing with ODSC, which will eventually influence their own decision in the future on the use of ODSC.

5.2 Future Research

5.3 Limitations

Some limitations of this study must be pointed out. First, the study relies on a single informant of each participating SME for information. A possible problem that may result from that is single-informant bias: the responses provided by the informant may not fully represent the perspectives of the whole organization. Considering the fact that SMEs are less complex and that owners and high-profile managers who are used as informants of the study are generally knowledgeable about their organizations, the single-informant bias should not be an issue in this study, except for a few questions in the survey that are related to senior managers, such as the questions that explore senior managers’ expertise in the Internet and their risk propensity. In those cases, the scores are likely to be inflated, but such inflation is systematic and should not result in biases that affect the construct relationships in the research model.
Second, the data for the study are collected through an online survey. A general limitation of an online survey is that potential participants that do not have Internet access are systematically excluded from the sample. The survey for the present study is conducted on the Internet and participants are invited through emails, therefore, the sample systematically excludes those SMEs whose owners or high-level managers (potential informants of the study) do not have email and Internet access. However, given the fact that email and Internet penetration rates are extremely high in the United States and the fact that the informants of the survey are business owners or high-rank managers, the likelihood that they do not have email and Internet access is slim. So this issue should not significantly bias the sample.
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Original Source: U.S. Bureau of the Census; Advocacy-funded research by Joel Popkin and Company (Research Summary #211); Federal Procurement Data System; Advocacy-funded research by CHI Research, Inc. (Research Summary #225); Bureau of Labor Statistics, Current Population Survey; U.S. Department of Commerce, International Trade Administration.


Appendix A: Scales and Measures

(Non-Adoption Group)

Decision Object Dimensions

*Relative Advantage*

Rated from 1=Strongly Disagree to 7=Strongly Agree

PU11--Selling online will increase our overall sales revenues.

PU13-- Selling online will bring us additional profits.

PU14--Selling online will help improve our ordering process.

*Perceived Ease of Use*

Rated from 1=Strongly Disagree to 7=Strongly Agree

PEU2-- Obtaining an e-commerce website to sell our products/services will be easy

PEU3-- Training competent personnel to support an e-commerce system will be easy.

PEU4--Maintaining an e-commerce website will be easy for our firm.

Decision Maker Dimensions

*Expertise*

Scale: 1=Novice, 4=Competent, 7=Expert.

Rate the level of expertise your managers and employees have in the Internet

Managers:  
1  2  3  4  5  6  7

All Other Employees:  
1  2  3  4  5  6  7

*Resources*
Rated from 1=Strongly Disagree to 7=Strongly Agree

RESO1--Our firm already has a pretty good business website.

RESO2--We have the resources necessary to build an e-commerce website.

RESO3--We have the IT personnel necessary to maintain an e-commerce website.

Risk Propensity

Rated from 1=Strongly Disagree to 7=Strongly Agree

RT1--Our firm is usually willing to take risks

RT2--Our senior managers are willing to take risks

Decision context Dimension

Competitive Pressure

Rated from 1=Strongly Disagree to 7=Strongly Agree

COMP1--Most of our competitors sell online.

COMP3--Our main competitors are already selling successfully online

COMP4--Our main competitors are seizing our market share.

Behavioral Intention to Adopt ODSC

Rated from 1=Strongly Disagree to 7=Strongly Agree

BI1--Our firm intends to sell products/services on the Internet within the next two years.

BI2--I predict my firm will start to sell products/services on the Internet within the next two years.

BI3--Our firm plans to sell products/services on the Internet within the next two years
Appendix A: Scales and Measures
(Adoption Group)

Decision Object Dimensions

*Relative Advantage*
Rated from 1=Strongly Disagree to 7=Strongly Agree

PU11-- Selling online has helped increase our overall sales revenues.

PU13-- Selling online has brought us additional profits.

PU14-- Selling online has helped improve our ordering process.

*Perceived Ease of Use*
Rated from 1=Strongly Disagree to 7=Strongly Agree

PEU2-- Implementing an e-commerce website was easy for our firm.

PEU3-- Training personnel to manage our online sales has been easy for our firm.

PEU4-- Maintaining the e-commerce website has been easy for our firm.

Decision Maker Dimensions

*Expertise*
Scale: 1=Novice, 4=Competent, 7=Expert.

Rate the level of expertise your managers and employees have in the Internet

Managers: 1 2 3 4 5 6 7

All Other Employees: 1 2 3 4 5 6 7

*Resource Slack*
Rated from 1=Strongly Disagree to 7=Strongly Agree
RESO1--Our firm already has a pretty good business website.

RESO2-- We have the resources necessary to run our e-commerce website.

RESO3-- We have the IT personnel necessary to maintain an e-commerce website.

Risk Propensity
Rated from 1=Strongly Disagree to 7=Strongly Agree

RT1--Our firm is usually willing to take risks

RT2--Our senior managers are willing to take risks

Decision context Dimension

Competitive Pressure
Rated from 1=Strongly Disagree to 7=Strongly Agree

COMP1--Most of our competitors sell online.

COMP3--Our main competitors are already selling successfully online

COMP4--Our main competitors are seizing our market share.

Behavioral Intention to Continue to Use ODSC
Rated from 1=strongly Disagree to 7=Strongly Agree, Reverse Scored

BI1-- Our firm will stop selling on the Internet in the next two years.

BI2-- Our firm intends to reduce our online selling efforts in the two years.

BI3-- Our firm will stop selling on our own website in the next two years.