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Virtual world commerce adoption (VWCA) : a case study of second life investigating the impacts of perceived affordances, trust, and need satisfaction

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ABSTRACT

VIRTUAL WORLD COMMERCE ADOPTION (VWCA):
A CASE STUDY OF SECOND LIFE INVESTIGATING THE IMPACTS OF
PERCEIVED AFFORDANCES, TRUST, AND NEED SATISFACTION

by
Kamolbhan Olapiriyakul

Virtual worlds are computer-simulated worlds in which multi-players can simultaneously interact in a rich graphical environment. The development of virtual worlds, along with the massive growth of users, creates opportunities for business organizations. This dissertation involves many studies regarding virtual world adoption in business by virtual consumers.

Most of the research in Information Systems (IS) was conducted investigating factors influencing technology adoption, such as ease of use and usefulness, subjective norms and behavioral controls, self-efficacy, performance and effort expectancy, flow, etc. However, most of these research studies focused neither on design aspects related to affordances nor users' goal-oriented behaviors, such as need satisfaction.

This dissertation examines the effect of affordances, referring to a property of an object, animal, or environment that affords, or makes available certain actions. Particularly, this dissertation investigates the users' perceived affordance of virtual products and environments, in which business transactions take place. In addition, relationship-based trust and need satisfaction are considered as crucial determinants of virtual world commerce adoption in this dissertation.

There are three studies that were conducted in Second Life in this dissertation, which are two preliminary studies and a main study. The preliminary studies use multiple

data collection methods, including user interviews, documentation, direct observations, and questionnaire surveys. The results of the preliminary studies suggest that trust, social influence, system security, system quality, and service quality are vital for users when they make purchase decisions. The initial measurement model containing valid and reliable measurement scales of the main research constructs was proposed.

The main study, using a revised questionnaire survey from the preliminary studies, was conducted to develop the conceptual framework of Virtual World Commerce Adoption (VWCA). Covariance-based and PLS-based path analyses were employed based on the data obtained from the participants who have different experience levels with online business transactions. The final results show a significant relationship between perceived affordances and intention to purchase products in the virtual world. This relationship is mediated by need satisfaction. However, the mediating effect of relationship-based trust is not significant. This is due to more concern about trust related to technical aspects of the system rather than trust from social exchange process.

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To my beloved sons, Pakin and Pete

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CHAPTER 1

INTRODUCTION

1.1 Overview

The objective of this chapter is to provide the reader with basic background information needed to better understand this dissertation. This chapter also provides a brief introduction of virtual worlds and discusses the significance of the research in virtual world commerce. This chapter specifically addresses the following topics in an orderly manner. The second section identifies research objectives. The third section explains the background of virtual worlds. Next, the description of Second Life virtual world and its social system characteristics are discussed. The fifth section explains the relevancy of this dissertation to information system research. Then, the scope of this dissertation and present research questions are identified. Last, this chapter is ended with the dissertation outline.

1.2 Objectives

Virtual worlds not only aim to provide new experiences for users to communicate and interact via an interactive and spatial environment that users create by themselves, but virtual worlds also attract many social and business organizations to establish and maintain their presences, make reasonable profits and create brand awareness to consumers. The massive growth of virtual worlds' subscribers creates a significant businesses opportunity for many companies, including Fortune 500 companies, such as IBM, Dell and Microsoft. These companies see virtual worlds as a compelling platform for establishing new markets and advertising hubs that attract potential customers.

Despite this great business potential, there are only a few companies reporting a growth in revenue and profits from their virtual-based business. Some real-life brands eventually abandon their virtual world branches, while others need to change their strategies in order to sustain their businesses in the ever changing virtual world.

In general, successful adoption of new information technology mainly depends upon the design of the systems that enhance user's ability in completing tasks, rather than training users or changing their attitudes toward acceptance or adoption of the systems after they have been built. Therefore, understanding system adoption is usually based on user's perspectives toward the use of the system. Previous research in e-commerce has extensively studied system adoption (e.g., Gefen et al., 2003). However, these research efforts in addressing the specific factors that induce the adoption of virtual world commerce are still doubtful.

The objective of this dissertation is to examine the determinant factors that enhance adoption of the virtual world in business. Specifically, this research primarily investigates users' motivations in using the virtual platform to purchase products. This study focuses on the following three research areas:

1. The characteristics of the commerce platform, such as the design of affordance tools and environments.

2. The consumer's trusting belief.

3. The extent to which products and socio-economic environments of the virtual world satisfy the users' needs.

In sum, the goal of this dissertation aims to develop a conceptual framework of virtual world commerce adoption, based on the three aforementioned research areas.

1.3 Background

Virtual worlds or synthetic worlds are persistent three-dimensional (3D) and computer-based environments that simulate many real world features (Castronova, 2005). The virtual world is created for its users to live a virtual life via their embodied personae or avatars, inhabit, socialize, complete quests and transact with other users. An avatar is a user's embodiment in a form of two-dimensional (2D) or three-dimensional (3D) graphical representation. Some examples of avatars include human-like embodiments, animals, robots, and other imaginary creatures.

There are many different types of virtual worlds which can generally be classified into the following categories: simulation games (e.g., America's Army), fantasy games (e.g., World of Warcraft), virtual reality (e.g., Second Life), and virtual fantasy (e.g., Entropia Universe) (Schultze et al., 2008).

Computer-based virtual worlds were originally developed from virtual reality devices and simulator games. Early development began when a cinematographer named *Heilig*[1] tried to create an ultimate full-view experience for spectators. The original idea was later picked up by the internet pioneer, Ivan Sutherland. In 1968, Sutherland created a head mounted display device that is considered the first virtual reality and augmented reality system. The graphics comprising the virtual environment were a simple wire frame model[2], a visual presentation of a 3D or physical object used in 3D computer graphics.

Besides the influence of virtual reality and visual presentation evolution, web-based virtual worlds are now equipped with various communication systems supporting

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[1] Source: http://www.mortonheilig.com/, retrieved June 2009
[2] From Wikipedia, http://en.wikipedia.org/wiki/Wireframe_modeling, retrieved June 2009

multi-user interactions. The first virtual worlds with these characteristics were MUDs (Multi-User Dungeons) and MUSHes (Multi-User Shared Hack, Habitat, Holodeck, or Hallucination). The former was a multi-player computer game that combined a role-playing game and a social chat room. The latter was a text-based multi-user online game able to link multiple users at the same time. However, the early virtual worlds such as MUDs and MUSHs were text-based systems that offered limited graphical interface. These conventional virtual worlds emerged independently from virtual reality technology, and later influenced by the gaming industry (Castronova, 2005). Maze War (also known as The Maze Game, Maze Wars or Simply Maze) was the first networked game run on Arpanet (the initial internet). Maze Wars contained all of the modern day online gaming features, such as multi-user, different points of view, 3D graphics, bots, chat, IM, shooting and scoring. Although Maze War is more of a game than a social virtual world, it was the first avatar space where players create eyeball avatars to chase the others around a maze.

An example of an early prototype of social virtual worlds was WorldsAway, an online two-dimensional, graphical, virtual chat environment that allowed users to design their very own avatars. Another example of an early online internet-based virtual world is CitySpace, which was initiated by educators in 1993. CitySpace was a virtual three-dimensional user self-generated environment similar to Second Life.

Another monumental achievement in the development of virtual worlds was the launch of Lucus film's Habitat in 1985. Habitat[3] is a combination of telegaming and online chat that incorporates motional user characters. Although Habitat did not contain a three-dimensional environment nor incorporate the immersive technology, it was still one

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[3] Source: http://www.atarimagazines.com/compute/issue77/habitat.php, retrieved June 2009.

of the most influential online role-playing games and regarded as a forerunner of the modern day multi-player, online, role-playing virtual reality applications that integrate graphical user interfaces. (Flaviàn et al., 2006). Also, Habitat's immense popularity set it as the benchmark for today's modern online communities that incorporate accelerated three-dimensional computer graphics and immersive elements.

Many of modern virtual worlds use the same technological architecture as Massively Multiplayer Online Games (MMOGs), which are capable of supporting multiple and unlimited access to the virtual environment. These virtual environments enable thousands of users to access similar resources at the same time without limitations of physical space. Among the various genres of MMOGs, social role-playing games enable a large number of players to interact with one another. This genre of the MMOGs is known as Massively Multiplayer Online Role-Playing Games (MMORPGs), which include Entropia Universe, Second Life, and Active Worlds. Another common characteristic of MMORPGs includes an ability of multi-player interactions in a spatial environment. The players share common themes (game themes such as fantasy and science fiction), and system architecture. Each game has a certain form of progression. Most of them allow social interaction within the game so that the players eventually develop an in-game culture. Millions of players control their (customizable) avatars. For instance, the players may require completing tasks to gain experience and may acquire items in order to progress to a more advanced stage (Castronova, 2005).

Although there are many types (or genres) of virtual worlds, the common features that every virtual world has can be summarized as follows:

- **Shared Space** – Virtual worlds allow multiple users to participate concurrently in the same environment.

- **Graphical User Interface (GUI)** – Recent virtual worlds employ the GUI that enables users to depict space visually. The GUI ranges from 2D to more immersive 3D environments.

- **Immediacy** – Virtual worlds allow users to interact in real-time and simultaneously.

- **Interactivity** – Virtual worlds allow users to alter, develop, build, or submit any customized contents.

- **Persistence** – Virtual worlds continue to operate regardless of whether users are logged in. The physical virtual environment including virtual objects and contents remain in the virtual space unless someone changes them.

- **Socialization** – Virtual worlds allow and encourage the formation of social communities or social groups such as teams, guilds, clubs, neighborhoods, associations, etc.

Leading virtual worlds and their characteristics are shown in Table 1.1. Since there are many existing and emerging virtual worlds, only some virtual worlds are selected and illustrated in this table. Many leading virtual worlds create their own virtual economies, which are designed to make their worlds more attractive and enjoyable for their inhabitants (Castronova, 2005).

Table 1.1 Virtual Worlds and Their Features[4]

Virtual worlds	Ability to customize the environment	virtual property ownership	Real-money trading	Local currency	Integrated commerce features	Users created communities or events	Graphical interface	Communication means		Obtained IP right for virtual items
								Text chat	VOIP	
Second Life	Yes	Yes	Yes	Linden Dollars	Yes	Yes	3D	Yes	Yes	Yes
ActiveWorlds	Yes	Yes	No	No	Yes	Yes	3D	Yes	No	Yes
Kaneva	Yes	Yes	Yes	Credits	Yes	Yes	2D/3D	Yes	No	Yes
The Sims Online	Yes	Yes	No	No	No	No	3D	Yes	No	No
Entropia Universe	Yes	Yes	Yes	PED	Yes	Yes	3D	Yes	No	Yes
There	Yes	Yes	Yes	Therebucks	Yes	Yes	3D	Yes	Yes	Yes
HiPiHi	Yes	Yes	Yes	No	Yes	Yes	3D	Yes	Yes	Yes
Weblo	Yes	Yes	No	No	Yes	Yes	No	Yes	No	Yes
IMVU	No	No	Yes	Credits	No	No	3D	Yes	No	Yes
Hobbo Hotel	Yes	Yes	Yes	Hobbo Coins	Yes	Yes	2D	Yes	No	Yes
World of Warcraft	No	Yes	No	No	Yes	No	3D	Yes	No	No

Similar to e-commerce, virtual world commerce is referred to as any business conducted within the virtual world using any of the applications that rely on its embedded systems, such as synchronous conversation, e-mail, instant messaging, electronic data interchange (EDI), electronic fund transfer (EFT), etc. Virtual world commerce can occur between a business and a customer (same as in B2C e-commerce), and/or among consumers or members of the virtual world (same as in C2C e-commerce).

The characteristics of the commercial platform incorporate an interactive graphical interface that encourages users to socialize and interact, as well as directly perceive an existence of the virtual embodiments, which is different from e-commerce platforms. The rapid feedback of the communication media, both text-based and voice-based systems enhance an ability of this new platform to facilitate vigorous interaction among business entities. These dominant characteristics of virtual commerce platform certainly create business potential and impact users' sensations and behaviors when they are in the virtual world.

1.4 Introduction to Second Life

Second Life[5] is an internet-based 3D virtual world developed by Linden Research Inc. It initially went online in 2003. The distinctive feature of Second Life is the ability for residents and users to create everything in the virtual space. In addition, residents can interact with each other through 3D motional avatars. Residents can explore, meet, socialize, participate in individual and group activities, as well as create and trade virtual goods – which can be defined as objects such as characters, items, currencies and tokens that exist inside various online games and hangouts (Lehdonvirta, 2009).

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[5] Official website is http://www.secondlife.com

At the beginning of September 2008, just over 15 million accounts were registered, though there were no reliable figures for actual long-term consistent usage. In January 2008, residents spent 28,274,505 hours in-world, and on average about 38,000 residents were logged on at any particular moment[6]. The growing number of users drastically increases the income obtained from various sources such as subscriptions, classified charges, group creations, land sales, money trades, etc. The company created a new virtual money called Lindens dollar, which can be used only in-world but can also be exchanged for US dollars and other currencies around the world.

Figure 1.1 Second Life virtual world.

The economy of Second Life is created by its residents who buy and sell virtual contents from one another in-world or in a free market[7]. These include land and

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[6] From Second Life statistics, http://secondlife.com/whatis/economy_stats.php, retrieved September, 2008.
[7] By definition, free market means a market that is free from government intervention (i.e. no regulation, no subsidization, no single monetary system and no governmental monopolies). In this situation, free

buildings, vehicles, devices of all kinds, animations, clothing, skin, hair, jewelry, flora and fauna, and works of art. These creations also retain the intellectual property (IP) rights so that they can legally sell to other people in various in-world venues. Moreover, residents also create and offer jobs that are similar to jobs in the real world. Career sectors may include stores, business management, entertainment, custom content creation, and personal services.

In terms of communication and social connection, users can employ various communication functions, either in synchronous format (such as chat and voice chat) or asynchronous format (such as email and messaging system). Based on the seamless technology in communication and the mature economy of Second Life, many organizations have become visible within this virtual world. Among these organizations are educational institutions, religions, arts, social networks, associations, and entertainment.

The following factors are important characteristics of Second Life and general social software[8]:

- **Identity** – Second Life allows users to create their own identities, known as avatars. However, this identity in the form of avatar is not permanent. Users can alter an appearance of the avatar. Therefore, Second Life uses a user name, which is unique and unchangeable. The user name appears on the top of avatars when they are in the virtual world.

- **Presence** – Refers to as an awareness of sharing the same space. Presence of users in Second Life can be detected either by the appearance of avatars in proximity, the status of avatars (such as away, busy, etc) and the alert when users in the network are online or offline.

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market implies a place where buyers and sellers do not coerce each other. In other words, the trade simply occurs from both consent and believes that it is a good enough choice. (Wikipedia.org)
[8] Source: http://interconnected.org/home/2004/04/28/on_social_software, retrieved July, 2009.

- **Relationships** – Second Life allows users to add people as friends and build up their social networks. Friends have more ability to access to personal profiles, share information among people in the same network, and acknowledge when friends' statuses are changed or updated.

- **Conversations** – There are various communication media in Second Life as described earlier. Users can choose from either synchronous method (text-based chat and voice chat) or asynchronous method (messaging system, note card and email). Second Life separates chat dialog from instant messaging window. Moreover, Second Life also incorporates various emotional cues (e.g., gestures, postures, etc.) that are not similar to static emoticons as seen in other social networking systems.

- **Groups** – Second Life users can form groups or become members of groups. Conversation or new feeds can be sent to group members to inform them of special events, meetings or other social gatherings.

- **Reputation** – The sharing environment of Second Life supports users in building social network and reputation, generally by informal interaction among users and word-of-mouth.

- **Sharing** – Second Life provides a common environment, where users share presences, information, data, photos, etc.

1.5 Relevancy to Information Systems Research

This dissertation involves a study of an emerging type of information system (i.e., the virtual world) primarily used by individual and group users. In particular, the research focuses on the utilization of virtual world in a specific activity: commerce. Similar to e-commerce research, the study of the virtual world's adoption in business is crucial as millions of users subscribe to the virtual world and a large amount of money has been spent on virtual products and services procurement. This research is important for users who are consumers, as well as users who own and operate their virtual properties in the virtual world. Therefore, studying the factors that influence new information system adoptions are the primary objective of information system researchers.

Furthermore, an in-depth study of virtual world commerce adoption can potentially support virtual merchants in using appropriate design of virtual environments, products, and various system features in supporting business functions. Similarly, the research can possibly help general consumers from risks associated with the virtual business (such as an asymmetry of product information), and vendor's opportunistic behaviors by suggestions for overall system improvement and design. This research also helps ascertain a good quality product development and service enhancement from virtual merchants.

Important questions that IS researchers need to solve include:

- What factors do consumers (or users) consider when engaging a business activity in the virtual world?

- How do businesses initially attract consumers and/or maintain their presences in the virtual world?

These questions are common research questions in technology adoption research. The theory of technology adoptions, which is a concrete theoretical concept developed in the IS field, is widely used to explain behaviors and attitudes of users regarding the adoption of the new information technology. Previous research studied the ease of use, the usefulness of the system, the self-efficacy, the positive attitude, the perceived trust, etc. as important factors in enhancing the system adoption.

An important question that system developers need to answer is:

- How does one design or create a system that reinforces business strategy in the virtual world?

Attractiveness of the system design is imperative in developing the hedonic systems, especially the virtual world, because users normally focus more on enjoyment and self-fulfillment when using the system. Moreover, the design must increase the

effectiveness and usability of the system and enable users to achieve and accomplish their tasks like other utilitarian systems.

1.6 Scope of the Research and Research Questions

The general research question addressed in this dissertation is "What makes people purchase virtual (or real) products in the virtual world?" In other words, this dissertation aims to examine the influential factors that affect the consumer's intention to purchase a product or obtain a service from virtual merchants. This research particularly focuses on the following three areas:

1. Affordances of the virtual world concern the effectiveness of the design of the virtual objects and environment, as well as other embedded functions that the users can observe within the virtual world environment.

2. The relationship-based trust formation between business partners.

3. The extent that the purchased products fulfill consumers' needs.

    Other specific research questions of this research are:

- What are the characteristics of the virtual world that enable consumers to engage in purchasing behavior? In particular, do perceived physical affordances of the virtual product and/or virtual environment encourage consumers in making a purchase?

- Do perceived relational affordances of the virtual environment (and embedded system functions) facilitate consumers in making a purchase in the virtual world?

- Do perceived transactional affordances of the system's functions support them in making a purchase?

- Does consumers' trust in the vendor (or those who assist/recommend them) enhance their purchasing intentions in the virtual world?

- Does consumers' need satisfaction with products or services offered by the virtual store enhance (or reduce) their purchasing intentions?

1.7 Organization of Dissertation

This dissertation includes seven chapters. Besides this chapter, an introduction, the subsequent chapters are organized in the following manner:

Chapter 2 provides a brief summary of theoretical backgrounds and related literature. The backgrounds of technology adoption theories, including the theory of planned behavior (Ajzen, 1991), and self-regulation theory (Bandura, 1997; Bagozzi, 2007b) are explained. In addition, the theories that research assumptions are based on, such as theory of affordances (Gibson, 1977), theory of human motivation (Maslow, 1943) and trust theory (e.g., Lewis and Weigert, 1985) are also described.

Chapter 3 describes the methodology of the research, which is subdivided into methodology for preliminary studies (including a pilot study), and a main study. The results of validity test of the initial measurement scales and the final measurement scales are illustrated in this chapter.

Chapter 4 summarizes the results of the preliminary studies. The univariate analyses results for measurement scales of the main study are discussed. This chapter also includes the results of the pretest of the revised measurement scales of perceived affordances and need satisfaction. Furthermore, the results of the open-ended questions of the main study are also discussed.

Chapter 5 summarizes the results of bivariate association of the main study, Principal Component Analysis (PCA), and Confirmatory Factor Analysis (CFA). This chapter also shows the final measurement model of the main study obtained from Confirmatory Factor Analysis.

Chapter 6 presents the results of covariance-based path analyses and PLS-based path analyses of structural models, and the results of hypotheses testing. The modified research models are proposed. Finally, the models are tested for moderator effects of users' demographic and usage characteristics. The final research model is suggested in this Chapter.

Chapter 7 discusses the results of the main study and concludes the final research model. Moreover, this chapter also proposes suggestions for research implications, limitations and future research directions.

Lastly, the appendices include consent forms, interview questions, questionnaire instruments, tables showing the operationalization of research constructs, a table showing the analysis of missing values, normalization and homoscedasticity results, outputs of path analyses from SAS and SmartPLS programs, copies of NJIT IRB approval, followed by references.

CHAPTER 2

LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 Introduction

Virtual worlds is developed from interactive and graphical rich multi-player gaming and become favorable for social networking and business collaboration. Albeit the supreme technical innovation of social virtual worlds, their applications in business areas are still underdeveloped. Many companies entering or emerging within these virtual worlds are experimenting with their businesses in this new context. Without proper guideline or best practice in this beginning stage of business initiation, it is important to understand the nature of the systems and the users who adopt the systems. Particularly, research in the technology adoption area focuses on the characteristics of the systems that enhance users' experiences and enables them to achieve their goals. In addition, prior studies in related fields should be reviewed. For instance, research in e-commerce must be examined because of the similarity of the commerce platforms between web-based commerce and virtual world commerce.

This chapter summarizes the related literature in the following areas: theory of affordances (Gibson, 1977), relationship-based trusting beliefs and trust in general social and commerce contexts (e.g., Doney and Cannon, 1997; Fukuyama, 1995; McKnight et al., 2002b), and need satisfaction (e.g., Porter, 1961, Deci et al., 1996). The structure of this chapter is divided into the following five sections describing the theoretical backgrounds and related literature. The next section discusses literature and the classic works on *theories of technology adoption* and *self-regulatory theories*. The third section discusses literature related to the *need satisfaction* concept and the *theory of human*

motivation. The research hypothesis related to need satisfaction is proposed in this section. The fourth section describes *theory of affordances* and its applications in social interaction, technology and virtual world studies. The research hypotheses related to affordances are proposed in this section. The fifth section discusses *trust theory* and its application in social and business areas. Previous literature on trust theory, especially in the area of e-commerce, is elaborately described. The research hypotheses related to trust are stated in this section. The last section summarizes the initial virtual world commerce adoption model (VWCA) and the research hypotheses.

2.2 Technology Adoption Theory and Self-Regulation Theory

This section discusses two major theoretical frameworks: (1) the Theory of Planned Behavior (TPB) and (2) Self-Regulation Theory (SRT). TPB is one of the technology adoption theories used to predict user attitudes and behavioral intention to use information technology while SRT is a concept developed from a Self-Determination Theory (SDT) used to explain behavior resulted from motivations. Previous research on technology adoption, applying the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA) and/or TPB, have their limits in predicting actual behavior as they fail to apply the concept of goal-directed behavior that is based on the self-regulation paradigm to explain the effect of (goal-oriented) consumer needs in guiding actual behavior.

2.2.1 Theory of Planned Behavior

The Theory of Planned Behavior (TPB) was developed by Ajzen in 1991. It was developed as an extension of the Theory of Reasoned Action (TRA) (Fishbein and Ajzen,

1975; Ajzen and Fishbein, 1980). TPB is a social cognitive concept that explains the intentional behavior of a person, which reflects a person's attitude, subjective norm, and perceived behavioral control. The dependent variable – behavioral intention – refers to the likelihood that a person will engage in a behavior. This theory is initiated from the idea that people generally form a positive expectancy regarding future behavioral engagement, such as positive attitudes, which leads to their intentions to perform the actual behavior. Figure 2.1 diagrams the TPB and its salient factors.
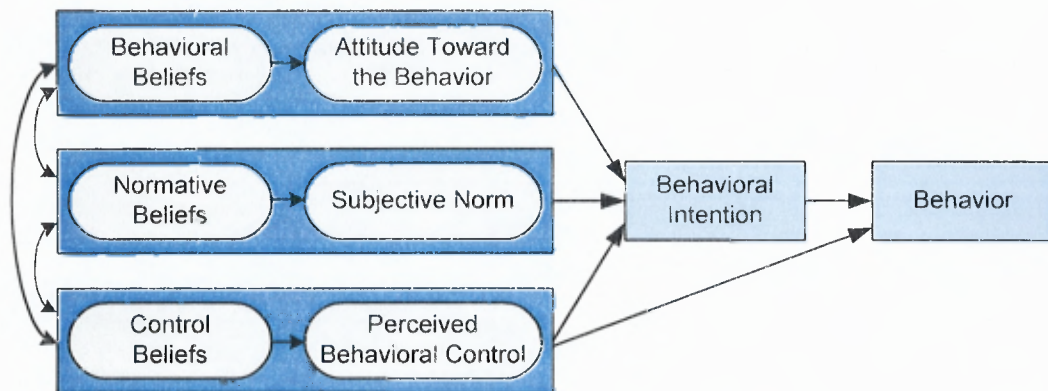
Figure 2.1 Theory of Planned Behavior (TPB).

TPB was developed to reduce the limitations of TRA in dealing with human behaviors that involve incomplete volitional control. TPB proposes that human action is led by three types of beliefs:

- **Behavioral (or Attitudinal) Beliefs** – Beliefs about the likely outcomes of the behavior and the evaluations of these outcomes.

- **Normative Beliefs** – Beliefs about the normative expectations of others and motivation to comply with these expectations.

- **Control Beliefs** – Beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors.

These three beliefs lead to the formation of the behavioral intention, which assumes to capture motivational factors that influence behavior, such as the willingness to try out things. Theoretically, the more favorable the attitude, the subjective norm with respect to a behavior, and the greater the perceived behavioral control, the stronger the intention to engage in the behavior. Accordingly, intention is an immediate antecedent of behavior.

Although TPB, as well as other technology adoption theories such as TAM, are well-known in predicting the behavioral intention of users in IS research, the theory fails to consider crucial determinants of decisions and actions, particularly the measurement relative to a goal-setting and an achievement of the desire (Bagozzi, 2007b). Bagozzi indicates the following five theoretical shortcomings of technology adoption theories (i.e., TRA, TPB and TAM) in measuring the goal-directed behavior:

1. The critical gap between intention and behavior disregard many actions that are not taken as ends, but rather as means to more fundamental ends or goals. In particular, the models ignore the linkage between actual use and goal attainment. Besides, the research suggests treating the intention-action linkage as a process constituted by goal striving, which may have to consider the succeeding phenomena of intentions, for instance, planning, overcoming impediments, resisting temptations, monitoring progress, readjusting actions, maintaining effort and will power, and reassessing or changing goals and means (Bagozzi and Dholakia, 1999).

2. The absence of these sound theories in determining the salient beliefs (i.e., perceived usefulness, perceived ease of use, attitude, subjective norm, and perceived behavioral control) as psychological representations using global measures, rather than summated product terms (Bagozzi, 1981). Oppositely, conceiving these terms as functions of either goals, motives or value hierarchies is more useful in predicting the salient beliefs because they consider the self-efficacy of individual goals, motives or values, as well as the linkages between them.

3. The disregard of group, cultural and social aspects creates the chaotic conclusion of behavioral prediction, especially for TAM. TAM is known as a framework explaining individual behavior, but not concerns in the social-influence decision

process (Bagozzi 2007b). Therefore, TAM does not practically describe the behavioral adoption or acceptance in group, interpersonal, organizational, and general social contexts, especially in situations where decision making requires interpersonal or group judgment.

4. The oversimplified notions of affects and emotions of the model address behavioral intentions. The extensions of TAM try to explain the effects of intrinsic motivation, affect toward use and anxiety as the indirect predictors of intentions (Venkatesh and Davis, 2000). Bagozzi (2007b) suggests considering both attitudes and emotions as appraisals of achieving and failing to achieve one's technology use goals. Notably, considering the roles of emotion is a crucial component of social identity and group settings studies in addressing desires and intentions.

5. The consideration of the self-regulation process in decision-making is omitted. Bagozzi (2007b) asserts that TAM and other contemporary models do not permit human agencies to be an alternative or compliment to their specifications, which is opposite to the fact that human agencies are capable of acting in accordance with the events when they happen and taking control of events or necessary actions. In other words, the models of technology adoption have not taken the natural reasoning process into accounts.

2.2.2 Self-Regulation Paradigm

Self-regulation is originally developed from the Self-Determination Theory (SDT) (Ryan and Deci, 2000). SDT classifies the types of behavioral regulation based on the degree of autonomous functioning (self-determined versus controlled). For instance, intrinsic motivation is a type of autonomous activity where people are self-regulated and intrinsically motivate a certain behavior. Extrinsic motivation, in contrast, is more controlled and less autonomous, and has different degree of behavioral regulation. The following are various types of self-regulation listed from the least to the most or fully internalized motivations (Deci et al., 1996; Ryan and Deci, 2000):

- **External regulation** refers to a behavior that is controlled by contingencies overtly external to an individual.

- **Introjected regulation** refers to a behavior that is motivated by self pressures or internal prods.

- **Identified regulation** refers to a behavior that is resulted from the self as personally important or valuable.

- **Integrated regulation** refers to a behavior that is resulted from the integration of identified values and regulations into one's coherent sense of self.

Self-regulation refers to systematic efforts to direct thoughts, feelings, and actions toward goal attainment by emphasizing the inherent link with the goal (Zimmerman, 2000). Goals enhance self-regulation through their effects on motivation, learning, self-efficacy, and self-evaluations of progress (Bandura, 1997). This theory concludes that people are likely to make a commitment to attain goals. At the same time, goals motivate people to increase efforts to meet the demands, and direct intentions toward behaviors, outcomes, and ways to process information. Most of the past research in self-regulation involves the study about goal-direct intentions and behaviors. However, many studies in IS and technology adoption do not consider the self-regulation in the technology adoption/acceptance process, as well as in the decision-making process.

Bagozzi (2007b) suggests that the new paradigm of technology acceptance is moving towards the goal-oriented core process as illustrated in Figure 2.2. The model is comprised of the following simple core process:

Goal desire → Goal intention → Action desire → Action intention

The process also consists of their causes, constraints, and effects, in which it begins with the goal-setting (Label A) to form norms, attitudes, and expectancies (Label B), and lastly to the goal-striving process (Label D). The self regulation concept is more focused on the goal-direct behavior model. In addition, the core decision process involves

the self-regulation or the awareness of the desire (or lack of desire) to engage in practical decision-making process (Label C).
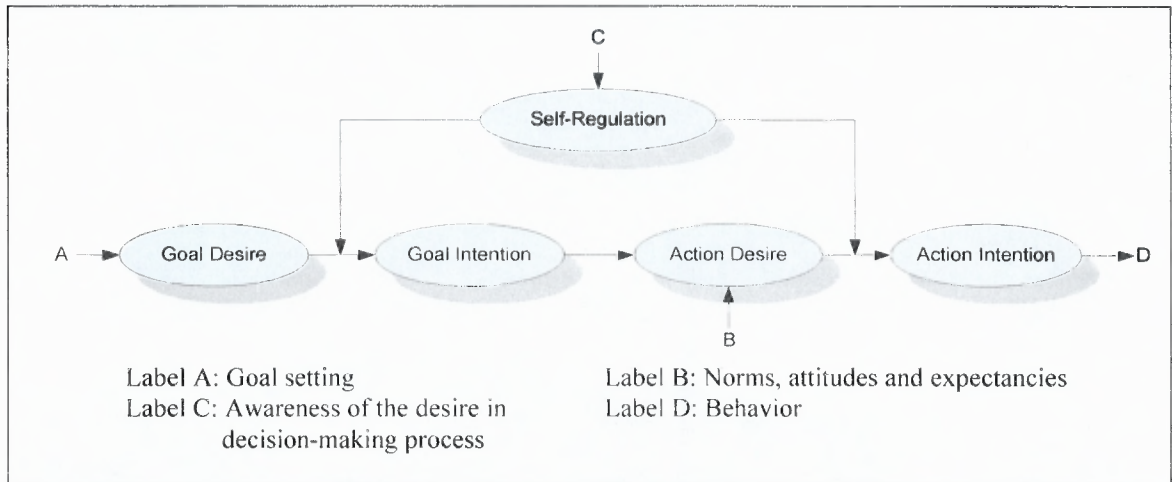
Figure 2.2 Technology user acceptance decision making core.

There are two categories of self-regulation: (1) reflectivity and (2) reflexivity (Bagozzi, 2007a). Reflective self-regulation means "the active imposition of personal moral or self-evaluation standards to a felt or possible goal desire or action desire" (p. 251). In other words, a person needs to evaluate the desire and see if they really want to pursue the goal-directed activity to achieve the desire. Reflexive self-regulation, in contrast, includes the learned values, dispositions, traits, virtues, and vices that activate the desire intentions (Bagozzi, 2007a).

The difference between the behavioral intention models such as TAM and the goal-directed model is the extent of cognitive elaboration and connection to the psychological processes following the intention formation (Bagozzi and Edwards, 2000). Specifically, the former consists of self-prediction of the behavior in which one will engage (Ajzen and Fishbein, 1980), while the latter indirectly leads to goal attainment by initiating or regulating the actions in supporting the goal-striving process. Mediating

between goal intentions and actions toward the goal require the completion of following

two functions (Bagozzi and Edwards 2000):

- Implementation intention function creates a strong link between an intended situation and a behavior.

- Self-regulatory appraisal process function, which includes the determinations of self-efficacy, action-outcome expectancies, and affective towards the means available for goal striving.

2.2.3 Adoption of Virtual World Commerce

Recent research on virtual world adoption employs an extended version of the

Technology Adoption Model (TAM) and flow theory to investigate the acceptance of

virtual worlds for interaction and communication in general (Fetscherin and Lettemann,

2007), and for business functions in particular (Shen and Eder, 2009). The previous

research by Fetscherin and Lettemann (2007) indicates that the most important

determinant of virtual world adoption is the perceived value of community functions of

the virtual world that enable new means to communicate, cooperate, and collaborate in

this pervasive environment. The effect of perceived value of community is greater than

the next most important determinant perceived usefulness of the virtual world. The

previous study by Shen and Eder (2009) related to the adoption of virtual worlds for

business assert that computer playfulness, self-efficacy and perceived enjoyment, in

addition to perceived usefulness, are important factors that lead to behavioral intention to

adopt the virtual world for business.

Although previous studies in virtual world adoption apply TAM and its extended

models in examining behavioral intention of users, this dissertation is based mostly on the

fundamental concepts TPB and self-regulation theories because of the inability of TAM

in initiating or regulating the actions resulted from the goal-striving process as described earlier in the previous section. In addition, this study evaluates whether virtual world commerce adoption can solely be determined by the technical aspects of the system and the attitude of the users towards the system. In particular, this dissertation proposes that the adoption of virtual world in commerce incorporates three main aspects to be described, which can be explained by fundamental ideas of either TPB or SRT.

First, the affordance design of the virtual environment and the contents (i.e., the navigability and control of virtual objects and entities, the sociability and the ability in engaging in transactions) are derived from the concepts of Perceived Behavioral Control (PBC) in TPB. By definition, PBC is the perceived about ease or difficulty of performing the behavior (Ajzen, 1991) and also is viewed as the perception of internal and external constraints on behavior (Taylor and Todd, 1995). The ability to engage the system or functions detected on the interface certainly facilitate users in system use. Therefore, the affordances of the virtual world can lead to the ease in control of actions or behaviors, especially through avatars in virtual worlds. In addition, subjective norms, which suggests that a behavior is resulted from a person's desire to act as relative to others' behaviors or thoughts that a person should act (Pavlou and Fygenson, 2006), is similar to the concept of social influence (Raven, 1964; Schmitz and Fulk, 1991), which refers to a change in a person's cognition, attitude, or behavior that originates from another person or group. Therefore, the concepts of affordances are overlapped between two fundamental concepts of TPB, which are subjective norms, and PBC.

Second, the relationship-based trusting belief concept is related to the concept of attitudinal beliefs as it relates to an individual's feelings about performing a target

behavior (Fishbein and Ajzen, 1975), and PBC. As explained by previous research in e-commerce, trusting beliefs is an antecedent of both attitude and PBC (Pavlov and Fygenson, 2006).

Finally, the need satisfaction concept is related to the goal-directed process as described in SRT, because of its relation to motivations and achievement or fulfillment of the needs a person has. The following figure depicts hypothetical relationships between the concepts of main research variables and the fundamental variables of TPB and SRT.
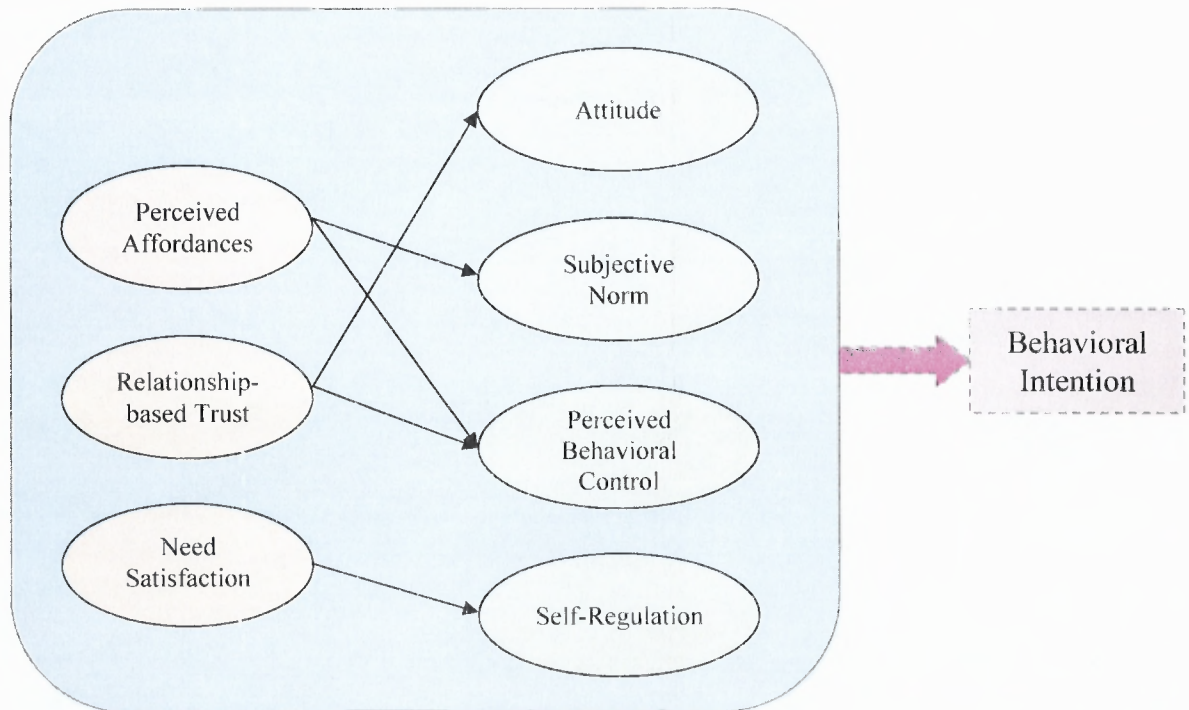
Figure 2.3 The hypothetical relationships between the three main research variables (on the left-hand side) and the fundamental concepts of TPB and SRT (on the right-hand side).

Based on the above explanation about the adaptation of the core variables of this dissertation from Theory of Planned Behavior (TPB) and Self-Regulation Theory (SRT), the dependent variable of this dissertation is the behavioral intention to make a purchase or to engage in business transactions in the virtual world. Intention to purchase or engage

in business transactions is an explanation of system adoption (Gefen et al., 2003). The operationalization of the system adoption in general, and particularly the intention to purchase, is elaborated in Table C.1 of Appendix C.

The measurement of web-based commerce systems such as e-commerce or web retailers is adapted from the previous research in technology adoption such as TRA and TAM (Davis, 1989). Generally, the dependent variables of research in e-commerce are stated as a purchase intention (Gefen et al., 2003), an intention to transact (Pavlou, 2003) or willingness to buy (Jarvenpaa et al., 2000). In this dissertation, the dependent variable is intention to purchase or intention to transact in the virtual world, which is defined as *a subjective possibility to make a business transaction or a purchase from virtual merchants, whose businesses are operated in the virtual world.*

2.3 Need Satisfaction and Theory of Human Motivation

The concept of needs has been studied and explored in various disciplines, including organizational behavior, social psychology and marketing. The fundamental concept of needs focuses on the formation of human motivation and the need fulfillment. Maslow (1943) and White (1959) assert that human behavioral changes are affected by motivations. The process of inducing change in human behavior begins with needs that common people possess (Maslow used the term "need deprivation" in stating such behavior that requires change). Humans naturally seek a way to fulfill their needs by motivating themselves in order to maintain a homeostasis status (Fletcher, 1942) or by motivating others to act towards a certain direction. The fulfillment of human needs implies gratification or satisfaction obtained from actions corresponding to motivations (Oliver, 1995). After needs are satisfied, new ones emerge (or activate), though not

consecutively, but simultaneously or overlapping the old ones. The dynamic cycle of need process is illustrated in Figure 2.4. The arrows represent the flow of need process.
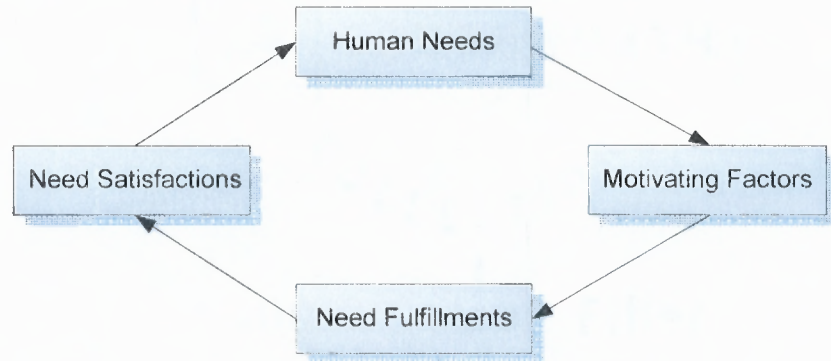
Figure 2.4 Dynamic cycle of need satisfaction process.

This section explains the concept of needs and its fundamental theories, including theory of human motivation and psychological need satisfaction concept, as well as related literature of these topics. In addition, this section states the research hypotheses that develop from the concept of need satisfaction and technology adoption.

2.3.1 Theory of Human Motivation

Motivation is a set of reasons determining the engaging behavior. There are various theories focusing on human motivation. For instance, incentive theory posits that motivation can be stimulated or discouraged from rewards and (coercive) forces, respectively. This dissertation focuses on the concept of need hierarchy (Maslow, 1943), based on the theory of human motivation.

The concept of Maslow's hierarchy of need asserts that human wants and desires enhance behaviors or, at least, behavioral intentions. Maslow (1943, 1954) posits that human needs are based on two need categories:

1. Deficiency needs (D-needs); and

2. Growth or being needs (B-needs).

The deficiency needs exist when the lower-level needs have been fulfilled and one is seeking to fulfill the next level of need that is in a higher-level. The deficiency can be detected again if the need has not been fulfilled. On the other hand, the growth needs are a higher-level of needs that occur whenever individuals satisfy the deficiency needs. For instance, individuals can detect if their self-actualization need occurs whenever one's concern is about personal growth, and want to obtain the appreciation of life. Growth needs include the need to know or understand (cognitive), the aesthetic need, the self-actualization need, and the self-transcendence need as shown in Figure 2.5.
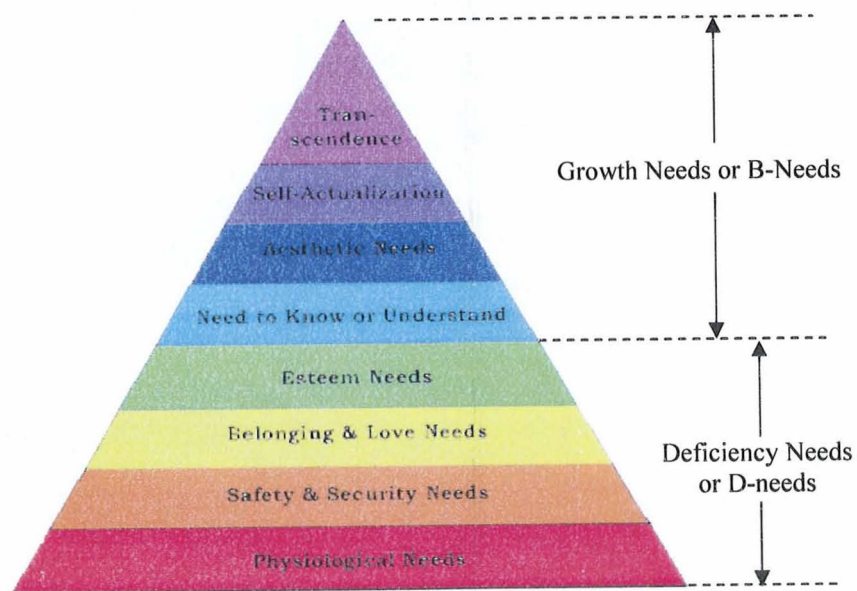
Figure 2.5 Maslow's need hierarchy.

According to the thesis of the theory of human motivations (Maslow, 1943), human needs emerge whenever they are motivated physically and mentally and can be arranged into a hierarchy of prepotencies, where the existence of need is connected to the

satisfaction of the other higher-level needs. Other than the above classification of needs shown on Figure 2.5, prior literature including Maslow (1943) posits that needs are classified into the following five overlapping levels that are ordered from the most pre-potency needs:

- **Physiological Needs:** Refer to the need that emerges to maintain homeostasis status, which is referred to as the normal state of the body's automatic efforts to maintain the equilibrium of the internal systems, such as water content of blood, salt and nutrition content, body temperature, etc. Therefore, clothing can be used to maintain homeostasis. Similarly, the need of vaccine or medicine is crucial to maintain normal body systems. The physiological needs also serve as the causes of other needs to arise. For instance, the person who feels hungry may seek to satisfy the need by having a big meal or seek to partially satisfy the need by having only some snack. The latter implies that the fulfillment of the physiological needs is not yet complete. Therefore, it is certain that physiological needs are the most pre-potent of all other needs.

- **Safety and Security Needs:** Generally refer to a safe, predictable, organized, ability to count on, and a situation in which unexpected, unmanageable, or harmful things will not occur. Safety needs can only happen in such phenomena as the common preference of a job with tenure and protection, the saving of money, or the insurance of properties. Otherwise, the need for safety seems to be active only when real emergencies (e.g., war, disease, natural disasters, crimes, etc) will potentially happen. Safety needs are important as today's social structure is globalized and has increased crime and threats of unlawful entities to harm ordinary people. Therefore, it is common for people to seek protection from legal entities. Not only do people seek legal protection, but they also rely more on trust mechanisms.

- **Belonging and Love Needs:** Involve the sense of getting love and affection, or the sense of belongingness to anyone. Love needs include both giving and receiving love. People seek to form affectionate relations with others to diminish the feelings of loneliness, ostracism, rejection, friendlessness, or rootlessness. Other than the love needs, people seek a place to belong within their societies or communities. Friendship and the sense of group belongingness are important to satisfy these needs. The need to belong is closely related to the need to make social contact and social interaction. To fulfill this need, individuals should seek interpersonal contacts and establish a relationship or relatedness with others. Otherwise, an insufficient amount of social contacts can result to loneliness (Weiss, 1979).

- **Esteem Needs:** Represents the desire for a firmly based, stable, self-respect and confidence to face the world. One's esteem may also reflect that a person needs to be respected, recognized, accepted, and appreciated by others. Esteem needs can be classified into two subsidiary types: (1) the desire for strength and achievement, and (2) the desire for reputation and prestige. Satisfaction of esteem needs leads to more self-confidence, worth, strength, capability, and feeling of being necessary in the world. Unfulfilled esteem needs, on the other hand, contribute to weakness, inferiority, and helplessness.

- **Self-Actualization Needs:** Are the highest level of needs and imply that a person has fulfilled what he/she wants to be and to do. They also include the feelings that one is capable or competent to do anything to satisfy oneself. For instance, a musician must create music, and an artist must produce paintings. The term self-actualization was initially introduced by Goldstein (1939), which referred to as the desire for self-fulfillment, or the tendency for an individual to become actualized in what he/she is potentially becoming. Specifically, to fulfill self-actualization means to become everything that one is capable of becoming (Wahba and Bridwell, 1976).

Although researchers encounter many difficulties when classifying needs into the categories proposed by Maslow (Wahba and Bridwell, 1976), most of them still accept the concept of need hierarchy and adapt them into their specific research areas. Mathes (1981) classifies human needs into three levels, consisting of physiological, belongingness and self-actualization. Alderfer (1972), on the other hand, modifies Maslow's need hierarchy to include only the needs for existence, relatedness and growth (ERG). The ERG concept proposes that existence needs include the physiological and safety needs, relatedness needs include the love and social needs, and growth needs include the self-esteem and self-actualization needs.

Wahba and Bridwell (1976) suggest that human needs can be classified into maintenance and growth needs. The maintenance needs include physiological and security needs, while the growth needs include belongingness, esteem and self-actualization. Previous research in organizational self-determination indicates that the concept of need hierarchy is applicable to organizational context (Deci et al., 1989). The

study asserts that higher-level needs are important issues whenever lower-level needs, such as pay and job security, are well satisfied.

2.3.2 Psychological Need Satisfaction

The concept of psychological need is based on the concept of Maslow's hierarchy of needs. Psychological need has been extensively studied in the area of job satisfaction in organizations (e.g., Porter, 1961; Roberts et al., 1971; Water and Roach, 1973). Much research has been conducted to identify the measurements of the need categories proposed by Maslow. Porter (1961), for instance, develops a need measurement based on Maslow's hierarchy of needs and suggests that physiological needs should be separated from other higher-order needs.

The physiological need dimension is excluded from the perceived (psychological) needs (Porter 1961, 1962, 1963a, 1963b), but another need dimension, autonomy need, has become an important factor to consider. His study assumes that the individual has already fulfilled the basic needs and should not be considered as an essential determinant of need fulfillment formation.

The effect of psychological need satisfaction in organization is examined using the need satisfaction questionnaire (NSQ) containing three questions for each individual item (See Table 2.1 for itemized measurement). NSQ consists of 13 items that comply with Maslow's types of needs and another two items that relate to two or more need categories. The items aim to measure the following attitudes:

- **The Need Fulfillment:** Measured by the ratings from the question "How much of the (job) characteristic is there now?"

- **Perceived Deficiency in Need Fulfillment (or the Discrepancy Score):** Obtained by subtracting the ratings from the question "How much of the (job)

characteristic is there now?" from rating the question "How much of the (job) characteristic do you think there should be?"

- **The Importance of the Need (or the Importance Score):** Measured by rating the question "How important is the (job) characteristic to you?"

Table 2.1 Categories of Needs and Specific Items

Maslow's Need Category	Items to measure
Security needs	• Feeling of security
Social needs	• Opportunity to give help to other people • Opportunity to develop close relationships
Esteem needs	• Feeling of self-esteem • Prestige inside the company • Prestige outside the company
Autonomy needs	• Authority • Opportunity for independent thought and action • Opportunity for participation in the setting of goals • Opportunity for participation in the determination of methods and procedures
Self-Actualization	• Opportunity for personal growth and development • Feeling of self-fulfillment • Feeling of worthwhile accomplishment
Items specific to two or more need categories	• Payment • Feeling of being-in-the-know

A Need Satisfaction Index (NSI) can be obtained using the following formula. The score reflects the extent of satisfaction toward the need (Porter, 1962, 1963a, 1963b).

$$Discrepancy\ Score\ =\ How\ much\ is\ there\ now - How\ much\ there\ should\ be$$

$$Importance\ Score\ =\ How\ important\ to\ you$$

$$Need\ Satisfaction\ Index\ (NSI)\ =\ \sum \left[\frac{Discrepancy\ Score}{Importance\ Score} \right]$$

Spreng and colleagues (1996) mention an Additive Difference Specification (ADS), which is a general form of such models as the ideal-point model or the value-percent disparity Model (Westbrook and Reilly, 1983). The general form of the ADS is illustrated in the following formula:

$$A_x = \Sigma_i \, W_i \, | \, B_{ix} - I_i \, |$$

where

A_x	=	overall attitude toward alternative x,
W_i	=	the importance weight of attribute i,
I_i	=	the ideal regarding attribute i, and
B_{ix}	=	the perception of the performance of alternative x on attribute i.

The application of the ADS on NSI score overcomes the problems associated with the use of discrepancy score (Teas, 1993) and allows meaningful interpretation of both positive and negative discrepancy score (Spreng et al., 1996). Therefore, Need Satisfaction Index (NSI) as discussed in this dissertation can be described in the following equation based on the ADS:

$$\textit{Need Satisfaction Index (NSI)} \; = \Sigma \, [\, | \, \textit{Discrepancy Score} \, | \; x \; \textit{Importance Score}]$$

Job satisfaction studies suggest that people with different personal qualifications perceive different importance in needs, and have different need-fulfillment deficiencies. For instance, low-level management positions are more likely to perceive more deficiencies in psychological need fulfillment than are middle-level management

positions, especially in the esteem, security, and autonomy needs. Self-actualization and security needs are more important than other kinds of needs.

Previous research asserted that autonomy, competence and relatedness needs were attributes determined by psychological needs, especially in the social context where people strive to engage in goal-directed behaviors (Hagger et al., 2006). The need for autonomy reflects the desire to have a personal choice, freedom, and ownership of actions. The need for competence contributed to the perception of success and control of outcomes. The need for relatedness reflects the desire of support from the others when doing something.

Social-determination theory (SDT) holds that basic psychological needs reflect the nature of human beings that can be applied to all people, regardless of gender, group, age, or culture. SDT asserts that humans strive to satisfy innate psychological needs. In an organizational context, people are the subjects under motivation mechanisms in the organizational systems. Specifically, the mechanisms drive people to achieve their needs and promote their work performances. Generally, the psychological needs based on SDT (including autonomy, competence, and relatedness needs) are essential for psychological growth and promote life satisfaction and well-being of the people (Sheldon et al., 1996; Deci and Ryan, 2000).

A study by Hagger and his colleagues (2006) explored the theory of motivation across the three levels including the global-level, contextual-level, and situational-level of psychological needs (as shown in Figure 2.6). The study proposes that self-determination theory explicitly endorses the role of global psychological needs in determining human motivation, which can predict the behavior directly and indirectly through contextual-

level and situational-level motivation. In particular, the theory focuses on the factors enabling people to meet their psychological needs, which can happen either from self-motivation or socially-driven motivation (e.g., Sheldon and Bettencourt, 2002).
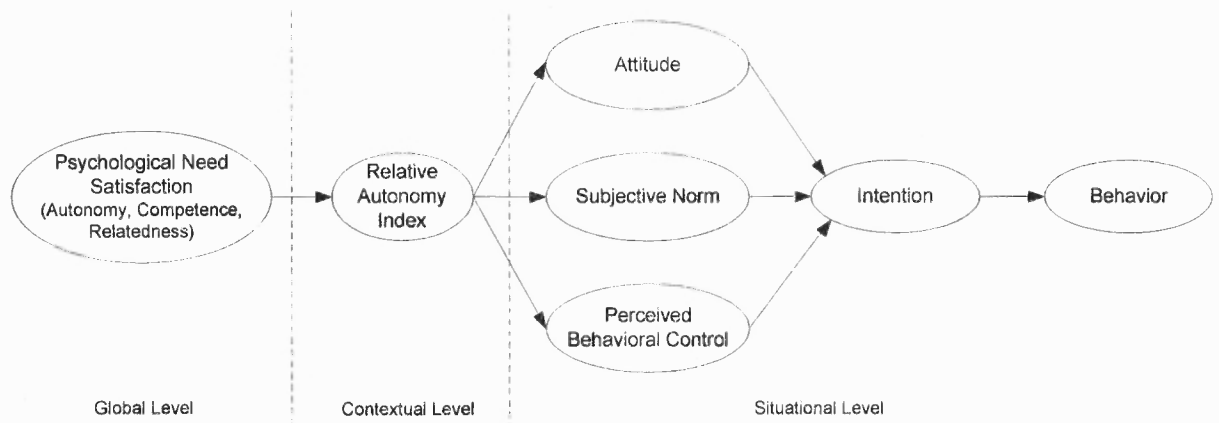
Figure 2.6 Integrated model of psychological need satisfaction and Theory of Planned Behavior.

Theoretically, the Theory of Planned Behavior (TPB) explains the psychological need satisfaction in global-level and influences of the autonomous motives in contextual level, which will affect the attitudes, subjective norm and perceived behavioral control constructs. However, the results of the study of motivation in the two behavioral contexts were only partially supported. In fact, the study revealed that autonomous motives on the contextual level affected only attitudes and perceived behavioral control, but not the subjective norm (Hagger et al., 2006). The study also shows that autonomous motives reflect the personal positive attitude and expectancies of the future, and encourage the individual to engage in such a behavior. The operationalization of need satisfaction construct from the selected literature is summarized in Table C.2 of Appendix C.

2.3.3 Need Satisfaction in Virtual World Commerce

Consumption of virtual goods is similar to real goods in that they both serve utilitarian and emotional purposes. Incentives to acquire virtual products in the virtual world depend on the attributes of the products, which are classified into the following three categories: (1) utilitarian; (2) hedonic; and (3) social attributes. Utilitarian attributes of virtual products include performance and functionality, whereas hedonic and social attributes mainly involve improving visual appearance, creating social distinctions and bonds, etc. The use of goods in the virtual world allows consumers to fulfill some higher objective, usually an intangible objective related to some fundamental human needs (Lehdonvirta, 2009).

Other than the need for acquiring virtual items (or real products), users who intend to use the virtual world as a means to communicate and exchange relationships with others also strive to achieve other needs related to social, affection, belonging, and esteem needs. This may be a reason why many users are particularly concerned about how their avatars' appearances and personalities are perceived by other users. This is why the virtual world allows users to adjust their avatars physical appearances (such as height, shape and skin color) and personalities that express how ones express themselves emotionally in the virtual world. This section describes the need satisfaction that occurs in the virtual world commerce environment, which can be classified into two major categories: (1) lower-level (or deficiency) needs, and (2) higher-level (or growth) needs.

Lower-Level (or Deficiency) Needs

According to Maslow's need hierarchy, lower-level needs are consisted of physiological needs and safety needs. Physiological needs can be divided into several kinds of basic needs, including food, clothing, and shelter. These needs are what every human acquires in order to live. Although, food may not be necessary required for survival in the virtual world, it is often essential for avatars to acquire other products while engaged in activities in the virtual world. Therefore, acquiring virtual products is important since users inherently have certain kinds of basic needs for their avatars survival.

Providing a wide variety of virtual products helps fulfill deficiency needs. This is why there are millions of virtual and real products available for purchase in the virtual world. For example, gadgets are items equipped by avatars used to increase their avatars' abilities or features. Consumer satisfaction attitudes toward the product purchased imply the extent that their needs are fulfilled. However, it is difficult to confirm that deficiency needs are initiated from the intrinsic motivation as suggested by Maslow (1954). For instance, needs may emerge from extrinsic motivations, such as from marketers who attempt to manipulate the market and induce consumer needs in the business environment. In particular, marketing strategies and advertisements are significant in creating consumer needs and motivations to acquire products or services. Need satisfaction can be evaluated after the consumer has some experience with the product purchased from a virtual business.

Issues concerning safety and security needs in the virtual world are also different from those in the real world. The safety and security issues in the virtual space relate not only to the health and well-being of the avatar, but also the protection of privacy and

personal information. Virtual consumers generally expect a secure commerce platform or other mechanism that allows them to securely exchange information, especially sensitive information such as credit cards and bank accounts. Similar to the physiological needs, satisfaction of the safety needs is measured by the extent of pleasurable experience that the consumers have when engaging in the business process. Specifically, the evaluation of the after-purchase service is another important indicator of deficiency need satisfaction that relates to safety and security issues.

Higher-Level (or Growth) Needs

The higher-level needs consist of social needs, esteem needs, autonomy needs, and self-actualization needs as suggested by Porter (1961). Social needs involve the requirement for emotional-based relationships such as friendship, intimacy, and a sense of belonging. Generally, people want to perceive a sense of belonging and acceptance from either their immediate families or extended social groups, such as professional organizations, sport teams, and other kinds of social communities. This is obvious especially in the virtual world where a substantial amount of users, social groups, and communities are established. An individual normally seeks approval and acceptance from other members in community. Brewer (1991) postulates that humans have two primary social needs: (1) needs for assimilation, and (2) needs for differentiation. Needs for assimilation refers to the desire to feel "inclusion within larger collectives (p. 478)." Whereas needs for differentiation refers to the desire to "distinguish (oneself) from any other persons in the social context (p. 477)." In other words, individual wants to fulfill both inclusive and distinctive needs from others.

Another type of need considered as a growth need is love (or affection). Love is the relationship developed between two or more persons and generally indicates a positive feeling. Individuals want to love and to be loved by others. In the virtual world, love needs can imply that a person loves to do something or intends to do something to strengthen the relationship with the others. Love needs are similar to social needs as they require the sense of belonging from those who are very close to oneself. On the other hand, unfulfilled love needs can be susceptible to loneliness, social anxiety, and clinical depression (Brewer, 1991).

Another type of higher-order needs is self-esteem needs. Self-esteem needs involve one's need to be respected, to have self-respect, and to respect others. It is common for people to attempt to fulfill their esteem needs in the real or virtual world in order to be recognized by others. This is similar to the self-actualization need, which is defined as a driving life force that ultimately leads to maximizing one's abilities and determine the path of one's life (Goldstein, 1939). However, Maslow (1943) argues that self-actualization is not a driving force, but the desire that leads a person to realize his/her capabilities.

Previous studies about purchasing behavioral in virtual worlds posit that self-esteem needs (Barnes, 2007) and self-actualization needs (Guo and Barnes, 2009) are intrinsic motivations that reinforce consumer needs to purchase products in the virtual world.

General Research Hypothesis from this Section

This research proposes the following hypothesis based on the literature on need satisfaction and previous research on TPB and self-regulation:

H1: The more the products (or services) offered by the virtual store are able to satisfy consumers' needs, the higher their intentions to make a purchase.

2.4 Theory of Affordances

This section explains the theory of affordances (Gibson, 1977). The original concept of affordances has been studied extensively and applied in social and technology studies. Much research in Information Systems (IS), particularly Human-Computer Interaction (HCI) and system design applies the concept of affordances to explain human perception and implementation of computer technology. In particular, affordances are vital in the design of social systems, such as social networking and collaborative systems. Therefore, social issues related to the context of technology use must be considered when designing or modifying a system (Gaver, 1996). Affordances thus become a crucial aspect in the design of socio-technical systems that enhance communication, collaboration and coordination.

This section also describes the concept of affordances and its application in social and technological systems. It also proposes the application of the theory of affordances in the virtual world, which concentrates on physical, relational, and transactional design aspects. This section also states the research hypotheses developed from the theory of affordance, as well as previous literature on technology adoption.

2.4.1 Gibson's Affordances

The original perspective of affordances asserts that animals (including humans) can perceive the existence of medium though their sensory receptors. For instance, air affords breathing while light affords vision. In the physical world, the environmental surroundings afford the animal to sense other substances, surfaces, layouts, enclosures, objects, places, events, and other animals. The idea of affordances originates from the investigation of environment phenomena, which contains the medium, substance, and surface that distinguish one object from another. In addition, affordances involve the possibility of action that an animal can have towards objects or events.

Affordances are central to the ecological approach of perception and action (Stoffregen, 2003). Perceptions that occur to animal's or human's senses can be converted into meaningful actions. The direct-perception view introduced by Gibson assumes that objects and events have inherent meanings, which are detected and exploited by the animal without mental calculation (Jones, 2003). For instance, humans detect affordances when they observe some constant objects and their properties (e.g., shape, size, color, texture, composition, motion, animation, and position).

According to Gibson (1977), an affordance is "a specific combination of the properties of its substance and its surfaces taken with reference to an animal (p. 67)." The word "afford" means "to make available." Affordances are perceived by the animal and suggest suitability to habituate action. In a specific human environment, affordances are "material properties of the environment that can support actor's existence and survival (Albrechtsen et al., 2001)." The theory of affordances provides guidelines to understand

the interactions between actors (either human or animals) and environment (Pijpers et al., 2006). In particular, objects, substances, and events enable actions to be performed.

Affordances are species-specific. This is due to each animal interpreting their environment differently depending on the value they place on the various surfaces, layouts of substances, and mediums. In this respect each animal would react to affordances in different ways. This is a reason that animals and human may have different perspectives and reactions toward objects or substances in their respective environments. The actors possess certain properties of objects and take particular actions to them in the environment. This process is called the "ability" or the "effectivities (Shaw et al., 1982; Turvey, 1992; Turvey and Shaw, 1979)."

Turvey (1992) explains the theory of affordances from the view of ontological scientific researchers, which focuses on the generic features of reality. The process of affordances involves the properties of the objects or things by which their changes and consequences can be perceived or predicted by rationality. The possibilities of future events (or what is called prospective control), and the dispositions toward actions are used to explain the concept of affordances. Turvey describes the following three characteristics of disposition (p. 178):

1. Disposition to do Y is prior to doing Y.

2. Disposition (or causal propensities) comes in pairs or in the form of complementary occurrences.

3. Disposition and suitable circumstances can create actuality.

Much research classifies affordances' definitions into two general terms. First, affordances are relations between an animal and its environment that have consequences for behavior (Chemero, 2003a; Stoffregen, 2000). Second, affordances are properties of

the environment of an animal that have consequences for the animal's behavior (Greeno, 1994; Reed, 1996; Turvey, 1992).

Stoffregen (2003) proposes a new definition of affordance. He defines affordances as properties of the animal-environment system that exist only at the level of the system. This definition of affordances does not refer to the behavior or the actualization of affordances, but mostly refers to opportunities for action determined by rational (emergent) properties of dynamic animal-environment systems. This idea argues that affordances arise from relations between animal and environment, which opposite to the definition given by Turvey (1992) who suggests that affordances are properties of the environment. Since Stoffregen's meaning of affordances includes opportunities for all actions, anything that has affordances may involve reactions. In other words, anything that has affordances always produces or relates to particular actions.

Chemero (2003a) agrees with the idea that affordances are animal-relevant properties of the environment, but argues that affordances exist only if there is an animal to take advantage of them. Affordances are not existed in the environment but they are matters of perceiving that the situation as a whole has a certain feature. In particular, affordances happen whenever the whole situation supports or demands a certain kind of action. In addition, affordances are not merely properties, or even features of the environment but the perceptions of the situation comprised of animal relative to environment. Affordances are relations between abilities of organisms and features of environment.

Chemero (2003a) also argues that affordances are not the aspect of body scale as suggested by Warren (1984) in his remarkable stair climbing experiment. Though

affordances determine the possibilities of action that an animal can implement, the perception of action does not always happen from the determination of the physical properties of animals, or particularly, the realization of animals towards the possibility of action alone. Regardless of this controversy, Chemero supports the ideas of abilities and effectivities (Reed, 1996; Stoffregen, 2000; Turvey, 1992) that affordances are depended on the dispositions (or effectivities) of the animal complemented by the properties of the environment (Shaw et al., 1982; Turvey, 1992; Warren, 1984). Chemero also proposes the concept of event, which happens whenever there are changes in environment and does not necessarily result in changes in abilities.

Pijpers and colleagues (2006) extend the theory of affordances to cover a concept of perception, which refers to the relationship between the affordances and the actor's emotional status. Perception describes action possibilities or behavioral potential offered by the environment. Changes in one's ability to act influence the perception of action possibilities. The results of perception-action experiments on wall climbing demonstrate that the actor's emotional state (e.g. anxiety and fatigue) changes the perception or realization of action possibilities, as well as the realizing affordances. The emotional state affects the detection of information related to action possibilities in the environment. The emotional state also constrains (or influences) the realization of action possibilities.

In conclusion, much literature on the theory of affordances concerns the relation between affordance perceptions and actions, as well as changes in behavior. Animals, especially humans, can detect or perceive affordances of environment. As a result, the perception of affordances can, but not always, produce actions. Finally, the perception of

affordances can influence actions, which may or may not be taken by animals (or humans), depending on situations and changes in the environment.

2.4.2 Ecological Approach to Social Interaction

Gaver (1996), who supported the Gibsonian concept of affordances, inspires the ecological approach to social interaction. In the social settings, affordances are defined as "properties of the world that are compatible with the relevance of people's interaction ... a link between perception and action (Gaver 1991, p. 79)." The ecological perspective has the four following distinguishing features (McArthur and Baron, 1983):

1. It assumes that perception facilitates the adaptive functions of the physical world in guiding the biologically and socially functional behaviors. Perception promotes individuals' goal attainments and guides individuals in seeking possible actions or behaviors, which will consequently enhance goals. This perspective is consistent with what Gibson stated "Sexual behavior, nurturing behavior, fighting behavior, cooperative behavior, economic behavior, political behavior – all depend on the perceiving of what another person or other persons afford, or sometimes on the misperceiving of it (p.135)."

2. The ecological perspective assumes that the perceived information can be revealed in objective physical events, which dynamically change as opposed to static displays. An event is a unit of information in structured stimulation (McArthur and Baron, 1983). Events provide the perceivers the information that supports the possible motives (stimuli) of behaviors. The ecological approach is interested in what information is provided by social stimuli that induces behavior, as well as addressing information and examining its dynamic stimulus.

3. The ecological perspective assumes that information available in events specifies the environmental affordances, which induce the opportunities for acting or being acted (Gibson, 1979). Affordance perception arises when there is some relevance between actions and goals. The physical properties such as color, smell, surface, size, and texture induce affordances when taken with reference to an observer.

4. The ecological perspective assumes that affordance perception depends on the perceivers' attunement, or what Gibson called the *education of attention*. The attunement of the observer varies based on the perceptual learning, goals, expectations and actions of each observer. Affordances detected by each observer are also different from those detected by the others.

The ecological approach suggests that social perception not only stresses the importance of social properties that are more readily to detect than others by all perceivers, but also emphasizes the difference between individual perceivers. Social affordances significantly apply the ecological approach to discover the individual's social perceptions that enhance any particular social activity. The theoretical concept of social affordances focuses on situations that comprise of social interaction, as well as the interaction with the physical environment (Greeno, 1994).

Greeno (1994) adopts the key idea of Gibson's affordances and explains them in the view of an interactionist. Instead of focusing on the contribution of physical systems in enhancing interaction, an interactionist views affordances as the relational contribution of an agent's abilities (or effectivities, or aptitudes) to perform an interactive activity in the environment. Other than the ecological psychology, studies that involve a more general view of affordances usually focus on perception as an aspect of human or animal interaction with the environment. The interactionist also considers more about the information processing that occurs in the relations of agents with the physical system and environment (and vice versa). In particular, the interactionist perspective indicates that communication, interpersonal interaction, and situation involving socially organized problems are relevant to affordances. For instance, interpersonal interaction involves conversations, pauses, facial expressions, and gestures that provide information to notify possibilities of actions.

Kreijns and colleagues (2004) study social interaction and sociability, based on social affordance theory and social presence theory, by investigating human interaction in social contexts. The study is based on the ecological approach of visual perception, which

comprises of three major ideas: (1) information, (2) affordances, and (3) Theory of Information Pickup (TIP). This research suggests that individual's perception is originated from a vision that an individual receives from the outside environment. This finding is consistent with other studies, which posit that perception from the environment can consequently result in action. Kreijns and colleagues use the term "perception-action coupling" to explain the relationship between perceptions and affordances. They also state that what the animal perceived is what the properties of the environment afford to the needs and the affectivities of the animal.

2.4.3 Socio-Technical Affordance Aspects of the Design

In the lawful physical environment, design increases predictability to afford perception and action (Gaver, 1996). For instance, a good design for a doorknob affords a person to predict the outcome of the action (to twist for opening or closing the door). In particular, the design of social tools must concern the possibilities offered by the physical environment for sociality, social interaction, and sociability (Gaver, 1996; Kreijns et al., 2004). Based on the theory of affordances, the design of social and communication systems requires the understanding of social phenomena in the environment to build the system that supports social interaction and collaboration. Specifically, the design serves as a means for understanding social behavior, as well as its underlying affordances. Gaver (1996) gives an example of the system design that supports collaboration and social interaction by enhancing social affordances. A good or bad design for communication systems, such as email and video conference, depends mostly on the degree of affordance incorporated in the design.

Considering information theory, the affordance concept is distinguishable from the information concept in technology adoption, particularly ease of use of technology interface. Figure 2.7 shows the four taxonomies of technology affordances that are used to explain affordances of the design of any devices and the extent that the design enhances perception of information given by the design:

- **Perceptible Affordances:** An affordance of information perceived about objects that users can act upon, such as a mouse and a keyboard afford the movement of cursor on the computer screen.

- **Hidden Affordances:** Users sometimes must learn to take appropriate action when there is no perception information available on the interface.

- **False Affordances:** Non-existence information for affordance that the users mistakenly perceive or try to act.

- **Correct Rejection:** Users do not perceive any action when there is no existence information for affordance.

From this particular point of view, an easy to use (or user-friendly) interface is relevant to the perceptible information of the objects and related action perception. The design of easy to use interfaces involves affordances offered by media, including visual and other forms of information. Visual information, such as graphical objects, incorporates such properties as shape, size, and text, can provide information that conveys to the system attributes related to some specific action. Gaver's taxonomy of affordances aids the design of artificial environments that can couple the user with the system (Albrechtsen et al., 2001).

thing, primarily those fundamental properties that determine just how the thing could possibly be used (p. 9)."

The fundamental principles of good design consist of two major characteristics: (1) the design provides a good conceptual model, and (2) the design makes things visible (Norman, 1988). Good conceptual design allows people to predict the outcomes of the actions. Therefore, good design objects should enhance the possibilities of a successful outcome. Similarly, a good design makes it possible for people to easily understand an object's functionalities and understand how to manipulate and control them. These two design principles are psychologically related. In other words, the good design of objects not only guides users on how to manipulate the object, but also allows them to predict the outcomes of their actions. In particular, a good design should guide the way to use the object to achieve the users' goals. This idea not only considers the physical affordances or the design that enhances usability (rather than complexity), but also the design that focuses on users' goals, plans, values, beliefs, and experiences.

In addition, every action or interaction that people have done with things is the result of their perceptions of visibility, appropriate clues, and feedback from others' actions (Norman, 1988). Fundamentally, human action consists of two aspects:

1. **Execution:** Involves doing some action, especially the action that has explicit goals.

2. **Evaluation:** Involves the comparison of what happens in the world and what the actor wants to happen.

Evaluation mostly involves perception of the world that may require interpretations and intentions toward goals. Whether the action of physical components involves both execution and evaluation, or either of them, is depended on the extent that

users directly perceive information necessary to take actions. For instance, the user can use direct perception to initiate actions and to achieve a goal, which means that the user has correctly used perceived affordances to guide action. However, if the perception is clumsy or obscure as to how to accomplish the goal, additional cognitive process (memory) or interpretation may be required for taking action.

Affordances alone are not sufficient in guiding action. Although affordances suggest a range of action possibilities, some situations limit the numbers of alternatives for actions (Norman, 1988). Therefore, both affordances and constraints are used to determine the proper course of action. There are four constraints that limit the course of action after the users perceive the affordances of any objects:

- Physical constraints limit possible operations.

- Semantic constraints rely on the situations to control the possible action.

- Cultural constraints contain a set to allowable actions for different social situations.

- Logical constraints limit the relationship between spatial or functional layout of component and other things that affect or are affected by.

Research in HCI considers individuals or users as social creatures. The interaction among users is depended on their understandings of others' moods or emotional status (Norman, 2004). The emotional status, which can be observed by facial expression, body language, posture, gesture, and the like, are usually tied to behavior. Norman asserts that not only the individual uses perceptual emotional status of others with whom they interact, but the individual also uses experience to interpret most situations. Norman includes anthropomorphism – the attribution of human motives, beliefs, and feelings to

animals and inanimate things – for any possible action that individuals take to enhance a pleasure to users.

In supporting Norman's perspective, Fogg (2003) states that persuasive technology, such as internet, interactive media, and multiplayer online games, involves social activities that influence users to take action in accordance with the persuader. This action is varied and based on inputs, needs, and surrounding situations. People can use five social cues to infer sociability with interactive computer devices. Specifically, people can use physical (i.e., face, eye, body, and movement), psychological (i.e., preferences, humor, personality, feelings, and empathy), language (spoken language, paralanguage, language recognition), social dynamics (i.e., cooperation, praise, reciprocity), and social roles (i.e., engineer, teacher, doctor, teammate, pet) in interaction.

In addition, Norman (2004) greatly emphasizes the importance of social interaction and communication resulting from product innovations. These product innovations are comprised of devices developed for individual users (i.e., email, telephone, email, cell phones, text messaging), organizational users (i.e., telegraph, memo, newsletter, fax, intranet), and group users (i.e., daily, newspaper, radio, television, Web 2.0). These technological devices have become crucial tools for many people in filling their objectives and affective needs. For instance, many of us cannot ignore the email that comes into our inbox every day. In addition, we use the short messaging service to keep in touch with family members, friends, and relatives who located in remote locations. Therefore, we not only use technology to communicate with other people in task-oriented purposes, but we also use technology for social connection and emotional fulfillment.

Norman (1988) asserts that affordances not only guide human action, but also cognitive beliefs that the human gains from experiences and rationalities. Norman mentions two cognitive science perspectives for understanding human memory. First, the traditional view explains that human thought is rational, logical, and orderly. Second, connectionism views every thought as based on experience and ability to retrieve past events, and use them to model present. The design plays a significant role in minimizing conscious mental activity that people use in everyday lives. In other words, the good design generally enhances affordances in creating perception of action and reduces the utilization of the mental resources.

2.4.4 Affordances of the Virtual Worlds

Affordances are the matters of virtual reality and virtual world design. The perception and action of an avatar in the virtual world can change user's behavior, which depends on the conscious environment to which the user belongs (Gibson, 1979). The concept of affordances is applied in the design of the virtual environment and virtual objects to enhance usability of the virtual world. Similar to the physical world, affordances of the virtual world aim to increase the user's ability to manipulate objects in the virtual environment by the avatar. For instance, the chair-like object can afford sitting, while the sofa affords both sitting and lying down. Previous research posits that the perception of affordances increases user engagement and satisfaction (Van Vugt et al., 2006). An aesthetic design of virtual clothing, for instance, is likely to attract the user more than a poor design, and may result in more satisfaction.

Schultze and colleagues (2008) postulate that affordances of the virtual world are abilities to stream real world and real-time information sources (i.e., radio, video and television) into a fantasy-space. The key affordances mentioned here include:

1. **Presence:** Implies virtual identity of embodied persona, agency, and performance capabilities.

2. **Placement:** With respects to others and objects.

3. **Perspective:** Refers to as a self-reflection that a person wants to promote to others.

4. **Place:** In which it situates users in geographical and social situations.

Previous research in virtual world commerce asserts that virtual worlds enhance flow experience of customers and affords their abilities to navigate (control characteristics), interact (content characteristics), and motivate (process characteristics) (Park et al., 2008).

Norman (1999) introduces the term "perceived affordances" to refer to *the affordances that reveal themselves when the information that includes the clues for operation and guidance are available for the user to perceive.* Although this term initially refers to the quality of perception for the real objects rather than the screen-based objects, other researchers substantially apply the concept to any other objects, especially those that involve screen-based interfaces (Gaver, 1991; Shneiderman, 1998). The perceived affordances of user interfaces concern mostly the perception that any action from the computer screen is meaningful, useful, and predictable. Norman asserts that, in the case of technical and user-interface design, the most important question is not the action possibilities, but the action that the user perceives as possible. For instance, what the user sees on the screen are not affordances, but the visual feedback that advertises

affordances. In particular, the user acknowledges the perceived affordances when seeing objects on the screen. In addition, the perceived affordances are useful when the real affordances are not available. In virtual worlds, social interactions, such as spoken words and visual gestures, are arbitrary when compared to the real physical manipulation of objects. Since the perceived affordances are not visible or sometimes hide the real affordances, the design must enhance the user perceivable action.

This dissertation adopts two major types of affordances (Olapiriyakul and Widmeyer, 2009). The first type is physical affordances or perception of physical affordances. Generally, physical affordances relate to the virtual objects and environments, as well as the perception of any action. The second type is social affordances or perception of social affordances, which can be divided into relational and transactional affordances. Social affordances depend mostly on the availability of the system functions that allow users to interact and communicate with other users. In particular, social affordances are related to an ability to perceive an existence of social entities and to take any action in the social space. Table C.3 of Appendix C summarizes the operationalization of related literature that the concept of perceived affordances is based on. For instance, usability and sociability concepts are examined and adapted to develop the new measurement scales of perceived affordances.

Physical Affordances

Physical affordances map the user's internal perception with various dimensions of the virtual world's structures (Rheingold, 1991). Manipulation of virtual objects via avatars creates the feelings of real interactions and feedbacks through visual perception.

Therefore, any interaction existed in the virtual world requires both affordances and avatars (McLellan, 1993).

Although physical affordances of the virtual objects are different from affordances of the real objects, in terms of their substances and properties, they can be recognized mostly by shapes, colors, and textures that simulate the graphical representations. In other words, virtual objects and environments provide a way to measure the physical affordances that support the complete natural visual perception (McLellan, 1993). The design of the virtual object and the environment must afford many activities. For instance, the design of the three-dimensional environments is composed of opening, path, step, shallow slope, and other affordances of avatar locomotion, while the design of virtual objects affords grasping, throwing, opening, sitting, etc. Most importantly, the design of the virtual environment must afford the context for social interactions, specifically, the avatar interactions.

Besides the advancement of the three-dimensional technology in simulating shape and space, and creating an interactive environment is a crucial issue. The development of the virtual world suffers from the lack of interaction control and the precision in interaction via avatar. Therefore, improvements in the control and the precision in interaction are focused on the improvement of the following three major types of interactions:

- **Direct user interaction** (such as hand tracking, gesture, and pointing) depends on natural intuitive mapping between the user action and the action.

- **Physical controls** (such as buttons, scroll bar, joysticks, etc.) enhance the perception of the presence in the virtual environment.

- **Virtual controls** relate to anything that the user feels that can be flexible to implement within the virtual environment.

Based on these classifications, the design of avatar interactions primarily involves hand and body movement, selection such as pointing and grasping, manipulation of objects, scaling display ratio up or down, and menu-based interaction.

In contrast to other types of virtual reality technologies, virtual worlds primarily use computer interface and hardware devices (screen, mice, and keyboard) to control the avatar movements and guide the affordances. The two most important considerations for the design of perceptual objects are the control of the desired interaction and the discovery of the desired action. The ability to control the manipulation is determined by how easy it is to use the system's interface. The good interface design makes all functions explicit and understandable by the users and allows them to predict the outcome of their manipulations. However, the convention (or culture) of the standard design that allows most users to understand and produce the desired action has become an issue. Interface design of many virtual worlds has been a major obstacle for users who expect to see the game-like quality of interface (as seen in other three-dimensional games, such as World of Warcraft) that minimize the time delay of graphical frame transfer and enhance interactivity through the use of more natural interface devices than keyboard and mouse (Kock, 2008).

The design of the virtual store and the virtual object that enhances affordances is essential since it enables users to understand the nature of usability. The virtual real estate that offers a housing design service, for instance, needs to consider affordances to create objects and places that are easy to use and allow users to perceive actions. For instance, stairways should be able to transport the avatar in going up or down, and a table should allow other objects to be placed on its top, etc. Besides these considerations on the design

of virtual objects and space, the design must be able to integrate various communication functions that can effectively convey information. Virtual advertising, for instance, can employ communication media, text banners, and video presentations to convey information to the target consumers. Not only the design must support functionalities of the virtual objects, but it should also encourage social functions and interactions among users, and between users and objects.

Norman (1999) suggests that the term affordances involve the usability of the physical products. However, the term perceived affordance does not involve usability of the IT artifacts, but mainly involves cultural conventions of the user. Meanwhile, other researchers still believe that perceived affordances offer a framework that affect usability of the screen-based artifacts (Gaver, 1991; Shneiderman, 1998). Current research applies use both affordance and perceived affordance concepts in usability and HCI research.

Usability of the system is a property that determines the system's ease of use. Usability also creates the feelings of acceptance or rejection of the system used (see Figure 2.8). Venkatesh and Davis (1996) assert that usability significantly determines ease of use of the system only when users have some direct hands-on experience with the system. However, usability does not help new users reduce their efforts in learning to operate the system at the beginning.
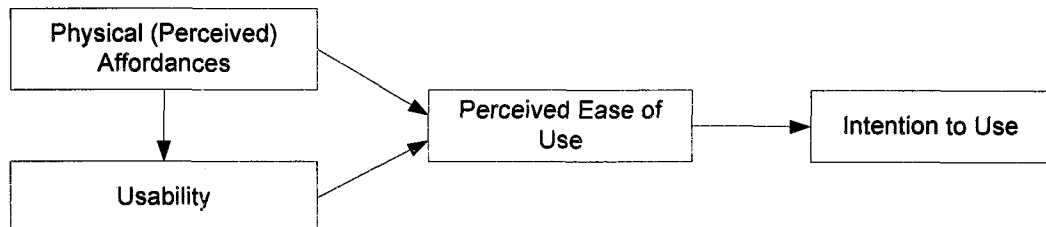
Figure 2.8 Usability as the result of perceived affordances of physical environment.

Previous research in e-commerce uses the term usability more frequently than the term ease of use (Flavián et al., 2006). Although these two terms are related, they are different in terms of the contexts of use. Usability, particularly in e-commerce, mostly refers to the easiness of use that results from the web interface design, while ease of use can refer to the general easiness of the systems use. Ease of use or perceived ease of use is originally defined as "the degree to which a person believes that using a particular system would be free of effort (Davis, 1989, p.320)." Previous studies indicate that perceived ease of use is a crucial determinant of intention to use (e.g., Venkatesh and Davis, 1996). Not only is the ease of use important for the system use, usefulness of the system is also an important determinant of the system use (Adams et al., 1992; Davis, 1989).

Furthermore, considering subjective aspects of the system use, rather than objective aspects of the task-tool fit, usability can refer to the more user-center perspective of the human-computer interaction system design, such as end-user satisfaction (Keil et al., 1995; Frøkjær et al., 2000; Flavián et al., 2006). In particular, the design that enhances usability needs to consider not only the ability to use the tool, but also the ability to obtain desirable outcomes. Previous research in e-commerce asserts that usability is important to create and maintain user satisfaction (Kim and Eom, 2002). Usability involves three subjective measurements: (1) effectiveness, (2) efficiency, and (3) satisfaction (Frøkjær et al., 2000; Flavián et al., 2006). For instance, usability of web-based e-commerce relates to the ease in navigating the site and making a purchase on the internet. This dissertation proposes that usability created from the perceived affordances is crucial in creating the desirable effect in using the outcome of the system use.

General Research Hypotheses from This Section

Based on literature about technology adoption, psychological need satisfaction, and related works to physical affordance concept as aforementioned in this section, this research proposes the following hypotheses:

H2: The more the perceived physical affordance of the system environment, the higher the consumer's need satisfaction.

H3: The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of products and services.

Social and Transactional Affordances

According to the social relations theory, interactions among people in virtual settings concentrate on affordances of users and entities in the environment (Allen, 1977). Theory of affordances postulates that the characteristics of the interactive environment include proximity, privacy, and legitimacy. Proximity affords a chance to encounter interaction, while privacy and legitimacy enable informal interactions (Fayard and Weeks, 2007).

Previous studies on Computer-Mediated Communication (CMC) systems are concerned more about whether the systems can convey social and emotional cues (e.g. Hiltz et al., 1986; Connolly et al., 1990). Social presence theory suggests that the level of impersonal contact is increased whenever the social presence of the systems is lowered. Short and colleagues (1976) suggest that the electronic media differs from other kinds of media in terms of the capacity of data transmission and transmission of the non- verbal cues (such as facial expression, socio-emotional cues, posture, gesture, vocal cues, tone, and others).

The virtual world is a special type of CMC where the users can perceive a higher level of social presence than other types of CMC. Most of the 3D virtual worlds support

both verbal and visual cues. Therefore, users, via their avatars, can detect the emotional status easier than in other types of CMC. Users can react to other people or objects by using only facial expression or posture. However, the use of non-verbal cues is still less flexible. Although this transmission of emotional cues cannot be compared to face-to-face interactions, using emotional cues is attractive to many users and can result to more user engagement in communication and collaboration (Walther, 1992). In addition, social cues that integrate various aspects of the physical environment and nonverbal behaviors can imply the nature of social situation and the actor's relative status (Sproull and Kiesler, 1986).

Media richness theory (Daft and Lengel, 1984) is often adapted together with the social presence theory to explain user behavior and acceptance of communication media. Media richness suggests that various communication media are differed due to the availability of the cue systems. Most users select a particular medium based on its suitability to the task (Dennis and Kinney, 1998), and the extent of ambiguity and equivocality reduction to the task (Daft et al., 1987).

Furthermore, immediacy of feedback is one of the most crucial determinants of media richness (Dennis and Valacich, 1999). Principally, immediate feedback implies richer media. For instance, face-to-face communication is richer than email because people can get an immediate feedback from the person with whom they communicate. In the virtual world, users can receive an instant feedback from other people by using various kinds of communication media, such as instant messaging and email. Users can also ignore any incoming message to retain their privacies. In addition, the use of asynchronous communication media, such as instant messaging (offline mode) and email,

enhances an opportunity for selective self-presentation and interpersonal impressions than the synchronous communication media or face-to-face (Walther and Burgoon, 1991).

Research in Computer-Supported Collaborative Work (CSCW) claims that the characteristics of the virtual environment, rendered by virtual reality technology, are suitable for supporting any process in distributed collaborative work and social interaction (Churchill and Snowdon, 1998). The research focuses on examining the nature of the spatial metaphor of the interactive environment and its highly intuitive nature in facilitating collaboration, such as awareness at a glance, support for ad-hoc and planned interaction, use of body language, conversation management, flexible negotiation, structuring, navigation, exploration, and some other large-scale collaboration. A previous study develops a spatial model to support the interaction of human and computer artifacts within the virtual world (Benford and Fahlén, 1993). The model concerns mostly on an individual autonomy, a conversation management, and a variety of informal and formal interaction mechanisms. Within the spatial environment, users can interact through various communication tools (both text-based and voice-based systems). The study shows that the interactions between objects and users, or among the user, are the outcome of their awareness of other's existences. The awareness between two objects is the basis for managing interactions. In other words, the object actively reacts to other's presences when the specified awareness thresholds are detected. For example, greeting messages can only send to the receivers after their presences have been detected in the spatial environment.

The development of the spatial trading environment (as seen in many virtual worlds) that supports multiple users in making business transactions applies the concept of object-based model of distributed systems (Benford and Fahlén, 1993). A distributed system involves a set of objects that interacts through a well-defined interface. Using the awareness of active users, as well as the spatial proximity of objects, is vital in designing the commercial environment in the virtual world. In particular, the awareness of objects' (or humans') presence can create the initial establishment for business interaction and communication. The concept of social affordance of this dissertation, which focuses on relational and transactional dimensions of the system design, is illustrated in Figure 2.9.
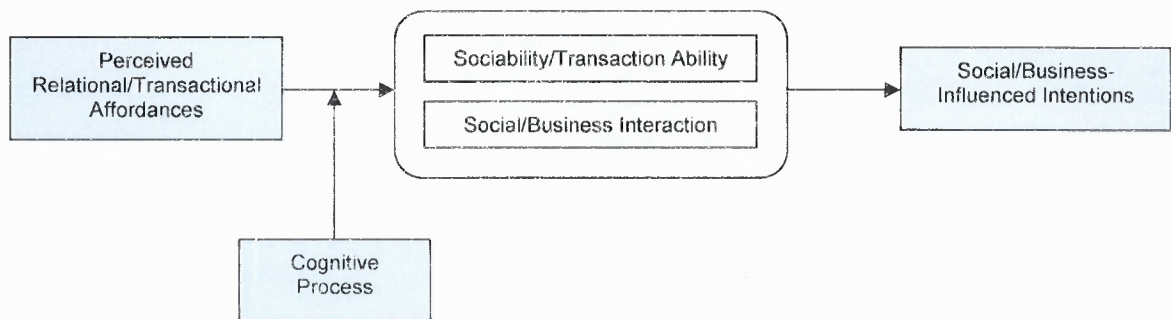
Figure 2.9 Social- and business-influenced intentions.

The difference between relational and transaction affordances mainly focuses on different behavioral outcomes. The social aspect of general web interface design focuses on the relational nature that is influenced by the feelings of intimacy and warmth, whereas transactional orientation focuses on the utilitarian aspect of the relationship between a company and a consumer (Kumar and Benbasat, 2006). Specifically, the primary concern of relational affordances in the virtual world is to enable users to develop social relationship with other users. In particular, relational affordances are related to the ability of users in enhancing social and emotional exchange by using both

verbal and emotional cues (through their avatars). Meanwhile, transactional affordances concern interactions between business parties in exchanging information about products and/or services in a business transaction. Transactions within the virtual world can be fulfilled by both social interactions (e.g., consumer-to-consumer trade) and available transactional systems, such as an instant currency converter, a fund transferring system, and a secure payment process. Users must perceive the transactional affordances of the virtual environment with clear perception of the completion of a transaction.

General Research Hypotheses from this Section

Based on the aforementioned literature in technology adoption and social affordances in this section, this research proposes the following hypotheses:

H4: The more the perceived relational affordance of the system environment, the higher the consumer's need satisfaction.

H5: The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of products or services.

H7: The more the perceived transactional affordance of system environment, the higher the consumer's intention towards making a purchase of products or services.

2.5 Trust Theory

Many psychologists, sociologists, economists, and organizational theorists define trust in diverse perspectives. Blau (1964), who focuses more on the relationships that exist in social phenomena, describes trust as "essential for stable social relationships (pg. 99)." Mayer and colleagues (1995) consider trust as relating to relative cost and benefit in an unpredictable situation. They define trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a

particular action important to the trustor, irrespective of the ability to monitor or control that other party (pg. 712)."

Originally, trust creates from people who usually like to make a cognitive prediction or estimation of the outcomes of their environment or their actions (Gefen, 2002b). The original idea of trust considers only the psychological states of an individual's mind, such as cognitive processes and individual's perceptions. However, it is only occasionally that people make a rational prediction of outcomes or behaviors of other people (Blau, 1964; Lewis and Weigert, 1985; Luhmann, 1979). Most of the time people make mistakes about an approximation of other people behaviors. As a result of the high potential in making wrong predictions of others or situations, people try to gather as much information as possible in order to make more accurate predictions or to judge whether to believe their own approximations. From this perspective, trust is a prediction that one makes based on one's own cognitive process and situation leading to the expectation of the outcomes from others' abilities, behaviors, and promises. Precisely, one can interpret trust in many ways according to the individual psychological perception, surrounding environment, and situation that require trust to exist. In general, the concept of trust is the expectancy of an individual or a group to a word, promise, verbal, or written statement of another individual or group that can be relied on (Rotter, 1971). However, the meaning of trust can be translated into many similar concepts. Therefore, trust is an interdisciplinary concept, consisting of multidimensional viewpoints.

Among various directions of trust, this dissertation explains trust in two broad concepts. First, trust is a general phenomenon in the social context. Trust in this

perspective focuses on the consequences of social and interpersonal relationships. Second, trust is an influence on business relationships, especially in a situation that involves risk and uncertainty. Specifically, this dissertation investigates trust that is dependent on the situational business context and shows whether trust is vital in the business process involving negotiation and interaction between business partners. This dissertation does not aim at investigating trust variables in either the real world's social or business contexts. However, trust in the virtual world is assumed to have similar characteristics to those in real world's social and business contexts, especially those characteristics in e-commerce that involve many parties conducting business transactions over the internet.

This section reviews the literature on trust theory that this dissertation is based. It also explains the trust concept that is applied in the virtual world context. The operationalization of trust obtained from previous literature is summarized in Table C.4 of Appendix C. Finally, the research hypotheses regarding trust are proposed.

2.5.1 Trust in Social Context

Trust in social literature (Luhmann, 1979; Lewis and Weigert, 1985; Zucker, 1986) and social psychology literature (Johnson-George and Swap, 1982; Rempel et al., 1985) emphasizes an interpersonal relationship among people within the same society, organization, and workgroup. The latter specifically focuses on the study of close relationships among people in the society. The concept of interpersonal trust is widely studied in many different perspectives, for instance, people's expectation in different situations, social interest and welfare, willingness to apply knowledge in making

decisions (McAllister, 1995), and technology effects, particularly the effects of media richness to interpersonal interactions (Olson and Olson, 2000).

Rotter (1967) defines interpersonal trust as "an expectancy held by an individual or a group that the word, promise, verbal or written statement of another individual or group can be relied upon." In most situations, the individual or group cannot directly control the behavior of the others. Butler and Cantrell (1984) indicate that the nature of interpersonal trust consists of cooperation between two persons, but may have an inequality of their positions or status. Previous research on e-commerce adoption finds that face-to-face interactions between individuals gain the most trust, while other communication technologies such as faxes, emails, or text-messaging gain lesser trust (Olsen and Olsen, 2000). The study also suggests that high interactive media has engendered trust in interpersonal interactions.

Lewis and Weigert (1985) define trust in the social context as a multidimensional construct consisting of both cognitive (e.g., competence, reliable, and professional) and affective (e.g., caring, emotional connection) elements, depending on situations, types of social relationships, and systems under consideration. For example, in the type of social relationship between couples and family, the affect-based trust is higher than cognition-based trust. The cognitive-based trust or trusting belief, developed from two processes: (1) the categorization process (second-hand information), and (2) the illusion of control process (the effort to think about trustworthiness), which refers to the calculative and rational characteristics of a person's reliability (McAllister, 1995; Rempel et al., 1985). Meanwhile, affect-based trust refers to the emotional aspects and social skill that a person has about society, such as the concern of others' welfare and interest (McAllister, 1995;

Rempel et al., 1985). Affect-based trust (or emotion-based trust) consists of the emotional bonds between individuals, such as the relationship between friends, the internal relationship between colleagues on a team, and the relationship among family members (Lewis and Weigert, 1985; McAllister, 1995).

In e-commerce research, emotional trust is the extent to which one feels secure and comfortable about relying on the trustee (Komiak and Benbasat, 2004) and is based on both rational (or cognitive) and irrational expectations (Komiak and Benbasat, 2006). In a long-term relationship, however, the affect-based trust developed in the social unit can reduce the need of cognition-based trust (McAllister, 1995). Previous research asserts that affect-based trust plays an important role beyond cognitive trust in the consumer's intention to adopt the agent-based system (Komiak and Benbasat, 2006), and intention to interact with the e-commerce sites (McAllister, 1995). As consumers develop close relationships with the vendors or the agents from repeated interactions, rational expectations are less likely to dominate the consumer's decision than the feelings and affects (Komiak and Benbasat, 2004).

In an organizational context, people are likely to develop a monitoring action against each other in order to defend their engaging behavior when the untrustworthiness situation or behavior developed (McAllister, 1995). Different types of monitoring actions are developed from trust-based behavior. The idea of cognitive-based trust involves the development of the control-based monitoring manner that occurs when people are more likely to defend themselves from some uncertain situations. In other situations, where people in the same social context tie together in close relationships, affect-based compromising is a key behavior that allows each member to respond to the needs of the

others (Clark and Mills, 1979). The affect-based trust is gradually developed in the organizational context when people start to know each other or have some kind of relationship towards each other for a certain time. This relationship is illustrated in Figure 2.10.
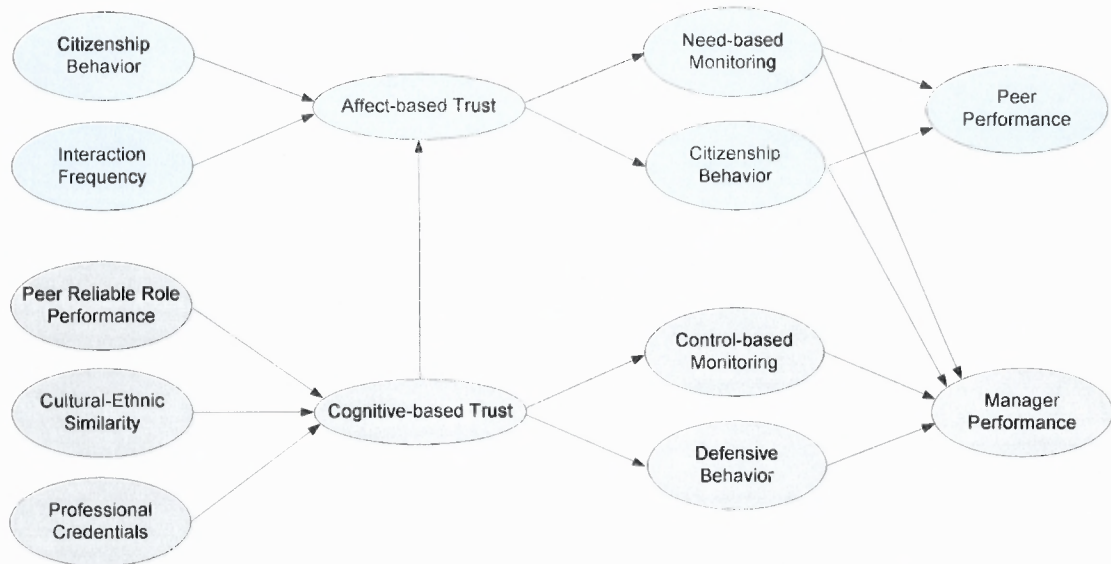
Figure 2.10 Cognition-based trust and affect-based trust.

Another perspective proposes that trust in the organizational context relates to the characteristics and interrelationships of trustor and trustee as shown in Figure 2.11 (Mayer et al., 1995). These characteristics of the trustor include propensity to trust or willingness to trust the others, personality traits of the trustor, and generalized expectation about trustworthiness of the others. The attributes of the trustee consist of trustworthiness and the risk underlying the transaction process. Mayer and colleagues (1995) explain trustworthiness by using three characteristics of trustee – (1) ability, (2) benevolence, and (3) integrity. These three characteristics are important to measure the trustworthiness of the trustee but may vary independently from one to the other.
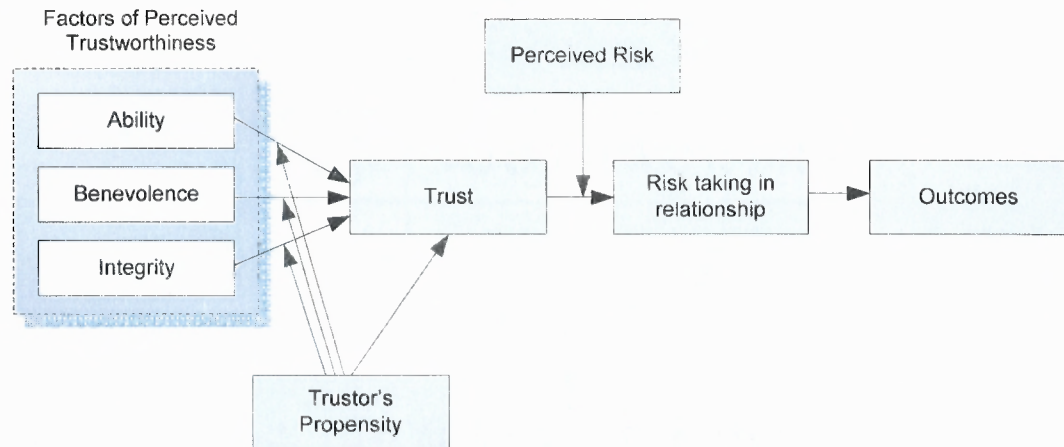
Figure 2.11 Model of trust between trustor and trustee.

2.5.2 Trust in Business Context

In marketing literature, research on trust usually involves the context of the distribution channel and service, which emphasizes on the long-term relationship building, the enrichment of customer commitment (Dwyer et al., 1987; Morgan and Hunt, 1994), the long-term orientation (Anderson and Weitz, 1992) and the perceived risk of the buying firm (Doney and Cannon, 1997). In social psychology and particular marketing areas, trust is referred to the perceived credibility and the benevolence of a target of trust (Doney and Cannon, 1997; Ganesan, 1994; Kumar et al., 1995).

Trust in business is the expectation that the other people or companies whom one has little or no control over will fulfill their expected commitments (Blau, 1964; Gefen, 2002a; Hosmer, 1995; Mayer et al., 1995) in the situations that involve significant risk or potential loss (Deutsch, 1958; Giffin, 1967). According to Gefen (2002a), trust in business relationships are characterized by the long-term relationship between clients and company (by its staffs), and by the concern of the operational part of the company. For instance, a salesperson is the person who interacts with the clients and is responsible for

keeping promises and acting in accordance with the clients' expectations. Interactions between the clients and the company's staffs are vital in trust creation since the staff must act on the behalf of the company to gain trust from the clients and make them feel that they can depend on any decisions the company makes.

Previous research on trust in the industrial buyer-supplier relationship suggests that trust in the business relationship is developed from the following five distinct processes (Doney and Cannon, 1997):

1. **Calculative Process:** Is based on an estimated cost and benefit that a buyer determines from untrustworthy action of a seller (Dasgupta, 1988; Williamson, 1991). The factors that invoke calculative process include, for instance, the buyer/vendor's reputation, and the seller/vendor relationship.

2. **Prediction Process:** Focuses on the development of trust through individual learning processes including repeated and broader experience of other parties. The factors that invoke prediction process are, for instance, likeability and similarity, and frequent contact from the seller/vendor.

3. **Capability Process:** Focuses on the abilities of the trusted parties (sellers or vendors) in fulfilling the buyer's expectations. The factors that invoke capability process include, for instance, ability and expertise, and power to fulfill the consumer's needs.

4. **Intentionality Process:** Focuses on the motivation of the trusted parties as determined from their behaviors and their verbal promises. The factors that invoke intentionality process include, for instance, willingness to act by corresponding to consumer's requests.

5. **Transference Process:** Focuses on the development of trust from other proof or trusted sources closely associated with the buyers. The factors that invoke this process are, for instance, the buyer/vendor's reputation, and the firm size.

Doney and Cannon (1997) explain that trust in industrial business relationships or between a supplier firm and client firm is also based on the supplier firm size, and the willingness of the supplier firm to customize their process to fulfill the needs of the client firm (see shown in Figure 2.12). This study also suggests that trust in industrial business

relationships is developed among the representatives of both firms, which are between the supplier's representatives or supplier's salespersons and the representatives of the client firm. Particularly, trust with a salesperson is created from the perceived expertise, the likeability or friendliness of the salesperson, the similarity or shared common interests, and the frequency of business contacts. However, the study shows that, as a consequence of trust, neither the supplier firm nor its salesperson influences purchase choice of the clients.
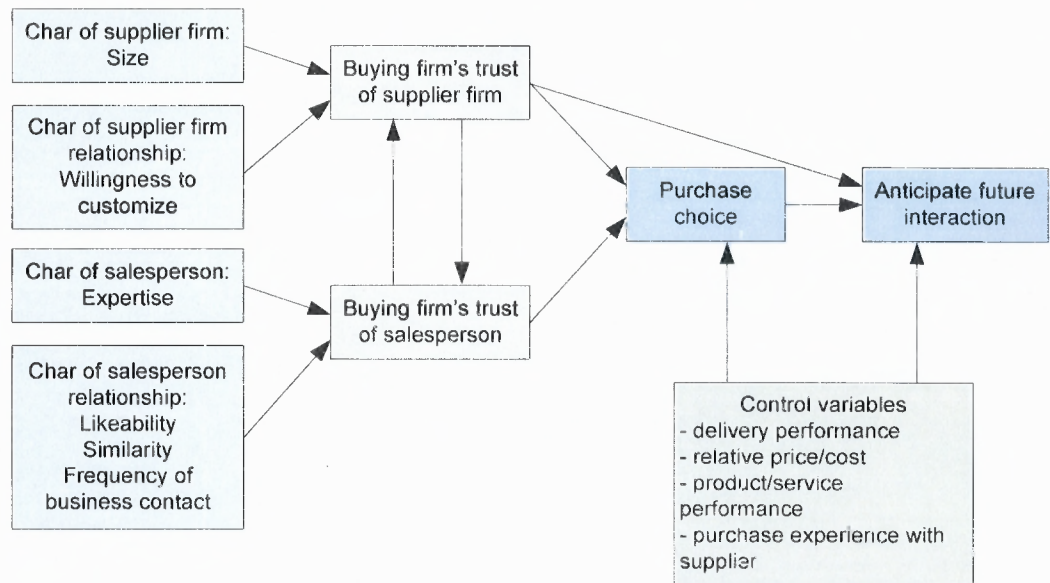
Figure 2.12 Antecedents and consequences of trust of a supplier firm and salesperson.

Trust in e-business refers to trust in a general business transaction that is conducted over the internet or other types of network, including electronic commerce, electronic trading, virtual enterprises, online retailing, and online auctions. Generally, e-business is defined as "the carrying out of business activities that lead to an exchange of value, where the parties interact electronically, using network or telecommunications technologies (Jones et al., 2000, p. 83)." E-businesses are classified by the type of business processes required in operating the e-business system, such as the procurement

process, marketing process, comparison of products or services process, information exchange process, delivery process, logistics, etc. The exchange in e-business includes not only the products and services exchange, but also the information exchange. Normally, e-business requires the following three components to enhance trust: (1) ensuring the identity and reliability of e-business stakeholders, (2) concerning the quality and protection of digital assets (such as sensitive information, digital goods or objects, and payment information), and (3) enhancing the dependability of services and systems (Jones and Morris, 1999).

Based on the above illustrations, trust in general business situations increases when a company behaves in accordance with the client expectation by being responsive, and decreases when the company behaves contradictory to the client expectation by not being dependable (Blau, 1964; Giffin, 1967; Gefen, 2002a; Luhmann, 1979).

2.5.3 Trusting Belief

Trust from the cognitive perspective is the belief that one party (called trustee) has the ability to perform cooperatively and accordingly to fulfill the other party's (called trustor) expectation. Generally, trusting beliefs are developed from a rational process that people have to another party in a situation. Trust, in general psychological and sociological research, is the belief about other people's honesty, benevolence, predictability, competence, etc. Gefen and colleagues (2003a) define trust as a three-dimensional construct, including competence, integrity, and benevolence. Interpretably, trust is the belief about the trustor's ability (competence), honesty (integrity), and generosity (benevolence) in performing with respect to the trustee's interests and benefits, and in a responsiveness manner (Hosmer, 1995).

Trust researchers agree that trusting belief is an antecedent of trusting intentions (McKnight et al., 2002a; Gefen, 2002b; Gefen and Straub, 2004). Previous studies conclude that trusting beliefs lead to consumer intention to engage in a business process, such as following the vendor's advice, sharing personal information (McKnight et al., 2002a, 2002b), purchasing or window shopping (Gefen, 2002b; Gefen and Straub, 2004).

Trusting beliefs can be divided into two processes. The first process involves trusting belief in getting information. Trust in this process plays an important role in getting information on the vendor website, to decide in particular, whether the information the consumer obtained is valid, credible, and accurate. The second process relates to the trusting belief in purchasing products from the vendor website. Trust represents the extent to which the web vendor will properly deliver, fulfill, and stand behind its product (Pavlou and Dimoka, 2006). Clearly, trust facilitates both consumers and web vendors through the processes of getting information and purchasing products by controlling social uncertainty (Zand, 1972) and overcoming psychological barriers to engaging in a behavior (Pavlou and Fygenson, 2006).

Furthermore, trust is vital to the user-vendor relationship in e-commerce. The consumer decision in e-commerce adoption involves not only the technological aspect (perceived usefulness and ease of use), but also the beliefs about the e-vendor's positive characteristics (Friedman et al., 2000). A previous study shows that trust in the web vendor's integrity and predictability enhances consumer intentions to purchase from the web vendor, while benevolence and ability do not (see Figure 2.13). As the result of this contradictory outcome, the research concludes that trust is a set of the beliefs of varying

importance depending on their relevance to the expected outcome (Gefen and Straub, 2004). More specifically, trust is indeed a multi-dimensional construct of social contexts.
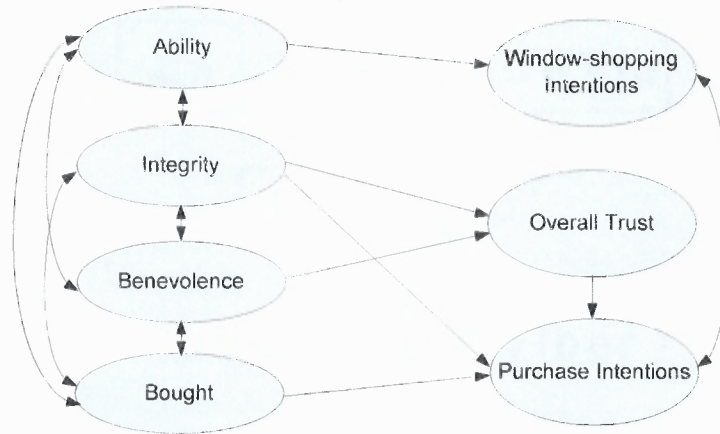
Figure 2.13 Trust and trustworthiness.

2.5.4 Trust in the Initial Stage

Previous studies examine trust in various perspectives, particularly, trust in an unfamiliar web vendor that emerges from initial exploration of any web-based commerce system. In this initial stage, the consumer relies on the information and the appearance of the website (Meyerson et al., 1996), such as product description, ease of use of web's menus and functions, etc. before they perceive that the website is credible. Therefore, trust formation at the initial stage is a longevity process and a very important stage in creating a good reputation (McKnight et al., 1998; Gefen and Straub, 2004).

According to McKnight and colleagues (2000), formation of trust in e-commerce is divided into two stages: (1) exploratory stage, and (2) commitment stage. The former involves establishing the initial trust, whereas the latter concerns supportive factors related to the consumer and the web vendor in maintaining reputation and sustainability of the business. Initial trust is established during the initial period when the consumer

visits and explores a vendor's website for the first time. The concept of initial trust is originally developed from the other concepts regarding the calculative-based behavior (Coleman, 1990; Williamson, 1993), which hypothesizes that a person will make his trust decisions based on rationally derived costs and benefits (Shapiro et al., 1992; Lewicki and Bunker, 1995).

Studies regarding initial trust in e-commerce traditionally explain the paradox of high initial trust level (as shown in Figure 2.14). The framework integrates four research streams together, which are personality-based trust (faith in humanity), calculative-based trust (trusting stance), institutional-based trust (structural assurance and situational normality), and cognition-based trust (categorization process and illusion of control process). Faith in humanity and trusting stance are similar to disposition to trust concept in psychology (McKnight and Chervany, 2001-2002; Gefen and Straub, 2000). A person with a high faith in humanity is likely to perceive that others are usually competent, benevolent, honest, ethical, and predictable. Meanwhile, a person with a high trusting stance is likely to assume that one will achieve better outcomes by dealing with people who are reliable or credible. In particular, the trusting stance will lead to trusting intention since it concludes that one is willing to depend on another, regardless of the beliefs in the others (McKnight et al., 1998).
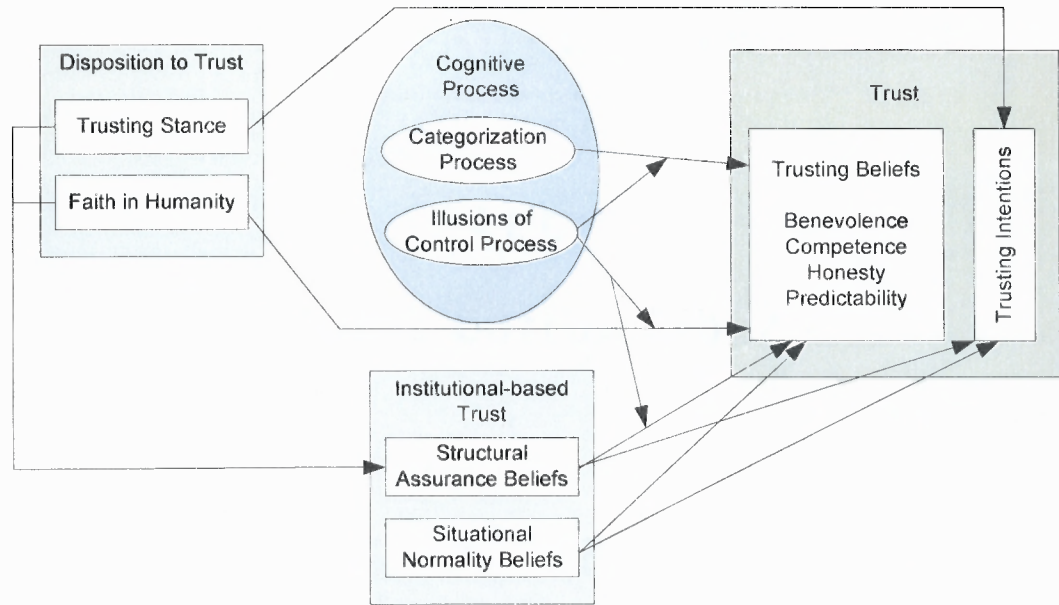
Figure 2.14 Initial formation of trust.

Likewise, institutional-based trust, which consists of situational normality and structural assurance, significantly increases trust by forming a sense of security to the consumer and facilitating the transaction success (Pavlou and Gefen, 2004). Institutional-based trust on many online marketplaces is a means to mitigate transaction risks, build a trustworthy marketplace, and encourage online transactions. Situational normality is an assessment that the transactions will succeed, based on how normal or customary the situation is likely to be (Baier, 1986; Lewis and Weigert, 1985). Meanwhile, a structural assurance or a structural safeguard refers to an assessment of success due to legal or regulatory protection, guarantees, safety nets, and other impersonal structures inherent in a specific context (McKnight et al., 1998; McKnight and Chervany, 2001-2002; Shapiro, 1987; Zucker, 1986). In general web commerce, structural assurance appears as seals of approval (McKnight et al., 2000), such as the Better Business Bureau's BBB online

reliability seal (www.bbb.com), the TRUSTe seal (www.etrust.com), and the 1-800 number (Gefen et al., 2003).

Last, cognition-based trust examines how trust builds on first impressions rather than through experiential personal interactions (Brewer and Silver, 1978; Meyerson et al., 1996). In some situation when people do not have enough information, people tend to trust whoever they know or ones who are similar to themselves. Specifically, when people have only limited information about others, people have to trust others based on second-hand information – categorization process (Morgan and Hunt, 1994; Zucker, 1986), and assess trustworthiness-illusion process (Langer, 1975; McKnight et al., 1998). Trust based on second-hand information, or categorization processes, is divided into: (1) unit grouping, (2) reputation categorization, and (3) stereotyping. In the initial stage of trust formation, or when the absence of first-hand experience with the trusted party occurs, the categorization process tends to produce high levels of trusting beliefs. Of these three categories of the categorization process, unit grouping means persons in the same group share common goals and values. Therefore, one member will form trusting beliefs toward another group member. Reputation categorization means those with good reputations are trustworthy. Moreover, stereotyping means one can form trusting beliefs about the other by generalizing from his/her favorable characteristics or properties. Additionally, illusion of control, which refers to the initial effort to think about another person's trustworthiness (McKnight et al., 1998), is likely to strengthen the tendency of the categorization processes, faith in humanity, and structural assurance beliefs to produce high levels of trusting beliefs.

In this case, initial trust significantly depends on both the psychological perception of the consumer (disposition trust), and the sociological construct of the e-commerce website (institutional trust). After this early stage of adoption or after initial trust is established, the consumer engages in trust-related behavior (such as vulnerable to vendor's opportunistic behavior, sharing personal information, making a purchase on website) and assesses the trustworthiness of the vendor by observing the consequences of these behaviors (McKnight et al., 2002b). At this period, the consumer usually forms his/her expertise to the website, which consequently promotes a long-term trust on the vendor's website. Trust in the second phase or the commitment stage is influenced by cumulative experience of the vendors' websites. The theory to support the trust concept in this stage comes from the concept of knowledge-based trust, which proposes that trust develops over time as one accumulates trust-related experience with another person (Lewicki and Bunker, 1995). However, trust developed in this stage can gradually decrease its importance since the general situation in organizations is mostly enhanced by short-term relationships rather than long-term relationships (McKnight et al., 1998). Figure 2.15 and Figure 2.16 show the frameworks of trust in the exploratory stage and in the commitment stage, respectively.
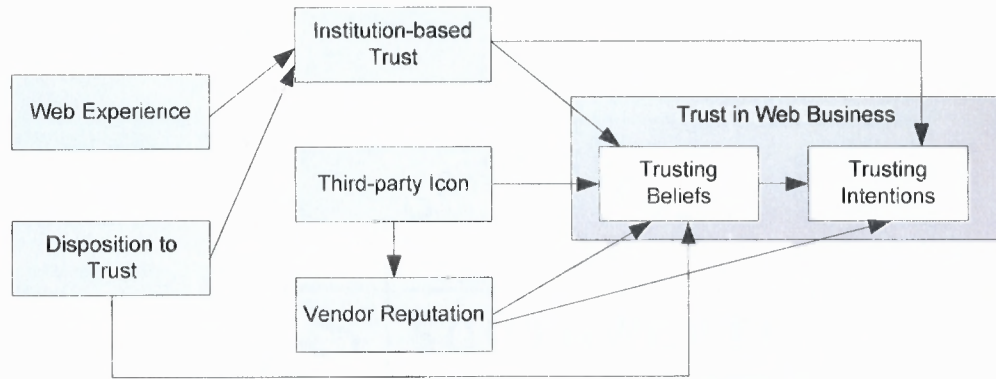
Figure 2.15 Trust in the exploratory stage.
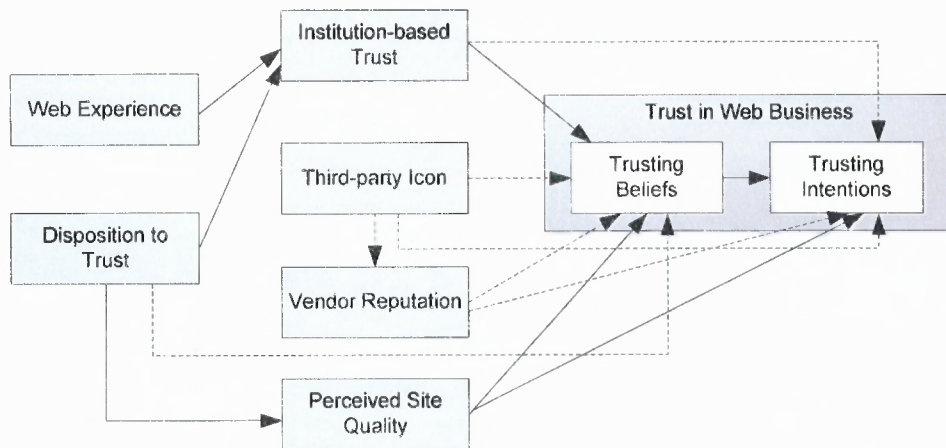
Figure 2.16 Trust in the commitment stage.

2.5.5 Trusting Intention

The trusting intention or, alternately, the willingness to depend on the web vendor is actually a trust construct (McKnight et al., 1998) that reflects volitional vulnerability, a concept commonly used to define trust (Mayer et al., 1995). Generally, trusting belief is an antecedent of trusting intention since people are likely to develop their presumptions based on their feelings that other parties are competence, integrity, benevolence, and predictability, before their intentions or subjective probabilities to depend on the other party are created. Previous studies support that trusting beliefs are essential in creating

trusting intentions. Consumers' willingness to buy from the web vendor (behavioral intention) is contingent to the consumer's attitude towards the vendor, which affects the vendor's ability to create consumer trust (or trusting belief) (Jarvenpaa and Tractinsky, 1999).

In conclusion, trust leads to the behavioral intention to use the vendor's website (Gefen et al., 2003; Pavlou, 2003), share personal information (McKnight et al., 2002a), purchase or inquire about the product (Gefen, 2000; Gefen and Straub, 2004; Jarvenpaa and Tractinsky, 1999; McKnight et al., 2002a), and engage in business transactions (Pavlou, 2003; Pavlou and Gefen, 2004). This rationale is also consistent with another prior researcher, which posits that consumers are less likely to patronize stores that fail to create trustworthiness (Jarvenpaa and Tractinsky, 1999).

Previous research (Gefen et al., 2003; Pavlou, 2003) shows the positive correlation between consumer trust and behavioral intention to use the system as suggested by the TAM model (Davis, 1989; Davis et al., 1989). Other research also confirms that trust and perceived usefulness of the website play an important role in creating purchase intention (Gefen et al., 2003b), and intention to transact (Pavlou, 2003). Figure 2.17 shows the integrated model of trust and TAM in e-commerce study (Gefen et al., 2003).
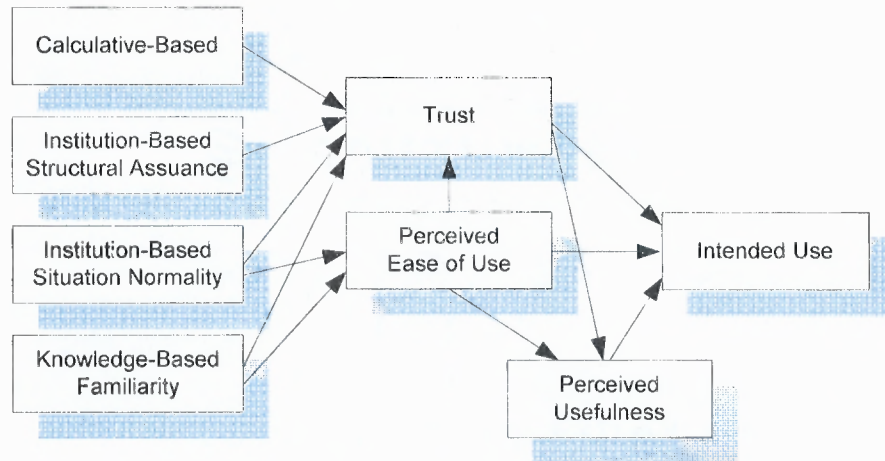
Figure 2.17 Integrated model of trust and technology acceptance model.

The model as shown in Figure 2.17 suggests a positive correlation between technological attribute-based antecedents that affect the user behaviors (in terms of their perceived usefulness (PU), their perceived ease of use (PEOU) and their intention to use the B2C websites to purchase a product), and the trust antecedents. The trust antecedences in this study consist of knowledge-based trust (familiarity with the web vendor), institutional-based trust (situational normality and structural assurance), and calculative-based trust.

2.5.6 Trust in Virtual World Commerce

As mentioned earlier, trust has been extensively studied in e-commerce and in many social systems, such as collaborative systems. Previous research asserts that trust in the new context of the virtual world should be examined because the virtual world not only integrates e-commerce platform, but also enhances social interaction and relationship among users (Junglas et al., 2007).

Although trust is not necessary for such social activities as general conversation (chat) and adventure, trust is crucial in establishing business relationships in the virtual

world, where the environmental constraint allows only minimal chance for users to obtain accurate information about other parties. Establishing trust within the virtual world may require a different approach from that of e-commerce, especially in establishing a long-term trust, customer loyalty, and satisfaction.

This section discusses trust objects and trust relations in virtual world commerce. Then, the explanation about social exchange theory, which is a fundamental idea of the exchange relationship in the virtual world, is presented.

Trust Objects and Trust Relations

The characteristics of trust objects in the new interactive environment can derive from the characteristics of the virtual environment that are similar to the real world. Other than the realistic virtual places and objects, simulating the social situations is vital for many people who habituate or reside in these worlds. Trust objects of the virtual world, in this case, are social entity and social relationship that exist in the environment.

The social entity within the virtual world is classified into many levels. In general, the social entity comprises the virtual character or embodiment that represents actual users, groups, associations, and organizations. Therefore, trust in the virtual world is related to the presence of identity. Identity can be doubtful and resulted in distrust between users. As a result, many virtual worlds establish a rule to support anonymity and to protect real identity of the user from theft and internet frauds. Anonymity sometimes discourages the user to trust the others with whom they interact, especially when they need to exchange information, and/or perform business functions. Therefore, to circumvent this limitation, it is crucial to establish some degree of trust between users.

Previous research suggests that identity models must engender trust while preserve the user's privacy (Dewan and Dasgupta, 2004). However, identifying the unique identity is very difficult, especially in the virtual world where avatars are used to embody the user. Previous research explains the identity formation process in the virtual world in the identity theory (Junglas et al., 2007). Since representing users by requiring them to reveal their real identities in the public space is a cumbersome situation and results in an attempt to mislead real identities by creating different avatar appearances from their real appearances, two processes are needed to form the new virtual identity: (1) exploration, and (2) commitment. The first process allows the user to explore new parts of virtual identity, which may be different from reality and can show who the user wants to be in the real world. The second process involves the extent of commitment the user has to the new identity and the likeliness that the user will constantly engage with the avatar. In particular, the virtual identity has become a real identity of the avatar but not the user.

Social Exchange

The original idea of social exchange or social exchange theory (SET) comes from the concepts of personal relationships that focus on the outcome structure and the process of interdependency developed from the dispositional level and expanded to the interpersonal level (Kelley, 1979). In particular, SET focuses on two types of outcome structures – costs and rewards in maintaining personal relationships. Rewards are pleasures, satisfactions, and gratifications a person enjoys from participation in a relationship (Thibaut and Kelley, 1959). On the other hand, costs of social exchange relationship involve punishment experienced, energy invested in a relationship, and rewards foregone

as a result of engaging in one behavior or course of action (Blau, 1964). Early development of SET concerns the distinction between economic and social exchanges. The economic perspective involves the monetary value that exists in the exchange relationships, while the social perspective occurs outside the economic issues. Early research on SET focuses on a non-economic exchange, such as the interdependency of personal relationships (Kelley, 1979). However, recent research on SET focuses more on social and organizational situations that are involved in economic exchange, for instance, the exchange between employee-organization (Tsui et al., 1997), business-business (Lambe et al., 2001), and company-client (Gefen and Ridings, 2002).

In e-commerce research, most commercial transactions incorporate both economic and social exchanges. As mentioned in previous research, e-commerce is a lean technology engaged with both business and communication platforms that enable the bypass of information asymmetry and privacy issues (Ma and Agarwal, 2007). Transactions on the internet rely more on direct communication between buyers and sellers in the form of information and attitudinal exchange.

The above explanation makes clear that SET has some correlation to the concept of trust (Gefen and Ridings, 2002; Luo, 2002; Molm et al., 2000). Specifically, trust should be developed whenever there are social, and/or business exchanges. Previous studies posit that trust is necessary in transactional processes and should be existed when there is an uncertainty environment or no clarity about legal protection (Luo, 2002; Molm, et al. 2000).

Previous studies also assert that trust can emerge from dominant social exchange mechanisms, i.e., the exchange within the community of the web users through the use of

human-mediated interaction systems, such as a bulletin board (Pavlou and Dimoka, 2006). Moreover, trust created from the social exchange mechanisms also involve the familiarity of the website obtained from repeated visits (Jarvenpaa and Tractinsky, 1999).

In addition, trust is potentially influenced by social exchange because of the virtual world nature that supports various social and business functions. Therefore, there will be a situation in which people (in the form of avatars) form a group, community, or situation, in which people introduce others to visit virtual stores. Virtual merchants should be aware of the power of social exchange, such as word-of-mouth (WoM), in creating positive or negative attitudes toward their businesses. Especially, WoM and feedback from customers are easily spread in the virtual world environment (Dellarocas, 2003; Herr et al., 1991). The reputation of the virtual store in providing good service, for instance, is the main reason why some stores can attract many customers. Previous research indicates that the nature of virtual worlds that enables co-location of multiple avatars enhances more sense of trust when compared to general web-based commerce (Goel and Prokopec, 2009).

General Research Hypotheses from this Section

Based on the previous literature and theories related to trust in social and business contexts, the link between trust and technology adoption concepts, and the social exchange theory aforementioned in this section, this research proposes the following hypotheses:

H6: The more the perceived relational affordance of virtual environment, the higher the consumer's trust they have.

H8: The higher the consumer's trust, the more intention they have towards making a purchase of products or services.

2.6 Proposed Conceptual Model and Research Hypotheses

This section summarizes the proposed conceptual model of this dissertation and the research hypotheses based on previous literature review. Figure 2.18 illustrates the proposed conceptual model of Virtual World Commerce Adoption (VWCA), which describes dependent and independent variables, as well as causal relationships between these variables. The research hypotheses are also summarized as follows:
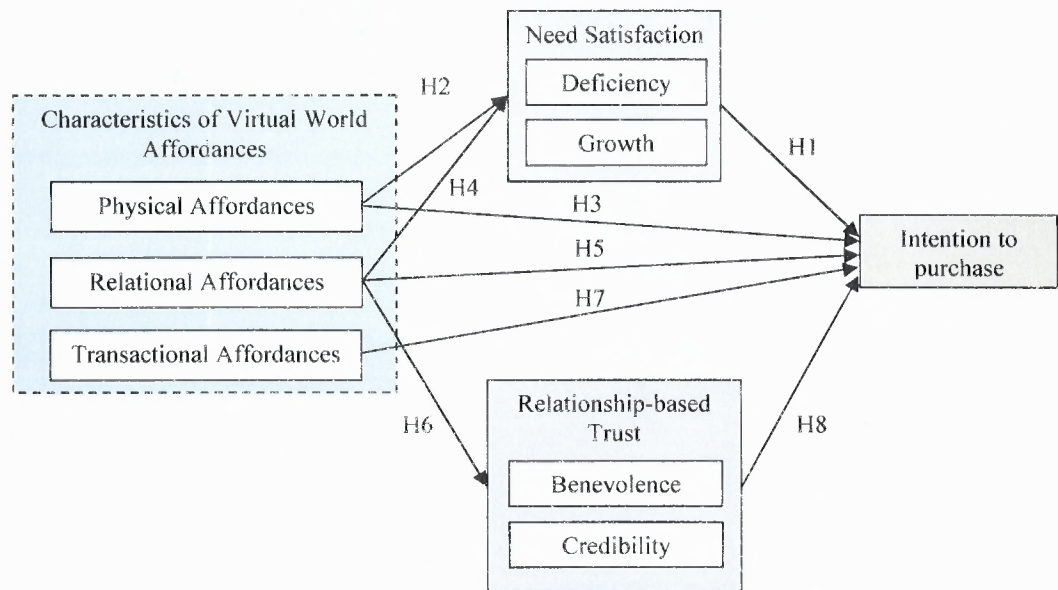
Figure 2.18 Virtual World Commerce Adoption (VWCA) model.

H1:   The more the products (or services) offered by the virtual store are able to satisfy consumers' needs, the higher their intentions to make a purchase.

H2:   The more the perceived physical affordance of the system environment, the higher the consumer's need satisfaction.

H3:   The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of products and services.

H4:   The more the perceived relational affordance of the system environment, the higher the consumer's need satisfaction.

H5:   The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of products or services.

H6: The more the perceived relational affordance of virtual environment, the higher the consumer's trust they have.

H7: The more the perceived transactional affordance of system environment, the higher the consumer's intention towards making a purchase of products or services.

H8: The higher the consumer's trust, the more intention they have towards making a purchase of products or services.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discusses the methodology of two preliminary studies and a main study of this dissertation. The research focuses on a single case study of Second Life. The case study uses various research methods invoking both qualitative and quantitative techniques. Qualitative techniques are employed crucially in the exploratory stage of the research. Preliminary study 1 is conducted using direct observations, documentation and interviews of the real users. Quantitative technique is employed for a confirmatory purpose. A pilot study and the main study use a questionnaire instrument for data collection. The self-report questionnaire is a technique to obtain empirical data from the subject directly. The data obtained from the survey will be analyzed and tested to confirm the research hypotheses and develop the research model.

The structure of this chapter is divided into four main sections. The first section describes the case study overview. The second section discusses the research methodology for the preliminary studies, which consist of two continuous studies in Second Life: (1) the first preliminary study; and (2) the pilot study. The third section discusses the methodology for the main study. Finally, this chapter is ended with a conclusion.

3.2 The Case Study Overview

This dissertation employs the case study method to investigate various phenomena of the virtual world by focusing on the research questions as aforementioned in Chapter 1. Case study is a preferred research methodology that focuses on understanding the dynamics present within a single setting (Eisenhardt, 1989). A single-case design is chosen for the first preliminary study rather than a multiple-case design. In this case, Second Life, *an "emergent" virtual world with concurrent realistic and fantastic instantiations*[9], is selected to be the case. The case study focused on investigating various features of its commerce platform and general consumer attitudes and beliefs about involvement in business activity in this environment.

A previous study by Yin (2002) indicates that the single-case study that represents a critical case can be used efficiently to explore, confirm, and test the theory. The single-case design used in the first preliminary study is also considered as a representative or a typical case because any finding is assumed to be informative about the experience of the average virtual world's residents and communities. However, the single-case may be supplemented by the multiple-case study to increase the credibility and accuracy of the proposed theory.

Previous literature posits that the case research method can be employed to capture user's knowledge and experience in using new information systems and to develop theory from this understanding (Benbasat et al., 1987). For IS research, the case study is employed to analyze both experience and attitude due to its three main advantages (Benbasat et al., 1987):

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[9] From Rennecker, J. in Schultze et al. (2008), a panel presented at the 2007 International Conference on Information Systems (ICIS).

1. Case study allows researchers to study the system in natural settings.

2. Researchers can obtain answers to "how" and "why" questions. In other words, the researcher is able to understand the nature and complexity of the processes taking place.

3. Case research method is suitable for a research area that has only a few previous studies carried out.

The rationales behind the selection of the case study, in this case is Second Life, include:

1. The commerce platform of Second Life enables users to create and develop their own environment, object properties, and rules. Therefore, users can simulate the real business functions and the environment similar to those in the real world. There is no embedded objective or narrative as seen in some other game-oriented virtual worlds, such as World of Warcraft.

2. The integrated virtual economy of Second Life is considered an evolutionary feature in supporting business functions. Virtual currency, in particular, is a mechanism that makes basic economic functions possible. In addition, the flexibility of Second Life's transactional systems that allow currency conversion and/or exchange encourages more business transactions in the virtual worlds.

This case study uses multiple data collection methods for the first preliminary study, and uses a questionnaire survey for the pilot and the main studies. The summary of the methodology of both the preliminary studies and the main study is explained in the following sections.

3.3 Methodology of the Preliminary Studies

The preliminary studies have been conducted from 2007 to 2008. There are two studies that are specifically focused on Second Life. The first study focuses on exploring general characteristics of Second Life's virtual environment and business functions. This preliminary study also explores various facts about other virtual worlds in general to establish the overall understanding about virtual worlds and their users. In this study,

multiple data collection methods, including an interview, were employed. The second study, a pilot study, focuses more on questionnaire instrument development. The initial questionnaire instrument is developed and tested in this step.

3.3.1 Preliminary Study 1

The methodology for the first preliminary study includes the interviews of 28 Second Life inhabitants, the documentation and the field observations. The direct observation began in October 2007 while the interviews were conducted from January to February 2008. Documents such as paper, newspaper, electronic news, magazine, reports and statistics were also collected and summarized during the same periods.

This preliminary study employs various data collection methods for the confirmatory purpose. In other words, the purposes of multiple data collection are to confirm the results obtained from multiple sources of evidence (triangulation), and obtain the in-depth information about behavioral aspects of virtual world commerce. In addition, multiple sources of evidence help ascertain that research questions are answered by one or more methods. The analysis of documentation, for instance, is suitable for collecting statistics and company facts, and is used to answer questions such as user growth and market size of various virtual worlds, while direct observations and interviews are intended to observe user behaviors and characteristics of the virtual commerce environment.

The validity of this case research can be explained by the triangulation concept, which is a well-known technique in data collection and interpretation. Triangulation is a technique that compares the results obtained from various sources (Mays and Pope, 2000). For instance, the interview results are compared and contrasted with the direct

observation and documentation. Then, the pattern of convergence and divergence (which is more important) is considered prior to the overall interpretation. A summary of the results obtained from multiple data collection methods used in the case study is presented in this section. A summary of the documentation including general characteristics of virtual worlds, facts about growing numbers of users, size of the economy of these different virtual worlds, and special interests about virtual world commerce is presented. Then, the results of the direct observations, including experience with the system, are discussed. Finally, the results of the active users' interviews in Second Life are explained informing the users' general attitudes towards the virtual world.

3.3.2 Preliminary Study 2 – A Pilot Study

According to the literature in technology adoption, trust and e-commerce, as well as the results of the preliminary study 1 discussed earlier, a pilot study using a quantitative research methodology was designed to examine the potential determinants of the virtual world commerce adoption. This pilot study is the first attempt in studying the impacts of the design of the virtual environment and objects on consumer purchasing behavior. Many new ideas emerged during the pilot study. For instance, ideas about system affordances emerged after the researcher investigated various usability aspects of the virtual world during the first preliminary study. The pilot study also attempts to apply the two new concepts originated from literature review and direct observations: (1) perceptible affordances, and (2) psychological need satisfaction, in explaining usability of the virtual world in shopping and measuring the real consumer satisfaction, respectively. These two new concepts, however, had been studied rarely in technology adoption, e-commerce and virtual world areas.

The goals of the pilot study are to develop and validate the measurement model of the proposed research constructs. The following figure describes the quantitative research method for the pilot study. For instance, the procedures in identifying the targeted research subject, the survey administration procedure, and the initial scale development will be discussed. In the next chapter, the results of the pilot test will be elaborated. This includes identification of measurement constructs, validity and reliability tests, factor analysis, regression analysis and final measurement model development.

Identifying the Target Population

The target research subjects are identified based on the current situations happening in the virtual world. First, experiment sites, which are simulated places (as known as SIMs) in Second Life, were selected from the high traffic SIMs. The traffic volume, as described earlier, is used to determine the popularity of the virtual places. The high traffic SIMs are occupied by many active users (or residents) who currently engage in various activities in these SIMs. The selected SIMs are usually a general place that users get together to meet and greet and perform a targeted commercial activity, such as selling and buying things. The experimental sites for the pilot study include, for example, Money Tree Island (SL grid – 172, 104, 22), Sweethearts Jazz Dance (SL grid – 197, 149, 23) and Freebies Beach (SL grid – 120, 13, 29). The researcher changed the experimental sites from time to time to make sure that there were enough subjects to recruit. In general, the numbers of active users of the experimental sites when the study took place are approximately 65,000-75,000 users.
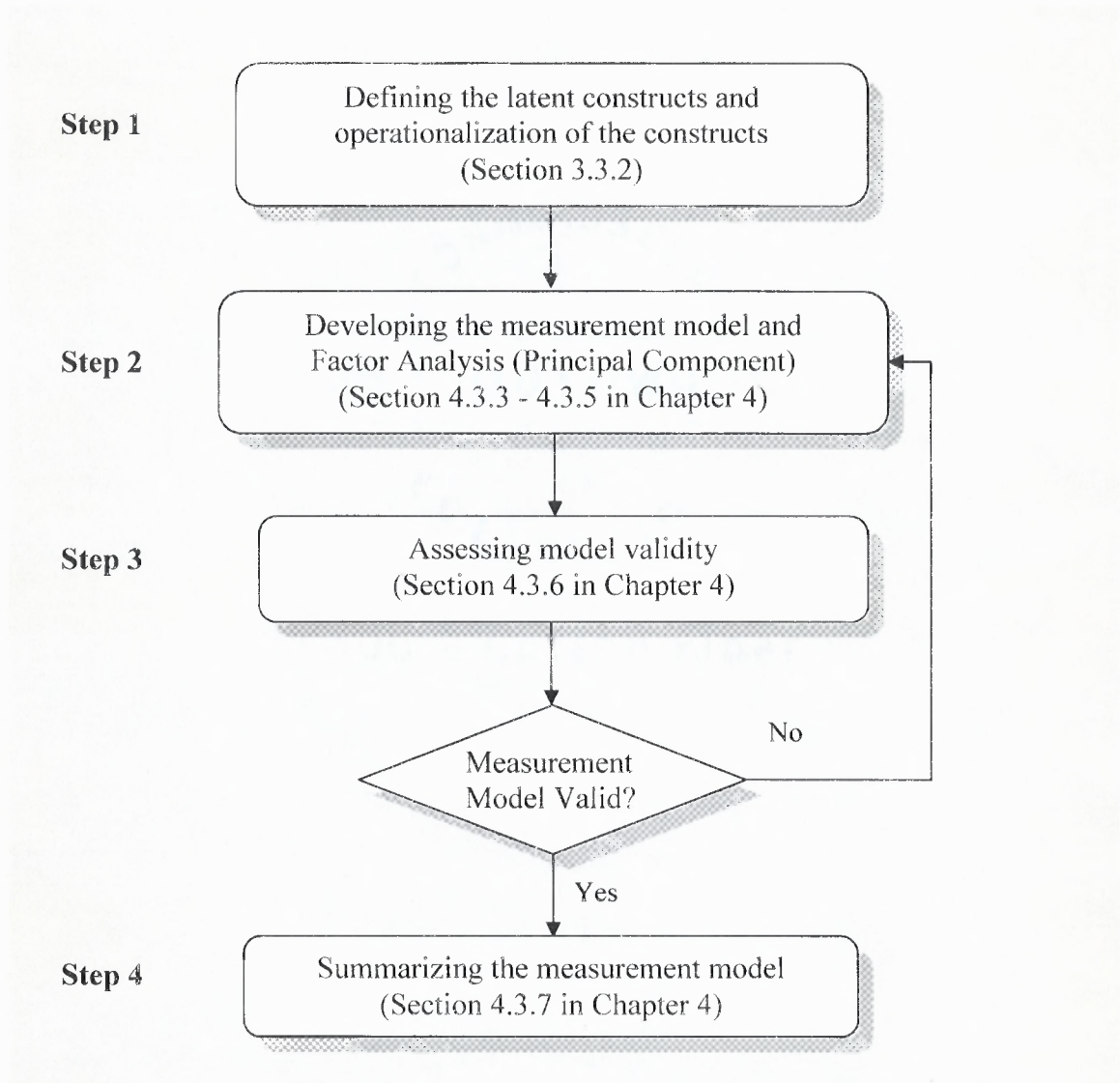
Figure 3.1 Steps in developing the measurement model.

The prospective research subjects were asked randomly to participate in the survey. The prospective subjects can either accept or deny their participation and they can also quit whenever they want. Since the survey is administered to actual Second Life residents, who have different backgrounds and experiences with the system, it certainly reflects real business situations more than using student subjects.

Survey Administration

A questionnaire containing initial scales is distributed to randomly selected Second Life residents who are residing in the identified SIMs. The users are required to access the questionnaire in two different ways. First, the questionnaire can be accessed within the virtual world via an avatar bot. The avatar bot is a typical avatar that is programmed to collect the survey responses. The participants can send an IM containing the keywords to the avatar bots to activate the survey. The participants must accept the survey consent form before they can proceed to the questions. This procedure of questionnaire response is similar to a general chat between users via a chat function. The participant answers the questions that the avatar bots ask by typing their answers on the chat dialog. The answers are automatically recorded. All answers can be uploaded to the spreadsheet applications for further analysis.

Second, the participants can access a web-based version of the survey via SurveyMonkey.com. Similarly, the participants must accept the survey consent form before they can proceed to the questions. All answers can be uploaded and converted to the spreadsheet format. After the participants finish all questions, they receive an incentive of 300 Linden Dollars (around 2 U.S. dollars).

A total of 130 respondents were obtained. Of this number, any questionnaires containing errors were taken out. The errors found in questionnaire response are divided into two types, which are: (1) redundancy response, and (2) majority missing value response. A redundancy response error occurs when all or most of the answers are the same. For instance, a respondent answers "agree" in all questions. The redundancy error can occur when the survey participants are given a monetary incentive, especially a

money reward. Another type of error is a majority missing response error, which occurs when the answers contain more than 50 percent missing values. These two errors can bias the results of the questionnaire and usually happen when using a self-report questionnaire in data collection. Ultimately, a final set of 89 completed questionnaires are actually used for data analyses.

Initial Instrument Development

The instrument development part involves establishing the scale's reliability, content validity, and construct validity (Straub, 1989). Validity is a degree to which a scale measurement accurately represents the interested construct. On the other hand, reliability is the degrees to which the observed variable measures the true value and is error free (Hair et al., 2006). Reliability is explained by Cronbach's alpha coefficient and Construct Reliability (CR) – the extent to which the measurement scales consistently represents the measured construct (Hair et al., 2006). The content validity and construct validity refer to the degree to which the measurement scales reflect the variable of interest (Cronbach and Meehl, 1955)

A procedure in obtaining the final measurement scales of each variable is divided into three steps. First, the content validity is obtained from the literature review. Second, the construct validity is measured using the 89 survey responses. This includes performing a Principal Component Analysis (PCA) of the measurement constructs. Third, convergent and discriminant validity analyses are performed. The final measurement model shows the scales' loadings of each latent construct and inter-construct correlations. Other than these three steps in obtaining valid and reliable measurement scales, a regression analysis is also performed to test the proposed model.

Assessing Content Validity

Content validity is the extent to which an empirical measurement reflects the domain of content in which one is interested (Carmines and Zeller, 1979). The initial scales are developed from a review of related literature. After the scales are extracted from the literature, they are reviewed by two researchers. The initial scales are analyzed for correctness of their meanings and words used.

Physical affordances concern the manipulation of virtual objects by users through their avatars that create the feelings of real interaction and feedback through visual perception. The design of physical affordances objects as mentioned by Mine (1995) includes the features that enhance direct user interactions, physical controls, and virtual controls. The virtual world interactions are usually performed by using computer interfaces and hardware devices, such as screen, mouse, and keyboard, because they allow the user to see and control the avatar movements. This also includes pointing, selecting, and manipulating objects by avatars. The measurement scales of the physical affordances address users' understandings about the objects they see and can predict the actions they can perform to these objects. The physical affordance scales are based on the usability scales of the previous research (Chen et al., 2004).

The design of the relational and the transactional affordances system does not focus on improving the controllability, the navigability, and the ability to manipulate virtual objects by avatars. These perceptions of affordances focus on the ability to interact and communicate with other users through avatars, and allow users to develop social relationships with other users or engage in business transactions. Affordances theory postulates that the characteristics of the environment that allow informal interaction

incorporate proximity, privacy, and legitimacy. Therefore, relational affordances are involved with the ability to incorporate many communication media, such as instant messaging, text-based chat, voice-based chat, and email systems, in interactions and relationship establishment. The relational affordances include the ability of the system's functions that allow users to incorporate various kinds of communication media in social interactions. The measurement scales of the relational affordances are based on the measurement items of sociability in the previous research (Kreijns et al., 2007).

Similar to the relational affordances, the transactional affordances are the ability of the users in using the system's functions in making a business transaction, such as buying a virtual currency, purchasing a virtual product, and transferring virtual money to other users. Transactions within the virtual world can be fulfilled by the design of the systems that enables users to use the system's functions in interactions and communications. Therefore, the success of virtual businesses thus also depends on two aspects of the system design: (1) the design of the system's functions in assisting users in interactions, and (2) the design of the system's functions in helping users in making transactions.

Other than the design of physical, relational, and transactional aspects of the systems, trusting belief is another important determinant of purchase intentions, especially in e-commerce (e.g., Pavlou and Fygenson, 2006). Previous research divides trusting beliefs in e-commerce into two types: (1) the general trusting beliefs, and (2) the specific trusting belief. Since trust is a naturally context-dependent construct (Luhmann, 1979), trust in virtual world commerce focuses on interpersonal relationships between trusting parties.

Other than the previous two concepts, the pilot study aims to investigate the effect of consumer's need satisfaction (e.g., Porter, 1961) in inducing consumer's intention to purchase virtual products. Based on the previous research in satisfaction (e.g., Tse and Wilton, 1988), the pilot study investigates only the effect of the product's need satisfaction. However, after the pilot study has been completed, a new idea regarding the need satisfaction construct is found. This new idea postulates that consumer's needs may not relate solely to the products that are bought for the avatars, but may also involve the need to achieve social recognition and self-esteem of the actual users. The idea of psychological needs, which are based on the theory of human motivation (Maslow, 1943), classifies needs into two types: (1) deficiency need, and (2) growth need.

The pilot study results in six measures for physical affordances, five measures for relational affordances, four measures for transactional affordances, twelve measures for trusting beliefs and two measures for need satisfaction, as summarized in the following operationalization of individual research constructs.

Operationalizing the Individual Construct

Operationalization of the individual constructs explains the meanings of the constructs and the measurement items for each construct. This pilot study adapts the scales from prior research as well as develops the scales for the new constructs. The questionnaire contains 38 questions, which are divided into two parts: (1) demographic questions, and (2) general research questions. Each part of the survey contains the following survey items.

- Demographic Questions

  - o Gender

  - o Age

  - o Level of education

  - o Time and frequency

  - o Experience in making a purchase

- Topic Questions

Characteristics of System Affordances

The characteristics of system affordances are referred to as the extent of the system's design of functions and tools that support users in controlling avatars and interactions. The characteristics of the system affordances can be explained by the following three latent constructs: (1) physical affordances, (2) relational affordances, and (3) transactional affordances.

o *Physical Affordances*

The physical affordance scales are based on the usability and the ease of use items from prior studies (e.g., Boling, 1995; Chen et al., 2004). Each item uses the five-point Likert scale of measurement. The initial measurement scales are:

- I find Second Life is easy to use.

- I find Second Life easy to become skillful in performing the system's functions.

- I find Second Life is easy to navigate.

- I find Second Life easy to operate.

- I can quickly accomplish my task in purchasing products in the virtual store.

- I can easily find specific information from the virtual store.

o *Relational Affordances*

The relational affordances scales are based on the sociability items (Kreijns et al., 2004). Each item uses the five-point Likert scale of measurement. The initial measurement scales are:

- Second Life enables me to interact with other people in an easy manner.

- Second Life enables me to casually talk with other people.

- Second Life enables me to get together with the group of people.

- Second Life enables me to attend social events.

- Second Life enables me to get together with family and friends.

o *Transactional Affordances*

Based on the aforementioned physical affordance and the relational affordance scales, the transactional affordance scales are introduced. Each item uses the five-point Likert scale of measurement. The initial measurement scales are:

- Second Life supports me in making business transactions.

- Second Life allows me to spend virtual currency in an easy manner.

- Second Life allows me to directly contact or exchange in business activity with the virtual store.

- Second Life requires only minimal time in completing a transaction.

Characteristics of Relationship-Based Trust

This construct measures the trusting beliefs of the consumers. The measurement scales are based on the scales used in previous research on trust in e-commerce (e.g., McKnight et al., 2002b; Pavlou and Gefen, 2002).

- I believe that the virtual store would act on my best interest.

- If I require help, the virtual store would do its best to help me.

- The virtual store is interested in my well-being, not just its own.

- I believe that the virtual store is sincere.

- The virtual store is truthful in its dealings with me.

- The virtual store is honest.

- I expect that virtual store will keep promise.

- The virtual store is reliable.

- The virtual store understands the market it works on.

- The virtual store is very knowledgeable.

- The virtual store is competent and effective in providing service.

- The virtual store has skills and expertise to perform transactions.

Need Satisfaction

Need satisfaction constructs contains two measurement scales adapted from the previous research on satisfaction (Tse and Wilton, 1988). These scales use the five-point semantic differential scales of measurement. The proposed scales are:

- Overall, I... (definitely dissatisfied/ definitely satisfied)... the product/service from the virtual store/agents.

- The product and/or service offered by the virtual store... (definitely dissatisfied/ definitely satisfied)... my needs.

Intentions to Purchase

While other constructs are considered as latent constructs, this pilot study uses a single scale to predict the intentions to purchase. Traditionally, the intention scales require respondents to express their likelihood of purchasing using a number of verbal intention descriptors (Day et al., 1991). Therefore, this pilot

study uses a five-point semantic differential scale type to predict intentions to purchase.

- I ... (definitely would not/ definitely would)... buy a product or obtain a service from a virtual store in the near future.

3.4 Methodology of the Main Study

The goals of the main study are to validate the initial measurement scales and improve the validity and reliability of research constructs, as well as develop the theoretical model of Virtual World Commerce Adoption (VWCA). The initial scales of perceived affordance variables are modified. Moreover, the new measurement scales of need satisfaction are introduced. The measurement scales of these variables are pretested again to make sure that the scales are valid and reliable for the main study.

Figure 3.2 shows the steps in conducting the main study starting from developing and validating the measurement scales of the perceived affordance and the need satisfaction constructs. Complete questionnaire items are shown in this section. The main study has been conducted from July to September 2009. The questionnaire surveys were distributed to various venues (or SIMs) in Second Life. A total of 327 completed surveys were obtained from participants who were residents. The data analysis parts and the results of model development will be discussed in Chapter 5 and 6.
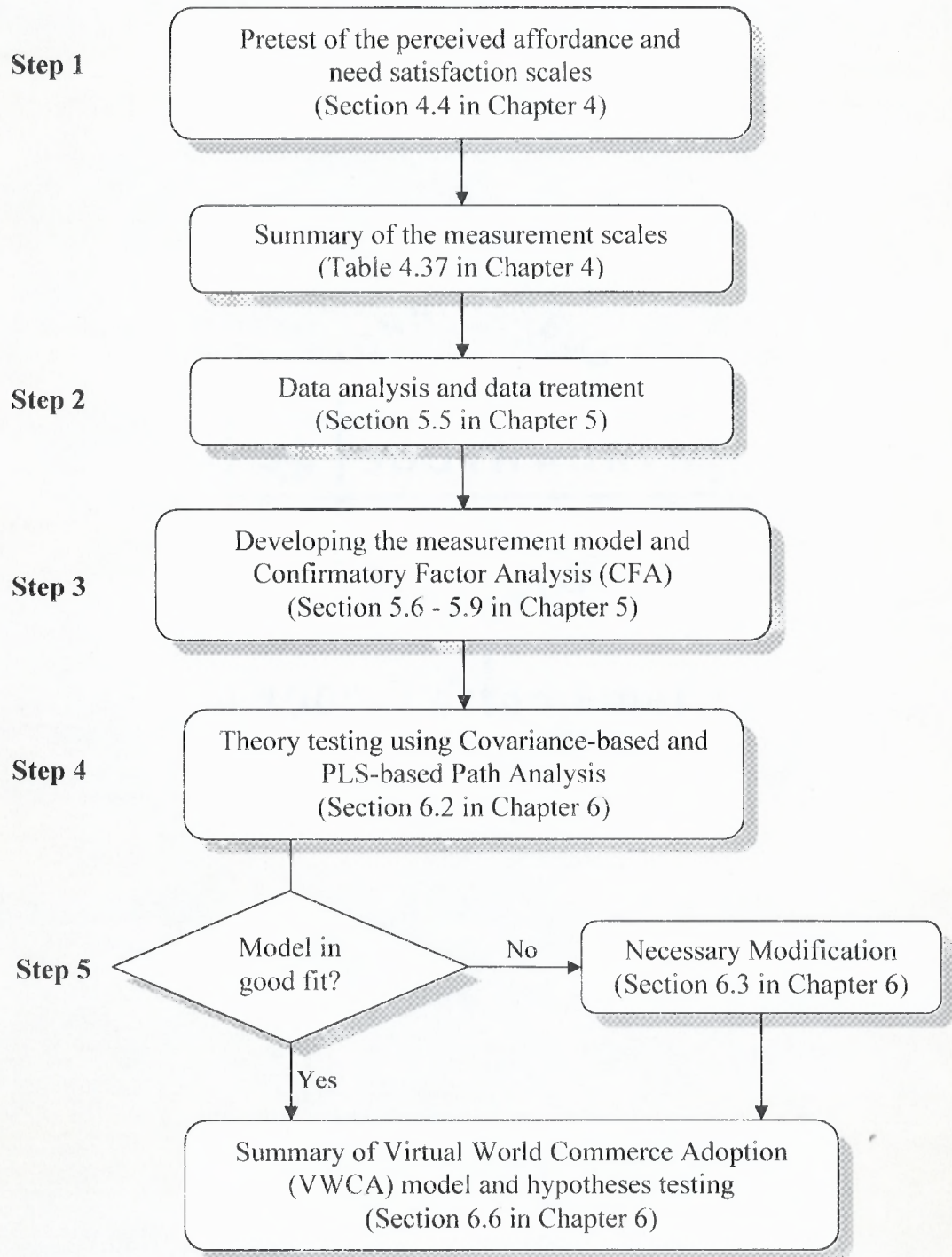
Figure 3.2 Steps in developing the theoretical model of Virtual World Commerce Adoption (VWCA).

Identifying the Target Population

Procedures in identifying the target population or research subjects are the same for both the pilot study and the main study. The researcher visited many high-traffic places in Second Life, which can be specified from small green dots on the map as illustrated in Figure 3.3. A higher number of small green dots imply that the virtual place has a high number of current users for duration of time.
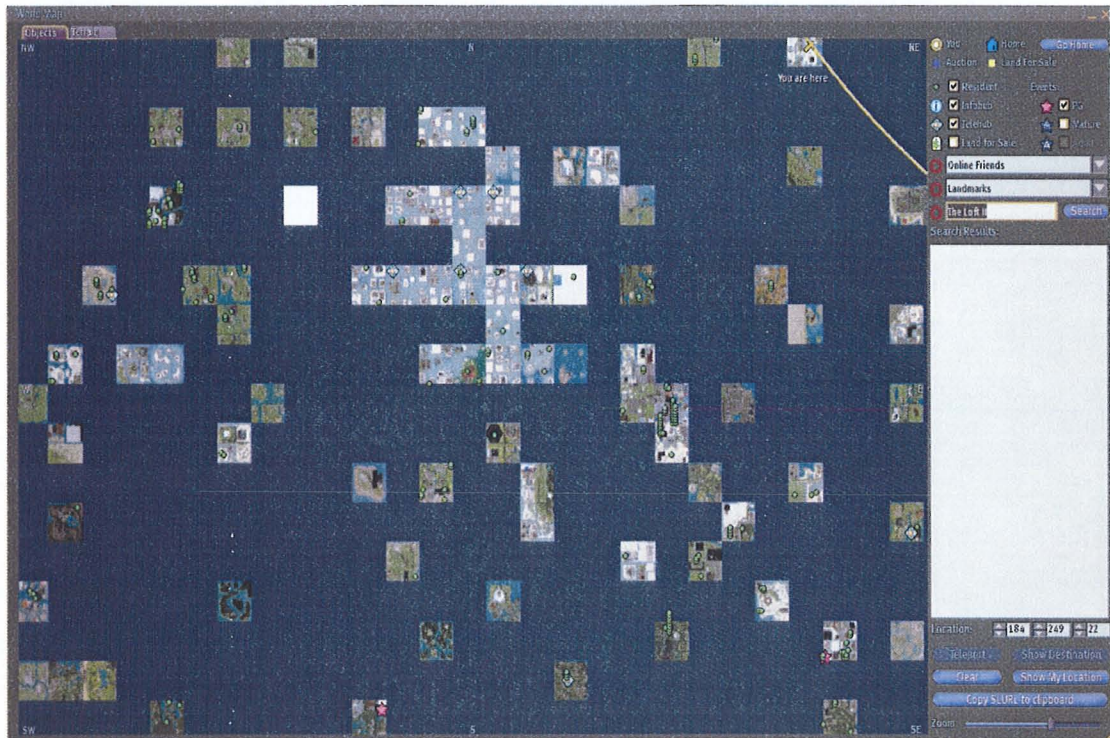
Figure 3.3 Targeting the research subjects using Second Life's World Map function.

Examples of virtual places that the subjects were recruited including:

(1) Virtual community places, such as Help Island Public [SL grid – 165, 115, 21], Bay City Docklands [SL grid – 92, 212, 25], and Morris Welcome Area [SL grid – 16, 222, 40].

(2) Business corporations such as the Loft Furniture and Prefabs [SL grid – 108, 212, 21], Bare Rose Fashion [SL grid – 158, 10, 30], RedGrave Fashion [SL grid – 227, 201, 22], Alady Island [SL grid – 7, 24, 405], and Deva Loka [SL grid – 22, 6, 54].

(3) Entertainment places, such as Sweethearts [SL grid – 60, 159, 21].

(4) Training center, such as New Citizen Inc. [SL grid – 71, 173, 28].

The researcher changed the experimental sites from time to time to make sure that there were enough subjects for recruitment.

Survey Administration

The questionnaires were distributed to randomly selected Second Life residents who were residing in the identified SIMs. A researcher in the form of an avatar with full description of the research objectives, personal information, and affiliation in the profile, invited the subjects by creating an initial interaction with them. The researcher sent an invitation message to the subject via Instant Messaging (IM) or a private message. The survey link was sent to the subjects who agreed to volunteer for the research. The subjects were required to access the web-based questionnaire survey via SurveyMonkey.com. They can either cut and paste the survey link on the internet browser or take the survey in Second Life directly. The latter is a preferred method for most participants. All answers can be uploaded and converted to the spreadsheet format. After the participants finished all questions, they received a reward of 300 Linden dollars (approximately 2 U.S. dollars).

A total of 327 completed surveys were obtained. Of this number, any questionnaires containing errors were taken out. The errors found in questionnaire response were mostly incomplete surveys, and denials of research consent. The final of 307 valid questionnaire surveys are used in subsequent data analysis.

Assessing Content Validity

The measurement scales are developed from the pilot study and related literature for the new measurement scales of need satisfaction. Four researchers had validated the face validity of the new measurement scales and the overall questionnaire instrument. Thereafter, the modified perceived affordance scales and need satisfaction scales were tested to make sure that the new scales meet criteria for validity and reliability of the measurement scales.

The need satisfaction scale is based on Porter's study (1961). These measurement scales, also called Need Satisfaction Index (NSI), are modified to prevent a problem about the scale interpretation as already mentioned by some researchers regarding the interpretation of the negative discrepancy score (Myers, 1988; Westbrook and Reilly, 1983). The main study proposes that need satisfaction comprises two dimensional constructs – deficiency need and growth need. The scales are adapted from Porter (1961) and other important literature related to psychological needs, such as Sheldon and Bettencourt (2002).

Intention to purchase scales are based on the scales developed in e-commerce research (e.g., Pavlou and Fygenson, 2006; Pavlou and Gefen, 2005). There are six scales of intention to purchase different kinds of products or services offered by the merchants in Second Life. Specifically, the differentiation between consumer's intention to purchase virtual products and consumer's intention to purchase real world products is assumed. The keywords "virtual" and "real world", as well as the time frame, are added to the measurement items of intention to purchase to reflect the likelihood of buying intention.

In conclusion, the measurement scales of each latent construct developed for the main study are as follows: four measurement scales for physical affordances, five measurement scales for relational affordances, four measurement scales for transactional affordances, eight measurement scales for trusting beliefs, eight series of measurement scales for need satisfaction (each series contains three items or questions), and six measurement scales for intention to purchase.

Operationalizing the Individual Construct

The operationalization of the individual construct explains the tangible measurements of each latent construct. The questionnaire contains 54 questions, which are divided into three parts: (1) demographic questions, (2) general research questions including two marker variables, and (3) open-ended questions. Each part of the survey contains the following survey items.

- Demographic Questions
  - Gender
  - Age
  - Level of education
  - Usage duration and frequency
- Topic Questions
  - *Physical Affordances*
    - I found that the program functions (or menus) allowed me to do things with ease.
    - I found that the program functions (or menus) supported me in navigation and control of my avatar.

- I found that the program functions (or menus) allowed me to understand their operations.

- I was able to predict the outcome of my actions when I saw the program's functions (or menus).

o *Relational Affordances*

- Second Life…enabled me to have a casual conversation with other people.

- Second Life…enabled me to know if I would be able to get together with the group of people.

- Second Life…enabled me to know how others feel emotionally.

- Second Life…enabled me to understand the state of mind of the people I interact with.

- Second Life…enabled me to establish close relationships with other people.

o *Transactional Affordances*

- Second Life…allowed me to understand the process of money transfer and/or money exchange.

- Second Life allows…allowed me to know the steps I should do when purchasing a product, transferring money and buying virtual currency.

- Second Life…enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase.

- Second Life…enabled me to easily view my money balance.

o *Relationship-based Trust*

- I do not believe that the virtual stores (and staffs) would act in my best interest.

- If I required assistance, the virtual stores (and staffs) would do their best to help me.

- The virtual stores (and staffs) were truthful in dealings with me.

- The virtual stores (and staffs) were unlikely to act opportunistically, even given the chance.

- I feel that the virtual stores (and staffs) were not credible.

- The virtual stores (and staffs) understood the market in which they work.

- The virtual stores (and staffs) had skills and expertise in running their businesses.

- The virtual stores (and staffs) were competent and effective in providing products and/or services.

o *Need Satisfactions* scales consist of a series of questions which are "How much this should be?", "How much is there now?", "How important are these to me?"

  - The opportunity to develop close friendships with other people in Second Life.

  - The sense of self-respect while I am in Second Life.

  - The opportunity to have my choice in expressing my "true self" through my avatar.

  - The feeling of pleasure and enjoyment while I am in Second Life.

  - The feeling of self-fulfillment I perceived while I am in Second Life.

  - The quality of products/services in Second Life.

  - The products/services from virtual stores in Second Life meet my needs.

  - The feeling of security from threats and/or uncertainties when using Second Life.

o *Intentions to Purchase*

  - I...(do not intend/really intend)...to use Second Life in the next month to purchase "virtual" goods or services (e.g., clothes for my avatar, virtual home design service).

- I...(do not intend/really intend)...to use Second Life in the next month to purchase "real world" goods or services (e.g., clothes for me, consulting and investing service).

- In the next 3 months, I am...(very unlikely/very likely)...to foresee purchasing "virtual" goods or services (e.g., clothes for my avatar, virtual home design service) in Second Life.

- In the next 3 months, I am...(very unlikely/very likely)...to foresee purchasing "real world" goods or services (e.g., clothes for me, consulting and investing service) in Second Life.

- I...(definitely will not/definitely will)...use Second Life to purchase "virtual" goods (e.g., clothes for my avatar) or obtain services (e.g., interior design for virtual property) from the virtual stores again.

- I...(definitely will not/definitely will)...use Second Life to purchase "real world" goods (e.g., clothes for me) or obtain services (e.g., investing and consulting services) from the virtual stores again.

3.5 Conclusions

The methodology that this dissertation uses is the case study, which focuses on a single case study of Second Life. Second Life is a mature virtual world established by Linden Research Inc. The early stage of this dissertation focuses on exploring the system characteristics of Second Life, as well as Second Life's residents or users who actively engage with the system. The purchasing and product procurement processes are examined. The preliminary studies use both qualitative and quantitative methods for data collection. The first preliminary study employs the interview of the real users, altogether with other methods, including direct observations and documentation. Then the pilot study is employed using the questionnaire survey of the actual users. Participants access the survey either from the SurveyMonkey.com or the avatar bots. A total of 89 valid completed surveys were obtained from the pilot study.

The pretest of perceived affordance and need satisfaction variables is conducted two weeks before the main study. A total of 67 completed surveys were obtained. The results of new measurement scales of these two variables are satisfactory. The main study is conducted using the questionnaire survey that includes open-ended questions. Participants access the survey only from the SurveyMonkey.com. They can choose to access the survey either outside or within the Second Life environment. There were 307 valid surveys obtained from the participants of the main study.

CHAPTER 4

RESULTS OF PRELIMINARY STUDIES, PRETEST, AND OPEN-ENDED QUESTIONS

4.1 Overview

This chapter discusses the results of preliminary studies, which consist of an exploratory study using qualitative techniques and a pilot study using a survey questionnaire. These preliminary studies' objectives are to explore the general system's characteristics and user behavior, as well as develop the measurement model of the proposed research framework. The initial measurement scales obtained from the preliminary studies include the perceived affordance scales, the relationship-based trust scales, the need satisfaction scales, and the intention to purchase scales.

The measurement scales of perceived affordance and need satisfaction are modified and pretested. Then, the main study using a questionnaire instrument developed from the pilot study and the pretest results is employed. Second Life is selected as the main case study. Actual Second Life users were invited to participate in the survey. The responses of the optional open-ended questions, which are included at the end of the questionnaire, are analyzed using a positivist text analysis method. The results are elaborated in this chapter.

This chapter is organized into the following six sections. The next section explains the results of the first preliminary study, which consists of the results from documentation, direct observations, and user interviews. The third section discusses the results of the pilot study. Then, the fourth section describes the results of the pretest of perceived affordance and need satisfaction variables. The fifth section discusses the results of the open-ended questions obtained from the main study in Second Life. Finally,

the chapter ends with the conclusions of the preliminary studies, the pretest and the results of the open-ended questions.

4.2 Results of the Preliminary Study 1

4.2.1 Summary of the Documentation

The first step of this case study is to find out information about various aspects of virtual worlds, especially Second Life. The following are the researcher's questions and answers obtained mainly from documentation such as company reports, fact sheets, news archives, etc.

Question: Who are users or visitors of the virtual world?

Virtual world users, referred to residents in Second Life, members in There.com, and citizens or tourists in Active Worlds, have different objectives and purposes of becoming members of the virtual world. Free members are capable of performing basic activities, such as chatting, exploring, and shopping with certain limitations. Meanwhile, paid members can perform more activities, such as buying lands, building worlds, creating contents, and selling virtual goods.

An early research on Second Life shows a large number of users who spend a considerable time in-world are creators and IT professionals (De Nood and Attema, 2006). A report on Active Worlds also states that a large number of users are educators, who are members of the Active Worlds Educational Universe (AWEDU). This educational community is created for educational institutions, teachers and students

(Mistry, 2003). Currently, more than a hundred universities around the world have joined AWEDU[10].

The majority of the users of many virtual worlds are professional people as described earlier. Additionally, a survey of 273 Second Life's visitors also reports that the largest proportion of survey participants obtain a college or university degree (De Nood and Attema, 2006). This finding is consistent with another survey of 250 Second Life's residents, which finds that a large proportion (29%) of respondents possessed a Ph.D. degree. The same report states that the largest proportion of the participants (62%) has a college degree, followed by a group of respondents (9%) who only possess a high school diploma (Fetscherin and Lattemann[11], 2007).

The average age of Second Life's users is 31, which is slightly above the average age of the users reported by Linden Labs (De Nood and Attema, 2006). Another report indicates that the largest age group of Second life's users is between 18 and 21 year old. Surprisingly, the second largest group is the users between the age of 41 and 50 years (Social Research Foundation[12], 2008). On the other hand, There.com reports an average age of 22, which is younger than the average age of Second Life's users[13]. There.com positions itself more as a hang-out or social destination rather than a creative platform. Therefore, the average age of There.com users is less than those of Second Life and Active Worlds.

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[10] From Activeworlds, http://edu.activeworlds.com/participants/index.html, retrieved February 2008.
[11] From Fetscherin and Lattemann, http://www.uni-potsdam.de/db/jpcg/Publikationen/2007_21_SL Report.pdf, retrieved March 2008.
[12] From Social Research Foundation Annual Survey, http://socialresearchfoundation.org/report/ index.html, retrieved April 2008.
[13] From Kzero, http://www.kzero.co.uk/blog/?p=961, retrieved October 2007.

The survey also reports a larger proportion of female users than the male users (De Nood and Attema, 2006; Fetscherin and Lattemann, 2007; Social Research Foundation, 2008). This survey also finds that female users generally have more education than male users. A majority of the users feels that an avatar is often a reflection of the person behind it. The survey finds that a large number of users (90.24%) choose avatars that have the same sex with the user's real genders. Only a few users are found as having a gender switch (De Nood and Attema, 2006).

Regarding the location, a majority of the users are from the United States. A survey reports that respondents are from 37 different nations. Most of the survey respondents are from the U.S. (56%) followed by the U.K. (8%), and Canada (8%). Respondents from European countries account for to 12% of the total respondents (Fetscherin and Lattemann, 2007). These findings are very similar to a survey of 1,258 Second Life residents, which reveals that 47% of respondents are from the U.S., followed by respondents from European countries (42%), and from Asia-Pacific countries (8%) (Social Research Foundation, 2008).

Question: What are the motives for being in the virtual world?

According to Maslow (1943), people have motives when doing things and trying to achieve their desires. The main thesis of the theory of human motivation posits that human needs emerge whenever human are physically and mentally motivated and can be arranged into a hierarchy of pre-potency, where the existence of need is connected to the satisfaction of the others, more pre-potent needs. Much of the literature including Maslow (1943) and Wahba and Bridwell (1976) indicate that needs are classified into five overlapping levels starting with the most pre-potency needs as follows: (1) physiological

needs, (2) safety and security needs, (3) belonging and love needs, (4) esteem needs, and (5) self-actualization needs.

Based on a presentation about Second Life[14], motives of the virtual world's users are classified into the following five categories:

1. **Role Players:** Role players are likely to do role playing and own virtual places for themselves.

2. **Explorers:** Like to do fun activities, visit beautiful places and explore Second Life.

3. **Meeters:** Love to make friends, meet people, diversion, hospitality, explore Second Life and also express themselves.

4. **Professionals:** Are likely to learn and work, improve social skills, express themselves, visit beautiful places and be appreciated.

5. **Searchers:** Like to express oneself, maintain relationship, improve social skills, diversion, escape form sorrow and be appreciated.

A survey of 1,258 Second Life's residents reveals that 54% of total respondents use Second Life to socialize, 49% of respondents are creating, 39% shop, 23% are running a Second Life business, 16% are professional (including training), 6% are performing scientific meeting and 4% are running a real life business (Social Research Foundation, 2008). Interestingly, another survey indicates that respondents who have a physical disability admit that Second Life has a therapeutic effect on psychological problem through self-help groups in the virtual world (De Nood and Attema, 2006).

The survey of 1,258 Second Life residents (Social Research Foundation, 2008) predicts that doing professional activities will increase 19%, the trend in running Second Life business will increase to 18% and the trend in running real life business in Second Life will increase 13%. Shopping has become the most popular activity (37%) in 2009

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[14] Motives for being in virtual worlds, source http://www.tothport.nl/?p=46, retrieved March 2009.

followed by socializing (28%). In particular, the respondents who have a primary job in real life have done the following professional activities: (1) teaching and/or learning, (2) collaborating with others to get work done, (3) holding or attending scheduled meetings, (4) visualizing information in 3D, (5) recruiting or interviewing, (6) rehearsing or practicing work activities, and (7) managing real world systems.

In conclusion, virtual world members generally use the virtual platform for interaction rather than for professional activities. However, reports find a growing trend of using the virtual world platforms for professional activities, such as in education and for business.

Question: What is the growth rate of the number of the virtual world visitors?

The top 50 virtual worlds report a total of 173.61 million registered users as of January 2008[15]. This includes the users who registered Second Life (12 million), There.com (1.5 million), Hobbo (90 million), and Neopets (45 million). Gartner Research[16] expects that 80 percent of active internet users (including Fortune 500 companies) will have an account in Second Life by 2011. Second Life also reveals an increase of active users to 800,000 as of July 2008, which is 58% higher than the previous month. User hours grow approximately 6% from an annualized rate of just under 350 million user hours in the first quarter of 2008 to over 380 million user hours in the second quarter[17]. A virtual world industry observation[18] predicts that virtual world users will grow 22.8%, while active users will reach 38.2% by 2015. Furthermore, paid members will grow 47.3% by

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[15] Source: http://www.virtualworldsnews.com/2008/01/17361m-register.html, retrieved January 2008, retrieved June 2007.

[16] From Gartner Research, http://www.gartner.com/it/page.jsp?id=503861, retrieved June 2007.

[17] From Second Life Blog, http://blog.secondlife.com/category/economy/, retrieved September 2008.

[18] From Gilbert B., Strategy Analytics Inc., http://www.engageexpo.com/presentations/Gilbert-StateOfThe VWMarket.pdf, retrieved May 2009.

the end of 2015. The virtual world industry also reports that active users make up only a small percentage of total broadband users. However, the percentage of registered users will increase about 25% by 2015 (Gilbert, 2009). The same source also releases the forecast of virtual world adoption, which shows that 22% of global broadband users will register for one or more virtual worlds within the next ten years[19].

It is also predicted that in the near future users will be able to access virtual worlds from various sources, such as mobile devices. Therefore, by the end of 2015, 29 million users are predicted to have a virtual world access from mobile devices, which is increased exponentially from 350,000 users in 2009. However, there are many technical limitations of today's mobile access, such as the small screen, the ease of navigation, and the graphical issues (2D vs. 3D), etc (Gilbert, 2009).

As previously indicated, the number of virtual worlds' visitors will increase dramatically in the near future and in parallel with the expansion of the broadband internet users. In addition, improvement of the speed and the capacity of the internet in many parts of the world will allow many internet users to access the virtual world applications, especially the users in other parts of the world, such as Asia and South America. Also, the evolution of mobile internet technology is another factor facilitating access to virtual worlds.

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[19] From Strategy Analytics Inc., source http://www.strategyanalytics.com/default.aspx?mod=PressRelease Viewer&a0=3983, retrieved September 2008.

Question: How large is the virtual world economy?

A virtual economy is an emergent economy existing in the virtual persistent world[20]. A virtual economy is created from exchanging virtual goods and services within the virtual world environment. Generally, people enter these virtual economies for other purposes than for real economic benefit. However, people increasingly gain some benefits from serious profit makings, and managing their own virtual businesses. Many people create virtual careers to serve the emerging virtual businesses.

Estimated from the number of potential users and the annual spending on virtual goods, the value of virtual world market is increasing from $1.5 billion in 2006 to around $10.3 billion in 2012, which is six times the value of the market in 2006[21]. In addition, the volume of real-money trade (RMT) of virtual items around the world was $2.09 billion in the first quarter of 2007. The values also include the virtual property and the virtual item traded on secondary markets, such as eBay. The main contribution to this figure comes from the growing of Asian market[22].

A massive expansion of virtual worlds attracts many companies, including Fortune 500 companies such as IBM, Dell, and Microsoft, to the virtual world market. Many companies agree that the virtual world market has a great potential to improve their marketing strategies, extend their customer service, and modernize the product design. Not only profit-oriented organizations, but other organizations, such as academic institutions, news and media, non-profit organizations, associations, and government organizations also see the opportunity in using virtual worlds as a mean to communicate

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[20] Source: http://en.wikipedia.org/wiki/Virtual_economy, retrieved May 2009.
[21] Source: http://executivesummary.wordpress.com/2008/02/18/virtual-goods-market-size/, retrieved September 2008.
[22] How big is the RMT market, http://virtual-economy.org/blog/how_big_is_the_rmt_market_anyw, retrieved September 2008.

or inform the world about their objectives and operations. Many brands in real-life industries, such as automobile, technology, entertainment, and others, are making their presences in various virtual worlds as summarized in Table 4.1. This potential of real-life brands is supported by the survey of 1,258 Second Life's residents, which indicates that 34% of respondents are interested in interacting with the real-life brands in Second life, while 52% are somewhat interested. Only 14% of respondents are not interested in interacting with the real-life brands in Second Life (Social Research Foundation, 2008).

Table 4.1 Real Life Brands in Virtual Worlds[23]

	Second Life	There	Kaneva	Gaia	HiPiHi	World of Warcraft	vMTV	Whyville	Kinset	Zwinky	Hobbo
Toyota	X	X		X		X		X			
Sony	X			X							
Warner Bros				X							
CosmoGirl		X									
Pepsi							X				
Vidal Sassoon					X						
Intel	X				X						
Turner			X								
Coca-Cola	X	X									
Penguin	X							X			
Brookstone									X		
Kajeet								X			
Virgin/EMI		X						X			
Nike										X	
WWE				X							X
MTV				X							
AT&T							X				
Ford Motor							X				

Second Life reports a significant expansion of in-world economy in the second quarter of 2008, which can be measured by various indicators. Property sales (e.g., lands and houses), which are the largest revenue source, is increased by 44.2% over the first

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[23] Brands and worlds, http://www.kzero.co.uk/blog/?p=1948, retrieved September 2008.

quarter to over 1.5 billion square meters. Total user-to-user transactions, a measure of the gross domestic product (GDP) in Second Life, is grown by 14.3% from an annualized rate of $300 million in the first quarter to $338 million in the second quarter. On average, resident spending per user hour is $0.87. Volume of the LindeX – Second Life virtual currency exchange – is increased by 5% to an annual rate of $108 million. The total value of Linden Dollars in circulation is grown by 8.6% over the first quarter to $19.7 million in the second quarter with the exchange rate remaining steady against the US dollar at approximately $L267 per one US dollar. According to the expansion of virtual economy, the number of the in-world businesses with positive monthly Linden flow, as known as a measure of profitability, is increased to 59,000 in June 2008, which is 9% higher than the first quarter[24]. Another survey indicates that 59% of the respondents are very likely to buy virtual products in Second Life. Moreover, 42% are willing to use their credit cards to make a purchase on Second life (Fetscherin and Lattemann, 2007).

In conclusion, the virtual economy is expanded significantly in the past few years and is predicted to continue growing in the future. The survey also predicts that a majority of the virtual worlds' visitors are increasingly interested in the real-life brand sales. Furthermore, the users are increasingly engaging in RMT in both the virtual world and the secondary market.

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[24] From Second Life Blog, https://blogs.secondlife.com/community/features/blog/2008/07/08/ second-life-virtual-world-expands-44-in-q2, retrieved September 2008.

4.2.2 Summary of the Direct Observations

In the field research conducted in Second Life, the researcher (in the form of an avatar) has investigated various phenomena by having informal interactions with other users and examining the virtual environment, system functionalities, and user interface design. Furthermore, the researcher tried a basic transaction process, such as buying virtual currency, purchasing products, and transferring money to other users in exchange for products and/or services. The results of the direct observation discussed in this section are divided into three areas:

1. Interactive virtual environment

2. Purchasing processes

3. Virtual currency usage and gaining

Interactive Virtual Environment

Second Life consists of many 3D spaces or simulators (SIMs) that are generated by its users. Among the various virtual places in Second Life, there are a plenty of popular SIMs in which residents are gathered. The number of visitors is known as traffic volume, the number of daily visitors, which is similar to the traffic volume of websites. The traffic volume is a measure of the SIMs' popularity. From direct observation, the researcher discovers that traffic volume is an important reason attracting newcomers and residents to join SIMs. The researcher examined many high traffic SIMs, where shopping is the primary activity. For instance, World of Beauty [SL grid – 2, 151, 24], Zero Style [SL grid – 125, 136, 38] and Sweet faces [SL grid – 13, 53, 34].

New users are encouraged to visit Tutorial Island to learn the system features, as well as learn to customize their avatar's appearance, use text-based chat function, and

navigate their avatars. As shown in Figure 4.1, the text-based chat function used to generate conversation is located at the bottom left of the screen. Conversation logs can also be seen by other avatars in the vicinity. When traveling on the island, transport mode, such as walking, running, and flying, can be employed. A map located on the upper right of Figure 4.1 can be used to locate and teleport their avatar in the virtual world.
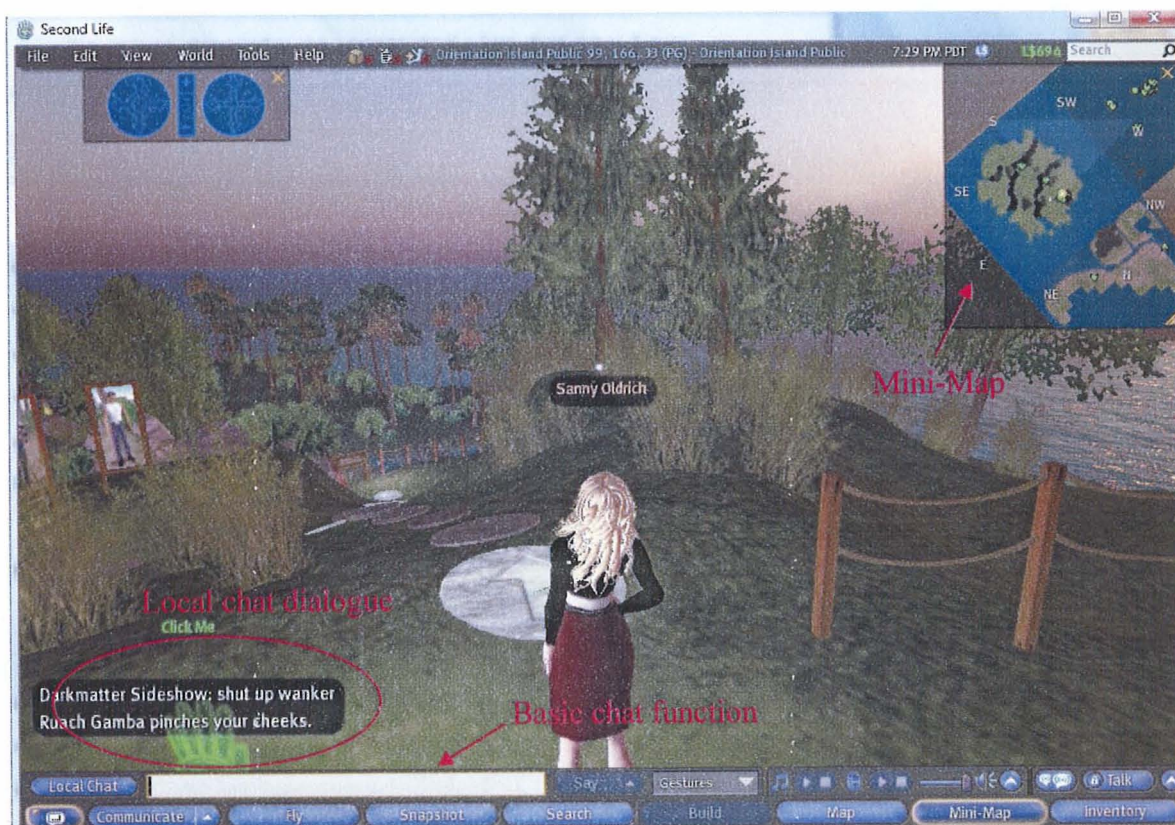
Figure 4.1 Basic functions of Second Life.

Users are able to learn and operate the basic functions in no time. However, other complex functions, such as the building function, require more time to learn and operate properly. In general, users can only build virtual objects on lands they own and on other

permitted lands. The land owners can allow or restrict any visitor from using a certain function on their lands, such as voice-enable systems or build functions.

Purchasing Processes

Because of many emerging SIMs, Second Life has become a place that many visitors call home. There is an increasing number of accommodations and properties in Second Life. Virtual businesses are also growing proportionally to the increasing numbers of visitors. There are both virtual items and real life items available for sale in the virtual worlds. However, the majority of residents are likely to acquire virtual items more than the real life items since real life items' purchasing process is still underdeveloped. Therefore, this observation is mainly focused on the purchasing process of the virtual items.

Product purchasing process consists of the following five phases as suggested by Kotler (2003):

1. Need identification
2. Information search
3. Evaluation of alternatives
4. Purchase and delivery
5. After-purchase evaluation

Need identification occurs when actual and desire states of the need are imbalanced. The need for a product occurs when there is a gap between the desired state and the actual state that is fulfilled by the product possession. Need identification phase occurs internally to individual consumers as a result of either self-motivation or product advertisement.

Information search is the next step to satisfy the need. Information search is based on two different decisions: (1) what product to buy, and (2) from whom to buy it (Turban et al., 2006). Residents can search for products and/or virtual merchants from various sources, such as in-world advertisement, search functions (as shown in Figure 4.2), online magazines (e.g., Second Style, SL Business Magazine and The Best of SL), online catalogs (e.g., XStreet SL and Onrez), and residents' recommendations (or word-of-mouth). Users can find specific stores and store locations using the search function. By entering keywords, users can browse for classified, events, showcase, land for sale, places, people, and group or they can search the keywords from "All" categories.

Figure 4.2 Second Life's search function.

After potential buyers acquired have information they want, they will evaluate the alternatives. In this phase, consumers make a decision based on the collected information about the product they want to purchase. This phase also includes negotiation and bidding (as seen on e-auction sites like eBay) to obtain a desire product's price. In virtual worlds, consumers can contact virtual agents or business owners directly, and can also find other information regarding prices, product creators, and product features from the virtual stores. Figure 4.3 shows the example of product specifications that consumers obtain directly by clicking on the product. The buy window shows the contents that the consumer will receive after buying a product. For instance, this figure shows, from top to bottom, a note card containing a sound menu information, object contents (shown as a yellow box content), specifications of the object (which is color, modification permit, copyright), a shoe base content that is used to shape the avatar's feet, a location of the store of this item, the price of this item, and the creator's name.

The next phase is purchasing and product delivery, which involves many instantaneous processes. Consumers receive the product right after the money is transferred to the virtual merchant. Consumers can use the product immediately or keep it in their inventories. Each avatar can only have one inventory system, which comprises of folders and sub-folders in which users keep their digital possessions. The new product's folder is created when the users buy a product. This system is very similar to the file and folder system of the Microsoft's Windows.

The post-purchase phase consists of customer service and evaluation of the usefulness of the product. Basically, consumers can obtain service from a virtual merchant if they contact them either by email or IM. However, there are many virtual

stores, in which their in-world staffs, information about the hours of operation, and the name of responsible person are available to find on the store.
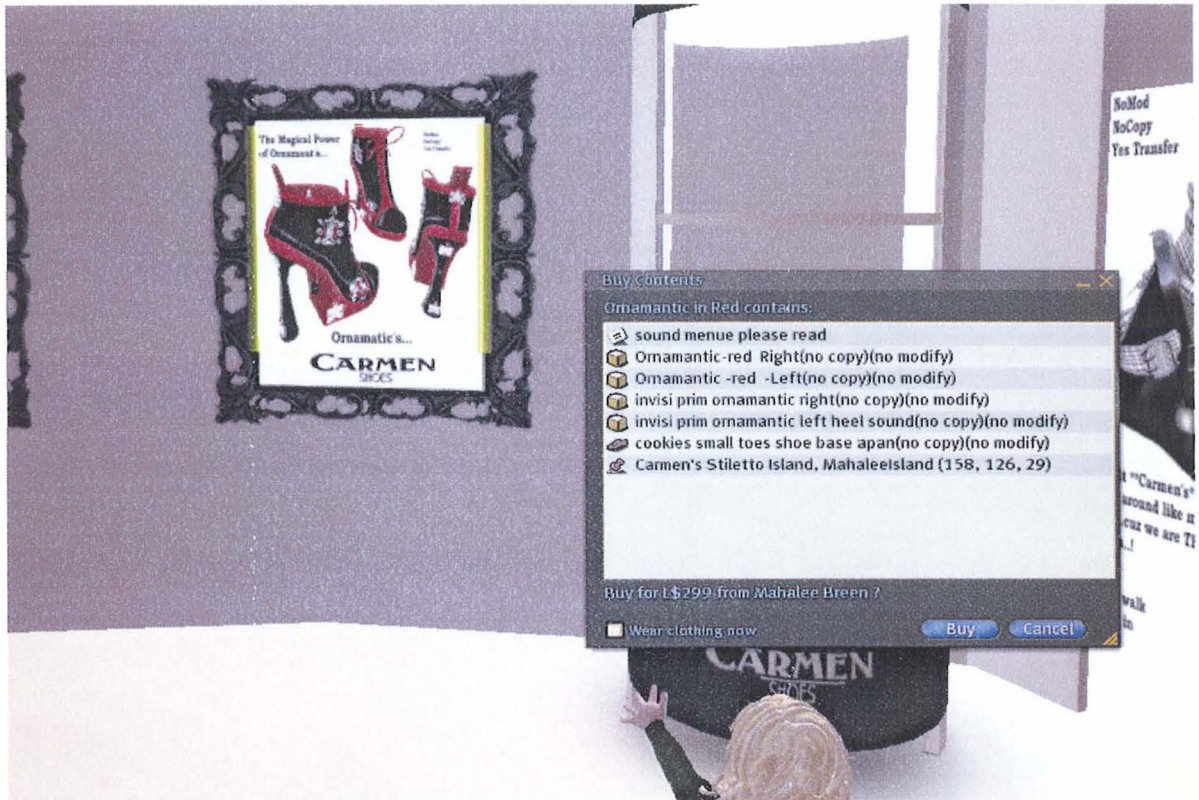
Figure 4.3 Example of product information.

Virtual Money Usage and Gain

Second Life residents can buy a virtual currency (Linden Dollars) directly from LindeX (Linden Dollar Exchange) market by clicking on $L sign function on the browser as shown in Figure 4.4. The buy currency window of the LindeX currency exchange function shows the amount in Lindens that the consumers want to buy, the current balance, and the new balance. The system will exchange the money from personal bank account, credit card account, or third-party account (such as Paypal) for Linden dollars at current exchange rate. Credits will be updated and posted on the user's account once the

money has been exchanged. There are two ways residents spend money in Second Life: (1) user-to-user direct transfer, and (2) product purchases. Similarly, the residents can also obtain in-world currency from direct transfers and product sales.
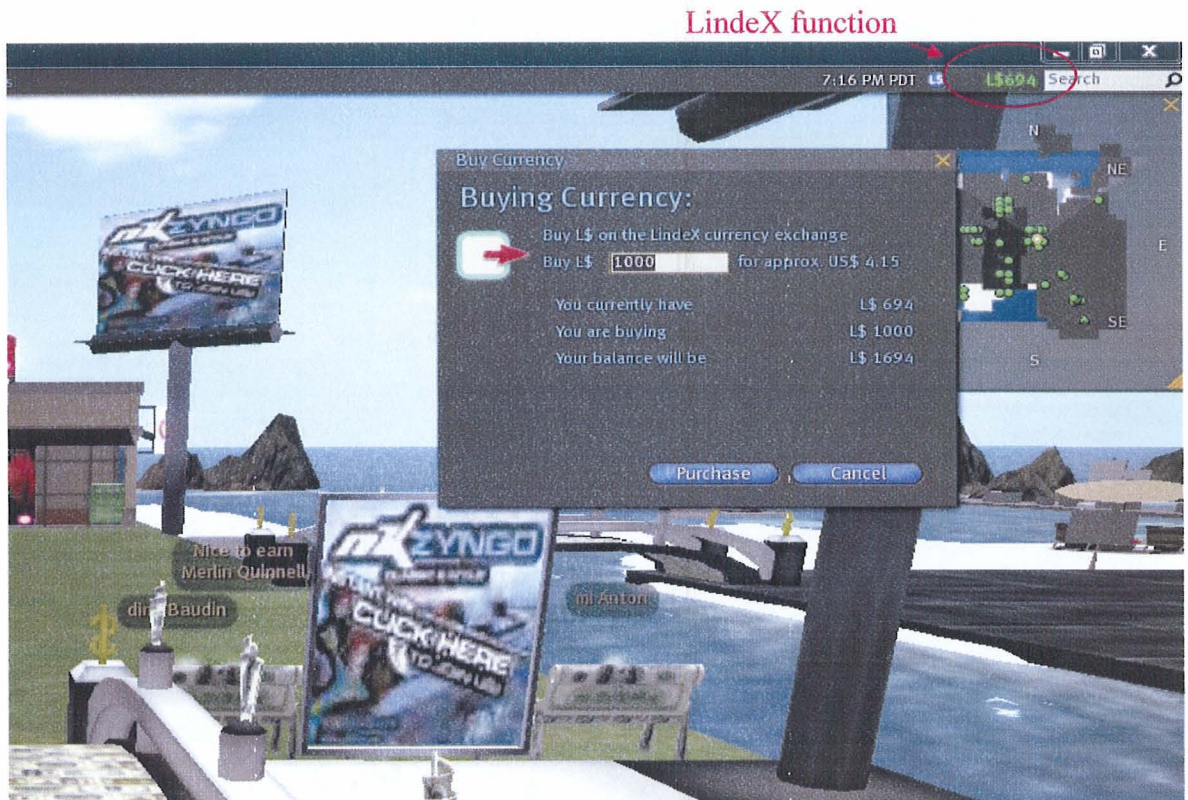
Figure 4.4 LindeX function of Second Life.

The field researcher has experienced the real money exchange, the purchasing of virtual products, and the user-to-user direct transfer. All of these methods for gaining or spending virtual money are occurred instantly after clicking a button. The money transfer and exchange processes are explicit because the residents obtain a transaction confirmation (appearing as a note card on the screen), and also an email confirmation after each transaction is completed.

Other than the currency exchange and product sale, residents can obtain in-world currency from other sources, such as camping (engage in a certain activity for a period of time to gain the virtual money), in-world jobs, and participating surveys. There are increasing numbers of SIMs that offer money to residents who camp, dance, or attend activities. As the number of campers or residents increases, the popularity of the SIMs is higher. The popularity of the SIMs is very important as the SIMs can be listed on the showcase page. Land owners or virtual merchants can also pay for the ads to make their sites visible on the search menu, as shown in Figure 4.5.
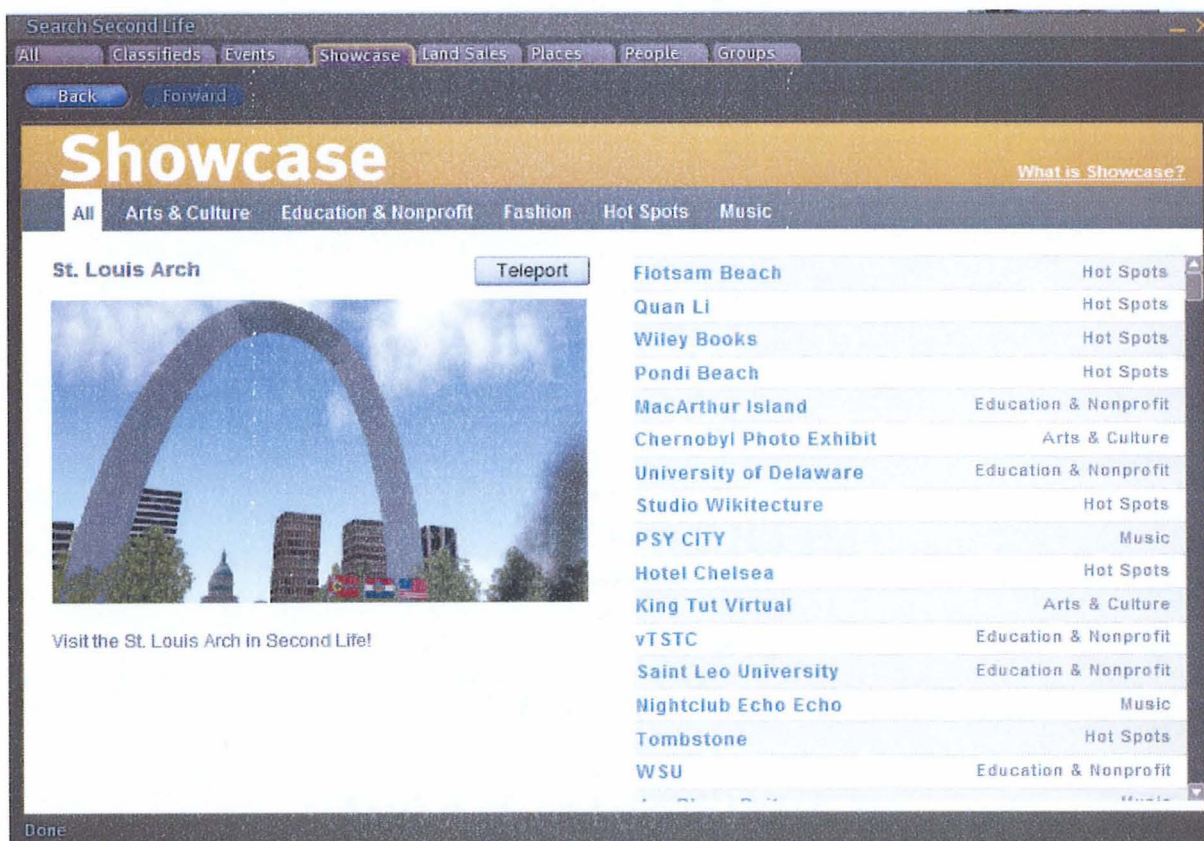
Figure 4.5 Suggestion places in search function.

4.2.3 Summary of the Interviews

The interviews of Second Life residents were conducted from January thru February 2008. The semi-structured interview is selected so that participants could comfortably express their beliefs, opinions, and experiences. Participants were asked questions about the system functions and their experiences with the virtual merchants. The semi-structured interview questions are found in Appendix B.1. The scope of the interview is designed based on the direct observations and the previous literature. This dissertation obtains many ideas from the literature in various areas, such as trust, usability, and satisfaction. The participants were required to interact with the researcher by using a chat function. The conversation logs were recorded automatically and be able to retrieved afterwards.

The unit of analysis of this interview is individual users (visitors), which are determined from their unique avatar's representations and avatar's names. However, this primary investigation was unable to obtain other personal information besides the virtual representations. This issue raises the question about a bias from duplicated interview of users who have multiple avatars. Although there might be the case that the participant takes multiple interviews, this exploratory study attempts to reduce this error by having only one field researcher for each study site. Therefore, the researcher can recognize participants and be able to manage the interview better.

As aforementioned in the previous section, the field researcher has spent a considerable times investigating the virtual environment and the general business process prior to the interview being conducted. This experience helps the researcher to better understand users, and reduce errors in interpreting data. The researcher entered high

traffic commercial SIMs and recruited prospective research subjects using a random invitation. The profile of the researcher was created to inform prospective research subjects about the researcher and the research objectives. All participants of the preliminary research are voluntary. However, the incentive of 500 Linden dollars (approximately 2.00 U.S. dollars) was given to each participant who completed the interview. The conversation logs between the researcher and the participant were automatically recorded. These conversation logs were transcribed and analyzed using two qualitative techniques, which are: (1) *positivist text analysis method* that explains the sense of a scripted text corresponding to an objective reality, and (2) *interpretivist method* that concerns about the contextual circumstances that influences interpretations (Lacity and Janson, 1994). Both positivist and interpretivist perspectives are acceptable and recommended for behavioral research in IS (Myers, 1997).

The positivist text analysis method uses frequency obtained from the interviews as the indicator of interested occurrences and phenomena. For instance, text analysis method identifies the frequency of the keywords appeared on the chat dialogs. This method of analysis uses a straightforward interpretation of the text meanings. Ambiguity of the text is solved by experts' interpretations. In this case, two experts must have a mutual agreement on the meaning of the text that contains ambiguity. The interpretivist method is used to understand and interpret some phenomena happened in the research context that are observed directly by the field researcher. The interpretivist approach is beneficial to understand the actual behavior of the participants.

A total of 28 Second Life's residents, based on distinctive avatar's representations, participated in the interview process. The crucial demographic

information, such as gender and age of participants, is not collected at this stage because most participants prefer to maintain their privacy and anonymity when interact with the researcher. Therefore, only information related to the system usage, general attitudes, and experience is obtained.

General Usage Information

The summary of the usage information obtained from the interviews is shown in Table 4.2. More than half of the participants have used Second Life for more than one month. Because many participants do not specify the exact time frame about usage duration, some conversation logs between researcher and participants are given below. More than half of them express that they can quickly learn the basic functions of the system, partly because Second Life has its own tutorials. The following are selected conversation logs:

- *"A few minutes...the tutorial in the beginning explained everything..."*

- *"Not very long...I found it pretty easy to learn how to do the basic things like shopping..."*

- *"...by the second day I was feeling much more confident and excited to use SL."*

Some participants feel that they still learn how to use the more sophisticated functions. One participant explained:

- *"Learning to get around, use the search engine was pretty simple. Learning to build and script seems a bit more complex...I haven't devoted any serous time to learning, although I intend to..."*

This interview also discovers that the friendly environment plays a major part in helping users learn and figure out how to use the systems more effectively. Some participants rely on other users in helping them learn about system's functionality.

- *"It didn't take long at all...people were very friendly and it was easy to* Figure *out most things."*

Table 4.2 Usage Information

Usage time	Frequency	Percent
Q1. How long have you used Second Life?		
Less than 1 week	4	14.29
1-2 weeks	1	3.57
2-4 weeks	5	17.86
1-2 months	4	14.29
More than 2 months	12	42.86
No answer/Not clear	2	7.13
Q2. How long did it take to get familiar with Second Life?		
A few hours	6	21.43
Less than a week	4	14.29
Less than a month	1	3.57
More than one month	1	3.57
No answer/Not clear	16	57.14

Participating in social activities is the primary activity engaged by most people while they are in the virtual world. According to the interview, common activities that people do in Second Life include: chatting, making friends, shopping, dancing, adventuring, event participation, and camping, respectively. Notice that shopping is among the most popular social activities that participants mentioned. While many users participate in general activities like chatting, dancing, and shopping, some of them participate in a special activity that they usually do with the others who have the same interests. The following are chat logs obtained from participants who are interested in many special activities in Second Life.

- *"I love the outdoors, I'm looking for outdoor themed places, so I don't feel like I'm indoors when I'm on SL...I enjoy clubs but mostly going out in SL with a friend and seeing something new, that I don't get to experience in RL, such as exploring ships..."*

- *"I'm a Viking...Don't you know what the Vikings where up to in day life? Exploring the mighty world and seek out the meaning of existence of Universe."*

- *"Well...I'm in the Elven Faery land groups they do RL charities, we have dance & drumming circles...boat races & more....just fun..."*

Using Avatar for Interaction

In Second life, users interact via avatars, which are virtual embodiments of the users. There are always questions about controlling the avatar or using the avatar for interaction in the virtual world, especially the 3D avatar. Ease of use and ease of learning are often used interchangeably to describe an amount of effort and time that users require to become knowledgeable with the system (Davis, 1989). Navigability involves controllability and efficiency of the system in browsing and controlling avatar's movement. Table 4.3 shows the interview results regarding the ease of use of various social tools and navigation.

Table 4.3 Social Tools Questions

Answers	Frequency	Percent
Q4. How comfortable or difficult do you feel when using Second Life for interaction?		
Comfortable	20	71.43
Not comfortable/Difficult	8	28.57
No answer/Not clear	0	0.00
Q5. Do you have any problems in navigating your avatar?		
Yes	7	25.00
No	13	46.43
No answer/Not clear	8	28.57
Q6. Do you have any problems in using communication tools?		
Yes	5	17.86
No	23	82.14
No answer/Not clear	0	0.00

The interview results show that most participants are comfortable when using system functions for interaction and communication. Specifically, many participants thought that Second Life's functions are fairly easy to use and learn. A participant mentioned that he liked the way Second Life integrated various graphical and communication features within a single environment.

- *"SL is the best chat client I have used because of the avatars and animation...and I also use it to keep in touch with members of my family and RL friends."*

This feeling of comfort is the main reason why users who have problems with shyness and some personality concerns use Second Life for interactions. For instance, some participants prefer to use Second Life as a means to expose themselves to other people, partly because of anonymity-promoted environment.

- *"I'm relatively comfortable interacting in places I am familiar with...I have the same shyness issues in RL."*

- *"It's a lot like the real world...I can be a bit shy in RL and I find myself shy in SL too...but I'm becoming more outgoing the more comfortable I get..."*

- *"I'm very comfortable using this for interactions, it provides a safe environment for meeting new people and exploring new ideas with anonymity and without fear..."*

Second Life is equipped with various communication functions, such as text messaging, voice chat, email, and video stream. Interviews show that Second Life's communication functions are critical tools for virtual communication. Also, it is found that the system's communication functions require only minimal time and effort to learn. It is also finds that using avatars for interaction and communication is enthusiastic as the users can express themselves both verbally and emotionally during conversations. Furthermore, virtual worlds encourage users to utilize those rich communication media rather than the cold text messaging. The following chat logs are examples of the participants' comments on Second Life communication functions:

- *"No problem for me...typing is easy...voice is only for selected people...and I use voice software."*

- *"I have not really attempted voice chat yet, just because I don't see it necessary...but everything else is quite user friendly..."*

While there is no major communication problem, some participants complain about compatibility issues, possible misunderstanding about emotional status, and efforts required in communication as seen in the following chat logs:

- *"Well...as in any text format it can be confusing at times without eye contact, body language and voice inflection to express feelings but with practice and experience it gets easier..."*

- *"I don't effectively type...however, the vast majority of English speakers have no difficulty in understanding my typos...I slow down when I speak with foreigners and use cut and paste to speak with them...I try and make fewer typos"*

- *"...anything sound related doesn't work with my Mac...it makes it freeze...yes, I have many problems. Thankfully, one of the helpers from Hippie Pay Island was able to help me a bit so it's not quite as bad..."*

- *"My biggest issue with text chat is the font being too small. I'm on a widescreen and it's hard to read from 2 and a half feet. The odd time a friend shows as 'waiting', other times they'd disappeared off my friends list...voice chat difficult at times, I'm on vista and sometimes it won't work..."*

Besides the rich graphical and interactive interface of Second Life, many difficulties relating to the navigability and the use of mouse and keyboard to maneuver the avatar in the desired directions are found from the interviews, especially from the new users who has been exposed the system for a few days. These participants complain about lags and long loading time when starting up the program and after browsing to the new virtual locations. The lags and long loading time occasionally interrupt their control of avatar movement and discourage many users in engaging the systems. The following chat logs are examples of problems associated with avatars' movement:

- *"I'm still a little clumsy walking and flying but not terribly so and I don't really have trouble finding things..."*

- *"Yes, always....usually the delay is the key factor in getting around effectively. Most places I will use TP [teleport] to land in an open area to avoid navigational issues."*

- *"Yeah...SL seems to freeze up a lot when I am trying to just walk around...also if I open my internet SL shouts down completely...I have been considering deleting SL because it's a huge hassle just to get things done at time."*

- *"...sometimes walking can be a bit tedious, flying to fast and running too hairy...sometimes I'd like to be able to move quicker, but not as quick as flying."*

Virtual Shopping Attitudes

Another objective of the preliminary studies are to examine whether users have any experience in making business transactions, especially in purchasing virtual products, and to determine their attitudes regarding their experiences. Question 7 (in Appendix B.1) is about experience in making transactions in the past. There are only 5 out of 28 participants (17.86%) who never purchase anything in Second Life. Thus, the majority of the participants (82.14%) have experience in using Second Life to search and possess products and/or services. The products the participants acquired include virtual clothes, hairs, shoes, and avatar skins, as well as more expensive products, such as lands, house, and condominium. Examples of other animated products include gestures and sounds. Many participants also acquire services from the virtual stores, such as interior design for their virtual houses and virtual investment brokers, etc.

Table 4.4 shows the results of the interviews related to the purchasing process and trusting attitude. The results obtained from participants who have experience in purchasing virtual items are described in the following topics:

Table 4.4 Purchasing Process and Trusting Attitude

Answers	Frequency	Percent
Q8A-1 How can you obtain products and/or services you want?		
Self-shopping	12	42.86
Have shopping partner(s)	7	25.00
Ask the owner for help	2	7.14
Others	7	25.00
Q8A-2 Is there any one to assist you when purchasing products?		
Yes	8	34.78
No	14	60.87
No answer/Not clear	1	4.35
Q8A-3 How confident are you when someone assists you in obtaining products/ services?		
Very confident	3	13.04
Confident	12	52.17
Not confident/Don't like	4	17.39
No answer/Not clear	4	17.39
Q8A-4 Will you trust a virtual agent/a representative of a virtual store who assists you?		
Trust	11	47.83
Not readily trust	6	26.09
Not so sure	2	8.70
Do not trust	1	4.35
No answer/Not clear	3	13.04
Q8A-5 How comfortable do you feel when using SL in making business transactions?		
Very comfortable	2	8.70
comfortable	6	26.09
Not comfortable	4	17.39
No answer/Not clear	11	47.83

Purchasing Methods (Questions 8A-1 to 8A-3)

The participants preferred self-shopping as the first priority. They explained that the purchasing process is fairly simple. They simply click on the item they want to purchase and select "buy" to make a purchase. Many of the participants do not have anyone assisted when purchasing products in Second Life, especially from the shop owner or the store agent, because they are mostly unavailable. However, some participants feel that

having a shopping partner, who is a friend or a person whom they just meet can increase good impressions. Only a few participants mention that they have or require assistance from the shop owner because the items they purchase have a special instruction.

When asking about the availability of assistance from the virtual stores, many participants (34.78%) mention that they always get assistance whenever they need it. They either send a message or contact an on-site agent for help. However, the majority of the participants (60.87%) complain that there is no on-site assistance from the virtual agents. These results imply that many virtual stores are lack of the service staffs.

When asking about the confidence when having assistance during the purchase, majority of the participants (65.21%) indicate that they have more confidence in purchasing items. Others feel very confident (13.04%) if there is assistance. Only a few participants (17.39%) assert that they are not confident having someone around as suggested by the following comments:

- *"I like anonymity."*

- *"I do not like anyone assisting me. I prefer to browse, take my time, look at everything suitable, and then buy…"*

Trusting Attitude (Questions 8A-4 and 8A-5)

Informal conversations between the researcher and general users in the field study suggest that trust in virtual world commerce is generally created by initial contact between sellers and buyers. In other words, trust is formed from the relationship established between business partners. However, the trusting attitude is inherently dependent on perceptions and dispositions towards the trustee (the sellers). Some residents are likely to believe that others are generally good and trustworthy, while the

others will gradually develop their trusting attitude after they have interacted with other users or virtual merchants for a certain time.

The results of the interview also confirm that initial contact improves trusting attitude. In particular, the results suggest that some participants (26.09%) do not readily trust virtual merchants but require a good portion of times and an interaction before they can trust them. The examples of these answers are the following:

- *"I wouldn't trust them completely and immediately. It would take some time and conversation...I would definitely trust them more..."*

- *"If I get a sense that they are sincerely interested and enthusiastic about what they do, then yeah [I will trust them]..."*

- *"It's hard to tell if I would trust them...But I think that if there was someone representing the store I might feel more comfortable giving that business my lindens...and conversation would definitely help..."*

A sizable proportion of participants (47.83%) are optimistic. They seem to trust the virtual merchants from the beginning. These are examples of the reasons they provide:

- *"They have no reason to do anything untrustworthy...They want to get the money, I want to get the stuff...It's a win-win if they are good people."*

- *"I have no reason not to trust them..."*

Some users do not trust the merchants since the beginning if they risk losing a lot of money due to a mistake or fraud concerning the transactions.

- *"I don't bother sorrow over losing a few lindens, but if I shall buy myself a whole set of an expensive Armor, then be a bit careful buying."*

When asking about their comforts in making transactions in Second Life, many of the participants complain about the potential of scam and fraud from the transaction process. Some of them (17.39%) do not spend their real-life money because they are not

confident about the security and the credibility of the system's process. However, some of them spend the money that is acquired in-world. These are examples of the reasons they give.

- *"I don't spend my own money...spending money that has been made in SL doesn't worry me..."*

- *"I have not bought any lindens. I don't feel comfortable using my RL financial info...I haven't had any problems using the lindens I have acquired from in-world sources though...camping, winning games, surveys..."*

A good proportion of participants (34.79%) express confidence in making business transactions in Second Life. One reason is that the participant seems to know how to deal with errors or make sure that their transactions are completed without any problems. This is an example of the reasons they gave.

- *"When I spend money to a friend, I always ask to make sure they've received it...No issues with buying lindens..."*

Future Purchasing Intentions and Security Concerns

Question 8B-1 (in Appendix B.1) asks the participants who have never made a purchase in Second Life about their plan to make a purchase. Four out of five participants (80.00%) want to make a purchase in the future. Only one participant expresses confidence that he/she will not make a purchase in the virtual world. Question 8B-2 asks the same group of participants about their feelings of security if they make a purchase from the virtual stores that cost them money. Only one participant mentions that he/she does not feel secure about using real money in the virtual world. Here is the reason:

- *"I don't believe that incorporating real money with virtual money was a good idea...Virtual currency should be separate from real world currency...it is a waste of real money to buy virtual money...I do not feel secure to buy a virtual service online."*

Regardless of these participants, other participants express a positive intention towards system's security. Security seems to be a minor issue for many participants. This is because the payment process of Second Life is linked to a secure payment method (e.g., secure credit card payment and PayPal), which is the method used in general web-based e-commerce. Therefore, it is not a surprise that many consumers are less concerned about fraud or theft regarding the transaction process.

Social influence is another determinant of the purchase intention in this new environment. Social influence is defined as "a change in a person's cognition, attitude, or behavior, which has its origin in another person or group" (Raven, 1964). Social influence can change the attitude of a person and is a factor encouraging users to involve in business activities in the virtual world. Shopping is an activity that residents do in a regular basis. Many of them posit that they want to try because others have done so.

- *"Yes because my friend said to me that he did it lot of times and never get any problem."*

- *"Yes others seem to trust it [the systems]."*

Certainly, social influence is an important influence that shapes consumer attitude and shopping behavior. And because of the ease of communication in the virtual world, the participants can report any problems they encounter to the vendors easily.

- *"Yes because if there are problems you can report them [the vendors]."*

Direct Contact with the Merchants

The effectiveness in using system's functions in communicate has become a strength of Second Life and a support for virtual companies. In this part of the survey, the participants are required to answer two questions (as shown in Table 4.5) about attitudes

and feelings regarding the benefits from using communication functions to contact virtual

merchants. Majority of the participants (75.00%) express that an ability to contact the

virtual store directly improves their confidences in the product and purchasing process.

The examples of the given reasons are:

- *"Yes, having them available to contact does increase my confidence because it feels more like actual shopping, and consumer satisfaction is very important...If there was just a store and no way to contact management it would feel like they were just out to make quick cash without really caring if the consumer is satisfied."*

- *"I think it would make the experience better, and make me more likely to go back if there were some kind of interaction, not just clicking and buying."*

- *"...It can be hard to find anything in SL without the help of a passerby or a store clerk..."*

Table 4.5 Interaction with the Merchants

Answers	Frequency	Percent
Q9. If you can contact store representatives (avatars) or the virtual store directly, do you think this will help improve your confidence in purchasing products/services of the virtual store?		
Increase confidence	21	75.00
Indifferent/About the same	1	3.57
Do not increase confidence	4	14.29
No answer/Not clear	2	7.14
Q10. Do you think asking for some suggestions from the virtual store/virtual agent before purchasing is beneficial?		
Very beneficial/Beneficial	14	63.63
Not really beneficial	5	22.73
Not beneficial	0	0.00
Do not know	2	9.09
No answer/Not clear	1	4.55

Perceived Risk

Some participants mention that buying virtual items only puts a small amount of money

at risk, which is relatively less than a real-life purchase. For example, the average cost of

virtual clothing is around 300 lindens (approximately 1.5 U.S. dollars), which is much

less than the cost of clothing in the real life. However, many participants are cautious with large money spending for virtual items. The following quotes are explained by some participants regarding the amount of the money spent in Second Life.

- *"...Much the way that I adopted online shopping in it is infancy...But I have a threshold for buying virtual items...a monetary threshold...there are plenty of free things here."*

- *"...It is nice to know that you can discuss anything, especially if it is an expensive object."*

Satisfaction and Enjoyment

Experience with the virtual store is an important factor in creating satisfaction. Good impressions are easily spread in the virtual world, in which many users communicate and exchange attitudes and opinions at all time. Therefore, reputation of the virtual store depends mostly on the recommendation from other users, particularly through a word-of-mouth (WoM). The WoM is an influential factor that encourages consumers to purchase from any certain store.

The interviews on this topic include three questions as illustrated in Table 4.6. The first question is about the quality of service they obtained from the virtual store. The participants who contact the virtual merchants (40.91%) are likely to have a positive impression. However, the same numbers of participants never have experience or never contact the virtual stores. No participant expresses bad feelings. The following quotes are examples of conversations that obviously express the impression.

- *"...It was fantastic. I bought some balloons from one place and contacted the creator and they customized it for my event ☺..."*

- *"Two days ago I was looking at some clothing and the store owner offered to remodel and retexture anything I wanted for no additional cost. I immediately made a few purchase."*

● *"...One of my trip to damage [the name of the store], I met most of the staff and the owner...I talked to him about what I wanted to see in the store...Dave [the owner] gave me L's to spend in his store...I really like the assistance I get there."*

Table 4.6 Purchasing Process and Trusting Attitude

Answers	Frequency	Percent
Q11. From your experience, how was the service quality of the virtual agent/store?		
Impressive	9	40.91
Never had experience	9	40.91
Unimpressive	0	0.00
No answer/Not clear	4	18.18
Q12. In overall, were you satisfied with the products/services offered by the virtual store?		
Very satisfied	9	32.14
Satisfied	12	42.86
Not really satisfied	1	3.57
Do not satisfied	1	3.57
No answer/Not clear	5	17.86
Q13. How enjoyable do you feel it is when purchasing items in Second life compared with purchasing items on the internet?		
More enjoyment	10	38.46
About the same/Equal	3	11.54
Less enjoyment	2	7.69
No answer/No comparison	11	42.31

When asking about satisfaction, the majority of the participants (75.00%) state that they are satisfied with the products and services from the virtual stores. Only a small proportion of the participants (7.14%) do not satisfy. Direct observations also suggest that not only does satisfaction emerge from good service, but an ability to contact the store agent directly also increases satisfaction. Direct contact between buyers and sellers is beneficial in terms of enhancing product utilization, and reducing time for product selection. Since there are millions of products selling in Second Life, some products are very easy to use (such as clothing and shoes), while the others, especially the high-end products (such as furniture), are sometimes hard to operate and require more time to understand their primitive functions. These high-end products are usually embedded with

scripts that allow users to manipulate their special features or to allow the user perform any action more realistic. A participant explains followings:

- *"I have bought furniture but not knowing how many prims (primitive parts or object parts) they were before, which make a big difference ... and it would have been nice to ask and know before buying."*

When the participants compare their experience with the virtual world shopping and the general internet shopping, many of them believe that they are different and incomparable. However, many participants (38.46%) still enjoy shopping in Second Life more, followed by the participants (11.54%) who feel that their enjoyment between these two shopping methods are the same. Some participants indicate that purchasing process of Second Life is instant and allow them to enjoy the products immediately. The following quotes are example of their reasons:

- *"It [the purchasing process] is pretty straight forward and you get the item immediately...compared to waiting for it to arrive...cannot beat that."*

- *"SL is instant – instant pay and instant receive of goods purchased...other forms of shopping there is a delay before receiving goods."*

- *"Well, it is very instant...that's good...no waiting for shipping."*

4.3 Summary of the Pilot Study Results

Only 89 of the 130 completed surveys are found to be valid. The remaining 41 surveys are invalid due to either from redundancy errors or majority of the data are missing (left blank). Of the 89 valid data sets:

- 50 data sets (56.18%) are obtained from subjects who have hands on experience in virtual world business transactions.

- 39 data sets (43.82%) are obtained from subjects who do not have or recall having any transactional experience

Table 4.7 Summary of Demographic Data

		Users with experience in making business transactions (N=50)		Users with no experience in making business transactions and "Don't remember" users (N=39)	
Gender					
	Female	24	48.00%	18	46.15%
	Male	26	52.00%	21	53.85%
Age					
	18-23	19	38.00%	21	53.85%
	24-29	13	26.00%	8	20.51%
	30-35	6	12.00%	3	7.69%
	36-40	2	4.00%	3	7.69%
	Over 40	10	20.00%	4	10.26%
Level of Education					
	Some high school	4	8.00%	7	17.95%
	High school grad	6	12.00%	9	23.08%
	Some college	26	52.00%	7	17.95%
	College grad	10	20.00%	11	28.21%
	Post-graduate work	3	6.00%	2	5.13%
	Post-graduate degree	1	2.00%	3	7.69%
Duration					
	Less than 1 week	11	22.00%	14	35.90%
	1 week to 1 month	12	24.00%	12	30.77%
	1 to 6 months	7	14.00%	8	20.51%
	6 months to 1 year	10	20.00%	1	2.56%
	More than 1 year	10	20.00%	4	10.26%
Frequency					
	Everyday	35	70.00%	14	35.90%
	2 to 3 times a week	11	22.00%	12	30.77%
	Once a week	3	6.00%	5	12.82%
	Once a month	0	0.00%	4	10.26%
	Less than once a month	1	2.00%	4	10.26%
Usage Time Per Week					
	Less than 1 hour	1	2.00%	8	20.51%
	1 to 10 hours	25	50.00%	17	43.59%
	10 to 20 hours	12	24.00%	8	20.51%
	20 to 30 hours	7	14.00%	4	10.26%
	More than 30 hours	5	10.00%	2	5.13%

Univariate analysis is performed separately based on the experience in business transactions, which can be classified into two groups: (1) experienced, and (2) non-experienced.

The numbers of male and female subjects are approximately the same, which are 47 and 42 respectively. There is no significant difference in the gender distribution between experienced subjects (24 female versus 26 male) and non-experience subjects (18 female versus 21 male) (Pearson Chi-square = 0.03, df = 1, sig. = .8626).

The data reveals that the minimum age of those surveyed is 18. There is no significant difference in the age group distribution between experienced subjects and non-experienced subjects (Pearson Chi-square = 3.76, df = 4, sig. = .4395). In addition, the results also find that there is no significant difference in the education level between experienced subjects and non-experienced subjects (Pearson Chi-square = 12.44, df = 5, sig. = .0293).

The other three demographic data are involved with the system usages. The result of Chi-square test shows some degree of significant difference in the usage duration between these two groups of users based on experience in business transactions (Pearson Chi-square = 9.14, df = 4, sig. = 0.0577). The result also reports a significant difference between these two user groups based on their usage frequency (Pearson Chi-square = 14.20, df = 4, sig. = 0.0067). In addition, the data reveals some degree of significant difference (Pearson Chi-square = 8.64, df = 4, sig. = 0.0706) when comparing the two user groups in terms of usage hours per week. Reviewing the data as a whole suggests that those who spend more time and more frequently in Second Life are likely to engage in business transactions.

4.3.1 Univariate Results of Independent Variables

This study focuses on the following three main independent variables: (1) perceived affordances, (2) relationship-based trust, and (3) need satisfaction. The perceived affordance variable can be divided into the following three latent sub-constructs: (1) physical affordances, (2) relational affordances, and (3) transactional affordances. These three latent sub-constructs have similar fundamental concepts, but are viewed in different dimensions. Therefore, the measurement scales of these three variables can be used to determine different affordance dimensions and are not unidimensional. The relationship-based trust has a very broad concept and requires many measurement scales to explain. Lastly, the need satisfaction is related to a comparison between user's desire and experience. This section discusses the measurement scales of these three research constructs.

Univariate Results of Physical Affordances

The results corresponding to the questions on physical affordances are summarized in Table 4.8. These results can be divided into two groups based on experience of the respondents with business transactions as described earlier. The data shows that experienced users postulate approximately the same level of perceived physical affordances as inexperienced users. The majority of the respondents agree with the statement of each measurement item. Specifically, these two user groups agree that Second Life is easy to use, navigate, and operate. Most of them quickly become skillful with the system's functions and environment, and can use the system to find specific information from virtual stores. However, experienced users can use Second Life to

accomplish tasks faster than inexperienced users, as indicated by the significant Chi-square.

Table 4.8 Summary of the Univariate Results for Physical Affordance Scales

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
PA1	I find SL is easy to use. Chi-square = 9.2870, p = .098							
	Experienced	3	0	4	28	12	3	50
	Percentage (%)	6.00	0.00	8.00	56.00	24.00	6.00	100.00
	Non-experienced	1	5	4	17	7	5	39
	Percentage (%)	2.56	12.82	10.26	43.59	30.77	12.82	100.00
PA2	I find SL is easy to become skillful in performing the system's functions. Chi-square = 6.3359, p = .275							
	Experienced	2	6	9	22	9	2	50
	Percentage (%)	4.00	12.00	18.00	44.00	18.00	4.00	100.00
	Non-experienced	2	7	5	9	13	3	39
	Percentage (%)	5.13	17.95	12.82	23.08	33.33	7.69	100.00
PA3	I find SL is easy to navigate. Chi-square = 5.8106, p = .325							
	Experienced	1	3	5	26	14	1	50
	Percentage (%)	2.00	6.00	10.00	52.00	28.00	2.00	100.00
	Non-experienced	4	4	6	16	7	2	39
	Percentage (%)	10.26	10.26	15.38	41.03	17.95	5.13	100.00
PA4	I find SL is easy to operate. Chi-square = 3.7799, p = .582							
	Experienced	1	6	6	26	10	1	50
	Percentage (%)	2.00	12.00	12.00	52.00	20.00	2.00	100.00
	Non-experienced	2	8	6	14	7	2	39
	Percentage (%)	5.13	20.51	15.38	35.90	17.95	5.13	100.00
PA5	I can quickly accomplish my task in purchasing products in the virtual store. Chi-square = 11.6143, p = .040							
	Experienced	2	4	5	24	13	1	50
	Percentage (%)	2.00	6.00	10.00	52.00	28.00	2.00	100.00
	Non-experienced	5	1	8	10	10	5	39
	Percentage (%)	2.00	6.00	10.00	52.00	28.00	2.00	100.00
PA6	I can easily find specific information from the virtual store. Chi-square = 4.2866, p = .509							
	Experienced	2	10	6	19	11	2	50
	Percentage (%)	2.00	20.00	12.00	38.00	22.00	4.00	100.00
	Non-experienced	2	7	6	12	6	6	39
	Percentage (%)	5.13	17.95	15.38	30.77	15.38	15.38	100.00

Univariate Results of Relational Affordances

Consistent with the results of physical affordances, the respondents who have different experience levels also have approximately the same perceived relational affordance of the virtual world environment. The results of the questions on relational affordances are illustrated in the following table.

Table 4.9 Summary of the Univariate Results for Relational Affordance Scales

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
RA1	SL enables me to interact with other people in an easy manner. Chi-square = 9.9210, p = .078							
	Experienced	4	0	6	26	10	4	50
	Percentage (%)	8.00	0.00	12.00	52.00	20.00	8.00	100.00
	Non-experienced	1	4	9	15	5	5	39
	Percentage (%)	2.56	10.26	23.08	38.46	12.82	12.82	100.00
RA2	SL enables me to casually talk with other people. Chi-square = 4.7398, p = .448							
	Experienced	3	3	12	18	11	3	50
	Percentage (%)	6.00	6.00	24.00	36.00	22.00	6.00	100.00
	Non-experienced	3	4	13	15	3	1	39
	Percentage (%)	7.69	10.26	33.33	38.46	7.69	2.56	100.00
RA3	SL enables me to get together with the group of people. Chi-square = 7.1334, p = .211							
	Experienced	2	1	5	24	17	1	50
	Percentage (%)	4.00	2.00	10.00	48.00	34.00	2.00	100.00
	Non-experienced	3	5	6	14	9	2	39
	Percentage (%)	7.69	12.82	15.38	35.90	23.08	5.13	100.00
RA4	SL enables me to attend social events. Chi-square = 5.0783, p = .406							
	Experienced	3	2	7	23	12	3	50
	Percentage (%)	6.00	4.00	14.00	46.00	24.00	6.00	100.00
	Non-experienced	2	6	8	13	7	3	39
	Percentage (%)	5.13	15.38	20.51	33.33	17.95	7.69	100.00
RA5	SL enables me to get together with family and friends. Chi-square = 7.5695, p = .182							
	Experienced	6	6	9	22	5	2	50
	Percentage (%)	12.00	12.00	18.00	44.00	10.00	4.00	100.00
	Non-experienced	2	11	5	11	7	3	39
	Percentage (%)	5.13	28.21	12.82	28.21	17.95	7.69	100.00

The results show the insignificance of differences between experience levels for all measurement scales of perceived relational affordances. Both user groups posit about the same levels regarding their perceptions about the aspects that the systems enable them to interact, communicate, form groups, establish relationships, attend any social events, and get together with their families and friends.

Univariate Results of Transactional Affordances

The results obtained from the questions on transactional affordances are shown in Table 4.10. Since the questions are related to personal experience in business transactions, such as experience in performing a money transfer or money exchange, these questions are apropos for respondents who have experience with business transactions only. Therefore, the data from the respondents without experience cannot be analyzed.

The results of the univariate analysis show high mean values for all questions. This implies that the respondents have a positive attitude towards the characteristics of the system's transactional affordances. Specifically, respondents who have experience with business transactions feel that Second Life supports them in making business transactions and allows them to spend virtual money in an instant manner. Moreover, most of them also indicate that Second Life allows them to make a contact or exchange with the virtual store directly.

Table 4.10 Summary of the Univariate Results of Transactional Affordance Scales

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
TA1	SL supports me in making business transactions. Mean = 3.68, S.D. = 0.88							
	Experienced	1	3	9	23	5	9	50
	Percentage (%)	2.00	6.00	18.00	56.00	10.00	18.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TA2	SL allows me to spend virtual currency in easy manner. Mean = 4.02, S.D. = 1.06							
	Experienced	2	3	4	20	17	4	50
	Percentage (%)	4.00	6.00	8.00	40.00	34.00	8.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TA3	SL allows me to directly contact or exchange in business activity with the virtual store. Mean = 3.94, S.D. = 0.93							
	Experienced	2	1	7	26	12	2	50
	Percentage (%)	4.00	2.00	14.00	52.00	24.00	4.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TA4	SL requires only minimal time in completing a transaction. Mean = 4.00, S.D. = 0.98							
	Experienced	0	6	4	21	16	3	50
	Percentage (%)	0.00	12.00	8.00	42.00	32.00	6.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-

Univariate Results of Relationship-Based Trust

Similar to the questions on transactional affordances, the questions on relationship-based trust are apropos for respondents who have experience with business transactions only. Therefore, the data from the respondents without experience are not analyzed. Table 4.11 shows the results of the univariate analysis of relationship-based trust.

Table 4.11 Summary of the Univariate Results of Relationship-Based Trust Scales

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
TR1	I believe that the virtual store would act on my best interest. Mean = 3.68, S.D. = 0.88							
	Experienced	1	3	9	23	5	9	50
	Percentage (%)	2.00	6.00	18.00	46.00	10.00	18.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR2	If I require help, the virtual store would do its best to help me. Mean = 4.02, S.D. = 1.06							
	Experienced	2	3	4	20	17	4	50
	Percentage (%)	4.00	6.00	8.00	40.00	34.00	8.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR3	The virtual store is interested in my well-being, not just its own. Mean = 3.94, S.D. = 0.93							
	Experienced	2	1	7	26	12	2	50
	Percentage (%)	4.00	2.00	14.00	52.00	24.00	4.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR4	I believe that the virtual store is sincere. Mean = 4.00, S.D. = 0.98							
	Experienced	0	6	4	21	16	3	50
	Percentage (%)	0.00	12.00	8.00	42.00	32.00	6.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR5	The virtual store is truthful in its dealings with me. Mean = 3.68, S.D. = 0.88							
	Experienced	1	3	9	23	5	6	50
	Percentage (%)	2.00	6.00	18.00	46.00	10.00	12.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR6	The virtual store is honest. Mean = 4.02, S.D. = 1.06							
	Experienced	2	3	4	20	17	4	50
	Percentage (%)	4.00	6.00	8.00	40.00	34.00	8.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR7	I expect that virtual store will keep promise. Mean = 3.94, S.D. = 0.93							
	Experienced	2	1	7	26	12	2	50
	Percentage (%)	4.00	2.00	14.00	52.00	24.00	4.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-

Table 4.11 Summary of the Univariate Results of Relationship-Based Trust Scales (Continued)

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
TR8	The virtual store is reliable. Mean = 4.00, S.D. = 0.98							
	Experienced	0	6	4	21	16	3	50
	Percentage (%)	0.00	12.00	8.00	42.00	32.00	6.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR9	The virtual store understands the market it works on. Mean = 3.68, S.D. = 0.88							
	Experienced	1	3	9	23	5	9	50
	Percentage (%)	2.00	6.00	18.00	46.00	10.00	18.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR10	The virtual store is very knowledgeable. Mean = 4.02, S.D. = 1.06							
	Experienced	2	3	4	20	17	4	50
	Percentage (%)	4.00	6.00	8.00	40.00	34.00	8.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR11	The virtual store is competent and effective in providing service. Mean = 3.94, S.D. = 0.93							
	Experienced	2	1	7	26	12	2	50
	Percentage (%)	4.00	2.00	14.00	52.00	24.00	4.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
TR12	The virtual store has skills and expertise to perform transactions. Mean = 4.00, S.D. = 0.98							
	Experienced	0	6	4	21	16	3	50
	Percentage (%)	0.00	12.00	8.00	42.00	32.00	6.00	100.00
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-

The results of univariate analysis show high mean values for all questions. This implies that the users generally have high relationship-based trust in the virtual store or persons who represent the store. In particular, most of the respondents mention that they believe that the virtual store is honest, truthful, sincere, reliable, and knowledgeable. Most of them also believe that the virtual store would act in their best interests and would

help them in any request they have. Most importantly, most of the respondents would rely on the ability and the competency of the virtual stores they dealing with.

Univariate Results for Need Satisfaction

The results corresponding to the questions on need satisfaction are shown in the Table 4.12. The results show that most of the respondents are generally satisfied with products and/or services offered by the virtual store. Many of them also agree that the product and/or service generally satisfy their needs.

Table 4.12 Summary of the Univariate Results of Need Satisfaction Scales

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
NS1	In overall, I …(definitely dissatisfied/definitely satisfied)… the product/service from the virtual store/agents. Mean = 3.90, S.D. = 0.91							
	Experience	1	2	7	21	16	3	50
	Percentage (%)	2.00	4.00	14.00	42.00	32.00	6.00	100.00
	Novice	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
NS2	The product and/or service offered by the virtual store …(definitely dissatisfied/ definitely satisfied)… my needs. Mean = 3.83, S.D. = 0.90							
	Experience	0	2	7	28	12	1	50
	Percentage (%)	0.00	4.00	14.00	56.00	24.00	2.00	100.00
	Novice	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-

4.3.2 Univariate Results of Dependent Variable

The intention to purchase is the dependent variable of this study. The participants answer a direct question about whether they do or do not have an intention to make a future purchase. The dependent variable is also measured using a five-point Likert scale. The results show no significant difference between the two groups of respondents based on experience with business transactions. Particularly, the majority of respondents want to

make a purchase in the virtual world in the future. The results corresponding to questions on intention to purchase are shown in the Table 4.13.

Table 4.13 Summary of the Univariate Results of Intention Scale

Label	Choice (SD to SA)	1	2	3	4	5	.	Total
INT	I ... (definitely would not/definitely would)... buy a product or obtain a service from a virtual store in the near future. Mean = 3.78, S.D. = 1.08							
	Experience	1	1	8	20	17	3	50
	Percentage (%)	2.00	2.00	16.00	40.00	34.00	6.00	100.00
	Novice	2	6	10	9	6	6	39
	Percentage (%)	5.13	15.38	25.64	23.08	15.38	15.38	100.00

4.3.3 Reliability

The initial scales are tested for their internal consistency. Briefly, the internal consistency is the extent to which the individual items are correlated with one another or with the total items constituted to form a measurement construct. Reliability of the measurements is accessed by a measure of internal consistency (Cronbach's alpha).

The following tables in this section show the correlation and the reliability of the measurement scales. The value of alpha in parentheses indicates the standardized Cronbach coefficient alpha (Cronbach and Meehl, 1955), which is the value of computed alpha when all scale items are standardized to have equal means and variances. The results illustrate that every latent construct has an acceptable reliability of greater than .70 as suggested by Nunnally (1982).

The following tables include descriptions of the following measures:

- **Mean (or Arithmetic Mean):** Represents a point estimation of values in a dataset. If the mean is high, the majority of survey responses are strongly agreed with question statements.

- **Standard Deviation:** Represents a measure of dispersion of the values in a dataset. If the standard deviation is low, the value of point estimation (mean) is more accurate.

- **Item-Total Correlation:** Represents the correlation between an individual item and the sum of the remaining items that constitute the scale. If the item-total correlation is small, the item does not measure the same construct measured by the other items.

- **Cronbach's Alpha when Item Deleted:** Represents a non-standardized coefficient alpha when the variable (item) is deleted.

Reliability of Physical Affordances Scales

Physical affordances scales are adapted from various scales of previous research on technology adoption (Gefen et al., 2003) and usability (Boling, 1995; Lederer et al., 2000). The standardized reliability of initial scale is .8755. Items report a high item-total correlation and high reliability coefficient.

Table 4.14 Reliability of Physical Affordances (alpha = 0.8755)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
PA1	I find SL is easy to use.	4.00	0.95	0.6291	0.8566
PA2	I find SL is easy to become skillful in performing the system's functions.	3.62	1.05	0.6636	0.8509
PA3	I find SL is easy to navigate.	4.00	0.90	0.7805	0.8335
PA4	I find SL is easy to operate.	3.80	0.99	0.7414	0.8376
PA5	I can quickly accomplish my task in purchasing products in the virtual store.	3.85	1.04	0.6444	0.8542
PA6	I can easily find specific information from the virtual store.	3.59	1.66	0.6059	0.8640

Reliability of Relational Affordances Scales

Relational affordances scales are adapted from previous research in social functions in collaborative learning (Kreijns et al., 2004). The standardized reliability of initial scale is .7918. The results report some problematic item-total correlations for RA1 and RA5, which yield the high Cronbach's alpha coefficients if either or both of these items are removed. However, these two items are not eliminated at this stage.

Table 4.15 Reliability of Relational Affordances (alpha = 0.7918)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
RA1	SL enables me to interact with other people in an easy manner.	3.85	1.12	0.4740	0.7786
RA2	SL enables me to casually talk with other people.	3.65	1.11	0.6657	0.7124
RA3	SL enables me to get together with the group of people.	4.08	0.94	0.6417	0.7278
RA4	SL enables me to attend social events.	3.79	1.18	0.6899	0.7078
RA5	SL enables me to get together with family and friends.	3.30	1.18	0.3984	0.8026

Reliability of Transactional Affordances Scales

Transactional affordances scales are adapted from previous research in technology adoption. The standardized reliability of initial scale is .7772. The results report some problematic item-total correlations for TA1 and TA4, which yield the high Cronbach's alpha coefficients if either or both of these items are removed. However, these two items are not eliminated at this stage.

Table 4.16 Reliability of Transactional Affordances (R = 0.7772)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
TA1	SL supports me in making business transactions.	3.81	0.97	0.5025	0.7215
TA2	SL allows me to spend virtual currency in easy manner.	3.98	1.16	0.7481	0.5885
TA3	SL allows me to directly contact or exchange in business activity with the virtual store.	3.87	0.97	0.6610	0.6574
TA4	SL requires only minimal time in completing a transaction.	3.94	1.36	0.3966	0.8155

Reliability of Relationship-Based Trust Scales

Relationship-based trust scales are based on previous research in interpersonal trust and e-commerce trust (e.g., McKnight et al., 2002b, Pavlou and Gefen, 2002). The standardized reliability of initial scale is .8990. The results report some problematic item-total correlations for TR1, TR3 and TR12, which yield the high Cronbach's alpha coefficients if any or all of these items are removed. However, these items are not eliminated at this stage.

Table 4.17 Reliability of Relationship Trust (R = 0.8990)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
TR1	I believe that the virtual store would act on my best interest.	3.68	0.84	0.4926	0.8972
TR2	If I require help, the virtual store would do its best to help me.	3.70	0.93	0.6435	0.8864
TR3	The virtual store is interested in my well-being, not just its own.	3.38	0.98	0.5190	0.8944
TR4	I believe that the virtual store is sincere.	3.79	0.81	0.6038	0.8883
TR5	The virtual store is truthful in its dealings with me.	3.82	0.78	0.8042	0.8783
TR6	The virtual store is honest.	3.84	0.81	0.6618	0.8853
TR7	I expect that virtual store will keep promise.	3.90	0.74	0.6970	0.8841
TR8	The virtual store is reliable.	3.83	0.77	0.6184	0.8876
TR9	The virtual store understands the market it works on.	3.87	0.89	0.6180	0.8877
TR10	The virtual store is very knowledgeable.	3.84	0.80	0.6300	0.8870
TR11	The virtual store is competent and effective in providing service.	3.93	0.71	0.6196	0.8879
TR12	The virtual store has skills and expertise to perform transactions.	3.92	0.69	0.4810	0.8940

Reliability of Need Satisfaction Scales

Need satisfaction scales are adapted from job satisfaction (Porter, 1961) and psychological need satisfaction literature (Sheldon and Bettencourt, 2002). The standardized reliability of initial scale is .8526. The results report high item-total correlations and the high Cronbach's alpha coefficients when the items are deleted.

Table 4.18 Reliability of Need Satisfaction (R = 0.8526)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
NS1	In overall, I ... (definitely dissatisfied /definitely satisfied)... the product/service from the virtual store.	4.03	0.91	0.7431	0.8429
NS2	The product and/or service offered by the virtual store ...(definitely dissatisfied / definitely satisfied)... my needs.	4.03	0.74	0.7431	0.8429

4.3.4 Factor Analysis and Identifications of Factors

According to Hair and colleagues (2006), factor analysis is a technique to reduce numbers of original variables to composite dimensions (or factors) with the minimum loss of information. The purpose of using factor analysis in this pilot study is to analyze the set of variables and to identify variables underlying latent factors. This method is valid for any sample with more than 50 observations. The total of 89 valid datasets is obtained from the pilot study. However, 50 datasets obtained from participants who have experiences with business transactions in the virtual world will be used to determine the number of factors, as it will better reflect all studied variables.

The initial datasets are analyzed using factor analysis (principal component with no rotation). The number of factors extracted and the significant loadings are obtained at this stage. As practical significance criteria, factor loadings in the range of ±.30 to ±.40 are considered as a minimum level for interpretation of structure. However, it is recommended that factor loadings ±.50 or greater are considered practically significant. Loadings exceeding ±.70 indicate a well-defined structure and are preferred in the

confirmatory research. In this pilot study, factor loadings of minimum ±.40 will be considered.

The initial factor loading results (as shown in Table 4.19) suggest eight factors are extracted according to latent root criterion of eigenvalues greater than 1. The Scree test criterion also suggests the same result. The following table illustrates the results of factor extraction, which suggest that eight constructs are extracted. All factors explain 73.86% of the total variance.

Table 4.19 Standardized Item Loadings for Individual Constructs

Indicator	1	2	3	4	5	6	7	8
PA1	**60**	20	24	-15	**43**	-9	-17	-14
PA2	**53**	-17	8	**-43**	35	23	-15	18
PA3	**55**	25	37	**-42**	25	21	10	-9
PA4	**62**	18	24	-51	13	20	16	4
PA5	**70**	4	21	-27	-18	-2	-14	19
PA6	**62**	-27	21	-12	16	18	6	-6
RA1	**41**	**47**	-4	17	**-42**	25	-11	0
RA2	**59**	23	-4	19	-9	30	30	-15
RA3	**49**	**52**	-34	4	-15	20	-17	-2
RA4	**60**	30	**-41**	11	-20	4	-6	27
RA5	**51**	10	-17	30	35	-6	**56**	19
TA1	**44**	**41**	-10	24	**46**	-32	16	1
TA2	**55**	**53**	20	5	2	-28	0	1
TA3	**55**	36	9	29	22	**-40**	-15	0
TA4	**43**	22	**55**	14	-23	8	-5	35
TR1	34	**-43**	**44**	**45**	2	17	10	23
TR2	**64**	-5	7	**50**	-6	30	-13	-3
TR3	**49**	-39	-2	32	21	6	22	8
TR4	**42**	-15	-15	25	28	28	-17	**-49**
TR5	**61**	**-55**	8	19	-7	5	-26	16
TR6	**58**	-27	8	21	3	-35	-34	-33
TR7	**66**	-32	1	-13	-5	-11	-2	-20
TR8	**45**	**-59**	-12	-9	-19	-26	33	7
TR9	**62**	-20	-25	2	-6	-3	-25	15
TR10	**62**	-15	**-49**	-19	2	25	4	-8
TR11	**55**	-18	-38	**-44**	-11	-23	6	3
TR12	**59**	-9	-40	-17	-5	-28	-18	24
NS1	**59**	1	29	3	**-50**	-17	18	-18
NS2	**53**	4	25	-12	**-50**	-11	28	-35

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

The data is also analyzed for the Measure of Sampling Adequacy (MSA) to determine the factorability of the overall set of variables and the individual variables. This index ranges from 0 to 1, where 1 refers the perfect predictability by other variables. The measures can be interpreted by the following guidelines (Kaiser, 1974):

- .80 or above is meritorious

- .70 or above is middling

- .60 or above is mediocre

- .50 or above is miserable

- below .50 is unacceptable

The initial results show five variables with MSA less than .50, in which TA1 has the lowest value (.3289). Therefore, a new analysis is performed by omitting TA1. The new results show that all variables have acceptable level of MSA. In addition, partial correlations are examined, revealing only six with values greater than .50 (PA1—TR10, RA3—TR1, RA5—TR5, TA4—TR5, TR3—TR5, NS1—NS2), which mean that the interrelationships among variables in general are in a good strength. Table 4.20 shows the Measure of Sampling Adequacy (MSA) on the diagonal and the partial correlations in the off-diagonal.

After obtaining the data, which indicate strong correlations between variables, and the initial factor loadings, the following factor analysis (principal component) with rotation can be applied. This is due to the initial item loadings do not contain a completely clean set of factor loadings. Therefore, an initial rotation is applied to simplify the factor structure.

Table 4.20 Measures of Sampling Adequacy (MSA) and Partial Correlations

	PA1	PA2	PA3	PA4	PA5	PA6	RA1	RA2	RA3	RA4	RA5	TA2	TA3	TA4	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	NS1	NS2
PA1	61																											
PA2	5	65																										
PA3	43	12	76																									
PA4	32	42	25	76																								
PA5	-32	34	24	-7	78																							
PA6	42	6	8	-20	29	74																						
RA1	-2	-12	3	14	17	-14	68																					
RA2	-4	-9	1	-8	-20	20	21	79																				
RA3	24	19	3	-19	3	-37	23	30	60																			
RA4	-11	-13	5	9	-5	-5	7	-10	44	76																		
RA5	18	26	-21	-2	-11	4	-31	35	6	29	54																	
TA2	-22	12	15	9	-10	3	11	-2	2	-3	2	77																
TA3	45	-32	-24	2	37	-24	-7	9	-9	-2	14	54	64															
TA4	8	-37	25	16	28	8	1	-13	27	-4	27	10	7	61														
TR1	5	19	6	-15	2	-19	17	-3	-52	8	31	-6	-4	15	58													
TR2	-5	-22	-10	15	18	14	10	27	13	10	0	22	-13	-9	43	82												
TR3	-11	-15	28	-1	-11	6	27	-17	-11	-9	48	-2	15	-29	-13	6	64											
TR4	-4	32	13	-21	-26	-9	12	10	-16	-18	8	-15	20	9	-20	32	2	64										
TR5	-3	31	-34	8	-12	16	-26	11	19	9	-60	-16	7	52	32	8	60	11	64									
TR6	36	-8	5	-29	10	-8	5	-36	12	9	2	-4	14	-33	3	11	-17	19	28	75								
TR7	8	2	-5	8	-6	-3	-20	9	4	-23	-9	29	-8	0	1	19	-2	-15	7	22	83							
TR8	-32	-18	20	10	-1	1	4	-7	-3	-21	48	-16	-6	-12	0	-12	-1	-20	27	24	13	69						
TR9	50	-7	-8	-28	30	-18	-1	11	-12	24	-20	14	-29	0	4	10	10	7	-4	-13	8	35	73					
TR10	-52	-16	18	36	12	43	-1	12	27	12	12	-21	20	-40	10	-20	-6	24	7	5	28	-15	22	71				
TR11	36	-12	-7	2	36	-35	-5	23	31	34	-7	9	-22	-5	-21	-15	-7	22	15	-21	32	35	-28	9	65			
TR12	-12	41	-19	-10	-16	17	16	-11	-4	2	4	9	27	3	-18	5	1	-22	6	9	-27	-2	35	12	41	75		
NS1	-13	15	3	-11	-4	20	42	-3	-40	38	23	-11	24	5	-25	-6	-31	-8	26	2	28	-3	0	-13	-15	-13	65	
NS2	0	-26	-7	31	15	0	-32	21	40	-30	-30	20	-30	4	33	-10	33	18	-35	23	-22	15	-7	-4	11	21	75	56

Note: Measures of sampling adequacy (MSA) are on the diagonal, partial correlations in the off-diagonal.
The printed numbers are rounded and multiply by 100.

4.3.5 Factor Analysis with Rotations

This study uses an oblique rotation technique (PROMAX rotation) employed by SAS. PROMAX rotation produces an orthogonal VARIMAX pre-rotation followed by an oblique rotation. The reason for using oblique rotation is because oblique rotation often produces more useful factor patterns than do orthogonal rotations in case that the factors are assumed to be correlated to each other. In other words, oblique rotation allows correlated factors instead of maintaining independence between the rotated factors. Therefore, it is necessary to examine the factor structure and the reference structure, in addition to loading pattern, to fully understand the components underlying factors and the correlation between factors (Harman, 1976; Muliak, 1972). Furthermore, this pilot study forces the number of factor to be extracted to five and six rather than seven or eight as suggested by the eigenvalues. This is because there are approximately five to six latent constructs (factors) that are proposed and considered as predictors of this pilot study. The next table shows the results of VARIMAX rotation with six number of factor extraction.

The results of the pre-rotation using VARIMAX rotation as shown in Table 4.21 suggest unclean factor loadings of many constructs (factors). For instance, TR5, TR6, TR10, RA5, PA1, PA5, and PA6 contain cross loadings while TA4 loads on another factor. However, there are some constructs that load on other factors, such as TA4, PA5, and RA5. Other orthogonal rotation techniques are also tested and the results are compared with the results obtained from VARIMAX rotation. However, neither of them shows any better results. The cross loadings and the communality are used to make a decision in dropping some items. Correspondingly, PA5, RA5, and TR6 are dropped and the new results of factor analysis (with PROMAX rotation) are obtained.

Table 4.21 Factor Analysis with VARIMAX Rotation (Initial Attempt)

Factor Label	Component	1	2	3	4	5	6	Communality
Credibility	TR11	**78**	-8	19	25	8	-2	.72
	TR12	**72**	2	26	10	1	25	.66
	TR8	**66**	35	-10	1	26	-24	.69
	TR10	**56**	22	49	30	-8	-19	.74
	TR9	**56**	30	26	9	5	19	.51
	TR7	**56**	33	4	27	23	12	.56
	TR6	**48**	41	-8	-2	19	47	.66
Benevolence	TR1	-10	**78**	-16	3	31	-1	.74
	TR3	22	**69**	10	10	0	0	.55
	TR2	3	**67**	41	3	23	24	.74
	TR5	47	**66**	-6	6	20	12	.71
	TR4	13	**51**	26	15	-22	13	.43
Relational	RA2	15	26	**80**	13	9	-7	.76
	RA3	12	-10	**75**	11	9	24	.67
	RA4	33	5	**70**	1	15	20	.67
	RA1	-8	-2	**63**	0	41	18	.61
	RA5	7	42	**44**	20	-7	10	.43
Physical	PA3	-2	4	12	**84**	24	14	.79
	PA4	14	0	19	**82**	26	6	.81
	PA2	32	20	0	**71**	-9	5	.66
	PA1	12	16	8	**60**	-1	59	.75
	PA6	25	47	2	**52**	19	1	.58
Need Satisfaction	NS1	25	17	15	8	**77**	13	.73
	NS2	24	5	16	17	**76**	-3	.69
	TA4	-20	20	9	22	**60**	32	.60
	PA5	37	9	14	45	**50**	19	.65
Transactional	TA3	10	17	24	9	10	**80**	.76
	TA2	2	-5	32	26	35	**61**	.66

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

Note that the results suggest that trusting belief construct is broken into two factors, which are benevolence trust (BEN) and credibility trust (CRE). As suggested by the previous study, benevolence trust is defined as *"the buyer's belief that a seller has beneficial motives, is genuinely concerned about the buyer's interests, and will act in a goodwill manner beyond short-term profit expectations"* and credibility trust is defined as *"the buyer's belief that a seller is competent and reliable, and will fulfill the transaction's contractual requirements"* (Pavlou and Demoka, 2006).

The final analysis using VARIMAX rotation shows the acceptable clean loadings on their corresponding factors with acceptable communalities of greater than .50 (Hair et al., 2006). The factor analysis with oblique (PROMAX) rotation is examined in the next steps and the results are shown in the following tables.

Table 4.22 Factor Analysis with VARIMAX Rotation (Final Attempt)

Factor Label	Component	1	2	3	4	5	6	Communality
Benevolence Trust	TR1	**79**	-12	-16	1	8	25	**.74**
	TR5	**73**	41	-1	7	11	12	**.74**
	TR2	**70**	-1	46	6	24	12	**.78**
	TR3	**67**	25	4	10	3	2	**.52**
	TR4	**51**	6	35	23	-6	-23	**.50**
Credibility Trust	TR11	-6	**81**	14	23	1	14	**.75**
	TR12	7	**77**	22	7	27	-3	**.72**
	TR8	34	**65**	-15	0	-20	39	**.75**
	TR10	23	**54**	51	30	-25	-5	**.76**
	TR9	35	**53**	29	10	15	-1	**.52**
	TR7	37	**51**	7	31	7	25	**.56**
Relational Affordances	RA3	-11	11	**79**	15	21	3	**.72**
	RA2	21	19	**76**	12	-2	13	**.69**
	RA1	1	-10	**68**	0	26	31	**.63**
	RA4	5	36	**67**	1	25	10	**.66**
Physical Affordances	PA3	2	-4	14	**85**	13	23	**.82**
	PA4	-1	17	15	**80**	14	27	**.79**
	PA2	22	32	0	**70**	3	-12	**.65**
	PA1	14	11	9	**67**	47	-5	**.71**
	PA6	48	20	5	**52**	-1	17	**.58**
Transactional Affordances	TA3	17	16	20	11	**81**	-2	**.76**
	TA2	-4	9	26	24	**72**	25	**.71**
	TA4	25	-17	6	18	**52**	46	**.61**
Need Satisfaction	NS2	6	16	21	20	2	**81**	**.77**
	NS1	20	19	18	10	20	**77**	**.76**

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer. Values greater than 50 are highlighted.

Table 4.23 shows the rotated factor pattern matrix, in which each loading represents a standardized regression coefficient or a regression weight associated with each factor. The results of factor loadings obtained from oblique rotation should rely on the rotated factor pattern matrix. However, the other two matrices: (1) reference structure

matrix (Table 4.24), and (2) factor structure matrix (Table 4.25), must be considered to fully understand the overall picture of the factor pattern and their multivariate correlations between factors and their variables. Reference structure matrix presents the values of semi-partial correlations. And factor structure matrix contains the product-moment correlations between the variables and common factors.

Table 4.23 Factor Pattern Matrix (PROMAX Rotation)

Factor Label	Component	1	2	3	4	5	6	Communality
Benevolence Trust	TR1	84	-21	-19	-4	4	18	.74
	TR2	71	-15	44	-7	15	3	.78
	TR5	70	35	-10	-5	10	4	.74
	TR3	66	17	-1	1	1	-5	.52
	TR4	52	-8	35	18	-12	-30	.50
Credibility Trust	TR11	-21	84	3	12	1	12	.75
	TR12	-4	81	8	-8	30	-8	.72
	TR8	24	67	-22	-11	-20	38	.75
	TR9	28	49	20	-4	13	-7	.52
	TR7	26	46	-4	21	2	19	.56
	TR10	13	44	49	20	-32	-8	.76
Relational Affordances	RA3	-17	2	80	5	11	1	.72
	RA2	15	7	78	0	-14	10	.69
	RA1	-3	-18	70	-10	14	29	.63
	RA4	-4	33	64	-15	19	7	.66
Physical Affordances	PA3	-7	-18	4	89	3	17	.82
	PA4	-13	6	3	81	6	22	.79
	PA2	15	22	-13	71	0	-20	.65
	PA1	6	4	-7	66	45	-15	.71
	PA6	43	8	-4	48	-7	10	.58
Transactional Affordances	TA3	13	18	4	-1	83	-12	.76
	TA2	-12	9	12	15	70	18	.71
	TA4	22	-22	-3	12	47	40	.61
Need Satisfaction	NS2	-6	11	18	12	-9	82	.77
	NS1	9	15	12	-2	11	76	.76

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

Table 4.24 Reference Structure Matrix (Semi-Partial Correlations)

Factor Label	Component	1	2	3	4	5	6
Benevolence Trust	TR1	78	-19	-17	-4	4	18
	TR2	66	-13	39	-6	14	3
	TR5	65	32	-9	-5	9	4
	TR3	61	16	-1	0	1	-5
	TR4	48	-7	31	16	-11	-28
Credibility Trust	TR11	-20	75	3	11	1	12
	TR12	-4	72	8	-7	28	-8
	TR8	22	59	-19	-10	-19	36
	TR9	26	44	18	-3	12	-6
	TR7	24	41	-4	18	4	18
	TR10	12	39	44	18	-30	-8
Relational Affordances	RA3	-16	2	72	5	10	1
	RA2	14	6	71	0	-13	-10
	RA1	-2	-16	63	-9	13	28
	RA4	-3	29	57	-14	18	6
Physical Affordances	PA3	-7	-16	3	80	3	17
	PA4	-12	6	2	72	5	21
	PA2	13	20	-12	63	0	-19
	PA1	6	3	-7	59	42	-14
	PA6	39	7	-4	43	-7	9
Transactional Affordances	TA3	12	16	4	-1	77	-12
	TA2	-11	8	11	14	64	17
	TA4	20	-19	-3	11	44	38
Need Satisfaction	NS2	-5	9	16	10	-8	78
	NS1	8	13	11	-2	11	72

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

Table 4.25 Factor Structure Matrix (Correlations)

Factor Label	Component	1	2	3	4	5	6
Benevolence Trust	TR1	**78**	-1	-10	8	11	33
	TR2	**74**	15	54	22	35	23
	TR5	**80**	52	12	23	14	22
	TR3	**70**	36	13	21	6	11
	TR4	**52**	20	40	31	2	-15
Credibility Trust	TR11	10	**83**	27	37	3	18
	TR12	20	**78**	36	24	28	4
	TR8	43	**68**	-6	13	-20	41
	TR9	45	**61**	40	27	19	7
	TR7	49	**61**	21	45	13	33
	TR10	34	**67**	58	44	-15	0
Relational Affordances	RA3	-1	20	**83**	28	34	8
	RA2	30	34	**79**	28	13	19
	RA1	8	-1	**69**	13	39	35
	RA4	16	44	**74**	18	36	16
Physical Affordances	PA3	14	11	27	**87**	25	32
	PA4	14	31	30	**85**	25	35
	PA2	32	44	14	**74**	7	-3
	PA1	24	23	26	**73**	54	7
	PA6	57	36	18	**60**	7	26
Transactional Affordances	TA3	25	20	34	24	**83**	9
	TA2	8	14	40	36	**79**	34
	TA4	32	-9	16	26	**59**	54
Need Satisfaction	NS2	20	25	29	32	14	**83**
	NS1	32	27	27	25	31	**82**
	NS1	32	27	27	25	31	**82**

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

The final factor loading pattern obtained from PROMAX rotation method is shown in Table 4.23. Clearly, the final rotation pattern, along with the reference structure and the factor structure, suggest the similar results to the orthogonal rotation method. The result of six factors extraction is accounted for 68.78% of the total variance.

Table 4.26 shows the inter-factor correlations obtained from factor analysis with PROMAX rotation. The results suggest that there are moderate correlations among the latent constructs. For instance, benevolence trust is correlated with credibility trust, and

transactional affordance is correlated with both physical affordance and relational affordance.

Table 4.26 Inter-Factor Correlations

	BEN	**CRE**	**RA**	**PA**	**TA**	**NS**
Benevolence	100					
Credibility	29	100				
Relational Aff.	16	27	100			
Physical Aff.	25	32	30	100		
Transactional Aff.	11	-2	30	20	100	
Need Satisfaction	21	9	9	18	20	100

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

4.3.6 Validity

Validity and reliability are two important characteristics of a good measurement construct. The goal of model building is to obtain a valid and reliable measurement that will result in the better predictive model. Validity refers to *an extent that a measure accurately represents what it is supposed to be*. On the other hand, reliability is defined as *a degree that the observed variable measures the true value and is free from errors no matter how many times the variables are repeatedly used* (Hair et al., 2006). In assessing validity and reliability of the proposed measurement model, the correlations are determined, as well as the orthogonal factor loadings. The validity, in this case refers to as construct validity, comprising of the following three validities: (1) convergent validity, (2) discriminant validity, and (3) nomological validity.

Convergent validity is the extent to which measurements of a specific construct converge or share a high proportion of variance in common (Hair et al., 2006) and is measured from the degree of item loadings more than .70. The result of principal component (with Varimax rotation), however, shows that many items violate the

convergent validity criteria but still have a significant variance to explain their corresponding factors (loadings greater than .50). These items are rather retained for subsequent analyses.

Discriminant validity is an extent to which a construct is distinguished from other constructs. Discriminant validity can be obtained by comparing estimated variance-extracted (VE) of any two constructs, which can be calculated by using the following formula, with the corresponding estimated inter-construct squared correlation (Fornell and Larcker, 1981).

Variance Extracted

$$VE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

where λ is standardized loadings

The results show that variance-extracted of any two constructs is greater than the estimated inter-construct squared correlation (the values above diagonal), which suggest no problems with discriminant validity (See Table 4.27).

Nomological validity is used to examine if the constructs are related to other constructs. The nomological validity can be assessed by checking the significance level of correlation between factors. Table 4.27 shows the p-values (values in parentheses) of the correlations, which are not significant at .05 levels. However, only the correlation between transactional affordances and credibility trust (p = .1110) is significant. This means that these two factors are not correlated.

Table 4.27 Correlation Matrix with Squared Correlation Estimation and Variance-Extracted

	PA	RA	TA	BEN	CRE	NS
Physical Affordances	1.0000	.0942	.1923	.1601	.2430	.1425
Relational Affordances	.3069 (.0302)	1.0000	.1999	.0934	.1956	.1499
Transactional Affordances	.4385 (.0014)	.4471 (.0011)	1.0000	.1180	.0521	.1979
Benevolence	.4001 (.0039)	.3056 (.0309)	.3435 (.0146)	1.0000	.2401	.0979
Credibility	.4930 (.0003)	.4456 (.0012)	.2282 (.1110)	.4900 (.0003)	1.0000	.1495
Need Satisfaction	.3775 (.0069)	.3872 (.0055)	.4449 (.0012)	.3129 (.0269)	.3866 (.0056)	1.0000
Variance Extracted (%)	**51.44**	**52.83**	**48.16**	**47.12**	**41.74**	**62.45**
Cronbach's alpha	**.84**	**.81**	**.73**	**.78**	**.83**	**.85**

4.3.7 Final Conclusions of Measurement Model

According to the results of factor analysis and correlations among the variables, the following figure shows a summary of the measurement model of this pilot study. The double headed arrows represent correlation coefficients rather than covariances as used in the covariance-based Structural Equation Model (SEM). Furthermore, the measurement model is tested again with different data sets to confirm the consistency of the model. In general, the initial measurement model can be tested using Confirmatory Factor Analysis (CFA) or Partial Least Square (PLS) methods.
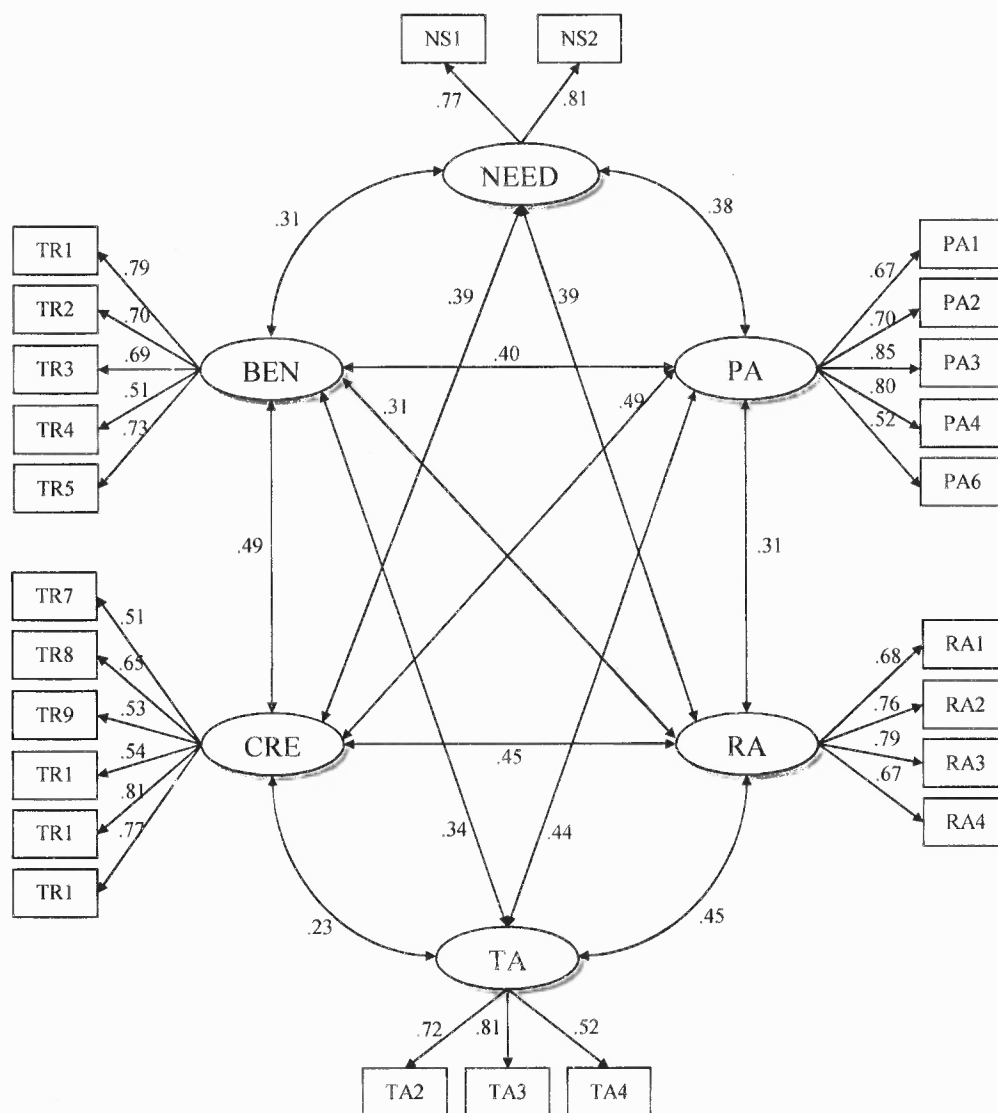
Figure 4.6 Measurement model of the latent constructs.

A minimum of 50 observations is strongly recommended for Confirmatory Factor Analysis (CFA). However, it is preferred that at least 100 observations or a ratio of 10 numbers of observations to each variable (10:1) is sufficient (Hair et al., 2006; Gefen et al., 2000). The initial measurement model obtained from the factor analysis suggested the following:

- Five scales are loaded on physical affordances

- Four scales are loaded on relational affordances

- Three scales are loaded on transactional affordances

- Five scales are loaded on benevolence trust

- Six scales are loaded on credibility trust

- Two scales are loaded on need satisfaction

The model shows individual factor loadings of the scale and the correlation coefficient among latent factors.

4.4 Summary of the Pretest Results

A pretest has been conducted in July 2009 to validate new measurement scales for two new variables, which are perceived affordances and need satisfaction. A total of 67 respondents volunteered to this pretest study. Note that the suggested minimum number of sample size that allows for valid results of Principal Component Analysis (PCA) is five times the minimum number of measurement scales, or at least 60 observations for this pretest (O'Rourke et al., 2005).

4.4.1   Reliability of Perceived Affordance Scales

The perceived affordance of the virtual world, which is divided into three dimensions – physical affordance, relational affordance, and transactional affordance – is measured using a five-point Likert type scale ranged from strongly disagree to strongly agree as shown in Table 4.28. The range of these scales is from 1 to 5.

Physical affordance scales are adapted from the ease of use scales (Davis, 1989) and usability scales (Boling, 1995; Lederer et al., 2000). However, the scales developed

during the preliminary studies are argued as they have identical wordings to the ease of use and the usability scales of previous research, which do not represent the proposed paradigm of affordances. Therefore, the old measurement scales are restated and pretested using Principal Component Analysis (PCA). The standardized reliability of the revised scale is .7602. However, the results reveal some problematic item-total correlations for PA1 (0.4545) and PA2 (0.5531). Deleting either or both of these measurement items will usually result to a higher Cronbach's alpha coefficient. However, these measurement scales are retained for the main study.

Table 4.28 Reliability of Physical Affordances (alpha = 0.7602)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
PA1	I found that the program functions (or menus) allowed me to do things with ease.	4.03	0.70	0.4545	0.7583
PA2	I found that the program functions (or menus) supported me in navigation and control of my avatar.	4.06	0.85	0.5531	0.7065
PA3	I found that the program functions (or menus) allowed me to understand their operations.	3.96	0.79	0.6208	0.6692
PA4	I was able to predict the outcome of my actions when I saw the program's functions (or menus).	3.91	0.88	0.6097	0.6754

Relational affordances scales (as shown in Table 4.29) are adapted from previous research regarding social functions in collaborative learning (Kreijns et al., 2004). For the same reason as the physical affordance scales, the old relational affordance scales are reworded to reflect the actual relational affordance construct, and not sociability scales as suggested in the previous research (Kreijns et al., 2004). The standardized reliability of

the revised scale is .8003. The results report some problematic item-total correlations for RA1 (0.3710) and RA2 (0.5929). Deleting either or both of these measurement items will usually result to a higher Cronbach's alpha coefficient. However, these measurement scales are retained for the main study.

Table 4.29 Reliability of Relational Affordances (alpha = 0.8003)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
RA1	Second Life enabled me to have a casual conversation with other people.	4.58	0.72	0.3710	0.8251
RA2	Second Life enabled me to know if I would be able to get together with the group of people.	4.16	0.77	0.5929	0.7589
RA3	Second Life enabled me to know how others feel emotionally.	4.00	0.89	0.6152	0.7518
RA4	Second Life enabled me to understand the state of mind of the people I interacted with.	3.93	0.94	0.6393	0.7440
RA5	Second Life enabled me to establish close relationships with other people.	4.13	0.97	0.7131	0.7198

Transactional affordances scales (as shown in Table 4.30) are based on previous research in technology adoption. This concept implies the adoption of business functions in particular. Again, the new scales are restated to improve the old measurement scales. The standardized reliability of the revised scale is .7601. The results report some problematic item-total correlations for TA1 (0.4654) and TA4 (0.4477). Deleting either or both of these measurement items will usually result to a higher Cronbach's alpha coefficient. However, these measurement scales are retained for the main study.

Table 4.30 Reliability of Transactional Affordances (R = 0.7601)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
TA1	Second Life allowed me to understand the process of money transfer and/or money exchange.	4.12	0.73	0.4645	0.7529
TA2	Second Life allowed me to know the steps I should do when purchasing a product, transferring money, and buying virtual currency.	4.18	0.67	0.7362	0.6015
TA3	Second Life enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase.	4.12	0.86	0.6022	0.6793
TA4	Second Life enabled me to easily view my money balance.	4.48	0.61	0.4477	0.7613

4.4.2 Reliability of Need Satisfaction Scales

Need satisfaction is measured by using the *Need Satisfaction Index (NSI)* as suggested by Porter (1961). The method to measure need satisfaction proposed in this dissertation is accepted by many researchers in many research areas, such as psychology (e.g., Coombs, 1950; Porter, 1961), and marketing (e.g., Kettinger and Lee, 2005). Theoretically, need satisfaction is measured by comparing a desire (or an expectation of a certain situation or thing), and an actual experience (or a perception or a performance). The result of this comparison produces a gap or what the marketing literature calls *a disconfirmation of expectation*. Porter's NSI also suggests that this gap is divided by the importance scale (how importance the situation or thing to the perceiver).

The operationalization of need satisfaction construct proposed in this dissertation follows the ADS formula (Spreng et al., 1996), in which the importance score is multiplied by the discrepancy score or the difference between "How much this should

be?" and "How much is there now?" All measurement scales related to NSI use 7-point semantic differential type of scales. The range of the NSI is from 0 to 42, where 0 means perfect fulfillment on needs, and 42 means the least fulfillment on needs.

To illustrate more about NSI, this is an example of two persons, X and Y, rating on these scales. Assuming that X rates 6 on "How much this should be" (I_j), and 5 on "How much is there now" (B_{ix}). On the other hand, Y rates 6 on "How much this should be" (I_j), and 7 on "How much is there now" (B_{ix}). These two responses produce the same results of $|B_{ix} - I_i|$, which are equal to 1. However, X rates 7 on the importance score, while Y rates only 5. The NSI obtained from X is 7, while NSI obtained from Y is 5. This result implies that X has more deficiency of need than Y because X feels that this certain thing is more important to him/her when comparing to Y. Therefore, X has more dissatisfaction on need or has a greater deficiency of need than Y.

Note that the absolute value of ($B_{ix} - I_i$) ignores the effect of negative sign. Because this research assumes that a negative sign also means overwhelming with a certain need. For example, a person rates on a satisfaction scale of social interaction. The rating score for "How much this should be" (I_j) is 5, but the score for "How much is there now" (B_{ix}) is 7. The value of ($B_{ix} - I_i$) is -2, which can imply that this person is overwhelmed with social interaction and he/she might feel that there is too much interaction with others. In summary, the NSI score of 0 implies that the need is fulfilled perfectly. The higher NSI score implies the magnitude of deficiency need. The highest possible score of NSI is 42, implying that a person is totally dissatisfied with a certain need he/she has.

Need satisfaction construct is divided into two levels, according to literature review section, which are higher-level or growth needs, and lower-level or deficiency needs. The scales of these need categories are based on measurement items of need satisfaction from Porter (1961, 1962, 1963a, 1963b) and other previous literature (e.g., Sheldon and Bettencourt, 2002). The standardized reliability of the revised scale of deficiency need satisfaction is .6671, and the revised scale of growth need satisfaction is .7275 (as shown in Tables 4.31 and 4.32). Note that the values of growth need satisfaction as expressed by NSI are a square root term. This transformation of NSI datasets is done to normalize the data.

Table 4.31 Reliability of Deficiency Need Satisfaction (R = 0.6671)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
NSI1	The quality of products/services of Second Life.	6.96	6.37	0.5350	0.4952
NSI2	The products/services from virtual stores in Second Life meet my needs.	5.58	6.07	0.5954	0.4092
NSI3	The feeling of security from threats and/or uncertainties when using Second Life.	8.12	10.11	0.3262	0.7617

Table 4.32 Reliability of Growth Need Satisfaction (R = 0.7275)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
NSI4	The opportunity to develop close friendships with other people in Second Life.	1.41	1.58	0.4006	0.7140
NSI5	The sense of self-respect while I am in Second Life.	1.21	1.50	0.5794	0.6441
NSI6	The opportunity to have my choice in expressing my true self through my avatar.	0.85	1.50	0.3291	0.7400
NSI7	The feeling of pleasure and enjoyment while I am in Second Life.	1.34	1.57	0.5941	0.6381
NSI8	The feeling of self-fulfillment I perceive while I am in Second Life.	1.38	1.69	0.5497	0.6562

Although the values of item-total correlation of need measurement scales, which is the correlation between an individual item and the sum of the remaining items that constitute the scale (Hair et al., 2006), are lower than .70, they imply the fact that these measurements of need satisfaction represent the different levels of needs as suggested by Maslow (1943, 1954). Recalling that needs are a hierarchical concept and comprises of many levels ranged from the lowest or physiological needs to the highest or self-actualization needs. The different level of needs, as shown by the different measurement items in questionnaire, represents different dimension of needs. Therefore, they should not have a high correlation to each other. However, this dissertation proposes that these measurement scales of needs are divided into only two categories, which are deficiency needs and growth needs, as also suggested by previous literature (e.g., Waters and Roach, 1973).

4.4.3 Principal Component Analysis for the Pretest of Perceived Affordance Scales

The factor analysis of the new measurement scales of perceived affordances is performed to evaluate the number of latent constructs or factors that the measurement items load on. The latent root criteria of eigenvalues greater than 1 is used to determine the number of factor extraction, as suggested by Principal Component Analysis (PCA). Additionally, the PCA suggests possible item reduction to make the overall measurement construct more reliable.

The significant criteria of factor loadings in the range of ±.30 to ±.40 are considered as a minimum level for interpretation of structure. However, it is recommended that factor loadings of ±.50 or greater are considered in general significant. Loadings exceeding ±.70 indicate a well-defined structure and are preferred. In this pretest of perceived affordance scales, factor loadings of minimum ±.40 will be considered as interpretable.

The initial factor loading results (as shown in Table 4.33) suggest four factors to be extracted, which explain 69.70% of the total variance. The Scree test, as shown in Figure 4.7, also confirms the same results. Since the results obtained from the initial analysis are not consistent with our presumption about the number of factors (or latent constructs) that represent the perceived affordances construct, some initial measurement items are eliminated. The items that are eliminated include PA1, RA1, RA2, and TA4. The decision regarding the item deletion is based on the results of reliability test obtained from the previous section. The final results of PCA with a VARIMAX rotation suggest three factors to be extracted, which explain 73.21% of the total variance. Table 4.34

shows the result of factor analysis with VARIMAX rotation, and Figure 4.8 summarizes

the measurement model of perceived affordance construct.

Table 4.33 Standardized Item Loadings for Perceived Affordance Scales

Indicator	1	2	3	4
PA1	59	-9	-34	-28
PA2	57	33	-44	10
PA3	57	-7	-57	34
PA4	62	3	-53	10
RA1	57	4	3	-68
RA2	68	-16	19	-47
RA3	56	-60	19	24
RA4	57	-63	24	29
RA5	66	-46	28	2
TA1	40	35	44	27
TA2	56	69	12	16
TA3	48	50	45	11
TA4	52	39	13	0

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.
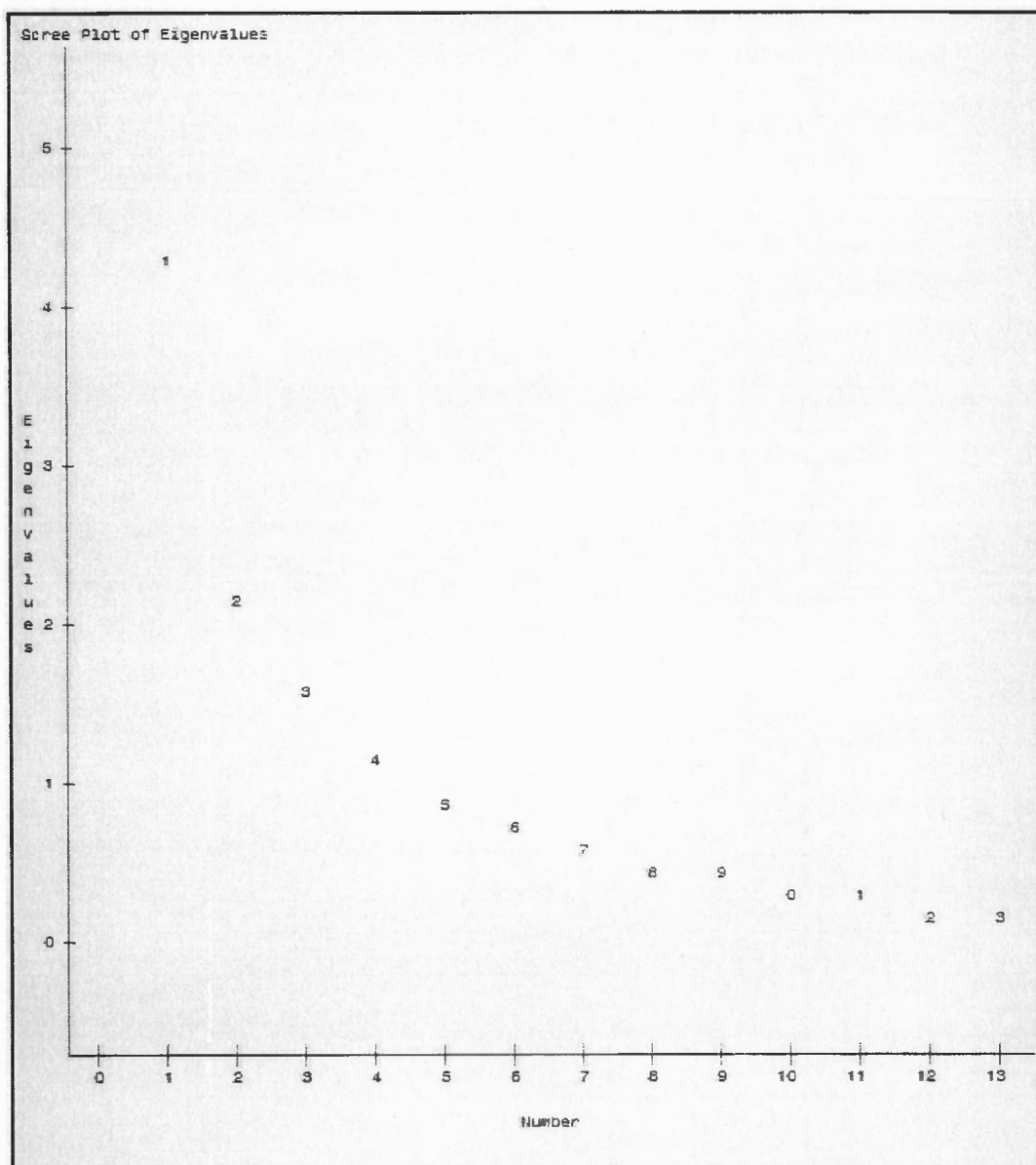
Figure 4.7 Scree plot showing the initial factor extraction for perceived affordance construct.

Table 4.34 Factor Analysis (VARIMAX Rotation) for the Pretest of Perceived Affordance Scales

Factor Label	Component	1	2	3	Communality
Relational affordances	RA4	**92**	10	2	**.86**
	RA3	**87**	13	2	**.88**
	RA5	**82**	12	15	**.70**
Physical affordances	PA3	24	**84**	-3	**.76**
	PA4	17	**84**	5	**.74**
	PA2	-4	**73**	31	**.62**
Transactional affordances	TA2	-11	35	**84**	**.84**
	TA3	9	9	**80**	**.66**
	TA1	16	-7	**78**	**.64**

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.
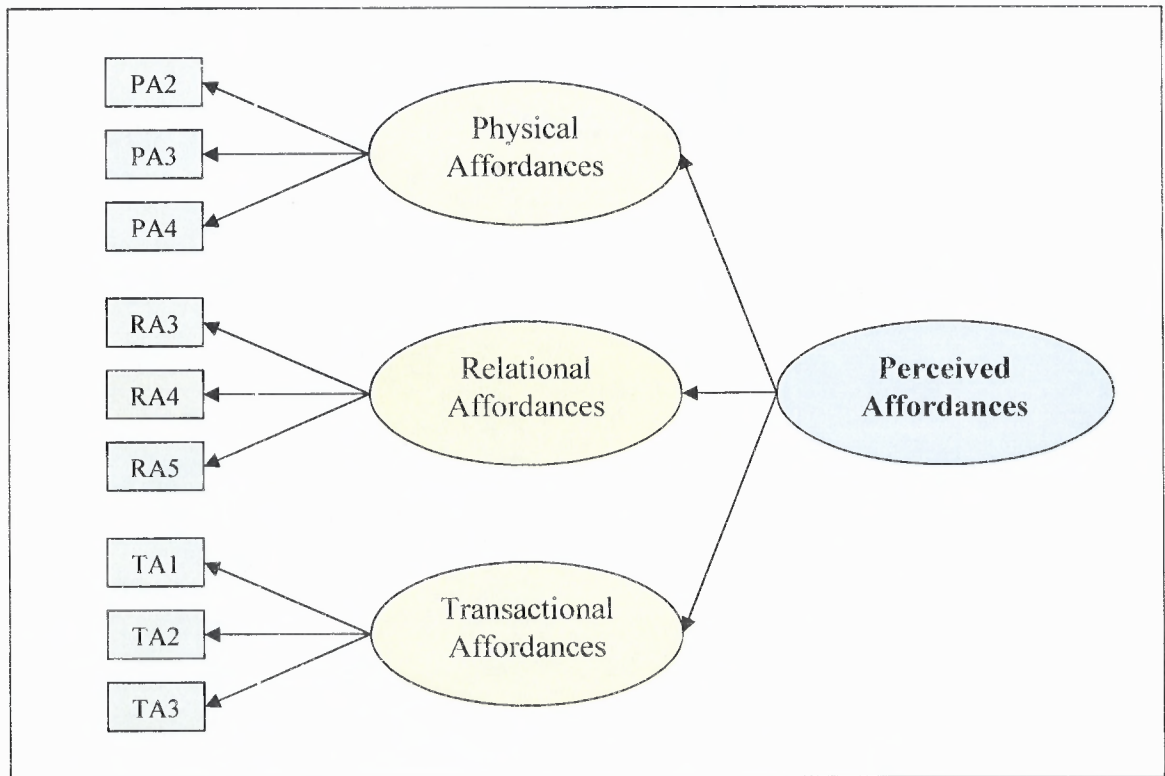
Figure 4.8 Measurement model of perceived affordance construct.

4.4.4 Principal Component Analysis for the Pretest of Need Satisfaction Scales

Similar to the measurement scales of perceived affordances, the factor analysis of the new measurement scales of need satisfaction is performed to evaluate the number of latent constructs or factors that the measurement items load on. The latent root criteria of eigenvalues greater than 1 is used to determine the number of factor suggested by principal component. Any factor loadings in the range of ±.30 to ±.40 are considered as a minimum level for interpretation of structure.

The initial factor loading results (as shown in Table 4.35) suggest two factors to be extracted, which explain 54.03% of the total variance. The Scree test, as shown in Figure 4.9, also confirmed the same results. Since the results satisfy the presumption about the number of factors (or latent constructs) corresponding to the need satisfaction construct, the factor analysis with VARIMAX rotation is performed next and the result is shown in Table 4.36. Finally, Figure 4.10 summarizes the measurement model of need satisfaction construct.

Table 4.35 Standardized Item Loadings for Need Satisfaction Constructs

Indicator	1	2
NSI1	60	-7
NSI2	68	-34
NSI3	46	-34
NSI4	77	-22
NSI5	66	-39
NSI6	58	65
NSI7	76	44
NSI8	46	30

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.
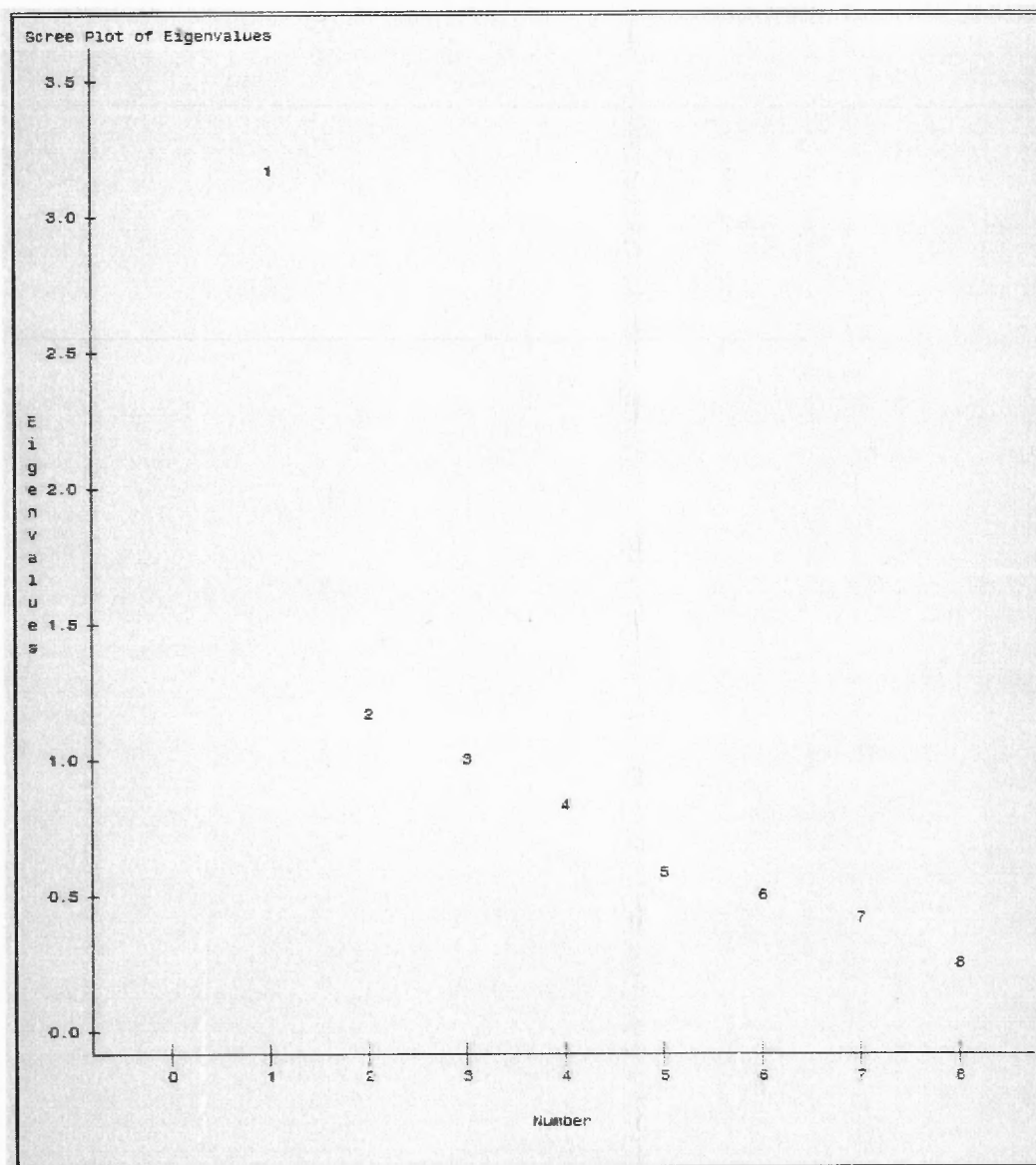
Figure 4.9 Scree plot showing the initial factor extraction for need satisfaction construct.

Table 4.36 Factor Analysis (VARIMAX Rotation) for the Pretest of Need Satisfaction Scales

Factor Label	Component	1	2	Communality
Satisfaction of Deficiency Needs	NSI1	87	3	.76
	NSI2	83	30	.78
	NSI3	52	17	.30
Satisfaction of Growth Needs	NSI8	13	76	.59
	NSI5	17	74	.58
	NSI7	32	73	.63
	NSI6	3	57	.35
	NSI4	33	50	.36

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.
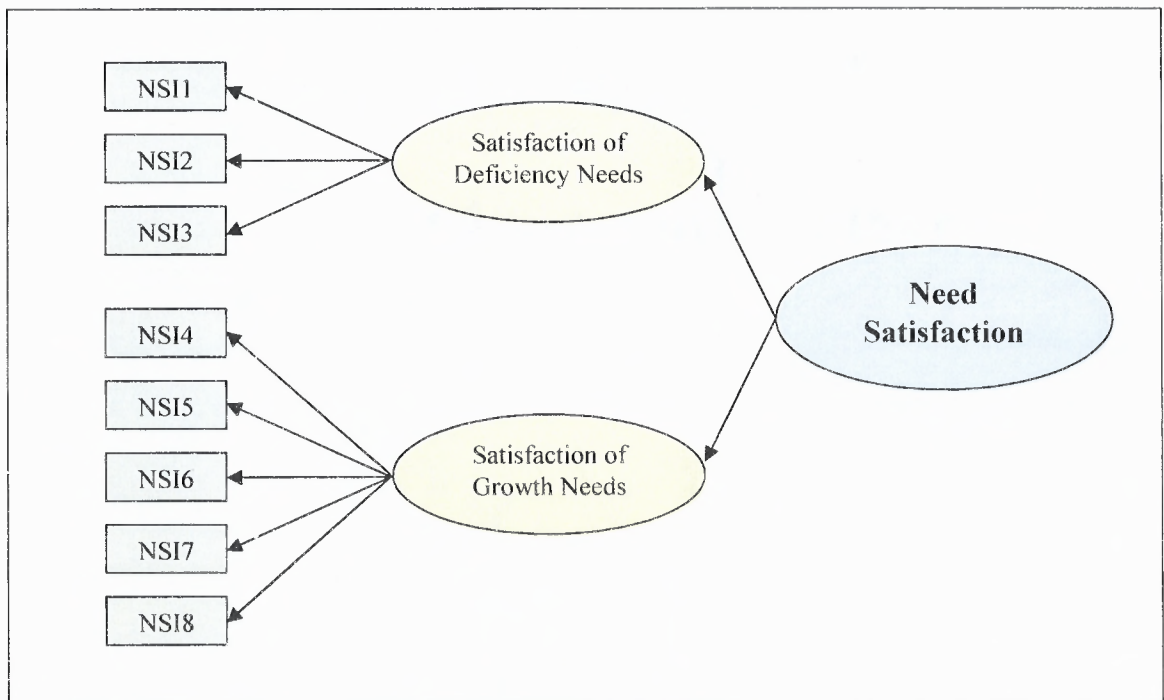
Figure 4.10 Measurement model of need satisfaction construct.

4.4.5 Conclusions of the Pretest

The pretest of the new measurement scales of perceived affordance and need satisfaction show a satisfactory result. The total of 67 completed questionnaire survey containing these new measurement scales is obtained. The initial scales are analyzed using the

Principal Component Analysis (PCA). According to the results, the perceived affordance construct is fragmented into three latent factors, which are perceived physical affordances (PA), perceived relational affordances (RA), and perceived transactional affordances (TA). Each latent factor contains another three measurement scales that load strongly on their corresponding latent factors.

The need satisfaction scales or Need Satisfaction Index (NSI) is obtained from respondents who answer series of questions suggested by Porter (1961). The NSI is modified by applying Additive Difference Specification (ADS) to make it more interpretable. The scales are analyzed using the PCA. The results suggest that the need satisfaction variable is fragmented into two factors, which are called deficiency need satisfaction (DEF) and growth need satisfaction (GRW). The former factor contains three measurement scales and the latter contains five measurement scales. All of these scales are loaded significantly on their corresponding factors.

The measurement model of the perceived affordance and the need satisfaction variables obtained from the pretest, as well as the previous validated measurement scales of the relationship-based trust and intention to purchase variables obtained from the preliminary studies, are retained for the main study. The following table summarizes the measurement scales of all variables related to this research.

Table 4.37 Summary of the Measurement Scales

Component	Wording
Perceived Physical Affordances (PA)	
PA1	I found that program functions (or menus) allowed me to do things with ease.
PA2	I found that the program functions (or menus) supported me in navigation and control of my avatar.
PA3	I found that the program functions (or menus) allowed me to understand their operations.
PA4 (dropped)	I was able to predict the outcome of my actions when I saw the program's functions (or menus).
Perceived Relational Affordances (RA)	
RA1 (dropped)	Second Life…enabled me to have a casual conversation with other people.
RA2 (dropped)	Second Life…enabled me to know if I would be able to get together with the group of people.
RA3	Second Life…enabled me to know how others feel emotionally.
RA4	Second Life…enabled me to understand the state of mind of the people I interacted with.
RA5	Second Life…enabled me to establish close relationships with other people.
Perceived Transactional Affordances (TA)	
TA1	Second Life…allowed me to understand the process of money transfer and/or money exchange.
TA2	Second Life…allowed me to know the steps I should do when purchasing a product, transferring money, and buying virtual currency.
TA3	Second Life…enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase.
TA4 (dropped)	Second Life…enabled me to easily view my money balance.
Benevolence Trust (BEN)	
TR1	I do not believe that the virtual stores (and staffs) would act in my best interest.
TR2	If I required assistance, the virtual store (and staffs) would do their best to help me.
TR3	The virtual stores (and staffs) were truthful in dealings with me.
TR4	The virtual stores (and staffs) were unlikely to act opportunistically, even given the chance.
Credibility Trust (CRE)	
TR5	I feel that the virtual stores (and staffs) were not credible.
TR6	The virtual stores (and staffs) understood the market in which they work.
TR7	The virtual stores (and staffs) were competent and effective in providing products and/or services.
TR8	The virtual stores (and staffs) were competent and effective in providing products and/or services.

Table 4.37 Summary of the Measurement Scales (Continued)

Component	Wording
Growth Need Satisfaction (GRW)	
NSI1	The Opportunity to develop close friendships with other people in Second Life. - How important is this? - How much this should be? - How much is there now?
NSI2	The sense of self-respect while I am in Second life. - How important is this? - How much this should be? - How much is there now?
NSI3	The opportunity to have my choice in expressing my "true self" through my avatar. - How important is this? - How much this should be? - How much is there now?
Deficiency Need Satisfaction (DEF)	
NSI4	The feeling of pleasure and enjoyment while I am in Second Life. - How important is this? - How much this should be? - How much is there now?
NSI5	The feeling of self-fulfillment I receive while I am in Second Life. - How important is this? - How much this should be? - How much is there now?
NSI6	The quality of products/services in Second Life. - How important is this? - How much this should be? - How much is there now?
NSI7	The products/services from virtual stores in Second Life meet my needs. - How important is this? - How much this should be? - How much is there now?
NSI8	The feeling of security from threats and/or uncertainties when using Second Life. - How important is this? - How much this should be? - How much is there now?

Table 4.37 Summary of the Measurement Scales (Continued)

Component	Wording
Intention to Purchase	
INT1	I…to use Second Life in the next month to purchase "virtual" goods or services.
INT2	I…to use Second Life in the next month to purchase "real world" goods or services.
INT3	In the next 3 months, I am…to foresee purchasing "virtual" goods or services.
INT4	In the next 3 months, I am…to foresee purchasing "real world" goods or services.
INT5	I…use Second Life to purchase "virtual" goods or services from the virtual stores again.
INT6	I…use Second Life to purchase "real world" goods or services from the virtual stores again.

4.5 Summary of the Open-Ended Questions

The questionnaire instrument used in the main study includes two optional open-ended questions, which ask the participants the following questions:

- What is the one thing that you like the most about SL (particularly, shopping in this virtual world)?

- What is the major barrier or shortcoming that decreases your willingness to use Second Life (particularly, to buy things)?

The results reveal some interesting findings regarding attitude about using Second Life in shopping. The summary of the findings, which are analyzed using positivist method (or text analysis method), shows the top seven reasons for each of the questions given by the participants as shown in Table 4.38.

Table 4.38 Results of the Open-Ended Questions

Answer	Frequency
What is the one thing that you like the most about SL (particularly, shopping in this virtual world)?	
Variety of products and services.	48
Meeting other people and making friends.	21
The opportunity to develop their own businesses and/or products, creativity.	18
A quick and easy purchasing process, convenience.	16
Can do (or buy) things cannot do, be, or afford in real life.	10
The opportunity to customize the avatar.	8
Quality and functionality of the products meet expectation.	7
What is the major barrier or shortcoming that decreases your willingness to use Second Life (particularly, to buy things)?	
Slow graphic loading/lags, slow purchasing process.	31
Problems regarding the product and service quality.	25
Lost inventory/security problems regarding the transaction process.	19
Prices of the products/service are too high or increasing.	18
No guideline for the products, no product ratings, or problems with product searching.	16
Problems with trust issues or risk of privacy concerns.	13
Products and services are not for real-life purpose.	7

The highest rank of the reasons regarding what the participants like the most about Second Life and particularly shopping in this virtual world is the variety of virtual products and services available for the customers. Although countless of companies have emerged in Second Life in the recent years, many participants complain that there is some barrier of getting the right products in the reasonable time. Many participants deprecate that there is no guideline for the products, either from the other users' feedbacks (or ratings) or from recommendation systems. Therefore, searching a particular product from a huge selection from virtual merchants in Second Life is time-consuming. Besides, some of the participants mention that the search function is based only on the merchants, not the products themselves. Oppositely, some participants appreciate the fact that they can find anything they want in Second Life.

Users are also satisfied that Second Life encourages creativeness from designers or business entities. This encourages creativity of virtual products and services that can fulfill the consumer needs. Some participants assert that they are able to acquire products that they cannot afford in real-life. Similarly, some participants also mention that they can also be what they want to be in the virtual world. This implies that these participants are able to fulfill their higher-level of the desires they possess when using Second Life. The next reason is the ability users have to customize their avatars. These two previous reasons also indicate that the avatar is reflection of the true-self or an expression of who the users want to be in real life. Finally, participants mention the quality and functionality of the products are acceptable. Other participants complain that the products are inferior. Many of them express that many products they purchased are quite different from what they have seen on the display, mostly because the quality of textures and color. Some participants report that the products do not fit well with their avatars. Moreover, some products do not have a demo that their avatars can try. Therefore, they consider the purchase a waste of money as the product do not fit their avatar or not meet their expectations of quality.

Among many good reasons given, there seems to have been a lot more complaints about Second Life and its ability to handle the business functions. For instance, many participants complain about the delay of graphic loading while they search for the products. This is a major barrier that discourages users from purchasing the products in this world. Moreover, many participants express some disappointment about their inventories being lost. Many of them suggest that the database systems should be improved. Also, expansion of the user's growth may deteriorate the consistency and the

reliability of the database systems. Moreover, many participants also complain that weak security can make some users feel insecure and uncertainty about providing their personal information to the others since it can be stolen by hackers. This reason is one of the major barriers for business operated in Second Life nowadays as the Linden Research Inc. cannot examine all users (and their real identities). Because of this reason, many participants do not trust the merchants or their business partners only by Second Life contact, but require other off-world information for business interactions. Based on these results obtained from the open-ended questions, it can implies that trust based on the relationships among users or between business partners is not required in this initial stage of businesses in Second Life. However, users are more focused on trusting mechanisms that provided by the virtual world platform or the company in which the system is created.

Finally, some participants assert the fact that business in Second Life generally involves the creation of virtual products, not real-life products. This reason makes some participants feel fruitless in spending money in Second Life. Many of them only spend the money they earn from various in-world sources, such as camping or participating in surveys. Although product prices increase, quality and creativity do not. Thus, many people feel that it is useless to spend money for these kinds of products.

4.6 Conclusions

The preliminary studies employ the case study method with a focus on the utilization of various qualitative methods in data collection and data analysis. The case study consists of the document analysis, the direct observation, and the semi-structured interview. The objectives of the document analysis are fact findings about the chronological

developments of the virtual worlds and their usages. The document analysis results provide a big picture of the virtual worlds about their evolutions and their expansion. The results of the document analysis show that the number of the active users and the registered users increases substantially. This also includes the number of transactions, market values, and business potential of the virtual world, which are grown proportionally with the number of registered users. Many sources also predict that the virtual world users, as well as the in-world business operations, will grow substantially in the next five years (or until 2012).

The purpose of direct observation is to examine the system's functions and new virtual world environment. Moreover, the researcher's experience from direct observations can enhance the understanding about the virtual world, people, customs, and values, which will help the researcher in the data interpretation. The results of direct observations suggest that virtual world is a social networking system that incorporates various interactive and multimedia communication mechanisms. Generally, the Second Life's features are moderately complicated. New users can easily become familiar with the basic functions, such as chat, instant messaging, gesture, and navigational functions. However, more complicated functions, such as building tools require more time to learn how to operate. Second Life residents enjoy many social activities that are created by residents. Shopping is also a popular activity as many virtual stores are ranked among the most popular places or the high-traffic SIMs according to the direct observations and the interviews. The researcher also finds that the purchasing process is fairly simple and secure. Therefore, users can easily exchange virtual currency and engage in business transactions in Second Life.

Finally, the interviews of 28 Second Life residents are conducted to understand the facts about general purchasing behaviors and attitudes towards the new virtual environment, the system functions, the virtual products and services and the purchasing processes. The results of the interviews suggested that Second Life provides users with good experiences. Avatars and other system functions are easy to operate and control. Many of them considered Second Life as another means to get in touch with friends and family.

As for attitudes about virtual shopping, many participants consider virtual shopping as a fun and exciting activity that they can enjoy with friends and other people they know. Participants generally express positive feelings about the service and the courtesy of the virtual merchants who assist them. Users also agree that having an agent help them with the purchasing process, product guidance, and customization is a great idea. Many inexperienced (with the product purchase) participants also expressed their intention to buy virtual products in the near future. Finally, a majority of the participants are satisfied with their experiences with virtual merchants.

The pretest of the perceived affordances and need satisfaction variables are conducted after the pilot study completed. All measurement scales of perceived affordance variables are redefined to consistent with the theory of affordances. Need satisfaction measurement scales are also introduced in this stage. The results suggest that three items are loaded in each of the perceived affordance construct. Need satisfaction construct is fragmented into two dimensions, which are deficiency need satisfaction and growth need satisfaction. There are three components loaded on deficiency need satisfaction construct, and five components loaded on growth need satisfaction construct.

The results of valid measurement scales of perceived affordance and need satisfaction variables are used in the main study.

The results of the open-ended questions obtained from the main study suggest many aspects regarding the improvement of the product quality and the system process. First, the Second Life systems must reliable and secure to support business functions and encourage users to create innovative products and/or services. Second, the system must be controlled to prevent any security leak and outside intrusion. Although Second Life is the anonymous promoted environment, real identity should be examined and required during the registration process, not just a valid email address. Third, the speed of hardware and the three-dimensional graphic technology need to be improved to overcome the delay of the content loading. This problem can create a major barrier for business entering in Second Life as all contents are loaded at the same time the customers arrive on their SIMs. Most importantly, the search function should be improved to include some filter systems that help customize products and/or services the users are seeking.

CHAPTER 5

BIVARIATE ASSOCIATION ANALYSIS AND DEVELOPMENT OF MEASUREMENT MODEL

5.1 Overview

This chapter discusses the development of the measurement model for the main study, which it was conducted in July to September 2009. The main study used a questionnaire survey method consisting of 54 questions. The questionnaires are divided into three major parts – (1) demographic information, (2) measurement items, and (3) open-ended questions – as already described in Chapter 4. The results of bivariate analysis, data treatment and the development of the measurement model using Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA) are discussed in this chapter. Then the results of hypotheses testing, using path analysis to perform the structural equation model (SEM) and partial least square (PLS) analysis, will be discussed in the next chapter.

The structure of this chapter consists of eleven sections. The results of bivariate analyses for demographic and usage information, as well as for measurement scales, are described in the sections two to four. Then the procedures of data remedies and data treatments are explained in section five. The sixth section describes the tests of reliability of the measurement scales of each latent variable.

The seventh section illustrates Principal Component Analysis (PCA) of the measurement scales. Then, the validity checks of each measurement construct are performed and the results are presented in section eight. The ninth section discusses the results of Confirmatory Factor Analyses (CFA) of both a main research model and a

model based on the data obtained from inexperienced participants. The tenth section discusses about a potential problem regarding common method bias and the test to detect the method bias. Finally, this chapter ends with conclusions.

5.2 Univariate and Bivariate Results of Demographic and Usage Data

This section describes results of demographic and usage data analyses using univariate and bivariate analyses (e.g., Chi-square test of independence). The main study focuses on some but not all demographic information of the users, such as gender, age, and level of education. Moreover, usage data, such as duration of system use (how long?), and frequency of system use (how often?), are also considered in this research to reflect actual experience of user and to detect any significant difference of the results obtained from different user groups.

A total of 307 from 327 survey observations were found to be valid. This is due to 17 incomplete surveys obtained from the participants who consented to the research. Of this number of valid observations:

- 226 observations (73.62%) were obtained from subjects who had hands on experience in virtual world business transactions.

- 81 observations (26.38%) were obtained from subjects who did not have or recall having any transactional experience.

Subsequent analyses including univariate analysis of demographic data, Principal Component Analysis (PCA), Path Analysis and Partial Least Square (PLS) method will be performed separately, based on participants' experiences in business transactions. In other words, the subsequent analyses of this main study will be classified into two groups, which are: (1) Experienced, and (2) Non-experienced groups.

Table 5.1 Summary of Demographic Data

		Users with experience in virtual world business transactions (N=226)		Users with no experience in virtual world business transactions and "Don't remember" users (N=81)	
Gender					
	Female	123	40.07%	46	14.98%
	Male	103	33.55%	35	11.40%
Age					
	18-23	52	16.94%	29	9.45%
	24-29	45	14.66%	18	5.86%
	30-35	41	13.36%	13	4.23%
	36-40	28	9.12%	7	2.28%
	Over 40	60	19.54%	14	4.56%
Level of Education					
	Some high school	15	4.89%	6	1.95%
	High school grad	40	13.03%	19	6.19%
	Some college	67	21.82%	22	7.17%
	College grad	68	22.15%	20	6.51%
	Post-graduate degree	36	11.73%	14	4.56%
Duration					
	1 week or less	7	2.28%	15	4.89%
	1 week to 1 month	10	3.26%	18	5.86%
	1 to 6 months	45	14.66%	20	6.51%
	6 months to 1 year	39	12.70%	14	4.56%
	1 year or more	125	40.72%	14	4.56%
Frequency					
	Several times a day	125	40.72%	31	10.10%
	Several times a week	91	29.64%	36	11.73%
	Once a week	5	1.63%	7	2.28%
	Less than a few times a month	3	0.98%	5	1.63%
	Less than once a month	2	0.65%	2	0.65%

Table 5.1 shows the summary of demographic and usage data of the main study. The numbers of male and female subjects are approximately the same for both groups. There is no significant difference in the gender distribution between experienced subjects

(123 female versus 103 male) and non-experienced subjects (46 female versus 35 male)

(Pearson Chi-square = 0.13, df = 1, sig. = .7135) as shown in Figure 5.1.
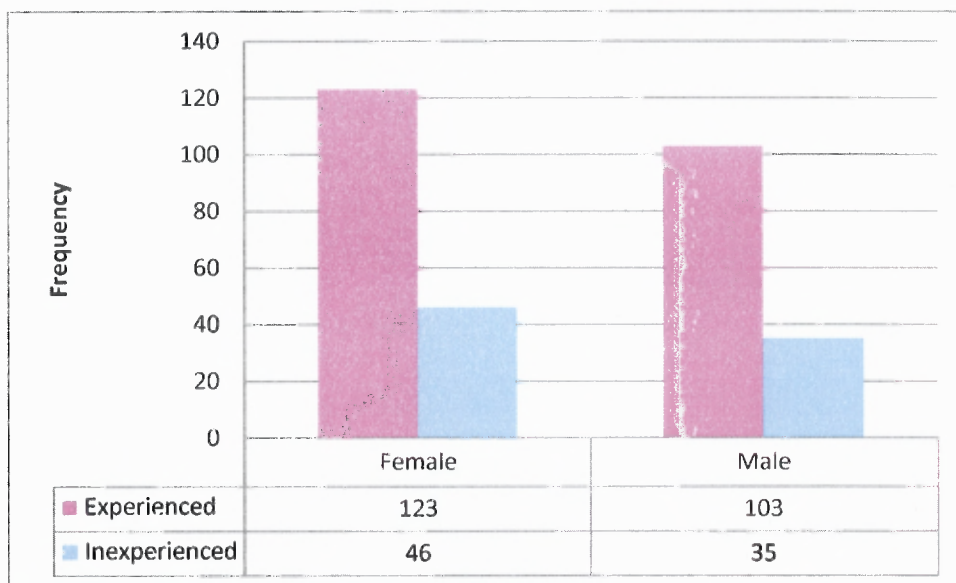
Figure 5.1 Univariate results for gender distribution.

The data reveal that the minimum age of the participants is 18, which is equal to

the minimum age of virtual world users. The data also reveal the following in regards to

the age of the participants (also shown in Figure 5.2):

- 18 to 23 years-old (52 experienced versus 29 non-experienced) accounted for 26.23%

- Over 40 years-old (60 experienced versus 14 non-experienced) accounted for 24.10%

- 24 to 29 years-old (45 experienced versus 18 non-experienced) accounted for 20.52%

- 30 to 35 years-old (41 experienced versus 13 non-experienced) accounted for 17.59%

- 36 to 40 years-olds (28 experienced versus 7 non-experienced) accounted for 11.40%
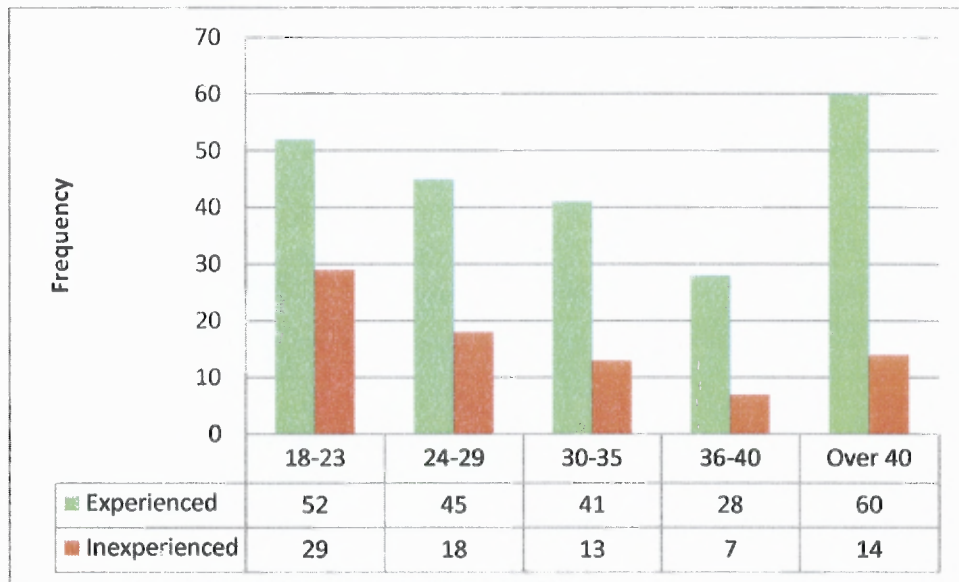
Figure 5.2 Univariate results for age distribution.

There is no significant difference in the age group distribution between the experienced subjects and non-experienced subjects (Pearson Chi-square = 6.86, df = 4, sig. = .1434).

The data shows the following in regards to the education level of the participants (also shown in Figure 5.3):

- 28.99% (67 experienced versus 22 non-experienced) had attended some college, but did not graduate

- 28.66% (68 experienced versus 20 non-experienced) were college graduates

- 19.22% (40 experienced versus 19 non-experienced) were high school graduates

- 16.29% (36 experienced versus 14 non-experienced) had obtained a post-graduate degree

- 6.84% (15 experienced versus 6 non-experienced) had attended some high school, but did not graduate

	Some high school	High school grad	Some college	College grad	Post-graduate degree
■ Experienced	15	40	67	68	36
■ Inexperienced	6	19	22	20	14
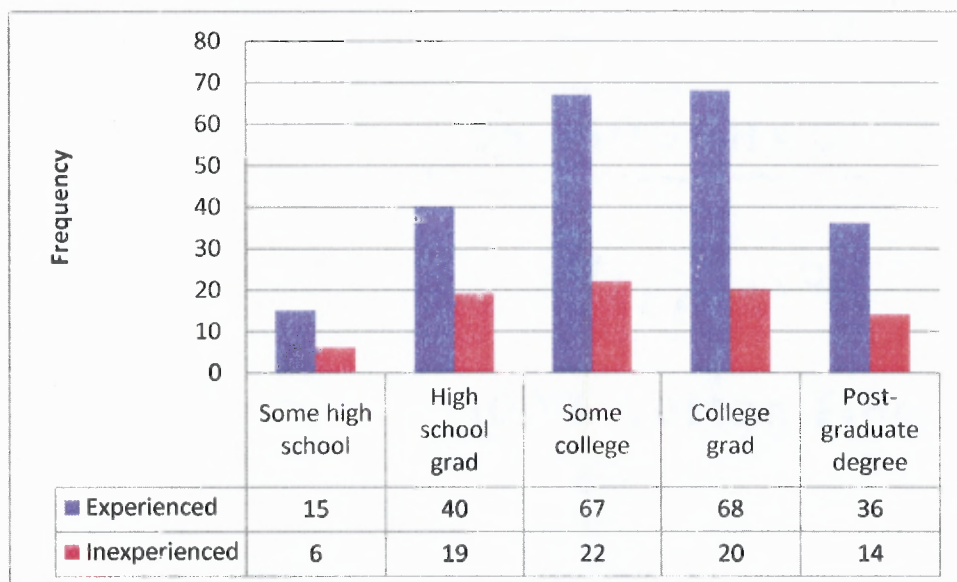
Figure 5.3 Univariate results for levels of education distribution.

Chi-square test reveals that no significant difference in educational level between the experienced subjects and non-experienced subjects (Pearson Chi-square = 1.88, df = 4, sig. = .7577).

The other two demographic data questions involved the system usages. The first question involves the duration each participant spent in the virtual world and the results are shown in Figure 5.4:

- 1 year or more: 45.28% (125 experienced versus 14 non-experienced)

- 1 month to 6 months: 21.17% (45 experienced versus 20 non-experienced)

- 6 months to 1 year: 17.26% (39 experienced versus 14 non-experienced)

- 1 week to 1 month: 9.12% (10 experienced versus 18 non-experienced)

- 1 week or less: 7.17% (7 experienced versus 15 non-experienced)

	1 week or less	1 week to 1 month	1 to 6 months	6 months to 1 year	1 year or more
Experienced	7	10	45	39	125
Inexperienced	15	18	20	14	14
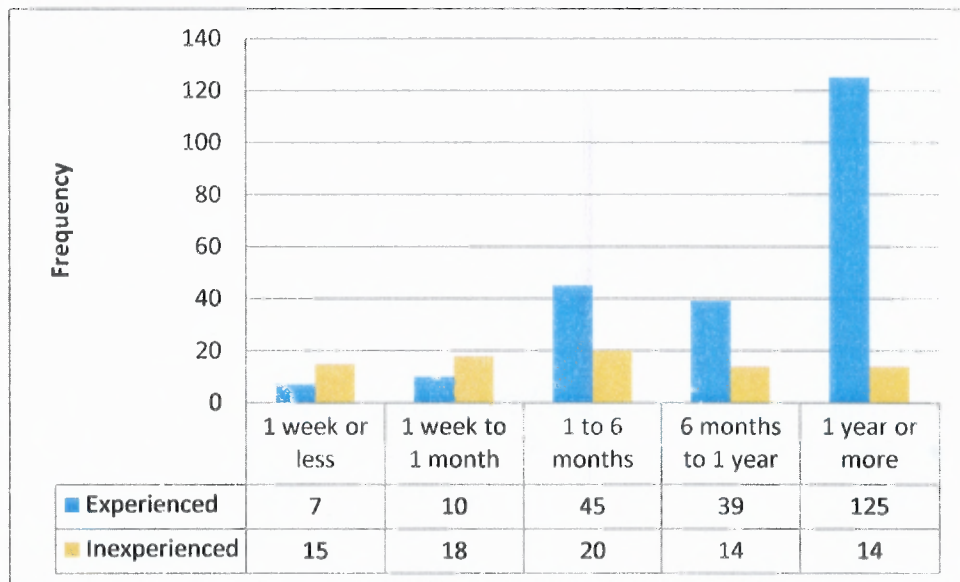
Figure 5.4 Univariate results for usage duration distribution.

The Chi-square result shows some degree of significant difference in the usage duration between these two user groups based on experience in business transactions (Pearson Chi-square = 60.18, df = 4, sig. = < .0001).

The following are the results obtained from the question regarding the usage frequency. The results are shown in Figure 5.5:

- Several times a day: 50.82% (125 experienced versus and 31 non-experienced)

- Several times a week: 41.37% (91 experienced versus 36 non-experienced)

- Once a week: 3.91% (5 experienced versus 7 non-experienced)

- Less than a few times a month: 2.61% (3 experienced versus 5 non-experienced)

- Less than once a month: 1.30% (2 experienced versus 2 non-experienced)

	Several times a day	Several times a week	Once a week	Less than a few times a month	Less than once a month
Experienced	125	91	5	3	2
Inexperienced	31	36	7	5	2
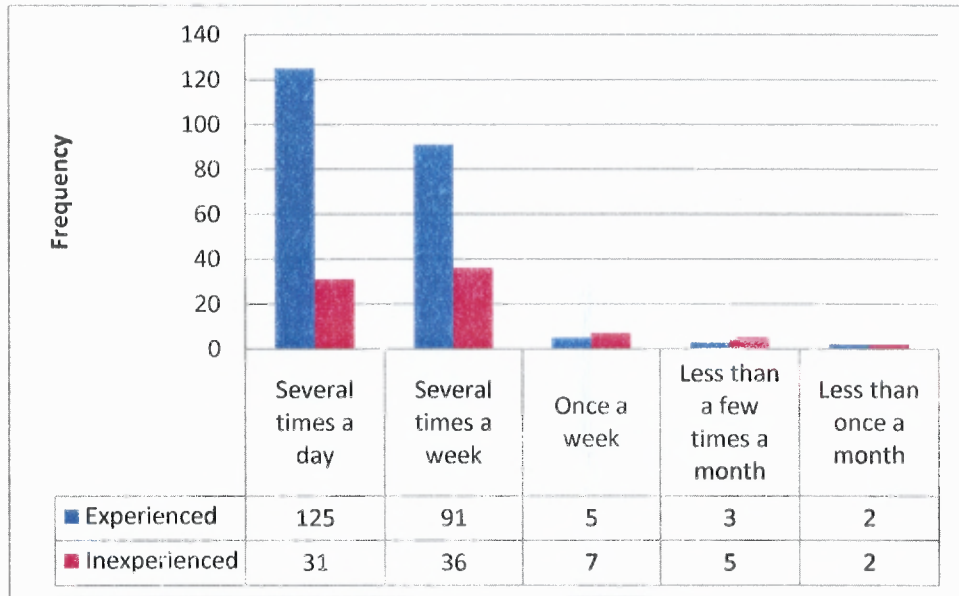
Figure 5.5 Univariate results for usage frequency distribution.

The Chi-square result is significant for the usage frequency between the two groups of users based on experience in making business transactions (Pearson Chi-square = 16.49, df = 4, sig. = 0.0024).

In sum, the results of univariate analyses suggest that those who spend more time and those who frequently use Second Life are likely to engage in business transactions. The results in this section indicate that usage duration and usage frequency can be candidates for control variables.

5.3 Univariate and Bivariate Results of Measurement Scales

This section shows the results of univariate analysis of both independent and dependent variables. Also, the Chi-square test for mean difference between answers obtained from respondents who have experience with transactions and those who have no experience has been described.

5.3.1 Univariate and Bivariate Analyses Results of Independent Variables

This dissertation focuses on the following three main independent variables: (1) perceived affordances, (2) relationship-based trust, and (3) need satisfaction. The perceived affordances can be divided into the following three latent sub-constructs: (1) physical affordances, (2) relational affordances, and (3) transactional affordances. These three latent sub-constructs have similar fundamental concepts but focus on different dimensions. Therefore, the measurement scales of these three variables can be used to determine different affordance dimensions. Perceived affordance scales use a five-point Likert type scale. Relationship-based trust is a very broad concept and requires many measurement scales to explain. Again, the measurement scales of relationship-based trust are measured by using a five-point Likert type scale. The study also focuses on the need satisfaction related to the product offered. The measurement of the need satisfaction variable uses the Need Satisfaction Index (NSI) as described in Section 2.3.2 in Chapter 2.

Physical Affordances

The results corresponding to the questions on physical affordances are summarized in Table 5.2. These results are divided into two groups based on the experience with business transactions of the respondents as described earlier. Means and standard deviations of these two participant groups are shown, in which the first number indicates the mean (and the standard deviation) of experienced group and the second number indicates the mean (and the standard deviation) of inexperienced group. The Chi-square test for PA1 is significant (Chi-square = 13.81, p = .0169). However, the other three measurement scales, which are PA2, PA3 and PA4, have p-values more than .05, which

are not significant. Overall, the data show that experienced users postulate about the same level of perceptible physical affordances of the virtual world environment as inexperienced users. Particularly, the results show that participants who have experience with business transaction are likely to have more perception in terms of ability to do things with ease. However, perceptions about the system's functions in supporting their avatars' navigability, understanding about the system's operation, and predicting the outcomes of their actions are the same for both participant groups.

Table 5.2 Summary of Univariate and Bivariate Analyses Results for Physical Affordances: *Does experience with business transaction affect perceived physical affordances?*

Label	Choice (SD to SA)	1	2	3	4	5	.
PA1	I found that program functions (or menus) allowed me to do things with ease (Mean = 3.89, 3.63; S.D. = 0.82, 0.93; Chi-square = 13.81, p = .0169)						
	Experienced	0	20	28	131	45	2
	Percentage (%)	0.00	8.85	12.39	57.96	19.91	0.88
	Non-experienced	3	7	15	45	9	2
	Percentage (%)	3.70	8.64	18.52	55.56	11.11	2.47
PA2	I found that the program functions (or menus) supported me in navigation and control of my avatar. (Mean = 4.06, 3.76; S.D. = 0.81, 1.07; Chi-square = 10.46, p = .0631)						
	Experienced	3	9	22	129	62	1
	Percentage (%)	1.33	3.98	9.73	57.08	27.43	0.44
	Non-experienced	5	4	14	38	19	1
	Percentage (%)	6.17	4.94	17.28	46.91	23.46	1.23
PA3	I found that the program functions (or menus) allowed me to understand their operations. (Mean = 3.83, 3.73; S.D. = 0.86, 1.04; Chi-square = 5.85, p = .3203)						
	Experienced	1	21	34	126	42	2
	Percentage (%)	0.44	9.29	15.04	55.75	18.58	0.88
	Non-experienced	3	9	11	40	17	1
	Percentage (%)	3.70	11.11	13.58	49.38	20.99	1.23
PA4	I was able to predict the outcome of my actions when I saw the program's functions (or menus). (Mean = 3.78, 3.65; S.D. = 0.93, 1.08; Chi-square = 10.99, p = .0516)						
	Experienced	4	22	36	119	42	3
	Percentage (%)	1.77	9.73	15.93	52.65	18.58	1.33
	Non-experienced	4	11	8	36	17	5
	Percentage (%)	4.94	13.58	9.88	44.44	20.99	6.17

Relational Affordances

Consistent with the results of physical affordances, the measure of mean difference of the measurement scales of perceptible relational affordances are not significant except for RA1 (Chi-square = 20.94, p = .0008) and RA5 (Chi-square = 14.40, p = 0.0133). The results for the questions on relational affordances are illustrated in the Table 5.3.

Table 5.3 Summary of Univariate and Bivariate Analyses Results for Relational Affordances: *Does experience with business transaction affect perceived relational affordances?*

Label	Choice (SD to SA)	1	2	3	4	5	.
RA1	Second Life…enabled me to have a casual conversation with other people. (Mean = 4.55, 4.20; S.D. = 0.65, 0.90; Chi-square = 20.94, p = .0008)						
	Experienced	1	1	10	72	140	2
	Percentage (%)	0.44	0.44	4.42	31.86	61.95	0.88
	Non-experienced	2	4	2	40	32	1
	Percentage (%)	2.47	7.94	2.47	49.38	39.51	1.23
RA2	Second Life…enabled me to know if I would be able to get together with the group of people. (Mean = 4.06, 3.68; S.D. = 0.84, 1.00; Chi-square = 9.57, p = .0882)						
	Experienced	2	8	38	100	70	8
	Percentage (%)	0.88	3.54	16.81	44.25	30.97	3.54
	Non-experienced	2	7	20	32	16	4
	Percentage (%)	2.47	8.64	24.69	39.51	19.75	7.94
RA3	Second Life…enabled me to know how others feel emotionally. (Mean = 3.81, 3.72; S.D. = 1.01, 0.91; Chi-square = 3.52, p = .6192)						
	Experienced	4	26	38	97	56	5
	Percentage (%)	1.77	11.50	16.81	42.92	24.78	2.21
	Non-experienced	1	7	19	36	15	3
	Percentage (%)	1.23	8.64	23.46	44.44	18.52	3.70
RA4	Second Life…enabled me to understand the state of mind of the people I interacted with. (Mean = 3.81, 3.60; S.D. = 1.02, 1.09; Chi-square = 5.11, p = .4031)						
	Experienced	6	24	31	102	56	7
	Percentage (%)	2.65	10.62	13.72	45.13	24.78	3.10
	Non-experienced	3	11	14	31	16	6
	Percentage (%)	3.70	13.58	17.28	38.27	19.75	7.41
RA5	Second Life…enabled me to establish close relationships with other people. (Mean = 4.16, 3.68; S.D. = 0.93, 1.10; Chi-square = 14.40, p = .0133)						
	Experienced	2	13	30	79	97	5
	Percentage (%)	0.88	5.75	13.27	34.96	42.92	2.21
	Non-experienced	4	8	15	30	20	4
	Percentage (%)	7.94	9.88	18.52	37.04	24.59	7.94

The results of bivariate analysis between two participant groups indicate that experienced participants perceive a higher level of relational affordances in terms of the system's ability in supporting them in communication and social relationship establishment with other users. However, both participant groups posit about the same perception of relational affordances in terms of the system's ability in predicting other's emotional and social situations.

Transactional Affordances

The results for the questions on transactional affordances are shown in Table 5.4. Since the questions are related to personal experience in business transactions such as money transfer or money exchange, these questions are apropos for respondents who have experience in making transactions only. Therefore, the data from the respondents without experience cannot be analyzed.

The results of transactional affordance scales show high mean values for all questions. This implies that the respondents have a positive attitude towards the characteristics regarding the transactional affordances of the system. Specifically, most of the experienced participants agree that the system's function allow them to understand the process of purchasing transactions, money transfer, and money exchange in Second Life. They also are able to easily check the financial status or the account balance.

Table 5.4 Summary of Univariate and Bivariate Analyses Results for Transactional Affordances: *Does experience with business transaction affect perceived transactional affordances?*

Label	Choice (SD to SA)	1	2	3	4	5	.
TA1	Second Life…allowed me to understand the process of money transfer and/or money exchange. (Mean = 3.93, S.D. = 1.05)						
	Experienced	4	6	29	119	62	6
	Percentage (%)	1.77	2.65	12.83	52.65	27.43	2.65
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TA2	Second Life…allowed me to know the steps I should do when purchasing a product, transferring money, and buying virtual currency. (Mean = 3.96, S.D. = 1.06)						
	Experienced	5	9	25	113	69	5
	Percentage (%)	2.21	3.98	11.06	50.00	30.53	2.21
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TA3	Second Life…enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase. (Mean = 3.88, S.D. = 1.09)						
	Experienced	5	21	27	101	69	3
	Percentage (%)	2.21	9.29	11.95	44.69	30.53	1.33
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TA4	Second Life…enabled me to easily view my money balance. (Mean = 4.04, S.D. = 1.19)						
	Experienced	1	8	84	0	129	4
	Percentage (%)	0.44	3.54	37.17	0.00	57.08	1.77
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-

Relationship-Based Trust

Similar to the measurement scales of transactional affordances, the questions on relationship-based trust are also related to experience in business transactions. Therefore, these questions are apropos for respondents who have experience in making transactions only. Therefore, the data from the respondents without experience is not analyzed. Table 5.5 shows the results of the univariate analysis for relationship-based trust.

Table 5.5 Summary of Univariate and Bivariate Analyses Results for Relationship-Based Trust: *Does experience with business transaction affect relationship-based trusting beliefs?*

Label	Choice (SD to SA)	1	2	3	4	5	.
TR1	I do not believe that the virtual stores (and staffs) would act in my best interest. (Mean = 2.54, S.D. = 1.13)						
	Experienced	19	96	57	33	12	9
	Percentage (%)	8.41	42.28	25.22	14.60	5.31	3.98
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TR2	If I required assistance, the virtual store (and staffs) would do their best to help me. (Mean = 3.68, S.D. = 1.08)						
	Experienced	2	18	43	115	41	7
	Percentage (%)	0.88	7.96	19.03	50.88	18.14	3.10
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TR3	The virtual stores (and staffs) were truthful in dealings with me. (Mean = 3.72, S.D. = 1.06)						
	Experienced	1	16	44	115	43	7
	Percentage (%)	0.44	7.08	19.47	50.88	19.03	3.10
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TR4	The virtual stores (and staffs) were unlikely to act opportunistically, even given the chance. (Mean = 2.89, S.D. = 1.33)						
	Experienced	9	42	72	65	17	21
	Percentage (%)	3.98	18.58	31.86	28.76	7.52	9.29
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TR5	I feel that the virtual stores (and staffs) were not credible. (Mean = 2.19, S.D. = 1.02)						
	Experienced	41	107	48	15	7	8
	Percentage (%)	18.14	47.35	21.24	6.64	3.10	3.54
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TR6	The virtual stores (and staffs) understood the market in which they work. (Mean = 3.59, S.D. = 1.19)						
	Experienced	3	17	47	107	41	11
	Percentage (%)	1.33	7.52	20.80	47.35	18.14	4.87
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-
TR7	The virtual stores (and staffs) were competent and effective in providing products and/or services. (Mean = 3.58, S.D. = 1.22)						
	Experienced	4	19	46	102	44	11
	Percentage (%)	1.77	8.41	20.35	45.13	19.47	4.87
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-

Table 5.5 Summary of Univariate and Bivariate Analyses Results for Relationship-Based Trust (Continued)

Label	Choice (SD to SA)	1	2	3	4	5	.
TR8	The virtual stores (and staffs) were competent and effective in providing products and/or services. (Mean = 3.81, S.D. = 0.99)						
	Experienced	1	10	49	111	50	5
	Percentage (%)	0.44	4.42	21.68	49.12	22.12	2.21
	Non-experienced	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-

The results of bivariate analysis show high mean values for TR2, TR3, TR6, TR7, and TR8. The average mean values of these measurement scales are greater than the median, implying that most of the participants have a strong believe on virtual store's trustworthiness. Specifically, most of them agree that the virtual stores are promptly help them and competent in handling business process in Second Life. In addition, most of the participants indicate that the virtual stores are credible and would act on their best interests. However, most of them disagrees that the virtual stores are unlikely to engage in opportunistic behavior if they have a chance.

In sum, although there are high perception on trust based on experience with the virtual stores, most of the participants still believe that the virtual stores are likely to take advantage from them if there is a chance.

Need Satisfaction

The results corresponding to the questions on need satisfaction are shown in Table 5.6. The results show that the respondents generally satisfied with the product/service offered by virtual stores as seen from a high number of frequencies in categories 0-6, which indicates the least deviation from the perfect need fulfillment. Specifically, the NSI value of zero indicates the perfect need fulfillment (where the answers from *How much is there*

now? and *How much this should be?* are the same) and the higher value of NSI indicates a higher deviation from the perfect need fulfillment. The more importance weight also implies that the need fulfillment is more deviate from the perfect line, given that all other scores are the same.

Therefore, categories of NSI that range from 0 to 42 indicate many levels of need satisfaction. The first category (0-6) indicates that the participants have a perfect or nearly perfect satisfaction on their needs, and any deviation from the perfect line does not have a strong importance weight. Whereas the last category (37-42) indicates that the participants have a large deviation from the perfect line, and this deviation also has a high importance weight. The Chi-square tests of mean difference between two participant groups for NSI1 to NSI5 are not significant, which imply the similarity between the distributions of the need satisfaction index between these two groups. The mean values of NSI6 to NSI8 are quite low, which indicate that most of the participants are nearly obtained what they expected. Although, the standard deviation for NSI6, which regards of the product and service quality, is large indicating that participants have different fulfillment on their needs about the product and service quality.

Table 5.6 Summary of Univariate and Bivariate Analyses Results for Need Satisfaction: *Does experience with business transaction affect consumer's need satisfaction?*

Label	Choice (SD to SA)	0-6	7-12	13-18	19-24	25-30	31-36	37-42
NSI1	The Opportunity to develop close friendships with other people in Second Life. (Mean = 1.50, 1.49; S.D. = 1.62, 1.45; Chi-square = 5.78, p = .4486)							
	Experienced	120	28	12	23	2	3	38
	Percentage (%)	53.10	12.39	5.31	10.18	0.88	1.33	16.81
	Non-experienced	40	18	3	7	1	2	10
	Percentage (%)	49.38	22.22	3.70	8.64	1.23	2.47	12.34
NSI2	The sense of self-respect while I am in Second life. (Mean = 1.27, 1.37; S.D. = 1.48, 1.64; Chi-square = 8.84, p = .1829)							
	Experienced	135	22	13	25	2	2	27
	Percentage (%)	59.73	9.73	5.75	11.06	0.88	0.88	11.95
	Non-experienced	51	9	3	2	0	2	14
	Percentage (%)	62.96	11.11	3.70	2.47	0.00	2.47	17.28
NSI3	The opportunity to have my choice in expressing my "true self" through my avatar. (Mean = 1.02, 1.31; S.D. = 1.58, 1.43; Chi-square = 9.89, p = .0784)							
	Experienced	159	8	9	11	0	7	32
	Percentage (%)	70.35	3.54	3.98	4.87	0.00	3.10	14.16
	Non-experienced	49	7	9	5	0	2	9
	Percentage (%)	60.49	8.64	11.11	6.17	0.00	2.47	11.11
NSI4	The feeling of pleasure and enjoyment while I am in Second Life. (Mean = 1.44, 1.53; S.D. = 1.68, 1.64; Chi-square = 8.82, p = .1841)							
	Experienced	124	16	13	24	0	6	43
	Percentage (%)	54.87	7.08	5.75	10.62	0.00	2.65	19.03
	Non-experienced	45	5	6	6	2	0	17
	Percentage (%)	55.56	6.17	7.41	7.41	2.47	0.00	20.99
NSI5	The feeling of self-fulfillment I receive while I am in Second Life. (Mean = 1.27, 1.46; S.D. = 1.55, 1.50; Chi-square = 3.51, p = .7422)							
	Experienced	143	12	16	17	2	4	34
	Percentage (%)	63.27	5.31	7.08	7.52	0.88	1.77	15.04
	Non-experienced	47	6	7	8	0	0	13
	Percentage (%)	58.02	7.41	8.64	9.88	0.00	0.00	16.05
NSI6	The quality of products/services in Second Life. (Mean = 2.80, S.D. = 5.59)							
	Experienced	65	17	21	41	1	9	72
	Percentage (%)	28.76	7.52	9.29	18.14	0.44	3.98	31.86
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
NSI7	The products/services from virtual stores in Second Life meet my needs. (Mean = 1.91, S.D. = 1.66)							
	Experienced	91	19	22	26	1	11	56
	Percentage (%)	40.27	8.41	9.73	11.50	0.44	4.87	24.78
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-
NSI8	The feeling of security from threats and/or uncertainties when using Second Life. (Mean = 2.27, S.D. = 1.90)							
	Experienced	86	14	12	25	2	7	80
	Percentage (%)	38.05	6.19	5.31	11.06	0.88	3.10	35.40
	Non-experienced	-	-	-	-	-	-	-
	Percentage (%)	-	-	-	-	-	-	-

5.3.2 Univariate and Bivariate Analyses Results of Dependent Variable

The intention to purchase is the dependent variable of this research. There are six measurement scales of this variable. These scales use a seven-point Semantic Differential type scale. The results reject the null hypothesis of no significant different for INT1, INT3, INT4, and INT5, which indicate that the mean distributions between these two participant groups are different. There is no significant different between the mean of two participant groups for INT2 and INT6. The results corresponding to questions on intention to purchase are shown in the Table 5.7.

Specifically, the Chi-square test for mean difference as shown in Table 5.7 reports that respondents who have experience with business transactions are more likely to make a future purchase of *virtual products* than those who do not have experience with business transactions in Second Life. Meanwhile, the chi-square test reports no difference on means of intention to purchase *real world products* between these two groups of the participants. Two out of three measurement scales regarding the intention to purchase real world products are not significant.

There are two kinds of products as stated in measurement scales of the dependent variable, which are *virtual* products, and *real world* products. Raw data obtained from these two groups of respondents are analyzed for their distributions and normality based on experience of the participants and the different kinds of products as stated in the measurement scales. A 2 x 2 contingency table is shown in Figure 5.6.

Table 5.7 Summary of Univariate and Bivariate Analyses Results for Intention to Purchase: *Does experience with business transaction affect intention to purchase?*

Label	Choice (SD to SA)	1	2	3	4	5	6	7	.
INT1	I…to use Second Life in the next month to purchase "virtual" goods or services. (Mean = 5.61, 4.34; S.D. = 1.73, 2.09; Chi-square = 33.69, p = < .0001)								
	Experienced	9	9	8	16	26	38	103	17
	Percentage (%)	3.98	3.98	3.54	7.08	11.50	16.81	45.58	7.52
	Non-experienced	11	4	4	12	11	13	12	14
	Percentage (%)	13.58	4.94	4.94	14.81	13.58	16.05	14.81	17.28
INT2	I…to use Second Life in the next month to purchase "real world" goods or services. (Mean = 2.45, 2.67; S.D. = 2.05; 1.98; Chi-square = 5.73, p = .5709)								
	Experienced	122	17	9	13	7	10	21	27
	Percentage (%)	53.98	7.52	3.98	5.75	3.10	4.42	9.29	11.95
	Non-experienced	37	8	3	7	6	3	5	12
	Percentage (%)	4.57	9.88	3.70	8.64	7.41	3.70	6.17	14.81
INT3	In the next 3 months, I am…to foresee purchasing "virtual" goods or services. (Mean = 6.01, 4.95; S.D. = 1.73, 2.06; Chi-square = 23.60, p = .0013)								
	Experienced	10	6	10	11	14	19	148	8
	Percentage (%)	4.42	2.65	4.42	4.87	6.19	8.41	65.49	3.54
	Non-experienced	7	2	8	8	11	6	31	8
	Percentage (%)	8.64	2.47	9.88	9.88	13.58	7.41	3.83	9.88
INT4	In the next 3 months, I am…to foresee purchasing "real world" goods or services. (Mean = 2.72, 2.99; S.D. = 2.28, 2.15; Chi-square = 22.88, p = .0018)								
	Experienced	119	21	16	9	8	7	34	12
	Percentage (%)	52.65	9.29	7.08	3.98	3.54	3.10	15.04	5.31
	Non-experienced	26	9	9	7	4	5	7	14
	Percentage (%)	32.10	11.11	11.11	8.64	4.94	6.17	8.64	17.28
INT5	I…use Second Life to purchase "virtual" goods or services from the virtual stores again. (Mean = 6.06, 4.62; S.D. = 1.47, 2.00; Chi-square = 44.56, p = < .0001)								
	Experienced	4	4	5	20	23	26	138	6
	Percentage (%)	1.77	1.77	2.21	8.85	10.18	11.50	61.06	2.65
	Non-experienced	8	4	6	17	9	10	20	7
	Percentage (%)	9.88	1.77	2.65	20.99	11.11	12.35	24.69	8.64
INT6	I…use Second Life to purchase "real world" goods or services from the virtual stores again. (Mean = 2.73, 3.20; S.D. = 2.12, 2.14; Chi-square = 8.62, p = .2830)								
	Experienced	100	31	13	18	9	10	25	20
	Percentage (%)	44.25	13.72	5.75	7.96	3.98	4.42	11.06	8.85
	Non-experienced	24	10	7	8	6	5	9	12
	Percentage (%)	29.63	12.35	8.64	9.88	7.41	6.17	11.11	14.81
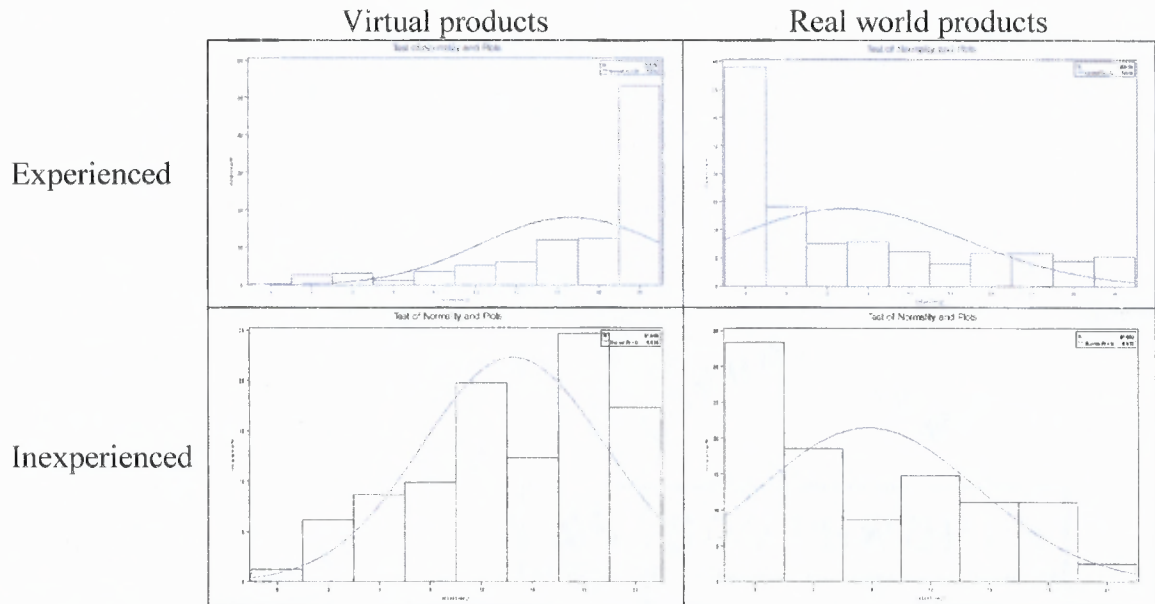
Figure 5.6 The 2 x 2 contingency table showing frequency and normal distribution plots.

The results of normality test, in which the null hypothesis states that the data is not normally distributed, are rejected. Both Shapiro-Wilk's W and Kolmogorov-Smirnov's D indices show the significant results, which can conclude that all data are normally distributed.

When comparing the responses based on user experience, the results of frequency plots, as shown in Figure 5.6, indicate that there are more frequencies on the right-hand side (indicating the highest likelihood score) for intention to purchase virtual products than those for intention to purchase real world products for both experienced and inexperienced user groups. In vice versa, there are more frequencies on the left-hand side (indicating the lowest likelihood score) for intention to purchase real world products for both user groups. These results imply that most of the respondents intend to purchase only the virtual products in Second Life in the near future.

5.4 Bivariate Association Analysis

Table 5.8 shows the results of Pearson correlations between any two measurement scales (components). Each cell shows the correlation coefficient and its significant level. Highlighted areas indicate significant correlations among components. A positive correlation implies that the relationship between two components is varied in the same direction. Oppositely, a negative correlation means the relationship between two components is varied in the opposite direction. The numbers representing correlation coefficients indicate the magnitudes of the relationship between two components, in which -1.00 and +1.00 indicate perfect relationships, while 0.00 indicates no relationship.

The following is a guideline for interpreting the strength of the relationships in the Pearson correlation matrix, based on the absolute values of the coefficient (O'Rourke et al., 2005):

- means a perfect correlation

- 0.80 means a strong correlation

- 0.50 means a moderate correlation

- 0.20 means a weak correlation

- means no correlation

The results of bivariate association as obtained from the correlation matrix show that there are many moderate to strong correlations among measurement scales of their corresponding latent variables and there are generally weak correlations between the measurement scales of any latent variable and the measurement scales of the other non-correspondence latent variables. For instance, there are significant correlations among components of perceived affordance, need satisfaction, and intention to purchase

constructs. There are significant correlations between perceived affordance scales and those of relationship-based trust. While relational affordance scales and transaction affordance scales are significantly correlated to those of need satisfaction and intention to purchase constructs.

The correlation matrix also shows that there are significant correlations between perceived affordance scales and those of dependent variable (INT1 to INT6). However, there are less significant correlations between need satisfaction scales and those of dependent variable, and also between relationship-based trust scales and those of dependent variable. In addition, the results also show that the correlations between marker variables (the variables that irrelevant with the context of study) and the other measurement constructs are weak.

The bivariate associations between dependent variable scales and the demographic data, including gender, age, level of education, and usage duration, reveal quite low correlation coefficients. However, the correlation between dependent variable scales and usage frequency shows many significant coefficients.

Table **5.8** Pearson Correlation Matrix

	Gender	Age	Edu	Duration	Freq	PA1	PA2	PA3	PA4	RA1	RA2	RA3	RA4	RA5	TA1	TA2	TA3	TA4	TR1	TR2	TR3	TR4
Gender	1.00																					
Age	0.17 .0094	1.00																				
Edu	-0.09 .1451	0.13 .0471	1.00																			
Duration	-0.01 .9245	0.16 .0168	0.07 .3220	1.00																		
Freq	0.02 .8148	-0.07 .2993	0.04 .5544	0.04 .5590	1.00																	
PA1	-0.05 .4782	-0.09 .1715	-0.11 .0875	-0.01 .9070	-0.04 .5078	1.00																
PA2	-0.10 .1508	-0.07 .3263	-0.10 .1158	0.12 .0629	-0.02 .7973	0.60 <.0001	1.00															
PA3	-0.05 .4955	-0.10 .1331	-0.16 .0169	-0.02 .8065	-0.09 .1906	0.52 <.0001	0.53 <.0001	1.00														
PA4	-0.10 .1189	-0.09 .2012	-0.13 .0546	0.03 .6928	-0.13 .0524	0.50 <.0001	0.47 <.0001	0.65 <.0001	1.00													
RA1	-0.04 .6006	0.06 .4080	0.02 .7491	0.07 .3170	-0.04 .5274	0.32 <.0001	0.34 <.0001	0.16 .0154	0.27 <.0001	1.00												
RA2	-0.09 .1611	-0.10 .1261	-0.22 .0010	-0.01 .8713	-0.09 .1985	0.46 <.0001	0.29 <.0001	0.34 <.0001	0.39 <.0001	0.52 <.0001	1.00											
RA3	-0.04 .5264	0.04 .5575	-0.09 .1975	0.05 .4768	0.20 .0025	0.21 .0014	0.08 .2290	0.16 .0173	0.27 <.0001	0.34 <.0001	0.44 <.0001	1.00										
RA4	-0.03 .6069	-0.06 .3784	-0.10 .1385	-0.02 .7991	-0.16 .0168	0.22 .0008	0.13 .0519	0.22 .0008	0.24 .0003	0.27 <.0001	0.43 <.0001	0.77 <.0001	1.00									
RA5	0.03 .6363	0.00 .9962	-0.16 .0187	-0.02 .7822	-0.30 <.0001	0.21 .0015	0.17 .0103	0.25 .0001	0.28 <.0001	0.38 <.0001	0.45 <.0001	0.47 <.0001	0.50 <.0001	1.00								
TA1	-0.09 .1564	0.03 .6151	-0.12 .0650	0.05 .4991	-0.09 .1534	0.29 <.0001	0.23 .0007	0.29 <.0001	0.31 <.0001	0.18 .0064	0.33 <.0001	0.21 .0012	0.20 .0025	0.25 .0001	1.00							
TA2	-0.12 .0732	-0.01 .9365	0.15 .0270	0.08 .2248	-0.12 .0693	0.30 <.0001	0.27 <.0001	0.28 <.0001	0.32 <.0001	0.26 <.0001	0.40 <.0001	0.24 .0003	0.20 .0021	0.27 <.0001	0.71 <.0001	1.00						
TA3	-0.05 .4178	0.01 .8642	-0.20 .0027	0.01 .9321	-0.06 .3473	0.32 <.0001	0.27 <.0001	0.24 .0002	0.37 <.0001	0.25 .0001	0.36 <.0001	0.27 <.0001	0.24 .0003	0.27 <.0001	0.57 <.0001	0.61 <.0001	1.00					
TA4	-0.03 .6163	0.00 .9827	-0.06 .4077	-0.04 .5244	-0.06 .3385	0.10 .1490	0.21 .0013	0.15 .0235	0.25 .0001	0.30 <.0001	0.15 .0278	0.13 .0443	0.07 .2845	0.20 .0050	0.33 <.0001	0.42 <.0001	0.38 <.0001	1.00				
TR1	-0.14 .0423	0.05 .4504	-0.10 .1228	0.16 .0151	0.02 .8207	0.25 .0001	0.35 <.0001	0.22 .0008	0.22 .0007	0.16 .0178	0.21 .0015	0.10 .1157	0.12 .0750	0.24 .0003	0.27 <.0001	0.24 .0002	0.22 .0008	0.16 .0182	1.00			
TR2	-0.04 .5166	-0.08 .2358	-0.11 .1007	-0.03 .6088	0.00 .9758	0.28 <.0001	0.19 .0033	0.21 .0011	0.29 <.0001	0.17 .0111	0.30 <.0001	0.20 .0027	0.23 .0005	0.25 .0002	0.26 <.0001	0.19 .0036	0.24 .0003	0.20 .0020	0.27 <.0001	1.00		
TR3	-0.12 .0703	-0.04 .5883	-0.11 .0978	-0.01 .8691	-0.01 .8843	0.28 <.0001	0.20 .0029	0.24 .0003	0.39 <.0001	0.27 <.0001	0.33 <.0001	0.18 .0075	0.19 .0051	0.23 .0006	0.27 <.0001	0.34 <.0001	0.38 <.0001	0.31 <.0001	0.33 <.0001	0.69 <.0001	1.00	
TR4	-0.11 .1138	0.01 .8660	-0.05 .4237	0.05 .4738	-0.07 .3180	0.16 .0183	0.13 .0536	0.04 .0313	0.12 .0662	0.10 .1266	0.19 .0036	0.09 .1923	0.11 .0908	0.13 .0435	0.21 .0012	0.15 .0237	0.18 .0075	0.06 .3629	0.28 <.0001	0.27 <.0001	0.23 .0005	1.00

Note: Numbers below show significance level of corresponding correlation. The highlighted areas show any significant correlation at .05 level.

Table 5.8 Pearson Correlation Matrix (Continued)

	Gender	Age	Edu	Duration	Freq	PA1	PA2	PA3	PA4	RA1	RA2	RA3	RA4	RA5	TA1	TA2	TA3	TA4	TR1	TR2	TR3	TR4
TR5	-0.10 / .1529	0.14 / .0379	-0.11 / .1122	0.15 / .0274	0.01 / .8555	0.21 / .0014	0.31 / <.0001	0.17 / .0098	0.23 / .0005	0.14 / .0341	0.18 / .0064	0.12 / .0686	0.07 / .2722	0.23 / .0004	0.23 / .0004	0.24 / .0003	0.17 / .0111	0.18 / .0077	0.44 / <.0001	0.36 / <.0001	0.51 / <.0001	0.02 / .7888
TR6	-0.06 / .3477	-0.02 / .7917	-0.06 / .3944	-0.11 / .0867	-0.01 / .8628	0.27 / <.0001	0.25 / <.0001	0.27 / <.0001	0.29 / <.0001	0.15 / .0256	0.28 / <.0001	0.22 / .0009	0.27 / <.0001	0.23 / .0004	0.33 / <.0001	0.38 / <.0001	0.32 / <.0001	0.33 / <.0001	0.33 / <.0001	0.46 / <.0001	0.49 / <.0001	0.17 / .0104
TR7	-0.14 / .0368	-0.09 / .1924	-0.18 / .0059	-0.04 / .5297	-0.01 / .8724	0.25 / .0001	0.20 / .0020	0.27 / <.0001	0.34 / <.0001	0.21 / .0015	0.29 / <.0001	0.24 / .0002	0.25 / .0002	0.19 / .0049	0.36 / <.0001	0.38 / <.0001	0.32 / <.0001	0.27 / <.0001	0.27 / <.0001	0.47 / <.0001	0.46 / <.0001	0.12 / .0739
TR8	-0.14 / .0310	-0.12 / .0757	-0.15 / .0210	-0.05 / .4671	-0.03 / .7069	0.25 / .0002	0.25 / .0002	0.26 / <.0001	0.34 / <.0001	0.19 / .0037	0.26 / <.0001	0.21 / .0016	0.25 / .0002	0.27 / <.0001	0.33 / <.0001	0.33 / <.0001	0.32 / <.0001	0.17 / .0084	0.29 / <.0001	0.54 / <.0001	0.50 / <.0001	0.18 / .0054
NSI1	0.05 / .4324	-0.03 / .6093	-0.03 / .6715	-0.04 / .5986	0.03 / .6641	-0.10 / .1419	-0.16 / .0140	-0.10 / .1178	-0.06 / .3515	-0.06 / .3909	-0.09 / .1857	-0.20 / .0025	-0.16 / .0158	-0.03 / .7027	-0.18 / .0082	-0.18 / .0078	-0.09 / .1785	0.06 / .3336	-0.07 / .2632	-0.09 / .1628	-0.09 / .1713	-0.01 / .8357
NSI2	0.14 / .0379	0.00 / .9857	-0.07 / .2964	-0.15 / .0291	0.03 / .6976	-0.04 / .5680	-0.07 / .3102	0.04 / .5283	-0.03 / .6266	0.01 / .8272	-0.09 / .1644	-0.05 / .4160	-0.06 / .3583	0.09 / .1578	0.00 / .9553	-0.13 / .0584	-0.04 / .5719	0.04 / .5183	-0.15 / .0249	-0.05 / .4986	-0.09 / .1559	-0.07 / .3132
NSI3	-0.04 / .5153	-0.03 / .7019	0.09 / .1953	-0.12 / .0838	-0.06 / .3947	0.05 / .4215	0.13 / .0580	-0.02 / .7614	-0.02 / .8730	0.12 / .0761	-0.04 / .5954	-0.05 / .4680	-0.03 / .6954	-0.02 / .7621	-0.10 / .1520	-0.10 / .1287	-0.10 / .1215	-0.05 / .5769	-0.01 / .8972	-0.03 / .6062	-0.04 / .5642	-0.07 / .2948
NSI4	0.05 / .4908	-0.09 / .1845	0.02 / .7685	-0.03 / .6977	0.07 / .2916	-0.03 / .6422	-0.05 / .4431	-0.02 / .7974	-0.02 / .7821	-0.05 / .4388	-0.14 / .0356	-0.23 / .0005	-0.19 / .0045	-0.05 / .4368	-0.14 / .0374	-0.08 / .2557	-0.12 / .0644	-0.02 / .8004	-0.02 / .7796	-0.10 / .1474	-0.09 / .1854	-0.10 / .1173
NSI5	0.05 / .4902	-0.01 / .9229	0.02 / .7985	-0.12 / .0814	0.07 / .2887	0.11 / .0928	-0.01 / .8464	0.00 / .9828	-0.04 / .5617	0.08 / .2512	0.00 / .9146	-0.13 / .0673	-0.09 / .1753	0.00 / .9857	-0.02 / .7180	-0.05 / .4758	0.02 / .7477	0.08 / .2108	0.05 / .4730	0.01 / .8919	0.01 / .9037	0.01 / .9085
NSI6	0.03 / .6538	-0.09 / .1987	0.10 / .1242	0.06 / .4092	0.03 / .6490	-0.16 / .0171	-0.04 / .4975	-0.13 / .0460	-0.09 / .1639	0.01 / .9303	-0.17 / .0088	-0.20 / .0021	-0.20 / .0029	-0.12 / .0755	-0.19 / .0033	-0.14 / .0295	-0.12 / .0704	0.03 / .6280	-0.04 / .5234	-0.21 / .0012	-0.21 / .0015	-0.11 / .1065
NSI7	0.00 / .9608	-0.12 / .0779	0.10 / .1540	-0.01 / .8640	0.02 / .7467	-0.10 / .1446	0.04 / .5982	-0.04 / .5806	-0.08 / .2062	-0.07 / .2994	-0.15 / .0212	-0.26 / <.0001	-0.19 / .0046	-0.13 / .0499	-0.18 / .0073	-0.20 / .0031	-0.17 / .0104	0.00 / .9653	-0.12 / .0770	-0.26 / <.0001	-0.32 / <.0001	-0.10 / .1514
NSI8	0.02 / .7379	-0.01 / .8298	0.08 / .2051	-0.07 / .2688	-0.04 / .5803	-0.19 / .0046	-0.07 / .2853	-0.10 / .1358	-0.10 / .1275	-0.03 / .6438	-0.22 / .0008	-0.23 / .0004	-0.29 / <.0001	-0.16 / .0137	-0.28 / <.0001	-0.27 / <.0001	-0.26 / <.0001	-0.03 / .6483	-0.15 / .0228	-0.32 / <.0001	-0.24 / .0003	-0.22 / .0007
INT1	-0.24 / .0003	-0.03 / .6946	0.06 / .3354	0.02 / .7599	-0.43 / <.0001	0.19 / .0034	0.15 / .0283	0.22 / .0007	0.27 / <.0001	0.25 / .0001	0.27 / <.0001	0.24 / .0003	0.17 / .0085	0.27 / <.0001	0.21 / .0018	0.24 / .0003	0.22 / .0008	0.22 / .0009	0.11 / .0855	0.02 / .7428	0.11 / .0955	0.09 / .1999
INT2	0.00 / .9608	-0.03 / .5868	-0.10 / .1434	-0.02 / .7689	-0.18 / .0060	0.15 / .0214	0.10 / .1503	0.14 / .0299	0.16 / .0181	0.00 / .9864	0.17 / .0123	0.17 / .0086	0.19 / .0036	0.11 / .0972	0.14 / .0303	0.12 / .0708	0.11 / .1118	0.02 / .7584	-0.01 / .8269	0.05 / .4854	0.07 / .3157	0.10 / .1510
INT3	-0.12 / .0707	0.00 / .9953	0.06 / .3783	0.06 / .3376	-0.34 / <.0001	0.14 / .0390	0.13 / .0543	0.16 / .0156	0.18 / .0053	0.26 / <.0001	0.24 / .0003	0.24 / .0003	0.23 / .0004	0.29 / <.0001	0.21 / .0017	0.25 / .0002	0.22 / .0007	0.19 / .0040	0.10 / .1206	0.00 / .9535	0.05 / .4938	0.10 / .1461
INT4	0.04 / .5256	-0.10 / .1312	-0.15 / .0224	-0.07 / .2627	-0.14 / .0330	0.20 / .0027	0.00 / .9944	0.15 / .0223	0.14 / .0307	-0.04 / .5584	0.20 / .0027	0.20 / .0028	0.24 / .0002	0.12 / .0781	0.18 / .0054	0.15 / .0256	0.17 / .0088	-0.02 / .7905	-0.09 / .1779	0.08 / .2247	0.05 / .4563	0.13 / .0432
INT5	-0.21 / .0012	0.04 / .5460	0.07 / .3293	0.09 / .1584	-0.23 / .0006	0.20 / .0022	0.22 / .0009	0.18 / .0082	0.21 / .0016	0.26 / <.0001	0.27 / <.0001	0.13 / .0439	0.13 / .0572	0.24 / .0003	0.25 / .0001	0.33 / <.0001	0.29 / <.0001	0.21 / .0017	0.23 / .0004	0.09 / .1560	0.17 / .0101	0.14 / .0305
INT6	0.04 / .5658	-0.02 / .7368	-0.13 / .0553	0.00 / .8975	-0.19 / .0034	0.13 / .0523	0.02 / .7430	0.08 / .2563	0.13 / .0571	-0.12 / .0621	0.17 / .0103	0.10 / .1391	0.14 / .0372	0.10 / .1256	0.19 / .0048	0.19 / .0036	0.18 / .0080	0.14 / .0401	-0.03 / .6602	0.08 / .2147	0.11 / .0934	0.11 / .0976
Marker1	-0.05 / .4475	-0.05 / .4833	0.10 / .1411	0.07 / .3198	-0.02 / .7645	0.13 / .0522	0.10 / .1203	0.01 / .9097	0.08 / .2095	0.13 / .0438	0.16 / .0196	0.14 / .0335	0.30 / <.0001	0.05 / .4168	0.11 / .0908	0.15 / .0277	0.07 / .2629	0.14 / .0401	0.11 / .1097	0.13 / .0435	0.08 / .2040	0.05 / .4368
Marker2	-0.04 / .5193	-0.14 / .0320	-0.07 / .3253	-0.04 / .5679	-0.10 / .1346	0.04 / .5569	-0.06 / .3606	0.00 / .9235	-0.03 / .6685	-0.14 / .0324	0.40 / .4044	0.33 / .3252	0.01 / .0096	0.20 / .1954	0.28 / .2844	0.30 / .2973	0.30 / .2988	0.78 / .7815	-0.12 / .0690	0.07 / .2788	-0.07 / .3272	-0.10 / .1472

Note: Numbers below show significance level of corresponding correlation. The highlighted areas show any significant correlation at .05 level.

Table 5.8 Pearson Correlation Matrix (Continued)

	TR5	TR6	TR7	TR8	NSI1	NSI2	NSI3	NSI4	NSI5	NSI6	NSI7	NSI8	INT1	INT2	INT3	INT4	INT5	INT6	Marker1	Marker2
TR5	1.00																			
TR6	0.28 <.0001	1.00																		
TR7	0.27 <.0001	0.62 <.0001	1.00																	
TR8	0.36 <.0001	0.47 <.0001	0.73 <.0001	1.00																
NSI1	-0.04 .5992	-0.08 .2454	-0.15 .0229	-0.09 .1586	1.00															
NSI2	-0.05 .4928	-0.11 .0866	-0.17 .0100	-0.11 .0974	0.45 <.0001	1.00														
NSI3	0.00 .9972	-0.03 .6676	-0.16 .0173	-0.05 .4170	0.24 .0003	0.37 <.0001	1.00													
NSI4	-0.05 .4581	0.00 .9721	-0.07 .2860	-0.05 .4347	0.36 <.0001	0.44 <.0001	0.31 <.0001	1.00												
NSI5	-0.01 .9343	0.04 .5783	-0.04 .5303	0.04 .5869	0.41 <.0001	0.40 <.0001	0.32 <.0001	0.61 <.0001	1.00											
NSI6	-0.11 .0889	-0.18 .0055	0.19 .0049	-0.21 .0012	0.24 .0002	0.19 .0051	0.23 .0005	0.37 <.0001	0.32 <.0001	1.00										
NSI7	-0.20 .0022	-0.17 .0099	-0.30 <.0001	-0.23 .0005	0.32 <.0001	0.28 <.0001	0.34 <.0001	0.43 <.0001	0.34 <.0001	0.66 <.0001	1.00									
NSI8	-0.14 .0293	-0.25 .0001	-0.26 <.0001	-0.27 <.0001	0.31 <.0001	0.28 <.0001	0.28 <.0001	0.39 <.0001	0.33 <.0001	0.49 <.0001	0.51 <.0001	1.00								
INT1	0.11 .1142	0.07 .2911	0.12 .0643	0.11 .1017	0.01 .8895	0.06 .3826	0.06 .3866	0.00 .9593	0.01 .8256	0.01 .9373	0.04 .5845	-0.04 .5119	1.00							
INT2	0.02 .7303	0.06 .3884	0.10 .1419	0.08 .2335	-0.01 .8484	-0.02 .7871	-0.04 .5261	-0.13 .0566	-0.06 .3981	-0.21 .0018	-0.14 .0390	-0.13 .0480	0.27 <.0001	1.00						
INT3	0.09 .2027	0.04 .5378	0.11 .1034	0.10 .1455	0.02 .8162	0.09 .1747	0.03 .6537	0.04 .5540	0.02 .7570	0.07 .2668	0.06 .3454	-0.02 .8094	0.78 <.0001	0.16 .0131	1.00					
INT4	-0.09 .1683	0.11 .0871	0.15 .0247	0.14 .0400	-0.04 .5961	-0.01 .8576	-0.10 .1682	-0.15 .0221	-0.05 .4214	0.25 .0001	-0.20 .0028	-0.17 .0116	0.13 .0442	0.78 <.0001	0.16 .0179	1.00				
INT5	0.20 .0021	0.15 .0250	0.18 .0079	0.20 .0029	0.00 .9130	0.02 .7427	-0.02 .7480	0.03 .6853	0.06 .4014	0.13 .0438	0.06 .3665	-0.07 .2807	0.41 <.0001	0.09 .1801	0.72 <.0001	0.09 .1870	1.00			
INT6	-0.04 .5822	0.11 .1131	0.19 .0039	0.13 .0469	-0.07 .2787	-0.06 .3309	-0.08 .2567	-0.14 .0407	-0.08 .2192	-0.23 .0006	-0.20 .0024	-0.15 .0241	0.15 .0238	0.60 <.0001	0.14 .0339	0.73 <.0001	0.18 .0065	1.00		
Marker1	0.08 .1981	0.18 .0063	0.17 .0118	0.19 .0042	-0.01 .8543	-0.05 .4144	-0.08 .2412	-0.09 .1579	-0.01 .8817	-0.07 .3207	-0.01 .9255	-0.08 .2333	0.17 .0094	0.24 .0002	0.20 .0027	0.25 .0001	0.18 .0072	0.20 .0032	1.00	
Marker2	-0.14 .0408	0.11 .0854	0.16 .0172	0.09 .1850	0.04 .5936	-0.04 .5076	-0.05 .4765	-0.03 .6634	0.00 .9434	0.02 .7204	-0.01 .8333	-0.14 .0370	-0.07 .3074	0.16 .0186	0.01 .8516	0.23 .0005	0.01 .8807	0.20 .0024	0.11 .1017	1.00

Note: Numbers below show significance level of corresponding correlation. The highlighted areas show any significant correlation at .05 level.

5.5 Data Analysis and Treatment

The measurement model is a specification of the model that shows how constructs are operationalized by sets of measurement variables (Hair et al., 2006). Before other statistical analyses can be applied, and the results that explain the causal relationships between variables can be obtained, raw data from the survey are examined and modified to meet the basic assumptions underlying statistical theory. These assumptions are:

- Missing data and outliers must initially be diagnosed and are appropriately handled.

- The data must be normally distributed.

- The variance of errors must meet the homoscedasticity condition.

After the data are treated appropriately to meet these criteria, other statistical analyses that assume the previous assumptions can be implemented. For instance, Principal Component Analysis (PCA) and factor analysis can be employed when the data are normalized and satisfy the homoscedasticity.

5.5.1 Analysis of Missing Data

The amount of missing data in this study is acceptable. In other words, all measurement scales contain less than 20% of missing data, which is acceptable for some statistical analyses or plausible data remedy techniques as suggested by Hair et al. (2006). The highest number of missing values is 38 out of 307 completed data sets, or 12.38%. The results of missing data analysis can be found in Appendix D. Since the data are missing at random (MAR), the probability that an observation is missing depends on the observed variable values of the individual, but not the missing variable values of the individual (Rubin, 1987). Multiple imputation method using PROC MI and PROC MIANALYZE procedures from Statistical Analysis Software (SAS) is employed for data remedies.

Contrary to a simple imputation that substitutes a value of each missing data, the multiple imputation strategy replaces each missing data with a set of plausible values that represent the uncertainty about the right value to impute (Rubin, 1976, 1987). This study uses EM algorithm to estimate the Maximum Likelihood Estimation (MLE) of the data with missing values, assuming that the data is a multivariate normal distribution.

In addition, to assess the randomness of missing data, this study compares between the data with and without missing values for each questionnaire item. In other words, the results of the t-test fall within the range of ±2.228, which suggest that there is no statistically significant difference in the means of the outcome variables associated with the known values of predictors, compared to those associated with the missing values of predictors.

5.5.2 Outliers

Outliers are captured by using graphical methods, such as box plot and stem-and-leaf plot. The analysis of the individual constructs shows the presence of outliers from the responses and the imputation of the missing data. According to Hair et al. (2006), outliers can be classified into four categories:

- **First Class Outlier:** Arise from a procedural error such as data entry errors and mistakes in coding.

- **Second Class Outlier:** Occur as the result of an extraordinary event such as uniqueness of the observation.

- **Third Class Outlier:** An extraordinary observation for which the researcher has no explanation.

- **Fourth Class Outlier:** An observation that falls within the ordinary range of values on each of the variables but are unique in their combination of values across the variables.

Table 5.9 shows the profile of individual outliers that has been detected and the decision towards data deletion or retention. For instance, there are initially 21 outliers detected from the physical affordance scales. These outliers are from the data collection or the survey. Data treatment has been performed by either or both the imputation and the normalization techniques. The final result yields the total of 15 outliers, which are retained for subsequent data analyses. These processes of data treatment can eliminate the entire outliers for the transactional affordance and the growth need satisfaction scales.

Table 5.9 Outliers and Decisions Regarding the Outliers

Construct	Type of outlier	No. of outlier	Source	Decision
Physical Affordances	2	21	(1) Data collection	(1) Eliminate by using other substituted values
		15	(2) Data treatment	(2) Retain in the analysis
Relational Affordances	2	6	Data collection	Retain in the analysis
Transactional Affordances	2	5	(1) Data collection	(1) Eliminate by using other substituted values
		0	(2) Data treatment	
Credibility Trust	2	3	Data collection	Retain in the analysis
Growth Need Satisfaction	2	13	(1) Data collection	(1) Eliminate by using other substituted values
		0	(2) Data treatment	
Deficiency Need Satisfaction	2	6	(1) Data collection	(1) Eliminate by using other substituted values
		0	(2) Data treatment	
Intention to purchase	2	1	Data collection	Retain in the analysis

5.5.3 Normality and Homoscedasticity Tests

Many multivariate statistics employed in this dissertation require the data to be normally distributed. The individual metric constructs are tested for their distributions by using the following two criteria:

1. **Skewness:** Is used to describe the balance of the distribution or to measure if the distribution has symmetrical shape. The data that are normally distributed should

have symmetrical shape. That is, the distribution does not shift to one side (left or right).

2. **Kurtosis:** Refers to the peakedness or flatness of the distribution compared with normal distribution.

The suggested value of both skewness and kurtosis is ±1 for the more stringent criteria. Kurtosis value in the range of ±2 is also acceptable. Any construct with values beyond this range for both tests indicates that the data need to be transformed. Table 5.10 summarizes the results of normality test and data transformation. Other normality test statistics, such as the test for Komogorov-Smirnov's D, Cramér-von Mises's W, and Anderson-Darling's A statistics are shown in Appendix E.

Table 5.10 Normality Test and Normalization of Data

Research Construct	Normality	Applicable Data Remidies
Physical Affordances (Range 3-15)	Skewness = -0.9931 Kurtosis = 1.4265 (not acceptable)	Transform using squared term to improve Skewness to -0.2675 and Kurtosis to 0.0809
Relational Affordances (Range 3-15)	Skewness = -0.6606 Kurtosis = 0.1197	
Transactional Affordances (Range 3-15)	Skewness = -0.9821 Kurtosis = 1.7653 (not acceptable)	Transform using third power term to improve Skewness to 0.2011 and Kurtosis to -0.7286.
Benevolence Trust Range (4-20)	Skewness = -0.1457 Kurtosis = -0.1489	
Credibility Trust Range (0-42)	Skewness = -0.5694 Kurtosis = 0.7505	
Growth Need Satisfaction Index Range (0-210)	Skewness = 1.5990 Kurtosis = 3.0511 (not acceptable)	Transform using cubed root term to improve Skewness to 0.4475 and Kurtosis to -0.5914.
Deficiency Need Satisfaction Index Range (0-135)	Skewness = 1.2445 Kurtosis = 2.1841 (not acceptable)	Transform using cubed root term to improve Skewness to -0.3198 and Kurtosis to -1.0181.
Intention to purchase Range (6-30)	Skewness = -0.0309 Kurtosis = 0.0906	

The homoscedasticity test examines if a dependent variable exhibits equal levels of variance across the range of independent variables (Hair et al., 2006). Therefore, the presence of unequal variance between these two variables implies the heteroscedasticity of variables' residuals or standard errors. The Breusch-Pagan test (1979) using the SPEC option in SAS for heteroscedasticity test is performed to test variance distribution between dependent and predictor variables. The results fail to reject the null hypothesis of no heteroscedasticity (at .05 significance level except need satisfaction at .01 level), which implies that the standard errors of the parameter estimates are correct and the data are ready for other statistical analyses. Appendix F illustrates the results of the test for homoscedasticity.

5.5.4 Detection of Multicollinearity

Multicollinearity occurs when two or more predictor variables in the model are highly correlated to each other. A model with a presence of multicollinearity, though not actually biasing the results, will produce high standard errors of the affected coefficients.

Multicollinearity can be detected by using a formal detection-tolerance or a Variance Inflation Factor (VIF). The former technique finds the tolerance values for the parameter estimated, which can be computed when the value of R-squared is known. The latter technique measures the inflation in the variances of parameter estimates due to collinearity (Freund and Littell, 2000; O'Brien, 2007). In general, a tolerance of less than 0.20 or 0.10 and/or the VIF of 5 or 10 and above indicates a multicollinearity problem (O'Brien 2007). The way to calculate the tolerance and the VIF are shown as follows:

$$Tolerance = 1 - R^2 \qquad VIF = \frac{1}{Tolerance}$$

REG procedure in SAS test is used to find the effect of multicollinearity of the proposed model. The values of tolerance of all variables are greater than 0.5 and the values of variance inflation are less than 2.0, which suggest no multicollinearity problem.

5.6 Reliability

The measurement scales are tested for internal consistency. Briefly, internal consistency is the extent to which the individual items are correlated with one another or with the total items constituted to form a measurement construct. Reliability of the measurements is accessed by a measure of internal consistency (Cronbach's alpha).

The following tables in this section show the correlation and the reliability of each research construct. The values of alpha in parentheses indicate the standardized Cronbach coefficient alpha (Cronbach and Meehl, 1955), which is the value of computed alpha when all scale items are standardized to have equal means and variances. The results illustrate that every latent construct has an acceptable reliability of greater than .70 as suggested by Nunnally (1982).

The following tables include descriptions of the following measures:

- **Mean (or Arithmetic Mean):** Represents a point estimation of values in a dataset. If the mean is high, the majority of survey responses are strongly agreed with question statements.

- **Standard Deviation:** Represents a measure of dispersion of the values in a dataset. If the standard deviation is low, the value of point estimation (mean) is more accurate.

- **Item-Total Correlation:** Represents the correlation between an individual item and the sum of the remaining items that constitute the scale. If the item-total correlation is small, the item is not measuring the same construct measured by the other items.

- **Cronbach's Alpha when Item Deleted:** Represents a non-standardized coefficient alpha when the variable (item) is deleted.

5.6.1 Reliability of Perceived Affordance Scales

Physical affordances scales are adapted from the scales of ease of use (Davis, 1989) and usability (Boling, 1995; Lederer et al., 2000) as mentioned earlier. The standardized reliability of the physical affordances scales is .8267 (as shown in Table 5.11). Relational affordances scales are adapted from previous research regarding social functions in collaborative learning (Kreijns et al., 2004). The standardized reliability of the relational affordances scales is .8086. However, the results report some problematic item-total correlations for RA1 and RA5 and suggest possible deletion for these items. Finally, transactional affordances scales also retain a high standardized reliability of .8025. However, the results report some problematic item-total correlations for TA4 and suggest possible deletion for this item. Note that the values of the physical affordance and transactional affordance scales are transformed using a squared term and a third power term, respectively.

Table 5.11 Reliability of Perceived Affordance Scales

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
Physical Affordances (Cronbach's alpha = 0.8267)					
PA1	I found that the program functions (or menus) allowed me to do things with ease.	15.85	5.93	0.6441	0.7851
PA2	I found that the program functions (or menus) supported me in navigation and control of my avatar.	17.15	5.91	0.6371	0.7883
PA3	I found that the program functions (or menus) allowed me to understand their operations.	15.41	6.09	0.6831	0.7672

Table 5.11 Reliability of Perceived Affordance Scales (Continued)

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
PA4	I was able to predict the outcome of my actions when I saw the program's functions (or menus).	15.11	6.38	0.6440	0.7851
	Relational Affordances (Cronbach's alpha = 0.8086)				
RA1	Second Life enabled me to have a casual conversation with other people.	4.55	0.65	0.4744	0.8072
RA2	Second Life enabled me to know if I would be able to get together with the group of people.	4.06	0.84	0.6000	0.7699
RA3	Second Life enabled me to know how others feel emotionally.	3.81	1.01	0.6695	0.7483
RA4	Second Life enabled me to understand the state of mind of the people I interacted with.	3.81	1.01	0.6530	0.7535
RA5	Second Life enabled me to establish close relationships with other people.	4.16	0.93	0.5823	0.7753
	Transactional Affordances (Cronbach's alpha = 0.8025)				
TA1	Second Life allowed me to understand the process of money transfer and/or money exchange.	73.19	36.08	0.6698	0.7264
TA2	Second Life allowed me to know the steps I should do when purchasing a product, transferring money, and buying virtual currency.	75.02	37.64	0.7387	0.6911
TA3	Second Life enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase.	71.84	40.48	0.6417	0.7404
TA4	Second Life enabled me to easily view my money balance.	98.03	32.93	0.4329	0.8374

5.6.2 Reliability of Relationship-Based Trust Scales

Relationship-based trust scales are based on previous research in interpersonal trust and trust in e-commerce (e.g., McKnight et al., 2002b; Pavlou and Gefen, 2002; Pavlou and Dimoka, 2006). According to the results of the Principal Component Analysis (PCA) of the pilot study, the measurement scales of relationship-based trust are fragmented into two categories, which are called in this main study a benevolence trust and a credibility trust. These measurement scales are measured using a five-point Likert type scale ranged from strongly disagree to strongly agree. The ranges of these scales are from 1 to 5.

Benevolence trust refers to a trustor's (buyer's) beliefs about a trustee's (seller's) goodwill intentions though given an opportunity to take advantage of the trustor (Pavlou and Dimoka, 2006). This dimension of relationship-based trust also implies that the trustee is concerned, truthful, and well intended to the trustor. Credibility trust refers the belief that a trustee (or a seller) is competent and reliable to perform a transaction properly and effectively. This dimension of relationship-based trust also concerns the ability of the trustee to keep promise and to act professionally.

The standardized reliability of benevolence trust scale is .6789 while the standardized reliability of credibility trust is 0.7714. (as shown in Table 5.12) The results report some problematic item-total correlations for TR1, TR4, and TR5. These items are suggested for possible deletion.

Table 5.12 Reliability of Relationship-based Trust Scales

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
Benevolence Trust (Cronbach's alpha = 0.6789)					
TR1	I do not believe that the virtual stores and staffs would act in my best interest.	3.35	1.01	0.3797	0.6647
TR2	If I required assistance, the virtual store (and staffs) would do their best to help me.	3.80	0.86	0.5719	0.5377
TR3	The virtual stores (and staffs) were truthful in dealing with me.	3.84	0.84	0.5805	0.5316
TR4	The virtual stores (and staffs) were unlikely to act opportunistically, even given the chance.	3.18	3.98	0.3300	0.6948
Credibility Trust (Cronbach's alpha = 0.7714)					
TR5	I feel that the virtual stores (and staffs) were not credible.	3.72	0.94	0.3561	0.8237
TR6	The virtual stores (and staffs) understood the market in which they work.	3.76	0.88	0.5733	0.7164
TR7	The virtual stores (and staffs) had skills and expertise in running their businesses.	3.76	0.92	0.7116	0.6403
TR8	The virtual stores (and staffs) were competent and effective in providing products and/or services.	3.90	0.81	0.6789	0.6589

5.6.3 Reliability of Need Satisfaction Scales

Need satisfaction construct is divided into two levels, according to literature review section, which are higher-level or growth needs, and lower-level or deficiency needs. The scales of these need categories are based on measurement items of need satisfaction of Porter (1961, 1962, 1963a, 1963b) and other psychological satisfaction literature (e.g.,

Sheldon and Bettencourt, 2002). These measurement scales are measured using the Need Satisfaction Index (NSI). The ranges of these scales are from 0 to 42.

The standardized reliability for the growth need satisfaction scales is .7621 and for the deficiency need satisfaction scales is .7887 (as shown in Table 5.13). The results report some problematic item-total correlations for NSI1 and NSI3, and suggest possible deletion for these items. Note that the values of the need satisfaction scales as expressed by NSI is transformed using a cubed root term.

Table 5.13 Reliability of Need Satisfaction Scales

		Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
Growth Need Satisfaction (Cronbach's alpha = 0.7621)						
NSI1		The opportunity to develop close friendships with other people in Second Life.	1.50	1.62	0.4856	0.7348
NSI2		The sense of self-respect while I am in Second Life.	1.27	1.48	0.5684	0.7057
NSI3		The opportunity to have my choice in expressing my true self through my avatar.	1.02	1.58	0.4040	0.7624
NSI4		The feeling of pleasure and enjoyment while I am in Second Life.	1.44	1.68	0.5961	0.6956
NSI5		The feeling of self-fulfillment I perceive while I am in Second Life.	1.27	1.55	0.6052	0.6923
Deficiency Need Satisfaction (Cronbach's alpha = 0.7887)						
NSI6		The quality of products/services in Second Life.	2.33	1.64	0.6598	0.6796
NSI7		The products/services from virtual stores in Second Life meet my needs.	1.91	1.66	0.6817	0.6553
NSI8		The feeling of security from threats and/or uncertainties when using Second Life.	2.27	1.90	0.5498	0.7959

5.6.4 Reliability of Intention to Purchase Scales

The measurement scales of intention to purchase is adapted from previous literature in e-commerce (e.g., Jarvenpaa et al., 2000; Pavlou and Gefen, 2005) These measurement scales are measured using a 7-point semantic differential type scale ranged from, for instance, definitely will not buy to definitely will buy. The ranges of these scales are from 1 to 7.

The standardized reliability of the intention to purchase scales is .7824 (as shown in Table 5.14). The results report a slightly problematic item-total correlation for INT5 and suggest possible deletion for this item.

Table 5.14 Reliability of Intention to Purchase Scales

	Wording	Mean	S.D.	Item-total Correlation	Cronbach's alpha when item deleted
Intention to Purchase (Cronbach's alpha = 0.7824)					
INT1	I…to use Second Life in the next month to purchase "virtual" goods or services.	5.61	1.73	0.5627	0.7417
INT2	I…to use Second Life in the next month to purchase "real world" goods or services.	2.45	2.05	0.5385	0.7477
INT3	In the next 3 months, I am…to foresee purchasing "virtual" goods or services.	6.04	1.73	0.5585	0.7428
INT4	In the next 3 months, I am…to foresee purchasing "real world" goods or services.	2.72	2.28	0.5362	0.7483
INT5	I…to use Second Life to purchase "virtual" goods or services from the virtual stores again.	6.06	1.47	0.4794	0.7621
INT6	I…to use Second Life to purchase "real world" goods or services from the virtual stores again.	2.73	2.12	0.5066	0.7555

5.7 Principal Component Analysis

According to Hair and colleagues (2006), Principal Component Analysis (PCA) is a technique to reduce numbers of original measurements to composite dimensions (or factors) with the minimum loss of information. PCA assumes that the variables of interest have optimal weights and are linearly correlated. The purpose of using PCA in the main study is to analyze the set of factors (or latent variables) and to identify the measurement scales underlying these latent factors. This method is valid for any sample with more than 50 observations. A total of 307 valid observations, which are divided into two categories or datasets, are used in analyses:

(1) 226 observations obtained from experienced users

(2) 81 observations obtained from inexperienced users

The initial datasets are analyzed using principal component without rotation. The number of factors extracted and the significant loadings are obtained at this stage. As practical significance criteria, factor loadings in the range of ±.30 to ±.40 are considered as a minimum level for interpretation of structure. However, it is recommended that factor loadings ±.50 or greater are considered practically significant. Loadings exceeding ±.70 indicate a well-defined structure and are preferred in the confirmatory research. In this research, factor loadings of minimum ±.40 are considered and shown as bolded numbers.

Table 5.15 and 5.16 show the results of the initial factor extraction. Table 5.15 suggests nine factors are extracted from the first dataset (data obtained from experienced users) according to latent root criterion of eigenvalues greater than 1. The Scree test criterion (Cattell, 1966) also suggests the same result as those obtained from latent root

criterion (as shown in Figure 5.7). Table 5.16 suggests seven factors are extracted from the second dataset (data obtained from inexperienced users), which is consistent with the results obtained from the Scree test criterion (as shown in Figure 5.8). The results of factor extraction reveal an explained variance of 67.09% of the total variance for the first dataset and 76.33% for the second dataset.

Table 5.15 Standardized Item Loadings (Without Rotation) of the First Dataset

Component	1	2	3	4	5	6	7	8	9
TR7	67	2	-23	25	-1	-20	-7	30	-19
TR8	65	10	-27	26	3	-17	6	20	-13
TA2	64	14	0	-11	-23	-11	-49	-14	3
TR3	63	8	-39	2	-3	-13	23	-10	-12
TA1	62	11	0	-5	-21	-7	-47	-25	9
TR6	61	11	-28	27	5	-12	-8	20	9
TA3	60	15	1	-6	-14	-6	-45	-23	2
TR2	58	2	-37	30	11	-13	22	-1	4
PA4	57	27	-6	-3	-9	50	-1	9	-1
RA5	49	20	10	-10	48	8	-1	-17	-18
TR5	44	16	-39	-5	-4	-6	34	-5	2
TR1	44	20	-34	-13	-10	-2	22	-1	-13
NSI8	-52	46	4	6	-5	13	3	16	40
NSI4	-31	64	-8	30	2	-7	-7	-3	-4
NSI5	-18	63	-6	38	6	-11	-6	-13	-8
NSI7	-46	60	8	-1	-4	9	-13	29	9
NSI6	-42	64	-1	-8	-2	-9	-15	34	24
NSI2	-23	54	12	27	20	6	-4	-40	20
NSI3	-20	48	-1	18	15	19	9	-9	-17
NSI1	-30	47	7	35	7	-13	9	-20	2
INT5	41	45	28	-41	-17	-33	13	8	-2
INT4	36	-17	67	45	-18	11	8	-4	-6
INT2	33	-9	64	35	-21	17	22	-2	5
INT6	36	-15	58	38	-29	0	9	-2	4
INT3	34	44	48	-45	1	-26	14	3	0
INT1	37	41	44	-43	-5	-16	22	-2	14
RA4	53	-4	24	-3	68	13	-6	9	21
RA3	51	-6	22	-14	66	12	-6	-4	18
PA3	49	25	-5	-5	-13	62	-3	7	5
PA2	43	27	-18	-15	-23	53	5	20	12
M2	11	-10	25	33	15	-14	-39	37	-5
M1	29	4	27	11	5	-18	17	41	29
TR4	33	3	-5	2	-13	-5	17	-30	65

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.
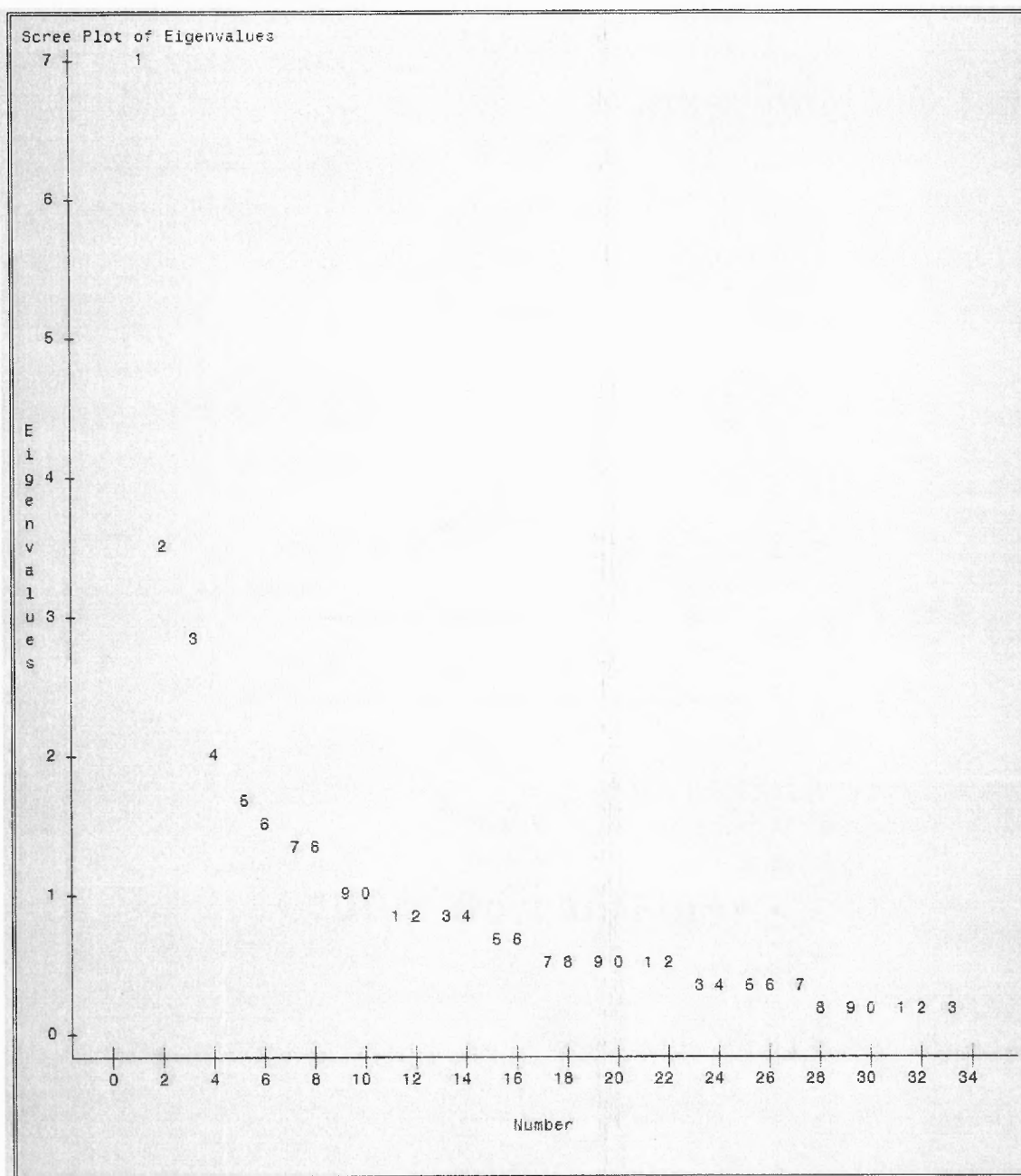
Figure 5.7 Scree plot showing the initial factor extraction of the first dataset.

Table 5.16 Standardized Item Loadings (Without Rotation) of the Second Dataset

Component	1	2	3	4	5	6	7
INT5	**71**	15	-24	23	41	-9	-10
INT1	**70**	3	-5	0	47	16	6
INT6	**65**	46	-28	12	-26	-26	**10**
INT3	**63**	0	-23	9	61	-6	-11
INT4	**62**	50	-21	4	-33	-12	**14**
RA5	**59**	-40	22	-33	-6	-11	-33
INT2	**57**	40	-13	-18	-34	-1	34
M2	**44**	17	-7	13	-31	39	-39
NSI4	**-12**	63	37	17	-5	**31**	-21
NSI3	**16**	55	40	19	**-10**	17	-39
PA3	37	-47	37	38	-22	-12	7
RA3	47	-49	29	-38	-4	5	-18
PA2	31	**-54**	19	44	3	25	24
NSI5	-6	**53**	65	-10	27	-19	-5
NSI1	-9	**20**	57	-23	20	18	39
NSI2	**28**	**39**	51	-7	7	-38	17
PA4	37	**-43**	46	51	-16	-3	13
RA4	52	**-37**	17	-55	-20	-11	-8
M1	38	**9**	-5	-29	2	70	29

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.
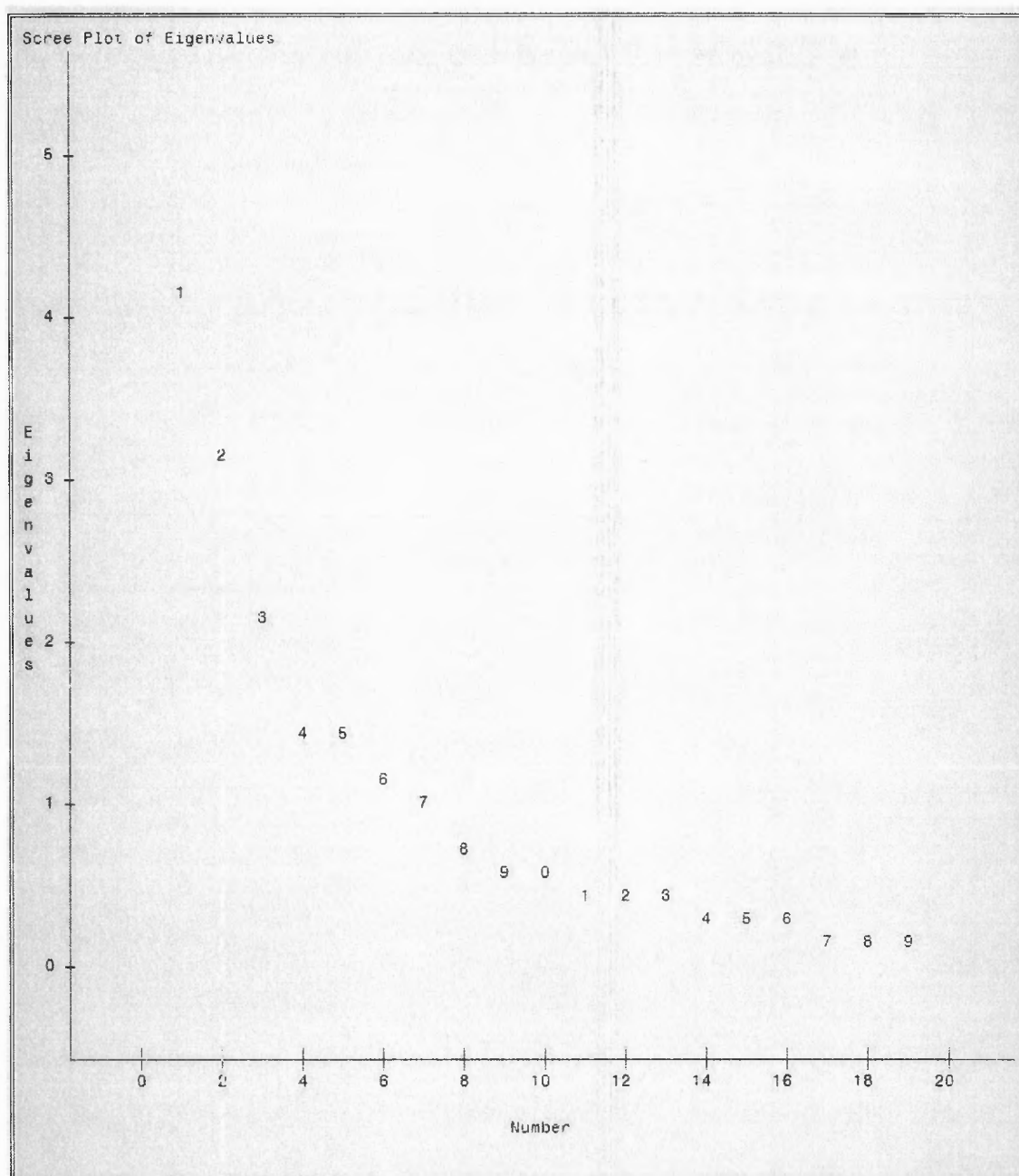
Figure 5.8 Scree plot showing the initial factor extraction of the second dataset.

The results of the pre-rotation of the second dataset show many unclean factor loadings for many latent constructs (components). Many components contain cross loadings while few components are not loaded on their corresponding factors. Therefore, the next step performs the Principal Component Analysis with rotation. Assuming that

each factor is not correlated to one another, an orthogonal rotation using VARIMAX method is used to perform the Principal Component Analysis as will be described in the following section. Orthogonal rotation is a well-known technique in social science research (O'Rourke et al., 2005). This rotation technique suggests that the components are not correlated and their variances are maximized.

Principal Component Analysis with VARIMAX Rotation

This study uses an orthogonal rotation technique (VARIMAX rotation) performed by SAS. The orthogonal rotation assumes that the factors are not correlated to each other. The results of all meaningful loadings (the loadings greater than .40) are shown as bolded numbers. To interpret the rotated factor pattern, an item that has a loading of .40 or greater for any single component and less than .40 for other components is considered as having a clean factor loading on that single component. The right column of Table 5.17 and 5.18 show the communality, referring to as the percent of variance in an observed variable that is accounted for by the retained components (or factors) (O'Rourke et al., 2005).

The Results of PCA with VARIMAX Rotation for the First Dataset

Table 5.17 shows the results of VARIMAX rotation of the first dataset. The result suggests an initial of nine components to be extracted, which explain 67.09% of the total variance. Based on the proposed model of the research, there are only eight variables (or latent factors) involved in the model. A marker variable, which consists of two measurement scales, is considered as an additional latent factor. The marker variables are loaded on a separated factor (factor 9), which suggests no presence of Common Method Variance (CMV). The detail about CMV will be discussed later in Section 5.10.

Table 5.17 Factor Analysis with VARIMAX Rotation (Initial Attempt) of the First Dataset

Factor Label	Component	1	2	3	4	5	6	7	8	9	Communality
Trust	TR8	77	-5	8	6	17	10	12	-3	11	.67
	TR3	76	-3	2	6	13	5	12	17	-21	.69
	TR2	76	-2	6	-6	5	16	5	17	-7	.65
	TR7	75	-14	9	5	25	7	11	-16	19	.74
	TR6	66	-2	4	-5	26	14	14	4	20	.59
	TR5	58	-3	-14	20	-4	-1	20	19	-21	.52
Need Satisfaction	NSI5	9	77	-3	-2	8	-5	-7	8	11	.63
	NSI4	3	75	-12	2	0	-15	-1	-10	10	.62
	NSI2	-10	74	5	4	3	12	-4	-10	27	.66
	NSI1	-1	67	7	2	-9	-7	-18	1	-5	.50
	NSI3	-6	57	-5	-1	-14	7	16	4	-2	.38
	NSI7	-35	55	-19	8	-10	-16	15	3	47	.74
	NSI8	-28	51	-14	5	-25	-23	12	-12	18	.54
Intention to purchase	INT4	2	-5	92	3	10	12	4	-1	4	.87
	INT2	0	-3	85	12	-2	8	13	5	0	.77
	INT6	7	-9	82	10	13	-3	0	-1	3	.72
	INT3	-2	5	9	88	12	19	4	0	5	.85
	INT1	2	3	14	86	8	14	13	-1	-6	.81
	INT5	13	2	3	83	20	1	6	10	12	.78
Transactional Affordances	TA1	19	-8	10	11	80	9	14	12	-4	.74
	TA2	22	-12	5	19	79	7	16	5	4	.76
	TA3	20	-4	7	14	74	14	15	8	-4	.67
Relational Affordances	RA4	14	-12	13	5	5	88	9	3	16	.86
	RA3	11	-15	6	12	9	85	7	-1	-1	.79
	RA5	18	7	1	20	16	66	13	8	-11	.57
Physical Affordances	PA3	16	1	11	5	17	13	79	-2	-8	.72
	PA2	16	-5	-2	8	9	1	77	21	11	.70
	PA4	27	0	10	12	18	16	72	-5	-7	.69
Trust (2)	TR4	10	-3	16	-2	19	9	-2	77	0	.67
	TR1	37	-5	-15	12	10	3	23	58	9	.59
Need Sat (2)	NSI6	-24	45	-30	14	-6	-18	3	0	51	.66
Marker	M1	20	-9	30	20	-10	16	-5	16	49	.48
	M2	8	-2	25	-15	19	16	-15	-39	45	.53

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

The results of Principal Component Analysis show that trust is loaded on two factors. However, there are some measurement items of trust that are not loaded in their corresponding factor. Specifically, TR2 and TR3 should load on the same corresponding factor as TR1 and TR4. The results also show that need satisfaction variable is not fragmented into two factors as has been hypothesized. Oppositely, the intention to purchase variable is separated into two factors. In this case, one factor is called an

intention to purchase *virtual* products, and another one is called an intention to purchase *real world* products. NSI6 contains cross loadings on both factors 2 and 8 and is excluded from subsequent analysis.

Table 5.18 shows the results of factor analysis after deleting TR1, TR4, and NSI6. The results suggest that only eight factors are extracted, which account for 67.03% of the total variance. There is no change from the initial rotation for other factors. The final results contain clean factor loadings for all latent constructs.

Table 5.18 Factor Analysis with VARIMAX Rotation (Final Attempt) of the First Dataset

Factor Label	Component	1	2	3	4	5	6	7	8	Communality
Trust	TR3	80	-5	4	6	16	8	11	-23	.75
	TR2	79	-4	-5	5	5	16	7	-3	.67
	TR8	74	-4	8	4	16	8	15	23	.67
	TR7	70	-14	6	5	22	5	14	35	.71
	TR6	64	-1	-1	-1	24	11	18	31	.60
	TR5	61	-3	16	-7	4	3	15	-36	.55
Need Satisfaction	NSI5	9	77	0	-4	7	-6	-5	9	.63
	NSI4	0	76	3	-13	0	-16	0	10	.63
	NSI2	-9	73	0	7	5	15	-7	-20	.62
	NSI1	0	67	2	6	-9	-7	-19	-3	.50
	NSI3	-5	58	-1	-4	-13	8	15	-10	.65
	NSI7	-35	56	14	-22	-15	-20	18	24	.50
	NSI8	-29	53	4	-12	-25	-22	10	0	.85
Intention to purchase (real products)	INT3	-3	5	89	8	12	19	5	3	.79
	INT1	1	4	85	13	9	15	13	-8	.74
	INT5	13	2	84	2	20	0	8	2	.78
Intention to purchase (virtual products)	INT4	2	-5	3	91	9	11	4	16	.88
	INT2	1	-4	12	87	-1	8	11	4	.80
	INT6	7	-9	9	83	13	-2	0	11	.74
Transactional Affordances	TA1	19	-8	11	10	80	9	14	2	.74
	TA2	21	-12	19	5	80	6	17	8	.85
	TA3	20	-5	13	8	75	15	15	0	.67
Relational Affordances	RA3	10	-16	11	6	9	85	7	6	.79
	RA4	13	-12	9	9	3	85	11	25	.85
	RA5	19	7	18	3	19	69	11	-8	.58
Physical Affordances	PA3	14	1	5	10	16	14	80	-3	.72
	PA2	17	-4	11	-3	9	-1	79	-1	.68
	PA4	26	0	10	11	19	17	72	-6	.68
Marker	M2	-1	1	-12	18	13	12	-11	65	.43
	M1	20	-7	30	22	-15	8	2	47	.51

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

The Results of PCA with VARIMAX Rotation for the Second Dataset

Table 5.19 shows the results of VARIMAX rotation with the initial of seven factors extraction. These factors accounted for 76.33% of the total variance. In the case of non-experienced users, the research interest is only four variables, which are physical affordances, relational affordances, need satisfaction, and intention to purchase, because other variables, such as trust, cannot be measured directly from users' direct experience. Therefore, five factors (including marker variable) are supposed to be extracted.

The results obtained from the initial factor rotation show that intention to purchase components are loaded on two factors similar to the results of the first dataset. The results also find that need satisfaction component is loaded on two factors, which does not comply with the proposed model. Therefore, the repeat analysis is done by assigning the number to be extracted to five. The new result is shown in Table 5.20.

Table 5.19 Factor Analysis with VARIMAX Rotation (Initial Attempt) of the Second Dataset

Factor Label	Component	1	2	3	4	5	6	7	Communality
Intention to purchase	INT6	88	30	0	0	-3	12	-11	.88
	INT4	87	19	1	-2	1	17	3	.83
	INT2	81	6	11	-4	10	1	28	.76
	INT3	9	91	12	1	-2	-5	0	.85
	INT5	31	84	4	9	-4	8	-6	.82
	INT1	16	76	19	11	8	2	29	.75
Relational Affordances	RA4	18	1	85	6	2	-15	10	.79
	RA5	4	21	83	17	-2	5	-6	.78
	RA3	-9	10	80	22	1	-3	13	.72
Physical Affordances	PA4	2	3	14	90	8	6	-4	.84
	PA2	-13	17	4	78	-15	-10	23	.74
	PA3	5	0	27	78	1	-1	-14	.70
Need Satisfaction	NSI5	-6	3	-4	-14	82	32	-12	.82
	NSI2	31	9	10	8	73	8	-15	.68
	NSI1	-13	-12	-3	3	67	-1	41	.65
	NSI3	13	4	-4	0	28	79	-5	.71
	NSI4	1	-11	-28	-11	32	70	11	.71
Marker	M2	28	12	19	8	-33	61	16	.64
	M1	16	15	13	-3	-5	10	85	.81

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

Table 5.20 Factor Analysis with VARIMAX Rotation (Final Attempt)

Factor Label	Component	1	2	3	4	5	Communality
Intention to purchase (real products)	INT4	86	8	3	19	-6	.79
	INT6	85	2	-2	28	-2	.81
	INT2	74	10	23	9	-14	.65
Marker	M2	55	0	6	6	16	.34
	M1	24	5	33	21	-14	.23
Need Satisfaction	NSI5	-10	87	-4	4	-12	.78
	NSI2	18	66	14	11	5	.51
	NSI4	19	63	-35	-13	-4	.58
	NSI3	34	61	-18	-2	10	.53
	NSI1	-23	61	16	-5	-7	.46
Relational Affordances	RA4	15	-6	86	1	9	.78
	RA3	-5	-1	78	9	27	.69
	RA5	10	-2	74	17	26	.66
Intention to purchase (virtual products)	INT3	10	-6	11	90	4	.84
	INT5	34	-2	0	82	11	.80
	INT1	18	8	25	78	9	.72
Physical Affordances	PA4	3	8	12	3	89	.82
	PA3	6	-2	22	-1	80	.69
	PA2	-10	-17	10	19	73	.62

Note: Values of loadings are multiplied by 100 and rounded to the nearest integer.

The new analysis shows clean factor loadings for all latent variables. The marker component, however, has slightly loaded in different factor but the effect is not high since the communality is only .34. The variance explained accounts for 64.63% of the total variance.

5.8 Validity

Validity and reliability are two important characteristics of a good measurement construct. The goal of model building is to obtain a valid and reliable measurement that will result in the better predictive model. Validity refers to the extent that a measure accurately represents what it is supposed to be. On the other hand, reliability is defined as the degree that the observed variable measures the true value and is free from errors no matter how many times the variables are repeatedly used (Hair et al., 2006). In assessing validity and reliability of the proposed measurement model, the correlations between the

measurement items are determined, as well as the orthogonal factor loadings. Validity, in this case refers to construct validity, comprising of the following three validities: (1) convergent validity, (2) discriminant validity, and (3) nomological validity.

Convergent validity is the extent to which measurements of a specific construct converge or share a high proportion of variance in common (Hair et al., 2006), and is measured from the degree of item loadings more than .70. The results of principal component (with VARIMAX rotation), however, show that many item loadings violate the convergent validity criteria but still have a significant variance explained on their corresponding factors (loadings greater than .50). These items are retained for subsequent analyses.

Discriminant validity is the extent to which a construct is distinguished from other constructs. Discriminant validity can be obtained by comparing estimated variance-extracted (VE) of any two constructs, which can be calculated by using the following formula, with the corresponding estimated inter-construct squared correlation (Fornell and Larcker, 1981). The results of discriminant validity using variance-extracted criteria for both datasets are shown in Table 5.21 and 5.22.

Variance Extracted

$$VE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

where λ is standardized loadings

Table 5.21 Correlation Matrix with Squared Correlation Estimation and Variance-Extracted of Experienced Users Group (First Dataset)

	PA	RA	TA	TRUST	NEED	INT_V	INT_R
Physical Affordances	1.0000	**.0790**	**.1556**	**.1739**	**.0049**	**.0644**	**.0188**
Relational Affordances	.2810 (<.0001)	1.0000	**.1037**	**.1081**	**.0462**	**.0803**	**.0411**
Transactional Affordances	.3944 (<.0001)	.3221 (<.0001)	1.0000	**.2084**	**.0495**	**.0981**	**.0420**
Trust	.4170 (<.0001)	.3288 (<.0001)	.4565 (<.0001)	1.0000	**.0531**	**.0234**	**.0128**
Need Satisfaction	-.0700 (.2951)	-.2150 (.0011)	-.2224 (.0008)	-.2305 (.0005)	1.0000	**.0011**	**.0376**
Intention to Purchase Virtual Products	.2538 (.0001)	.2834 (<.0001)	.3132 (<.0001)	.1529 (.0215)	.0325 (.6273)	1.0000	**.0361**
Intention to Purchase Real Products	.1370 (.0397)	.2028 (.0022)	.2050 (.0020)	.1133 (.0892)	-.1938 (.0137)	.1900 (.0042)	1.0000
Variance Extracted (%)	**59.42**	**63.58**	**61.42**	**51.39**	**44.05**	**74.01**	**75.80**
Cronbach's alpha	**.79**	**.81**	**.84**	**.85**	**.80**	**.88**	**.88**

Table 5.22 Correlation Matrix with Squared Correlation Estimation and Variance-Extracted of Inexperienced Users Group (Second Dataset)

	PA	RA	NEED	INT_V	INT_R
Physical Affordances	1.0000	**.1250**	**.0082**	**.0309**	**.0004**
Relational Affordances	.3536 (.0012)	1.0000	**.0107**	**.0773**	**.0166**
Need Satisfaction	-.0908 (.4200)	-.1034 (.3582)	1.0000	**.0000**	**.0255**
Intention to Purchase Virtual Products	.1757 (.1166)	.2781 (.0120)	.0048 (.9663)	1.0000	**.1674**
Intention to Purchase Real Products	-.0201 (.8584)	.1288 (.2518)	.1598 (.1542)	.4092 (.0001)	1.0000
Variance Extracted (%)	**65.50**	**63.19**	**46.67**	**69.69**	**66.99**
Cronbach's alpha	**.79**	**.82**	**.72**	**.85**	**.87**

The results of validity for the first dataset show that variance-extracted of any two constructs is greater than the estimated inter-construct squared correlation (the values above diagonal) between these two constructs, which suggest no problems with discriminant validity.

For the first dataset, the results of validity for the second dataset show that variance-extracted of any two constructs is greater than the estimated inter-construct squared correlation between these two constructs, which also suggest no problems with discriminant validity.

Nomological validity is used to examine if the constructs are related to other constructs. The nomological validity can be assessed by checking the significance level of correlation between factors. Table 5.21 and Table 5.22 indicate the p-values (shown in parentheses) of the correlations between two variables for the first and the second datasets, respectively. For the first dataset, the correlations are significant at the .05 levels except for the correlation between need satisfaction and physical affordances, between need satisfaction and intention to purchase virtual products, and between trust and intention to purchase the real products in the virtual world. This means that these three pairs of variables are not correlated.

For the second dataset, most of the correlations are not significant at .05 levels. However, the correlations between physical affordances and relational affordances, between relational affordances and intention to purchase virtual products, and between intention to purchase virtual products and intention to purchase real world products are significant. This means that the other pairs of correlations than these four aforementioned pairs are not statistically correlated.

5.9 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is a technique used to test how well the measurement scales fit the latent constructs and is used to develop a measurement model (Hair, et al., 2006). CFA is an important step before the Structural Equation Modeling (SEM) and path analysis model. This section describes the results obtained from PROC CALIS of Statistical Analysis Software (SAS) in developing the measurement models of both datasets.

Figure 5.9 shows the complete measurement model of the first dataset. The measurement items (components) that contain lower loadings than .50 are eliminated, including TR5 and NSI3. The Chi-square test for the model fit is not significant due to a large degree of freedom. However, the ratio between the Chi-square and the degree of freedom is less than 2:1, which indicates a good fit (Marsh et al., 1988). Other fit indices, especially GFI, NFI, and NNFI, indicate a slightly below .90 level, which indicate an acceptable model fit. The following are the summary of the fit indices for the first dataset.

- Goodness of Fit Index (GFI)   .8551
- Adjusted Goodness of Fit Index (AGFI)   .8170
- Comparative Fit Index (CFI)   .9120
- Normed Fit Index (NFI)   .8301
- Non-normed Fit Index (NNFI)   .8971

All loadings of measurement scales are significant at .05 levels and there is no problematic standard errors (the standard error that is very near zero point) appearing in the results. The standardized item loadings range from .56 to .97, which are at least

moderately large. The two headed arrows indicate covariances between two latent constructs.

The measurement model of the first dataset suggests the following:

- Three scales are loaded on physical affordances

- Three scales are loaded on relational affordances

- Three scales are loaded on transactional affordances

- Five scales are loaded on trusting beliefs

- Six scales are loaded on need satisfaction

- Three scales are loaded on intention to purchase virtual products

- Three scales are loaded on intention to purchase the real products

Note that the scales of trusting beliefs and need satisfaction are not fragmented into two sub-constructs as hypothesized in the previous chapters.
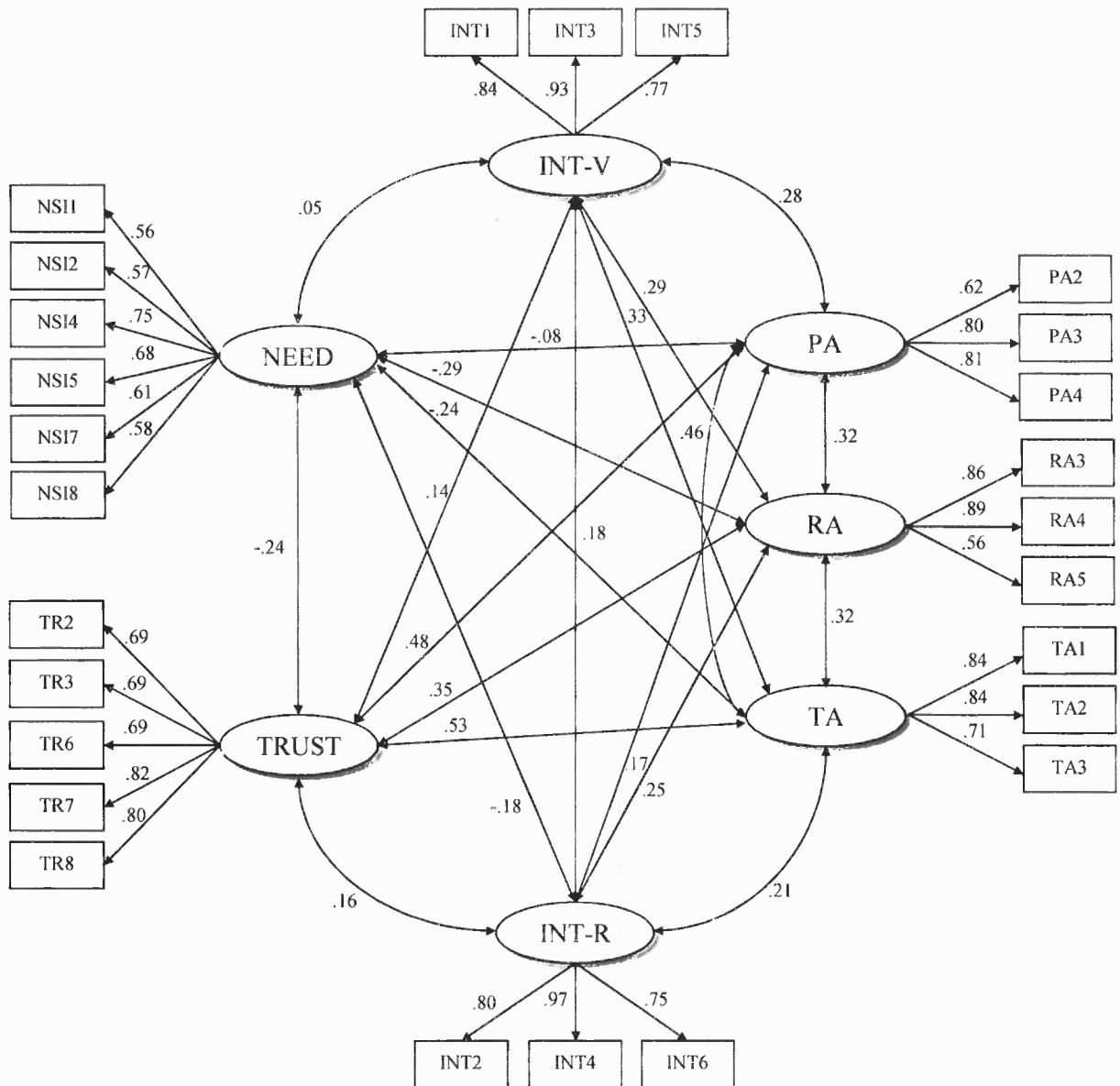
Figure 5.9 Measurement model of the first dataset (experienced users).

Figure 5.10 shows the complete measurement model of the second dataset. The measurement item NSI1 is dropped due to the low loading on its corresponding latent factor. The Chi-square test for the model fit is not significant due to the large degree of freedom. However, the ratio between the Chi-square and the degree of freedom is less than 2:1, which indicates a good fit (Marsh et al., 1988). Other fit indices, especially GFI,

CFI, NFI, and NNFI, indicate a below .90 cutoff level. The following are the summary of fit indices of measurement model for the first dataset.

- Goodness of Fit Index (GFI)   .8203

- Adjusted Goodness of Fit Index (AGFI)   .7400

- Comparative Fit Index (CFI)   .8803

- Normed Fit Index (NFI)   .7622

- Non-normed Fit Index (NNFI)   .8472

All loadings of measurement scales are significant at .05 significance levels and there is no problematic standard errors appeared on the results. The standardized item loadings are ranged from .40 to .95, which are at least moderately large. The two headed arrows indicate covariances between two latent constructs.

The measurement model of the second dataset suggests the following:

- Three scales are loaded on physical affordances

- Three scales are loaded on relational affordances

- Four scales are loaded on need satisfaction

- Three scales are loaded on intention to purchase virtual products

- Three scales are loaded on intention to purchase the real products
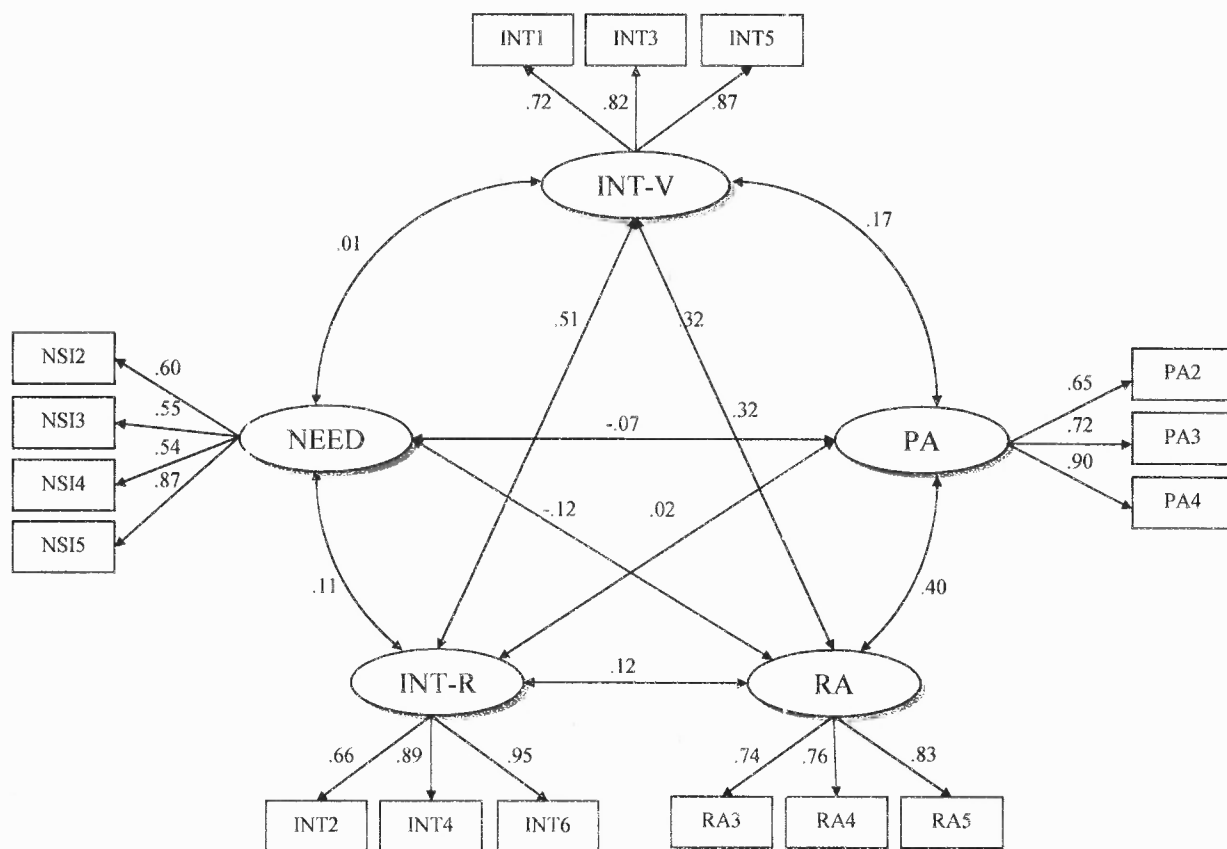
Figure 5.10 Measurement model of the second dataset (inexperienced users).

5.10 Common Method Bias Problem

Common Method Variance (CMV) refers to the amount of spurious covariance shared among observed variables due to the common method used in collecting data (Buckley et al., 1990). Podsakoff and colleagues (2003) identify three important components, in which correlations between the observed variables can be fragmented as follows:

$$\text{Observed correlation} = \text{Construct-level correlation} + \text{Spurious correlation due to CMV} + \text{Residual}$$

Although the effect of CMV does not totally bias the results in general, it can be a major potential validity threat in social science research (Podsakoff et al., 2003). Some

researchers believe that CMV causes a bias in validity of the research in IS (e.g., Woszczynski and Whitman, 2004). While others argue that the extent of bias is not substantial and does not cause a potential threat in validity of the research in this area (e.g., Malhotra et al., 2006).

Despite the absence of consensus about the seriousness of common method bias problem in social science research, CMV generally exists in research that uses a single method in data collection, especially self-report surveys (Malhotra et al., 2006). Podsakoff and colleagues (2003) classify the causes of CMV into four categories:

- **Common Rater Effects:** Refer to any artifactual covariance between the predictor and criterion variable produced by the same respondent, who provides the measure of these variables. For instance, respondents are likely to maintain consistency in their responses or they may have a certain mood or emotional state when providing responses.

- **Item Characteristic Effects:** Refer to any artifactual covariance that is caused by the influence or interpretation that a respondent might ascribe to an item solely because of specific properties or characteristics the item possesses such as scale format, item wording, ambiguity, etc.

- **Item Context Effects:** Refer to any influence or interpretation that a respondent might ascribe to an item solely because of its relation to the other items (Wainer and Kiely, 1987), such as scale length and grouping pattern of questionnaire items.

- **Measurement Context effects:** Refer to any artifactual covariation produced from the context in which the measures are obtained such as measurement obtained from the same location or the same point in time.

CMV also depends on whether the constructs measured are concrete or abstract (Cote and Buckley, 1987). Normally, the abstract concepts are likely to produce more method biases than the concrete concepts because of the difficulty and ambiguity in subjective interpretations of the scale items. In this case, the subjective interpretations may increase random responding or systematic response tendencies, which result in common variance bias (Podsakoff et al., 2003).

Podsakoff and colleagues (2003) suggest the following two primary ways to control the CMV:

1. **Procedural Design Control:** Procedural remedies involve techniques such as obtaining survey responses from different sources, using temporal, proximal, psychological or methodological separation of measurement, protecting anonymity and reducing evaluation apprehension, counterbalancing question order, and finally, improving scale items from ambiguity.

2. **Statistical Control:** Statistical remedies are introduced as another method for assessing and minimizing the CMV (Malhotra et al., 2006; Podsakoff et al., 2003). The statistical techniques for CMV remedies include traditional Multitrait-Multimethod (MTMM) procedure (Campbell and Fiske, 1959; Straub, 1989), CFA-based MTMM technique (Straub et al., 2004; Podsakoff et al., 2003), Harman's single-factor test (Harmann, 1967; Podsakoff and Organ, 1986), and partial correlation procedures such as marker-variable technique (Lindell and Whitney, 2001) or general factor covariate technique (Podsakoff and Todor, 1985).

In the main study, where a self-report survey has been employed, the researcher realized the possible presence of CMV in the survey data. Therefore, the test for common method detection is conducted. First, the questionnaire has been redesigned to include two marker variables that are theoretically unrelated to other variables in the study. These two marker variables are as follows:

M1: I enjoy reading weblog on the internet.

M2: I really like watching news clips from YouTube.

The marker variables are measured using a five-point Likert scale ranged from strongly disagree to strongly agree. Then, after completing the data collection, the marker variables have been analyzed using Harman's single-factor test and marker variable test as suggested by Lindell and Whitney (2001) and Malhora and colleagues (2006). The single-factor test using Confirmatory Factor Analysis (CFA) is conducted to obtain the overall fit index of the CMV-based model. The result as shown in Figure 5.11 indicates

that the model fit the data quite well: Chi-square (296) = 460.19, NFI = .8542, NNFI = .9246, CFI = .9409 and RMSEA = .0497. When comparing with the model in Figure 5.9, which has a slightly poorer fit than the model that includes marker variables, this can be conclude that the model may not completely free from method bias.

The marker variable technique is performed next by investigating the correlation matrices between the two models – one is the model that includes marker variables (as shown in adjusted estimates column in Table 5.23), and another one is the model that does not include marker variables (as shown in uncorrelated estimates column in Table 5.23). The correlations of these two models are then compared using the t-test of mean difference. The null hypothesis (H_0) states that there is no difference between the means of these two groups. The results reveal a quite small t-stat of -1.59. The p-value for this t-test is quite large at .1198, which is more than the standard cutoff of .05, meaning that the result is not significant. Therefore, the null hypothesis of equal means cannot be rejected. This implies that CMV does not substantially distort the results of CFA and will not potentially harm the results obtained from path analysis, as will be discussed later in next chapter.
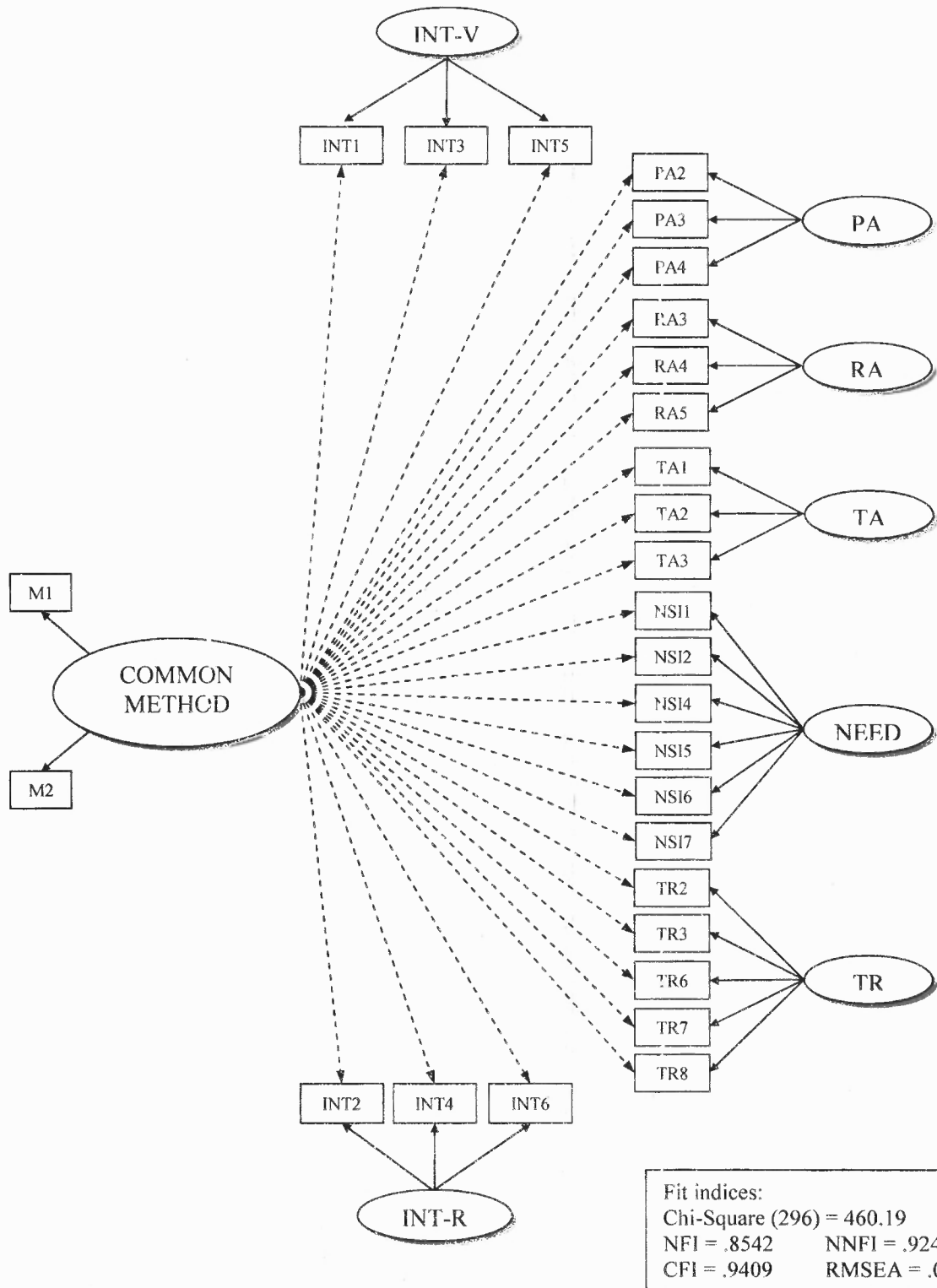
Figure 5.11 Nomological network of a relationship including the effect of CMV.

Table 5.23 Parameter Estimates Comparing between the Original Correlations and CMV-Adjusted Correlations

Factor Correlations	Uncorrelated Estimates	Adjusted Estimates (Marker variables)
$r_M = .1261$		
r (RA, PA)	.2810	.1773
r (TA, PA)	.3943	.3070
r (TA, RA)	.3221	.2243
r (TR, PA)	.4170	.3329
r (TR, RA)	.3288	.2319
r (TR, TA)	.4565	.3781
r (NS, PA)	-.0699	-.0247
r (NS, RA)	-.2150	-.3903
r (NS, TA)	-.2224	-.3988
r (NS, TR)	-.2305	-.4081
r (INT_V, PA)	.2538	.1461
r (INT_V, RA)	.2834	.1800
r (INT_V, TA)	.3132	.2140
r (INT_V, TR)	.1529	.0307
r (INT_V, NS)	.0325	-.1071
r (INT_R, PA)	.1369	.0124
r (INT_R, RA)	.2028	.0877
r (INT_R, TA)	.2050	.0902
r (INT_R, TR)	.1133	-.0146
r (INT_R, NS)	-.1638	-.3317
r (INT_R, INT_V)	.1898	.0729

Note: r_M = shared correlation resulting from CMV; PA = physical affordances; RA = relational affordances; TA = transactional affordances; TR = trust; NS = need satisfaction; INT_V = intention to purchase virtual products; INT_R = intention to purchase the real products

5.11 Conclusions

This chapter illustrates procedures in developing a validated measurement model for the main research of VWCA in Second Life. The first two sections of this chapter show the results of bivariate analysis of variable correlations. The analysis is performed by comparing two different groups of research participants – experienced users versus inexperienced users. The results reveal significantly different results regarding usage duration and usage frequency between these two groups of participants. Therefore, the

results suggest that these two usage characteristics could potentially impact the dependent variable of the model. For individual measurement items, the bivariate analysis is performed and suggests that the mean distribution of measurement items between two groups of participants, in general, are not significant. Nevertheless, many measurement items, such as transactional affordance scales and relationship-based trust scales, are not applied for inexperienced user group.

The pretest for affordances and need satisfaction variables are conducted. A total of 67 respondents volunteered for the pretest. The results obtained from Principal Component Analysis (PCA) indicate that affordance variables are loaded correspondingly to their measurement constructs, which are divided into *physical affordances*, *relational affordances*, and *transactional affordances*. Need satisfaction scales are loaded on two different factors, which are consistent with the initial research hypotheses. The initial measurement model of these two variables is introduced to the main study.

The main study is conducted in various virtual venues in Second Life. A total of 307 valid survey responses are obtained. Raw data are treated for missing value, normalization, homoscedasticity, and multicollinearity before subsequent analyses are employed. Then the reliability test, using Cronbach's alpha and item-total correlation, are performed to find the reliability score of each measurement construct.

Modified data are analyzed using principal component with VARIMAX rotation to find the number of factor and factor loadings that suggest by the data. The results are slightly different from what has been hypothesized. In other words, trust and need satisfaction are shown as single-factor variables rather than multi-factor variables. However, the results suggested by PCA reveal satisfactory validity scores. Confirmatory

Factor Analysis (CFA) is conducted next to summarize the measurement models for both datasets. The results of the analyses both datasets report a slightly below acceptance level for some fit statistics, which suggest a minimum of .90 for most of the fit indices (except for AGFI should be greater than .80). Finally, the test for Common Method Variance (CMV) is performed using Harman's single-factor test to compare the overall fit index of the models with and without method variance. Marker variable technique is employed to find the effect of CMV on the dataset. The results suggest that CMV does not substantially distort the measurement models.

CHAPTER 6

PATH ANALYSIS USING COVARIANCE-BASED STRUCTURAL EQUATION MODELING (SEM) AND PARTIAL LEAST SQUARES (PLS)

6.1 Overview

Path analysis is a technique used to assess interdependencies among variables of interest similar to the regression modeling technique. The purpose of using path analysis in this dissertation is to examine the model fit and test the hypotheses. The two path analysis methods used in this research include: (1) covariance-based Structural Equation Modeling (SEM); and (2) Partial Least Squares-based (PLS) structural equation modeling.

These two methods are second generation techniques allowing for simultaneous modeling of relationships among multiple independent or *exogenous*, and dependent or *endogenous* constructs (Gefen et al., 2000). A distinction between exogenous and endogenous constructs is different from independent and dependent variables in ordinary regression model. Endogenous and Exogenous are defined as follows:

- **Endogenous:** Is a variable whose variability is predicted to be causally affected by other variables in the model.

- **Exogenous:** Is a variable whose variability is not influenced by other variables in the model.

Path analyses using SEM and PLS are recommended for testing model fit and causal relationships. These two techniques are popular among IS researchers and are generally required for a quality publication in IS literature (Chin, 1998). Path analysis technique is suitable for models that include many latent variables or variables that are directly unobservable. The technique is easy to understand since the path model is a

pictorial model illustrating many direct and indirect causal relationships, path coefficients or path loadings, and values of variance explained. In addition, this research uses path analysis techniques to find a better or an alternative model based on the available data. The alternative models suggested by the program represent the better model fit, but may not be consistent with the theoretical background of this dissertation. Therefore, using path analysis to obtain the alternative models must be implemented cautiously, together with supportive theoretical concepts.

As described earlier, there are two major techniques used in testing research hypotheses and obtaining the model fit. The first technique is covariance-based Structural Equation Modeling, in this case using SEM for abbreviation, which is a technique based on common factor analysis introduced by Jöreskog (1970). The second technique is Partial Least Squares path modeling, in this case using PLS for abbreviation, also known as component-based structural model (Wold, 1979), which is based on Principal Components Analysis (PCA). The advantages of using these two techniques over first-generation techniques, such as factor analysis or multiple regression, are as follows (Chin, 1998):

- Accommodate a complex model where there are multiple relationships between predictor and criterion variables

- Design for evaluating unobservable (latent) constructs

- Allow error terms to be measured for observed (manifest) variables

- Combine a test for a priori substantive/theoretical and measurement assumptions against empirical data (i.e., confirmatory analysis)

This chapter explains the results of path analysis obtained from both SEM and PLS methods. This chapter is structured in the following manner. The next section

describes the summary of the path analyses for the data obtained from experienced user group using both covariance-based SEM and PLS-based SEM. The third section explains possible modifications for the main research model (VWCA). The fourth section describes the summary of the path analysis results for the data obtained from inexperienced user group using both covariance-based SEM and PLS-based SEM methods. Then, the results of moderating effects are discussed in section five. Finally, this chapter ends with the summary of the hypotheses testing results and the conclusions of the research model.

6.2 Path Analysis (Structural Equation Modeling) for the Main Research Model (VWCA)

6.2.1 Path Analysis Using Covariance-Based SEM

Covariance-based SEM consists of the following two inter-related models: (1) measurement model, and (2) structural model. The measurement model, obtained earlier from CFA in Chapter 5, is composed of identified latent variables and their measurement scales. On the other hand, the structure model defines causal relationships (or paths) among these latent variables. SEM assumes that each latent variable contains a unique measurement error. Therefore, covariance-based technique assumes that measurement errors are meaningful in interpreting the accuracy of data observed, as well as the accuracy of theoretical concept (Gefen et al., 2000).

In general, SEM produces several indicators to measure the overall model fit. The following are quality criteria that are considered in this research (Bentler and Bonett, 1980; Chin and Todd, 1995; Gefen et al., 2000; Hair et al., 1998):

- Coefficient of determination (R^2) is a statistical measure of how well the regression line approximates the real data points.

- Effect size measures the magnitude of an effect providing information on the extent to which a null hypothesis is false (Cohen, 1988).

- Cronbach's alpha (α) is a measure of measurement reliability.

- Chi-square (df) or a ratio of the Chi-square to the degree of freedom.

- Goodness-of-Fit Index (GFI) measures the absolute fit of the combined measurement and structural model.

- Adjusted Goodness-of-Fit Index (AGFI) measures the absolute fit with an adjustment for degrees of freedom of the combined model.

- Normed Fit Index (NFI) is a percentage of observed-measure covariation explained by a given measurement or structural model (compared with an overall null model that solely accounts for the observed measure variances).

- Non-Normed Fit Index (NNFI) is a modified version of NFI that produces a better reflection of model fit at all sample sizes.

- Comparative Fit Index (CFI) is a better version of NFI that provides an assessment of comparative fit independent of sample size.

- Parsimonious Normed Fit Index (PNFI) is a modification of NFI that takes the parsimony of the model into account.

- Root-Mean Square Error of Approximation (RMSEA) is a non-centrality measurement that takes into account the error of approximation in the population.

The first dataset obtained from participants who have experience with business transactions is analyzed using covariance-based SEM to perform path analysis. A total of 226 completed survey responses are used in the analysis. The overall model is expected to have a good fit. In other words, the ideal theoretical model must have the following characteristics (Hatcher, 1994; Gefen et al., 2000):

- The p-value of the model's Chi-square test should be nonsignificant (or greater than .05)

- The ratio of the Chi-square to the degree of freedom should less than 3:1

- Absolute values of t-stat for each factor loadings and path coefficient should be over 1.96

- R-squared values for the latent endogenous variables should be relatively large

- The distribution of standardized residuals should be symmetrical and centered on zero, and relatively few or no standardized residuals should exceed 2.0

- The model should demonstrate relatively high fit indices, normally over .90 for GFI, CFI, NFI and NNFI, over .80 for AGFI and below .05 for RMSEA

- The combined model should demonstrate a high level of Parsimonious NFI (PNFI) or at least more than .60 (Netemeyer et al., 1990)

Figure 6.1 depicts the fundamental research model based on the result of the Confirmatory Factor Analysis in the previous chapter.
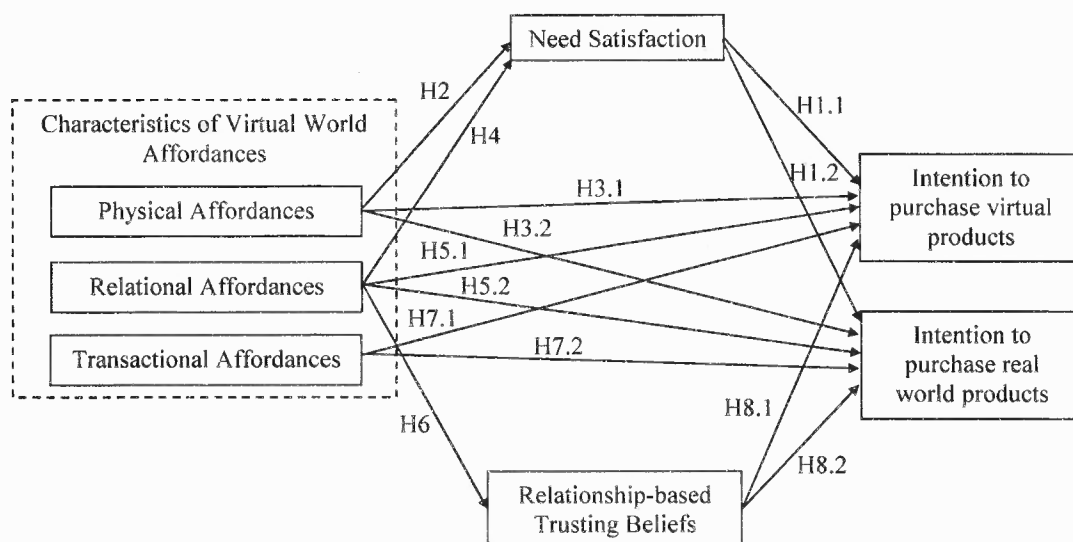
Figure 6.1 Virtual World Commerce Adoption (VWCA) model.

The results of CFA suggest that mediating variables, which are satisfaction and relationship-based trust, are not fragmented into two factors as proposed in the initial research presumptions and from the pretest results. The results also suggest that TR1, TR4, and NSI6 should be excluded from the measurement model.

Path analysis is also used to test the significance of research hypotheses. The null hypothesis (H_0) assumes that there is no significant relationship between predictor variable and criterion variable as has been hypothesized. To accept the alternative hypothesis (H_a), which means that there is a significant relationship between predictor variable and criterion variable, the result of t-value should be large so that the p-value is less than .05 (for the results to meet a 95% confidence interval).

The results obtained from path analysis SEM, as illustrated in Figure 6.2, show a satisfactory measurement model. In other words, all factor loadings significantly load on their corresponding latent variables. The results support hypotheses 1.1, 4, 5.1, 5.2, 6, and 7.1. However, the results for hypotheses 1.2, 2, 3.1, 3.2, 7.2, 8.1, and 8.2 are not supported. The results of R-squared of important endogenous variables, which are intention to purchase virtual products (INT_V) and intention to purchase real world products (INT_R) are 22.93% and 9.59%, respectively. R-squared of the intervening variable, need satisfaction, is 9.10%. The effect sizes are medium for intention to purchase virtual products (INT_V), and small for intention to purchase real world products (INT_R). *Post-hoc* statistical powers are 1.00 for intention to purchase virtual products (INT_V), and .9775 for intention to purchase real world products (INT_R). The summary of hypotheses testing based on the results obtained from covariance-based SEM is shown in Table 6.1. The table shows specific research hypotheses and the results of the causal relationships based on the proposed research framework in Chapter 2.
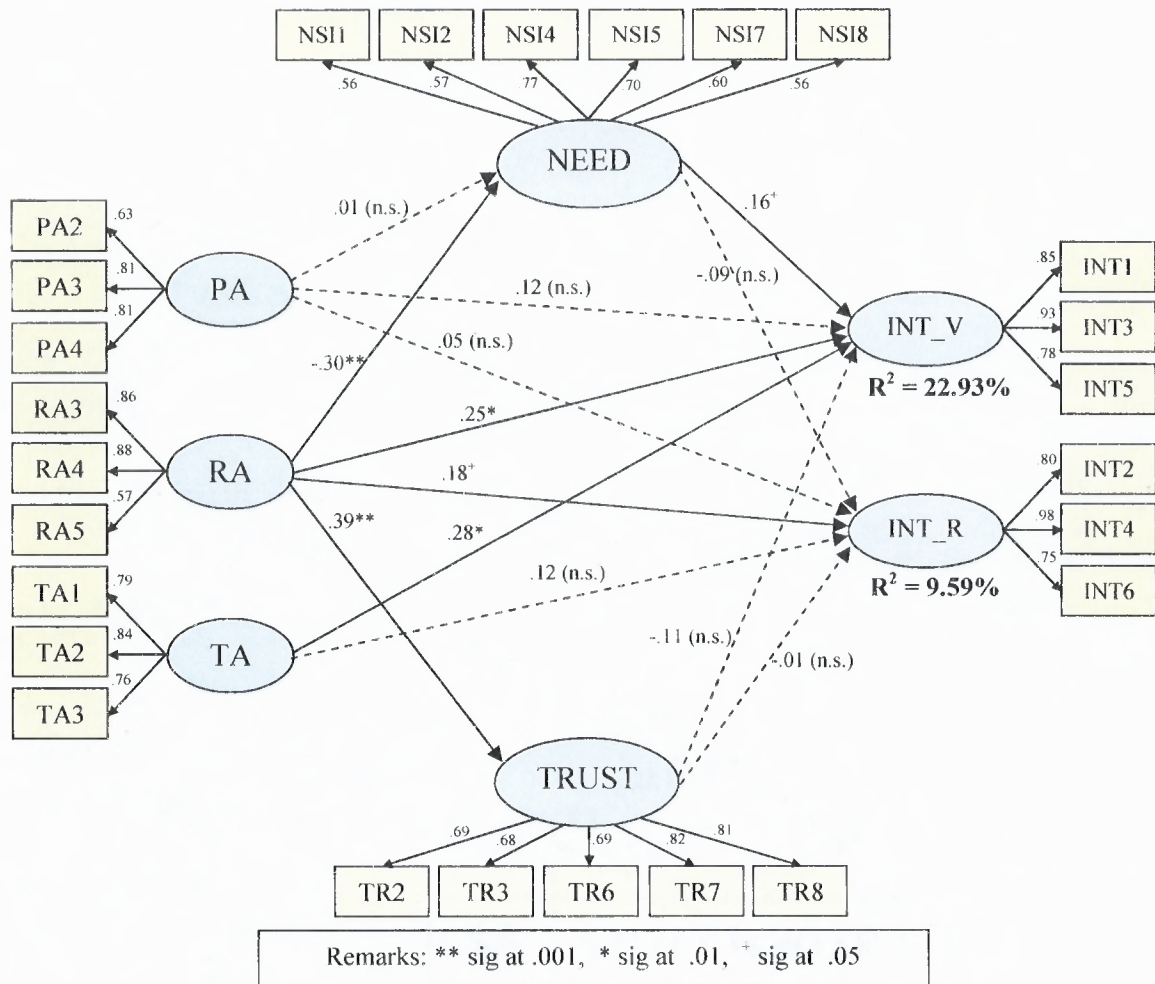
Figure 6.2 Path analysis using covariance-based SEM method for Virtual World Commerce Adoption (VWCA) model.

The results do not support the hypotheses underlining the relationships between trust and intention to purchase (H8.1 and H8.2). Therefore, it can be concluded that relationship-based trusting belief is not an important predictor of consumer's intention to purchase in the virtual world. This result is contrary to the results of previous research on trust in e-commerce and trust in other social contexts, which posit that trust is vital in every social and business relationship or in situation in which there is uncertainty and fear of opportunistic behavior (e.g., Luhmann, 1979; Mayer et al., 1995; McKnight et al.,

2002a). Moreover, the correlations of these relationships are also negative, which can be implied that the consumer may subsequently establish trust after they have already acquired and used the products.

Table 6.1 Results of the Hypotheses Testing for VWCA Model Using Covariance-Based SEM

	Research Hypotheses	Results
H1.1	The more the *virtual* products or services offered by virtual stores are able to satisfy consumers' need, the higher their intentions to make a purchase.	Supported
H1.2	The more the *real world* products or services offered by virtual stores are able to satisfy consumers' need, the higher their intentions to make a purchase.	Not supported
H2	The more the perceived physical affordance of the system environment, the higher the consumer's need satisfaction.	Not supported
H3.1	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Not supported
H3.2	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not supported
H4	The more the perceived relational affordance of the system environment, the higher the consumer's need satisfaction.	Supported
H5.1	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Supported
H5.2	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Supported
H6	The more the perceived relational affordance of virtual environment, the higher the consumer's trust they have.	Supported
H7.1	The more the perceived transactional affordance of system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Supported
H7.2	The more the perceived transactional affordance of system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not supported
H8.1	The higher the consumer's trust, the more intention they have towards making a purchase of *virtual* products or services.	Not supported
H8.2	The higher the consumer's trust, the more intention they have towards making a purchase of *real world* products or services.	Not supported

The results of the path analysis also show that the relationship between physical affordances and intention to purchase virtual products (H3.1) and the relationship between physical affordances and intention to purchase real world products (H3.2) are not significant. Similarly, the result of the hypothesis 7.2, regarding the relationship between transactional affordances and intention to purchase real world products, is also not supported.

The relationships between relational affordances and intention to purchase (H5.1 and H5.2) are intervened by need satisfaction and are partially supported. In other words, there is a significant relationship between need satisfaction and intention to purchase virtual products, but no relationship between need satisfaction and intention to purchase real world products. This result suggests that consumer's need satisfaction or fulfillments on the virtual products they intend to purchase are more important than trust on the vendor's benevolence and credibility in this environment. Finally, the results also find that the design of the system that facilitates users in interaction is crucial for business success in the virtual world.

Most of the fit indices (i.e., GFI, CFI, NFI and NNFI) are slightly below the .90 level when combining the measurement model and the structure model. These results clearly suggest that the model is having a slightly short of the acceptable fit level. The ratio of the Chi-square to the degree of freedom is approximately 2:1, which indicates an acceptable model fit (e.g., Gefen et al., 2000). The following are a summary of the fit indices of the path model:

- Goodness of Fit Index (GFI)   .8389

- Adjusted Goodness of Fit Index (AGFI)   .8002

- Comparative Fit Index (CFI)   .8914

- Normed Fit Index (NFI)   .8101

- Non-normed Fit Index (NNFI)   .8752

- Root Mean-Square Error of Approximation   .0682

- Parsimonious NFI (PNFI)   .7054

The model's PNFI is greater than .60, which indicates simplicity of the model. Based on the principal of parsimony, the preferred explanation is the one that is least complicated (Hatcher, 1994). In other words, if there are equal satisfactory models for an explanation, the one that contains a fewer paths is more preferred.

6.2.2 Path Analysis Using Partial Least Squares (PLS-Based) SEM

A component-based approach (PLS) is performed in comparison with a covariance-based approach (SEM) as aforementioned in the previous section. The component-based PLS path analysis, sometimes called "projection to latent structures," was introduced by Wold (1975). This method focuses on maximizing the variance of endogenous variables explained by exogenous variable in the model (Chin and Newsted, 1999).

PLS path analysis is recognized in social science research that typically involves unobservable constructs. PLS is the technique that estimates the case values so they capture most of the variance of manifest empirical measurements for the purpose of prediction. Like the covariance-based approach, a PLS path model combines two models together. These two models include: (1) measurement model consisting of measurement items and their corresponding latent factors, and (2) structural model relating some endogenous latent variables with other latent variables (Tenehaus et al., 2005). There are several advantages of using PLS path method, including:

- No assumptions about the population or scale of measurement (e.g., distribution, types of scales, normality) are required.

- Ability to model multiple dependent and multiple independent variables, as well as ability to handle a very complex model.

- Robustness with regard to several inadequacies of data (e.g., missing values, data noise, multicollinearity).

- Make a relatively accurate and strong prediction for small sample size.

Among these advantages, PLS has the following disadvantages that should be considered, which are:

- The model has no theoretical rationale supports for both measurements and relationships.

- The assumption of equal weights makes the results highly arbitrary.

- A problem about *consistency at large* (McDonald, 1996), which involves a disappearance of inconsistence due to overestimation of path loadings and underestimation of the correlations between the latent variables when the number of cases in the sample and the number of indicators per latent variables increase to infinite.

- Difficulty of interpreting the result of the overall model quality unless a bootstrap has been performed.

This research uses the PLS path analysis with a bootstrap algorithm from SmartPLS[25] to estimate the model fit and to test the research hypotheses. The bootstrap technique is known as a technique for resampling with replacement from the original sample. The standard error for parameter estimates can be obtained by bootstrap technique as suggested by Shrout and Bolger (2002). This section describes the process of conducting the PLS path analysis for the main study model (VWCA) and the model based on the data obtained from inexperienced users. Then, next section will explain alternative models that are suggested by the data, including a hierarchical model.

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[25] Ringle, C.M., Wende, S., and Will, S. SmartPLS 2.0 (M3) Beta, Institute of Operations Management and Organizations, University of Hamburg, http://www.smartpls.de

Unlike the path analysis SEM, PLS does not show fit indicators for the overall model, such as Chi-square or AGFI, instead the model validity is measured by R-squared or variance explanation (Gefen et al., 2000). To access the overall fit, the bootstrap technique is performed and a value of the Global Fit (GoF) can be obtained (Tenenhaus et al., 2005). The following are descriptions of various coefficients explained by the PLS path model:

- Cronbach's alpha (α) is a measure of measurement reliability. The value of alpha greater than .70 is for an acceptable scale and greater than .80 for a good scale.

- Composite reliability (CR) is an alternative to Cronbach's α as a measure of reliability. In PLS path analysis, using CR is more consistent than Cronbach's alpha as it usually over- or under-estimate scale reliability.

- Average Variance Extracted (AVE) is the average communality of each latent factor and is used to establish convergent validity. AVE should be greater than .50 for adequate model (Chin, 1998).

- Communality for PLS analysis is identical to AVE, which is used to measure the average percent of variance explained by an indicator of a latent factor.

- R-squared (R^2) is also related to the overall effect size measure. In general, the R-squared of .02, .15 and .35 are considered to be a "small", "medium", and "large" effect, respectively (Cohen, 1988).

- Redundancy coefficient measures the percent of variance in the indicators for the dependent variable that are explained by the independent variables.

- Global Fit (GoF) index measures for the overall fit of the model obtained by resampling technique (bootstrap). In general, the GoF values of .10, .25 and .36 are considered an "adequate", "moderate" and "good" global fit, respectively (Wetzels et al., 2009).

Note that the results of the PLS analysis described in this section are not based on the measurement model suggested by CFA in Chapter 5. The PLS analysis using SmartPLS can perform path analysis using the principal component analysis. The measurement model is suggested by the program at the same time as the structural model.

Therefore, the initial measurement scales (as illustrated in Figure 5.9 in Chapter 5) are used in this PLS analysis rather than the final measurement model obtained from CFA.

Figure 6.3 depicts the main research model (VWCA) based on the PLS path analysis obtained from participants who have experience with business transactions in Second Life. Raw data are treated for missing values and normality is used. The measurement model used in the analysis is based on the presumptions of the research.

Before constructing the overall model, the model is tested for direct effects between perceived affordance variables – physical affordances (PA), relational affordances (RA), and transactional affordances (TA) – and intention to purchase variables, which are divided into intention to purchase virtual products (INT_V) and intention to purchase real world products (INT_R). The results of the direct-effect model are shown under D-Model in Table 6.3. Next, the mediating effects of need satisfaction (GRW and DEF) and relationship-based trust (BEN and CRE) are tested as shown in the MAIN model of VWCA in Figure 6.3. The models' construct reliability and validity are shown in Table 6.2.
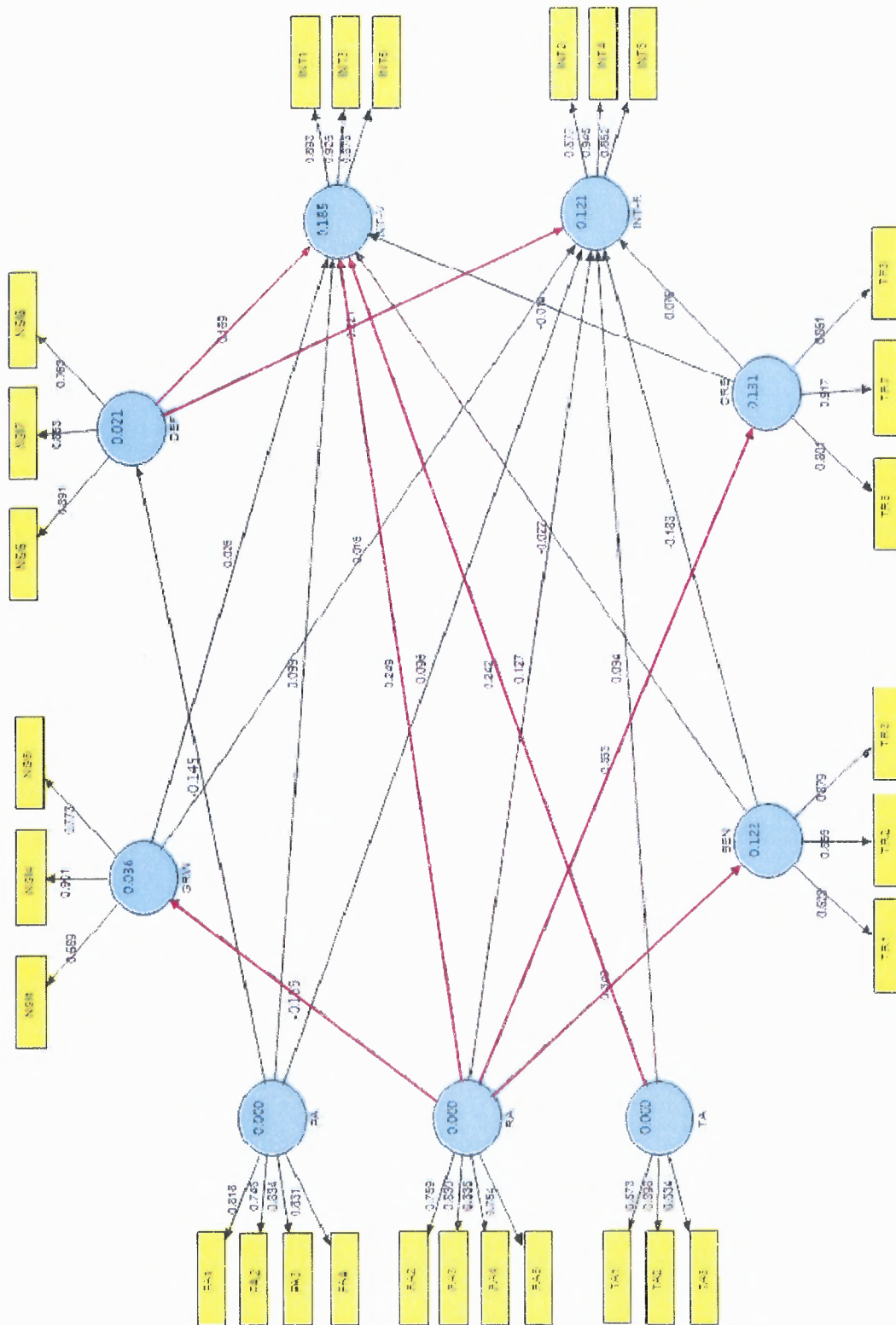
Figure 6.3 PLS path model for Virtual World Commerce Adoption (VWCA) – MAIN Model.

Table 6.2 Benchmark for Construct Reliability and Validity of D-Model and MAIN-PLS Model

	Cronbach's Alpha	Composite Reliability	AVE	Square root AVE
D-Model				
PA	0.8266	0.8835	0.6551	0.8093
RA	0.8072	0.8735	0.6336	0.7959
TA	0.8374	0.9023	0.7550	0.8689
INT_V	0.8816	0.9269	0.8089	0.8993
INT_R	0.8768	0.9243	0.8030	0.8961
MAIN Model				
PA	0.8266	0.8829	0.6540	0.8087
RA	0.8072	0.8736	0.6330	0.7956
TA	0.8374	0.9023	0.7550	0.8689
BEN	0.6948	0.8340	0.6311	0.7944
CRE	0.8237	0.8955	0.7413	0.8609
DEF	0.7886	0.8754	0.7016	0.8376
GRW	0.7186	0.8336	0.6284	0.7926
INT_V	0.8816	0.9269	0.8089	0.8993
INT_R	0.8768	0.9242	0.8027	0.8959

The results report no problem with reliability and validity of the measurement scales except for the measurement scales of benevolence trust (BEN) in the MAIN model that has a slightly low Cronbach's alpha. However, the CR is relatively good (0.8340). The results report a satisfactory level of convergent validity after some insignificant loadings are removed. Specifically, RA1, TA4, TR4, TR5, NSI2, and NSI3 are dropped from the model. The results also suggest no problem for discriminant validity for both D-Model and MAIN model, as assessed by the square root of the AVE exceeds the intercorrelations of the construct with the other constructs in the model (Fornell and Larcker, 1984). Thus, the results of PLS path analysis (principal component) support the previous research presumptions that relationship-based trust (BEN and CRE) and need satisfaction (DEF and GRW) are not unidimensional. The details of latent variable correlations and the overall quality criteria are included in Appendix H.2.

To assess the nomological validity of the models, the relationships between latent variables are tested using the bootstrap algorithm (with no sign change). The bootstraps are performed using 500-resample and 2000-resample iterations. The results of path coefficients, R-squared, effect size, and power analysis are shown in Table 6.3.

Table 6.3 Nomological Validity, Effect Size, and Statistical Power of D-Model and MAIN-PLS Model

Path	Path Coefficient	Significant? 500 resamples	Significant? 2000 resamples	R-squared	Effect Size	Power (95% C.I.)
D-Model						
PA → INT_V	.0982	-	-			
PA → INT_R	.0595	-	-			
RA → INT_V	.2030	-	$p < .01$			
RA → INT_R	.1556	-	$p < .01$			
TA → INT_V	.1962	$p < .05$	$p < .01$			
TA → INT_R	.1172	-	-			
INT_V				0.1531	0.1808	0.9999
INT_R				0.0693	0.0745	0.9585
MAIN Model						
PA → INT_V	.0749	-	-			
PA → INT_R	.1279	-	-			
PA → DEF	-.1448	-	-			
RA → INT_V	.2308	$p < .05$	$p < .001$			
RA → INT_R	.0884	-	-			
RA → BEN	.3487	$p < .001$	$p < .001$			
RA → CRE	.3626	$p < .001$	$p < .001$			
RA → GRW	-.1886	-	$p < .05$			
TA → INT_V	.2415	$p < .05$	$p < .001$			
TA → INT_R	.0945	-	-			
BEN → INT_V	-.0223	-	-			
BEN → INT_R	-.1826	-	-			
CRE → INT_V	-.0144	-	-			
CRE → INT_R	.0764	-	-			
DEF → INT_V	.1687	-	$p < .05$			
DEF → INT_R	-.2208	-	$p < .05$			
GRW → INT_V	.0263	-	-			
GRW → INT_R	.0156	-	-			
BEN				0.1216	0.1318	0.9998
CRE				0.1314	0.1512	0.9999
DEF				0.0209	0.0213	0.6016
GRW				0.0356	0.0369	0.8291
INT_V				0.1849	0.2425	0.9999
INT_R				0.1213	0.1380	0.9916

The results show that a larger resampling size enhances statistical significance. These results are consistent with the prior research (Tenenhaus et al., 2005), which suggests that a higher number of resamples may lead to more reasonable standard error estimates and will result in a better model prediction. The D-Model supports only the relationships between relational affordances and intention to purchase virtual and real products (RA → INT_V/INT_R), and between transactional affordances and intention to purchase virtual products (TA → INT_V). The model explains about 15.31% of the total variance, which is considered as having a moderate effect size. The statistical power, which is the probability of rejecting a false null hypothesis (H_0), known as 1-β (Baroudi and Orlikowski, 1989), are .99 for intention to purchase virtual products (INT_V), and .96 for intention to purchase real world products (INT_R). In this case, all results satisfy the 95% confident interval criteria. The GoF of the D-Model, which can be calculated from the following formula, is 0.2778 implying that the model has a moderately good fit.

$$\text{Global Fit (GoF)} = \text{Sqrt} (\overline{\text{AVE}} * \overline{\text{R}^2})$$

The mediating effects of relationship-based trust and need satisfaction variables are examined next. The results obtained from both bootstrap analyses show many significant paths. The paths between relational affordances and intention to purchase virtual products (RA → INT_V), relational affordances and benevolence trust (RA → BEN), relational affordances and credibility trust (RA → CRE), relational affordances and growth need satisfaction (RA → GRW), transactional affordances and intention to purchase virtual products (TA → INT_V), deficiency need satisfaction and intention to

purchase virtual products (DEF → INT_V), and between deficiency need satisfaction and intention to purchase real world products (DEF → INT_R) are significant.

The overall model has the R-squared for intention to purchase virtual products (INT_V) of .1849 and for intention to purchase real world products (INT_R) of .1213. The effect sizes are medium and small, respectively. The statistical powers are .99 for both intention to purchase virtual products (INT_V) and intention to purchase real world products (INT_R). Other power stats for endogenous variables are shown in Table 6.4. The GoF for the overall MAIN model, which represents the main research model (VWCA), is 0.2692 implying that the model has a moderately good fit. The results of hypotheses testing obtained from PLS-based SEM are summarized on Table 6.4. The table shows the specific research hypotheses and the results of the causal relationships based on the proposed research model described in Chapter 2.

Table 6.4 Results of the Hypotheses Testing for MAIN Model Using PLS-Based SEM

	Research Hypotheses	Results
H1.1a	The more the *virtual* products or services offered by virtual stores are able to satisfy consumers' *growth* need, the higher their intentions to make a purchase.	Not Supported
H1.1b	The more the *virtual* products or services offered by virtual stores are able to satisfy consumers' *deficiency* need, the higher their intentions to make a purchase.	Supported
H1.2a	The more the *real world* products or services offered by virtual stores are able to satisfy consumers' *growth* need, the higher their intentions to make a purchase.	Not supported
H1.2b	The more the *real world* products or services offered by virtual stores are able to satisfy consumers' *deficiency* need, the higher their intentions to make a purchase.	Supported
H2	The more the perceived physical affordance of the system environment, the higher the consumer's *deficiency* need satisfaction.	Not supported
H3.1	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of virtual products or services.	Not supported

Table 6.4 Results of the Hypotheses Testing for MAIN Model Using PLS-Based SEM (Continued)

	Research Hypotheses	Results
H3.2	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not supported
H4	The more the perceived relational affordance of the system environment, the higher the consumer's *growth* need satisfaction.	Supported
H5.1	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Supported
H5.2	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not Supported
H6.1	The more the perceived relational affordance of virtual environment, the higher the consumer's *benevolent* trust they have.	Supported
H6.2	The more the perceived relational affordance of virtual environment, the higher the consumer's *credibility* trust they have.	Supported
H7.1	The more the perceived transactional affordance of system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Supported
H7.2	The more the perceived transactional affordance of system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not supported
H8.1a	The higher the consumer's *benevolent* trust, the more intention they have towards making a purchase of *virtual* products or services.	Not supported
H8.1b	The higher the consumer's *credibility* trust, the more intention they have towards making a purchase of *virtual* products or services.	Not supported
H8.2a	The higher the consumer's *benevolent* trust, the more intention they have towards making a purchase of *real world* products or services.	Not supported
H8.2b	The higher the consumer's *credibility* trust, the more intention they have towards making a purchase of *real world* products or services.	Not supported

The results also suggest that there is no mediating effect resulting from adding relationship-based trust but there is a partially significant effect from need satisfaction, that is the relationship between relational affordances and growth need satisfaction (RA → GRW). The results only reveal that there are significant relationships between

relational affordances and relationship-based trust variables (RA → BEN/CRE), and between deficiency need and intention to purchase (DEF → INT_V/INT_R).

6.3 Modification of the Main Research Model (VWCA)

6.3.1 Modification Using Covariance-Based SEM

The results obtained from covariance-based SEM described in Section 6.2 suggest that the overall fit of the models as determined by the fit indices are lower than a cutoff value of .90. The structural equation procedure also suggests an alternative for improving the model and the overall fit. According to a Wald test and a Lagrange Multiplier test, the previous research model of VWCA can be improved by adding paths between physical affordances (PA) and TRUST, and between transactional affordances (TA) and TRUST to the model. The modified model is depicted in Figure 6.4. After the model is modified, the overall fit indices are improved to the following values:

- Goodness of Fit Index (GFI)   .8539

- Adjusted Goodness of Fit Index (AGFI)   .8174

- Comparative Fit Index (CFI)   .9091

- Normed Fit Index (NFI)   .8265

- Non-normed Fit Index (NNFI)   .8948

- Root Mean-Square Error of Approximation   .0626

- Parsimonious NFI (PNFI)   .7146

The results show a satisfactory model fit as measured by AGFI, which is above the cutoff value of .80. CFI is slightly above .90, which indicates a good fit. The ratio of the Chi-square to the degree of freedom is less than 2:1. Moreover, the model's PNFI is

greater than .60, which indicates simplicity of the model. The revised model's R-squared for endogenous variables intention to purchase virtual products (INT_V) and intention to purchase real world products (INT_R) are .2102 and .0952, respectively. The effect sizes are medium for intention to purchase virtual products (INT_V), and small for intention to purchase real world products (INT_R). *Post-hoc* statistical powers are .9999 for intention to purchase virtual products (INT_V) and .9765 for intention to purchase real world products (INT_R).
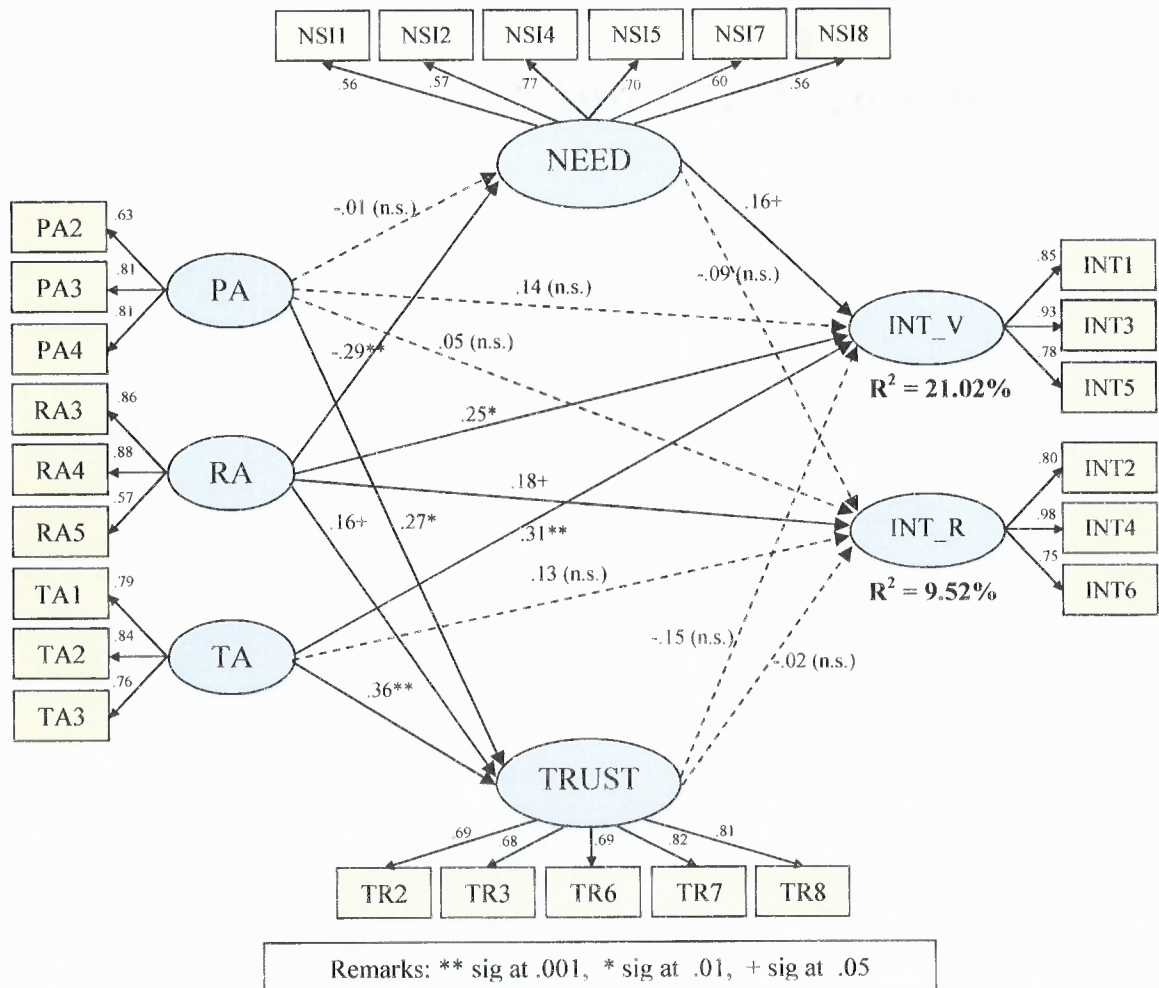
Figure 6.4 Path analysis showing the modified model (REV-SEM Model) as suggested by covariance-based SEM method.

In addition, the results obtained from the modification greatly improve the R-squared of relationship-based trust from .1523 to .3860. This implies that physical affordances and transactional affordances of the virtual environment are strong predictors of trust. However, the modified model still does not report a significant relationship between trust and intention to purchase.

6.3.2 Modification Using PLS-Based SEM

The results obtained from PLS-based SEM described in Section 6.2.2 suggest that the global fit of the model and the R-squared values are slightly low. The REV-PLS model contains a revision of the MAIN model by adding four causal paths: between physical affordances and benevolence trust (PA → BEN), between physical affordances and credibility trust (PA → CRE), between transactional affordances and benevolence trust (TA → BEN), and between transactional affordances and credibility trust (TA → CRE). This modification is based on the values of latent variable correlations as shown in Table 6.5, which suggests moderately large correlations between these four pairs of latent variables as seen as bolded numbers.

Table 6.5 Latent Variable Correlations

	BEN	CRE	DEF	GRW	INT-R	INT-V	PA	RA	TA
BEN	1.0000								
CRE	0.6488	1.0000							
DEF	-0.3200	-0.3207	1.0000						
GRW	-0.1092	-0.0925	0.5082	1.0000					
INT-R	0.0828	0.1314	-0.2543	-0.1251	1.0000				
INT-V	0.1522	0.1721	0.0437	0.0330	0.1856	1.0000			
PA	**0.4045**	**0.4126**	-0.1448	-0.0603	0.1736	0.2601	1.0000		
RA	0.3646	0.3727	-0.2576	-0.1651	0.1875	0.3422	0.4273	1.0000	
TA	**0.4136**	**0.4766**	-0.2351	-0.1233	0.1827	0.3314	0.4165	0.4087	1.0000

Note that the correlations between many variables show negative values, especially the correlations that relate to need satisfaction variables (DEF and GRW). This is because the construct of need satisfaction implies the score of deficiency of need. In other words, the higher the value of these variable, the more deficiency the participant feels on a certain kinds of needs they have. For example, the correlation between deficiency need satisfaction (DEF) and intention to purchase real world products (INT-R), which is -0.2543, can be interpreted as participants have a deficiency of the lower-level need. As a result, the deficiency of need creates more intentions to make a purchase of real world products.

Figure 6.5 depicts the revised model (REV-PLS model) based on the results of the PLS path analysis obtained from participants who have experience with business transactions. The models' construct reliability and validity indicators are shown in Table 6.6.

Table 6.6 Benchmark for Construct Reliability and Validity of REV-PLS Model

Construct	Cronbach's Alpha	Composite Reliability	AVE	Square root AVE
PA	0.8266	0.8843	0.6565	0.8102
RA	0.8072	0.8735	0.6338	0.7961
TA	0.8374	0.9024	0.7552	0.8690
BEN	0.6948	0.8335	0.6287	0.7929
CRE	0.8237	0.8955	0.7412	0.8609
DEF	0.7886	0.8753	0.7016	0.8376
GRW	0.7186	0.8336	0.6283	0.7926
INT-V	0.8816	0.9242	0.8089	0.8993
INT-R	0.8768	0.9269	0.8027	0.8959
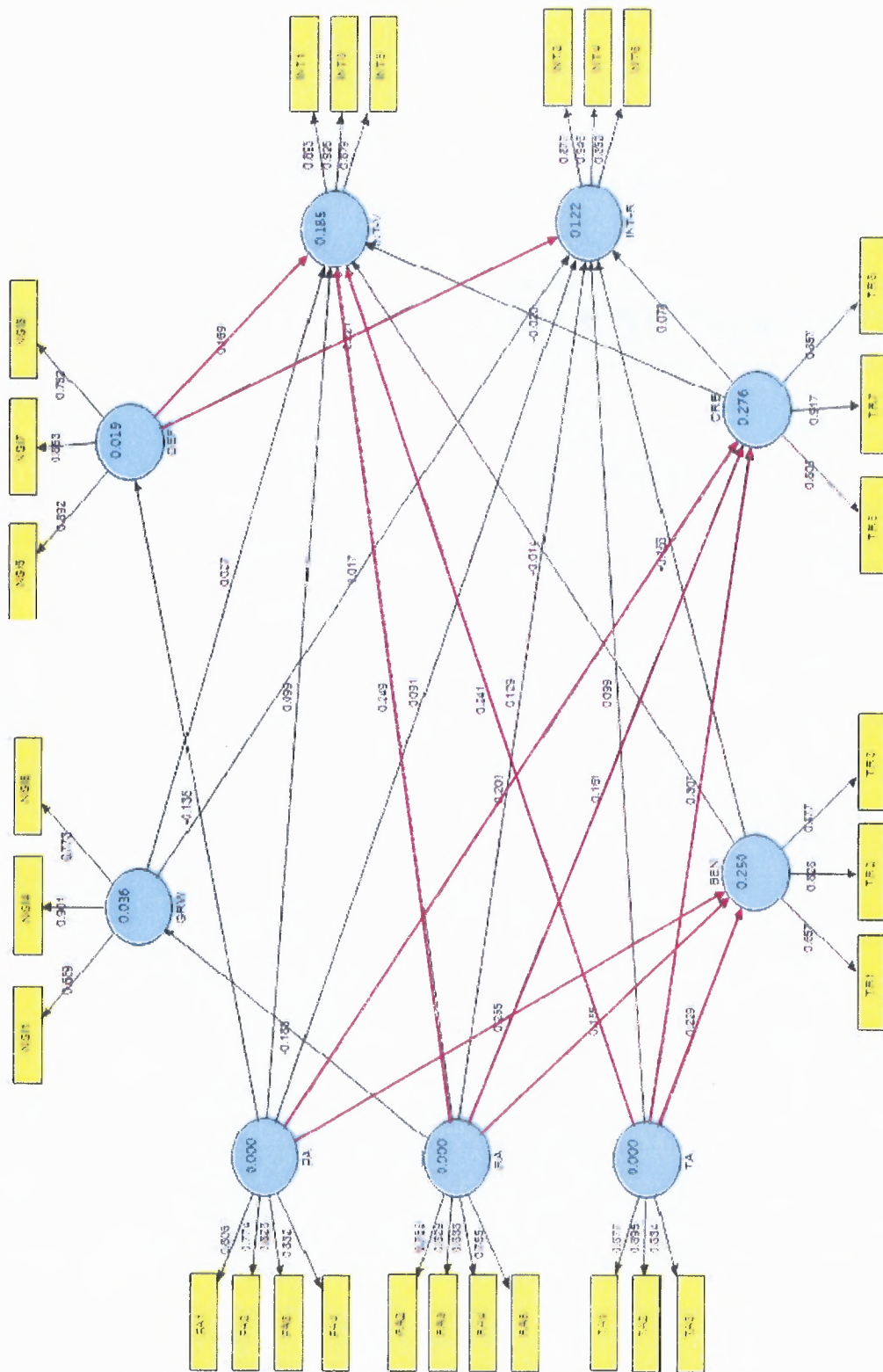
Figure 6.5 PLS path model for the revised Virtual World Commerce Adoption (VWCA) model – REV-PLS Model.

The results report no problem with reliability and validity of the measurement scales except for the measurement scales of benevolence trust (BEN), which report a slightly low Cronbach's alpha. However, the CR is relatively good (0.8335). The results report a satisfactory of convergent validity as all loadings of measurement scales are significant. The results also suggest no problem for discriminant validity. The details of latent variable correlations and the overall quality criteria are included in Appendix H.3.

To assess the nomological validity of the models, the relationships between latent variables are tested using Bootstrap algorithm (with no sign change). The bootstraps are performed using 500-resample and 2000-resample iterations. The results of path coefficients, R-squared, effect size, and power are shown in Table 6.7.

The best results obtained of path analysis for REV-PLS model support the following relationships: physical affordances and benevolence trust (PA → BEN), between physical affordances and credibility trust (PA → CRE), relational affordances and intention to purchase virtual products (RA → INT-V), relational affordances and benevolence trust (RA → BEN), relational affordances and credibility trust (RA → CRE), transactional affordances and intention to purchase virtual products (TA → INT-V), transactional affordances and benevolence trust (TA → BEN), transactional affordances and credibility trust (TA → CRE), deficiency need satisfaction and intention to purchase virtual products (DEF → INT-V), and deficiency need satisfaction and intention to purchase real world products (DEF → INT-R).

Table 6.7 Nomological Validity, Effect Size, and Statistical Power of REV-PLS Model

Path	Path Coefficient	Significant?		R-squared	Effect Size	Power (95% C.I.)
		500 resamples	2000 resamples			
PA → INT-V	.0683	-	-			
PA → INT-R	.0895	-	-			
PA → DEF	-.1380	-	-			
PA → BEN	.2552	p < .01	p < .001			
PA → CRE	.2003	-	p < .01			
RA → INT-V	.2386	p < .05	p < .001			
RA → INT-R	.1095	-	-			
RA → BEN	.1545	-	p < .01			
RA → CRE	.1609	-	p < .05			
RA → GRW	-.1884	-	-			
TA → INT-V	.2313	p < .05	p < .001			
TA → INT-R	.0795	-	-			
TA → BEN	.2289	p < .01	p < .001			
TA → CRE	.3069	p < .001	p < .001			
BEN → INT-V	-.0137	-	-			
BEN → INT-R	-.1882	-	-			
CRE → INT-V	-.0197	-	-			
CRE → INT-R	.0782	-	-			
DEF → INT-V	.1686	-	p < .05			
DEF → INT-R	-.2214	-	p < .01			
GRW → INT-V	.0270	-	-			
GRW → INT-R	.0168	-	-			
BEN				0.2495	.3324	1.0000
CRE				0.2764	.3820	1.0000
DEF				0.0191	.0195	0.5628
GRW				0.0355	.0368	0.8281
INT-V				0.1847	.2265	0.9999
INT-R				0.1221	.1391	0.9920

The model explains about 18.47 % of the total variance of the intention to purchase virtual products (INT-V), and about 12.21% of the total variance of the intention to purchase real world products (INT-R), which are considered as having a moderate and small effect sizes, respectively. The statistical power values for both endogenous variables are .99. The GoF of the overall REV-PLS model is 0.3232. This implies that the model has a better fit compared to the MAIN model, which has a GoF value of 0.2692.

6.3.3 Modification Using Hierarchical PLS Model

A hierarchical model is tested due to a presence of large correlations between second-order latent variables and their dimensional first-order latent variables, such as those highlighted on Table 6.8. The hierarchical constructs or multi-dimensional constructs can be defined as constructs involving more than one dimension (Edwards, 2001; Wetzels et al., 2009). The unity of hierarchical constructs is based on a theoretical and empirical ground (Edwards, 2001).

Based on human motivation theory (Maslow, 1943), it is obvious that deficiency needs (DEF) and growth needs (GRW) are two dimensional needs that are based on the same theoretical concept (i.e., the theory of human motivation). Likewise, benevolence trust (BEN) and credibility trust (CRE) are rooted from the same theoretical ground of trust theory (e.g., McKnight et al., 2002b; Pavlou and Dimoka, 2006). Therefore, the hierarchical model is proposed and tested as an alternative to the REV research models in Sections 6.3.1 and 6.3.2. The hierarchical model (HI-Model) is depicted in Figure 6.6.

Table 6.8 Correlations of First-Order and Second-Order Latent Variables

	BEN	CRE	DEF	GRW	INT-R	INT-V	NEED	PA	RA	TA	TRUST
BEN	1.0000										
CRE	0.6337	1.0000									
DEF	-0.3300	-0.3204	1.0000								
GRW	-0.0708	-0.0700	0.4864	1.0000							
INT-R	0.0602	0.1546	-0.2480	-0.1128	1.0000						
INT-V	0.1273	0.1543	0.0374	0.0481	0.1872	1.0000					
NEED	-0.2420	-0.2354	0.8808	0.8421	-0.2146	0.0490	1.0000				
PA	0.4031	0.3926	-0.1344	-0.0180	0.1672	0.2601	-0.0929	1.0000			
RA	0.3578	0.3646	-0.2679	-0.1145	0.1925	0.3386	-0.2280	0.4187	1.0000		
TA	0.4067	0.4673	-0.2382	-0.0682	0.1790	0.3311	-0.1843	0.4163	0.4030	1.0000	
TRUST	0.8843	0.9215	-0.3584	-0.0778	0.1229	0.1580	-0.2632	0.4401	0.3998	0.4872	1.0000
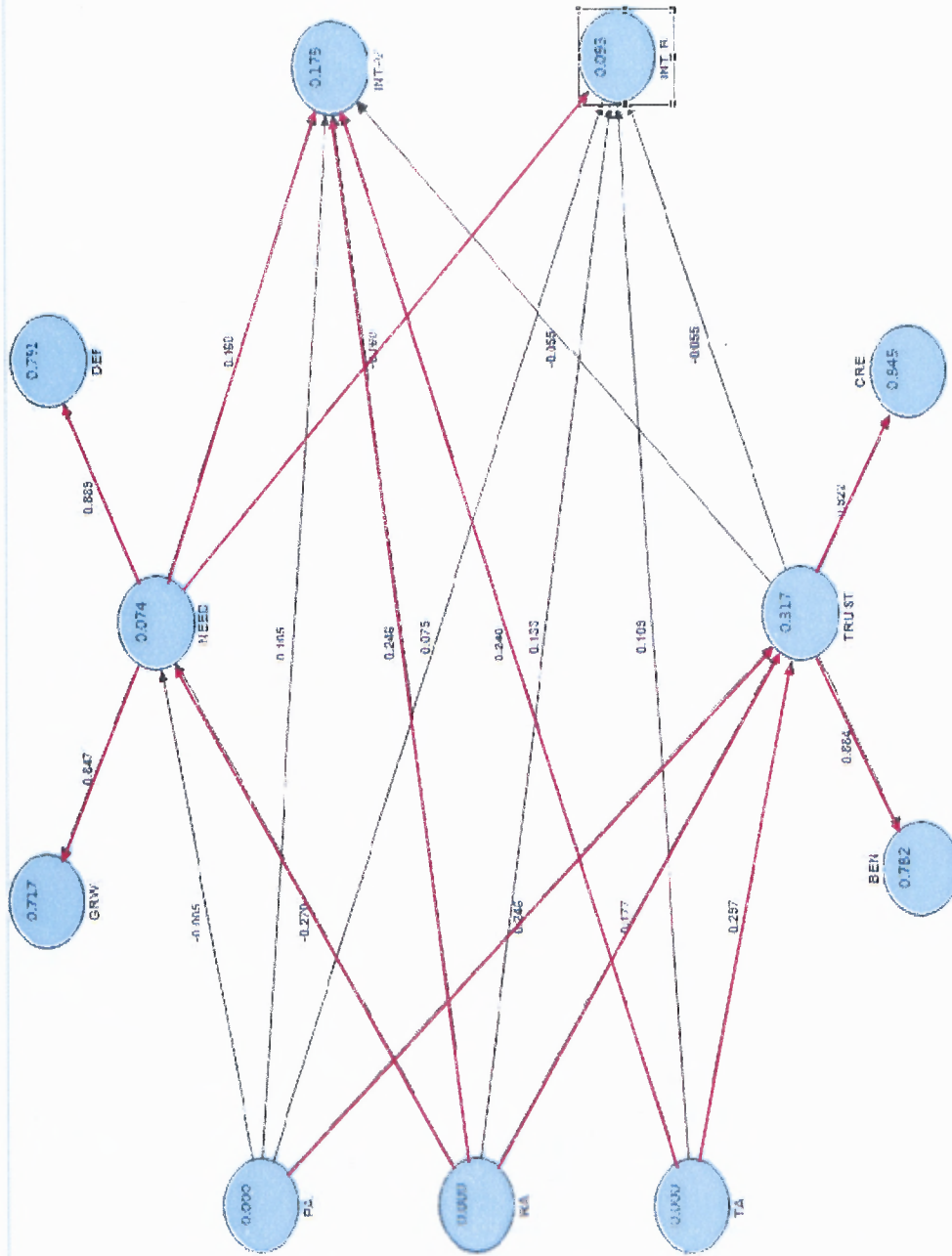
Figure 6.6 PLS path hierarchical model for Virtual World Commerce Adoption (VWCA) – HI-Model.

The models' construct reliability and validity indicators are obtained and shown in Table 6.9. The hierarchical model reports no problem with convergent validity, as seen from the AVE above .50. The results report no other problem with reliability and validity of the measurement scales. The results also suggest no problem for discriminant validity. The details of latent variable correlations and the overall quality criteria for this model are included in Appendix H.4.

Table 6.9 Benchmark for Construct Reliability and Validity of HI-Model

Construct	Cronbach's Alpha	Composite Reliability	AVE	Square root AVE
PA	0.8266	0.8841	0.6563	0.8101
RA	0.8072	0.8740	0.6351	0.7969
TA	0.8374	0.9024	0.7551	0.8689
TRUST	0.8377	0.8826	0.5614	0.7492
BEN	0.6948	0.8328	0.6316	0.7947
CRE	0.8237	0.8955	0.7412	0.8609
NEED	0.8046	0.8604	0.5086	0.7132
DEF	0.7886	0.8768	0.7040	0.8390
GRW	0.7186	0.8427	0.6429	0.8018
INT-V	0.8816	0.9270	0.8090	0.8994
INT-R	0.8768	0.9243	0.8031	0.8961

To assess the nomological validity of the HI-Model, the relationships between latent variables are tested using Bootstrap algorithm (with no sign change). Similar to the previous models, the bootstraps are performed using 500-resample and 2000-resample iterations. The results of path coefficients, R-squared, effect size, and power are shown in Table 6.10.

The best result supports many relationships, except the relationships between physical affordances and intention to purchase virtual products (PA → INT_V), physical affordances and intention to purchase real world products (PA → INT_R), physical affordances and need satisfaction (PA → NEED), relational affordances and intention to

purchase real world products (RA → INT_R), transactional affordances and intention to purchase real world products (TA → INT_R), trusting belief and intention to purchase virtual products (TRUST → INT_V), and between trusting belief and intention to purchase real world products (TRUST → INT_R).

Table 6.10 Nomological Validity, Effect Size, and Statistical Power of HI-Model

Path	Path Coefficient	Significant?		R-squared	Effect Size	Power (95% C.I.)
		500 resamples	2000 resamples			
PA → INT-V	0.0909	-	-			
PA → INT-R	0.0628	-	-			
PA → NEED	-.0005	-	-			
PA → TRUST	0.2464	p < .05	p < .001			
RA → INT-V	0.1928	p < .05	p < .001			
RA → INT-R	0.1661	-	-			
RA → NEED	-0.2696	p < .05	p < .001			
RA → TRUST	0.1771	-	p < .05			
TA → INT-V	0.2237	p < .05	p < .001			
TA → INT-R	0.0924	-	-			
TA → TRUST	0.2969	p < .01	p < .001			
NEED → DEF	0.8893	p < .001	p < .001			
NEED → GRW	0.8467	p < .001	p < .001			
NEED → INT-V	0.1598	-	p < .05			
NEED → INT-R	-0.1600	-	p < .05			
TRUST → BEN	0.8843	p < .001	p < .001			
TRUST → CRE	0.9216	p < .001	p < .001			
TRUST → INT-V	-0.0547	-	-			
TRUST → INT-R	-0.0546	-	-			
NEED				0.0738	0.0796	0.9737
DEF				0.7907	-	-
GRW				0.7170	-	-
TRUST				0.3171	0.4643	1.0000
BEN				0.7818	-	-
CRE				0.8494	-	-
INT-V				0.1787	0.2186	0.9999
INT-R				0.0928	0.1023	0.9728

The model explains about 17.87 % of the total variance for intention to purchase virtual products (INT-V), and about 9.28% for intention to purchase real world products (INT-R). The effect sizes for both of them are medium and small, respectively. The statistical power for both endogenous variables are .99 and .97, respectively. The GoF for

the HI-Model is 0.3348, implying that the model has a good and better fit than the REV and MAIN models, which have GoF values of 0.3232 and 0.2692, respectively.

The results of HI-Model suggest that the hierarchical VWCA model has a better fit for the overall data obtained from empirical data. The model also shows that the direct effect between relational affordances and intention to make a purchase of virtual products is mediate by the need satisfaction variable. However, the direct effect between relational affordances and intention to make a purchase of real world products is not significant. The model also shows that trusting belief is not a predictor of intention to purchase, as the results obtained from both SEM and PLS are confirmed. The perceived affordance dimensions strongly predict trusting belief. Relational affordances and transactional affordances predict intention to purchase virtual products.

The hierarchical model is retested by excluding those variables that are not significantly related to dependent variables. That is, trusting belief and physical affordances are excluded from the model. The result is shown in Figure 6.7. The model summarizes that there are significant effects from relational affordances and transactional affordances on intention to purchase virtual products. Relational affordances also significantly relate to intention to purchase real world products. All direct relationships are mediated by need satisfaction variable. The model explains about 17.04 % of the total variance for intention to purchase virtual products (INT-V), and about 4.75% for intention to purchase real world products (INT-R). The effect sizes for both of them are medium and small, respectively. The statistical power for both endogenous variables are .99 and .92, respectively. The GoF for the HI-Model is 0.2699, implying that the model has a moderately good fit.
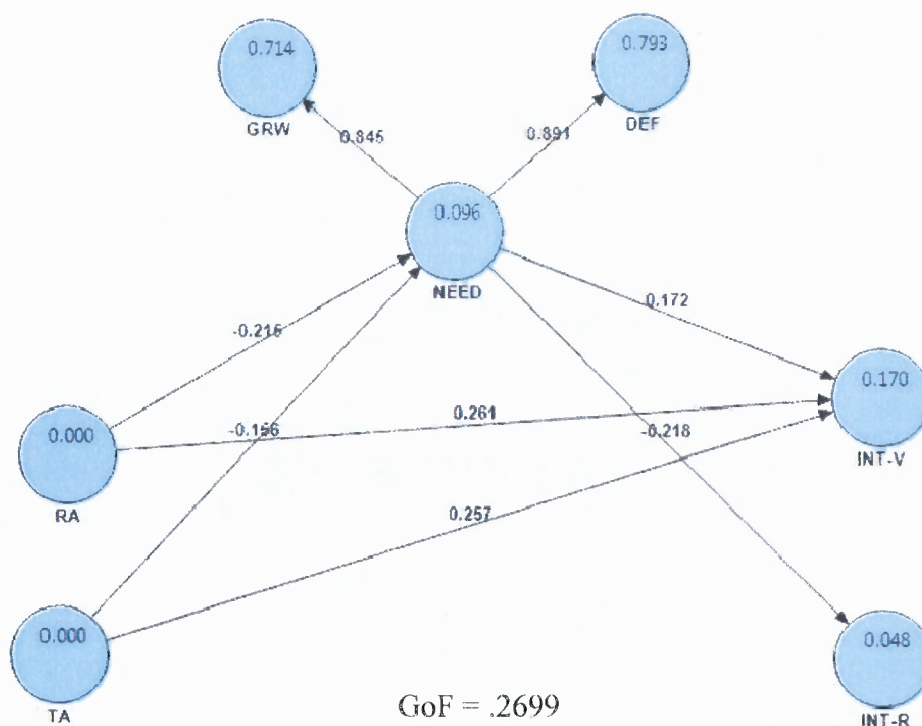
Figure 6.7 PLS path hierarchical model after reducing variables.

6.4 Path Analyses for Inexperienced User Group

6.4.1 Path Analysis Using Covariance-Based SEM for Inexperienced User Group

Figure 6.8 depicts the model based on the result of the CFA obtained from participants who do not have experience or those who do not recall having experience in business transactions as described in the previous chapter.

Figure 6.9 Covariance-based SEM based on inexperienced users.

The results obtained from path analysis as illustrated in Figure 6.9 report that the measurement model is valid. In other words, all factor loadings significantly load on their corresponding latent variables. However, the results of hypotheses testing only support hypothesis 5.1, while the other hypotheses are not supported. The R-squared of the endogenous variables, which are intention to purchase virtual products (INT_V) and intention to purchase real world products (INT_R), are 12.47% and 5.43%, respectively. The effect sizes are medium for intention to purchase virtual products (INT_V), and small for intention to purchase real world products (INT_R). *Post-hoc* statistical powers are .8069 for intention to purchase virtual products (INT_V), and .4009 for intention to purchase real world products (INT_R). The summary of hypotheses testing for the based-case model is shown in Table 6.11.

Table 6.11 Results of the Hypotheses Testing for Model Based on Inexperienced Users Using Covariance-Based SEM

	Research Hypotheses		Results
H1.1	The more the *virtual* products or services offered by virtual stores are able to satisfy consumers' need, the higher their intentions to make a purchase.		Not supported
H1.2	The more the *real world* products or services offered by virtual stores are able to satisfy consumers' need, the higher their intentions to make a purchase.		Not supported
H2	The more the perceived physical affordance of the system environment, the higher the consumer's need satisfaction.		Not supported
H3.1	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.		Not supported
H3.2	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.		Not supported
H4	The more the perceived relational affordance of the system environment, the higher the consumer's need satisfaction.		Not supported
H5.1	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.		Supported
H5.2	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.		Not supported

This result implies that at the initial stage of the purchasing experience, it is very crucial that the system is designed in a way to support interaction among users. A good design of the system that supports communication and social interaction is vital in establishing users' intentions to purchase in this early stage. The model does not include the relationship-based trust variable, as well as the need satisfaction variable, because it is too early for the users to establish trust or know exactly what their needs are. Therefore, the effects from relationship-based trust and need satisfaction are ignored.

The overall fit of the BASE model is below .90 level, when combining the measurement model and the structure model together. The ratio of the Chi-square to the

degree of freedom is less than 2:1. The fit coefficients also indicate a slightly below acceptable model fit (e.g., Gefen et al., 2000). The following summarizes the fit indices of path model.

- Goodness of Fit Index (GFI)   .8079
- Adjusted Goodness of Fit Index (AGFI)   .7097
- Comparative Fit Index (CFI)   .8451
- Normed Fit Index (NFI)   .7392
- Non-normed Fit Index (NNFI)   .7934
- Root Mean-Square Error of Approximation   .1092
- Parsimonious NFI (PNFI)   .5544

6.4.2 Path Analysis Using PLS-Based SEM for Inexperienced User Group

The model illustrated in Figure 6.10 is analyzed using PLS path analysis. The results are based on the data from participants who do not have experience with business transactions. Raw data that are treated for missing values and normality are used in the analysis. The measurement model used in the analysis is based on the presumption of the research as described earlier. Relationship-based trust and some measurement items of need satisfaction (i.e., NSI6, NSI7 and NSI8) are excluded from the model because these measurement scales are not applicable to the participants.

The results report no problem with reliability of the measurement scales as shown in Table 6.12. However, there is some problem regarding the convergent validity for NEED due to a few low loadings on the measurement model. Therefore, the items with low factor loadings (i.e., RA2, NSI1, and NSI2) are dropped. The results suggest no problem for discriminant validity.
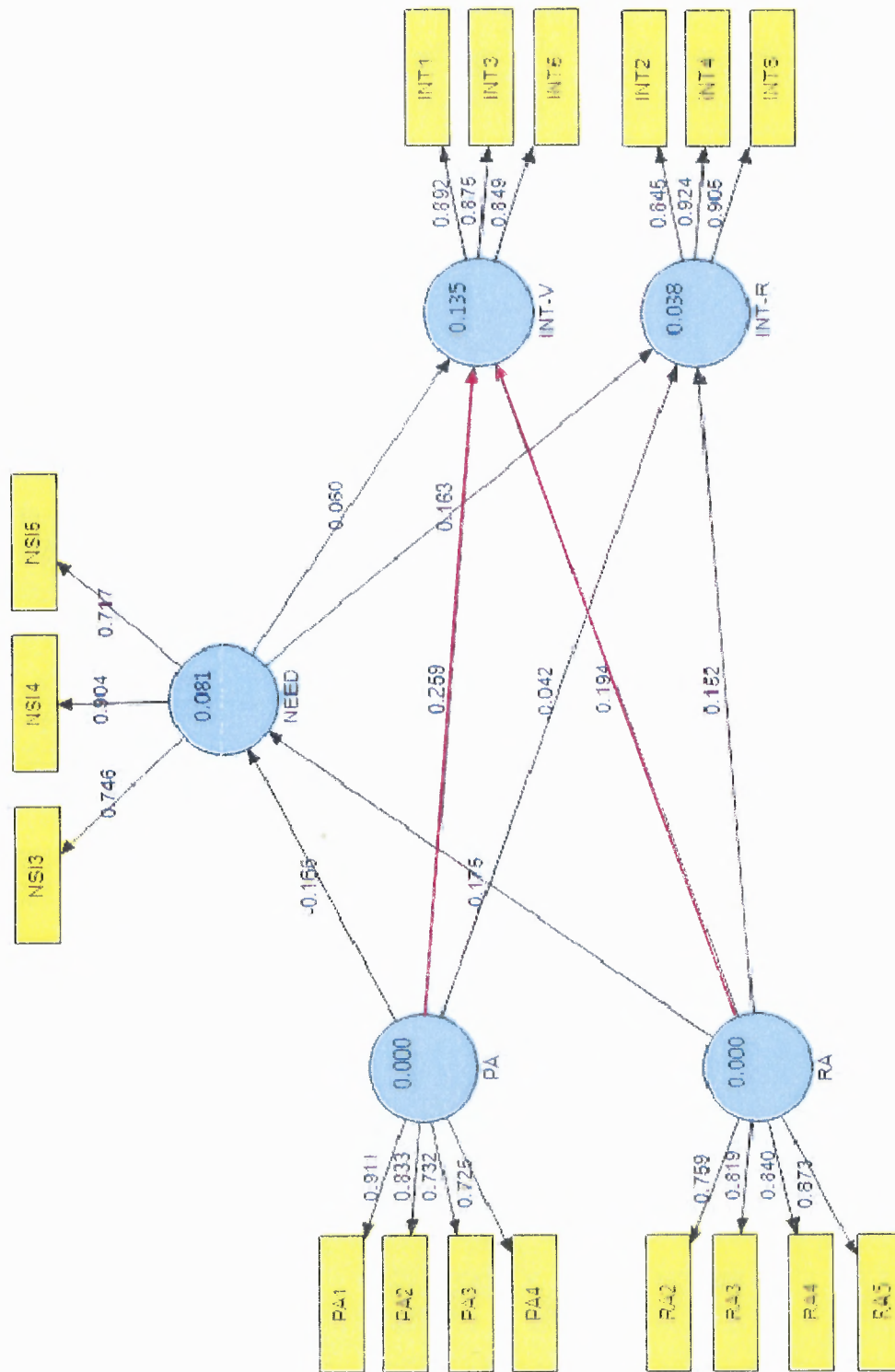
Figure 6.10 PLS path analysis for the model based on inexperienced users.

Table 6.12 Benchmark for Construct Reliability and Validity of Inexperienced User Model Using PLS-Based SEM

	Cronbach's Alpha	Composite Reliability	AVE	Square root AVE
PA	0.8363	0.8787	0.6464	0.8039
RA	0.8439	0.8939	0.6788	0.8239
NEED	0.7262	0.8345	0.6960	0.8342
INT_V	0.8472	0.9051	0.7607	0.8722
INT_R	0.8710	0.9207	0.7948	0.8915

To assess the nomological validity of the model, the relationships between latent variables are tested using Bootstrap algorithm (with no sign change). The bootstraps are performed using 500-resample and 2000-resample iterations. The results of path coefficients, R-squared, effect size, and power are shown in Table 6.13.

Table 6.13 Nomological Validity, Effect Size and Statistical Power of the Model Using PLS-Based SEM for Inexperienced Users

Path	Path Coefficient	Significant?		R-squared	Effect Size	Power (95% C.I.)
		500 resamples	2000 resamples			
PA → INT_V	.2432	$p < .05$	$p < .001$			
PA → INT_R	-.0750	-	-			
PA → NEED	-.1312	-	-			
RA → INT_V	.2089	-	$p < .01$			
RA → INT_R	.1404	-	-			
RA → NEED	-.1331	-	-			
NEED → INT_V	.1107	-	-			
NEED → INT_R	.2537	-	-			
NEED				0.0809	0.0880	0.6967
INT_V				0.1345	0.1554	0.8425
INT_R				0.0376	0.0391	0.2803

According to the results obtained from 2000 bootstrap resampling as shown in Table 6.13, the model supports only the relationships between physical affordances and intention to purchase virtual products (PA → INT_V), and between relational affordances and intention to purchase virtual products (RA → INT_V). The results also suggest that there is no mediating effect resulting from adding need satisfaction into the model.

The model explains about 13.45 % of the total variance, which indicates a moderately low effect size. The values statistical power is .84 for intention to purchase virtual products (INT_V). The GoF of the model is .2455, which implies that the model has a moderately good fit. The summary of hypotheses testing for the model based on inexperienced user group is summarized on Table 6.14.

Table 6.14 Results of the Hypotheses Testing Based on Inexperienced Users

Research Hypotheses		Results
H1.1	The more the *virtual* products or services offered by virtual stores are able to satisfy consumers' *growth* need, the higher their intentions to make a purchase.	Not supported
H1.2	The more the *real world* products or services offered by virtual stores are able to satisfy consumers' *growth* need, the higher their intentions to make a purchase.	Not supported
H2	The more the perceived physical affordance of the system environment, the higher the consumer's *growth* need satisfaction.	Not supported
H3.1	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Supported
H3.2	The more the perceived physical affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not supported
H4	The more the perceived relational affordance of the system environment, the higher the consumer's need satisfaction.	Not supported
H5.1	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *virtual* products or services.	Supported
H5.2	The more the perceived relational affordance of the system environment, the higher the consumer's intention towards making a purchase of *real world* products or services.	Not supported

6.5   Moderating Effects

This section shows the results of moderator effects of the main research model and the model based on inexperienced user group. The hierarchical PLS model (HI-Model) is tested for the moderating effects of demographic and usage variables, including gender, age, level of education, usage duration, and usage frequency.

According to the results from the bivariate association (see Table 5.8 in Chapter 5), only the correlations between usage frequency and dependent variables are strong. Therefore, it is expected that the moderator effect of usage frequency is significant. Moreover, the results also find that the moderator effects from variables gender and level of education are also significant. The result of gender differences obtained from this research is consistent with other prior research in virtual community and e-commerce (e.g., Gefen and Ridings, 2005; Awad and Ragowsky, 2008).

The results of PLS-based path analysis for moderating effects show that the effect of gender on intention to purchase virtual products (INT_V) is significantly different. The t-value obtained from the bootstrap technique is 2.82 ($p < .01$). The path coefficient is -0.17, which can be interpreted as female and male participants are significantly different in having intention to purchase virtual products. The negative value indicates that males have less intention to purchase than female.

In addition, the results also reveal that the effect of level of education on intention to purchase virtual products (INT_V) is significantly different (t-value = 2.25, $p < .05$). The result of the path coefficient is 0.13, meaning that the higher the level of education, the more the intention to purchase virtual products.

For the usage data, the results show that only the effects of usage frequency on both dependent variables are significant. The t-value for the effect on intention to purchase virtual products (INT_V) is 4.07 (p < .001) and the t-value for the effect on intention to purchase real world products (INT_R) is 3.59 (p < .001). The path coefficients predicting INT_V and INT_R are -0.31 and -0.19, respectively. The negative sign implies that the more frequency in using the Second Life, the less the intention to purchase virtual and real world products.

The results of the moderator effects for the main research model are shown in Figure 6.11. The model that includes the moderator effects reveals a higher value of R-squared (31.24% for endogenous variable INT_V), but not the R-squared of INT_R (8.12%). The GoF is 0.5255, which indicates a model has a good fit.
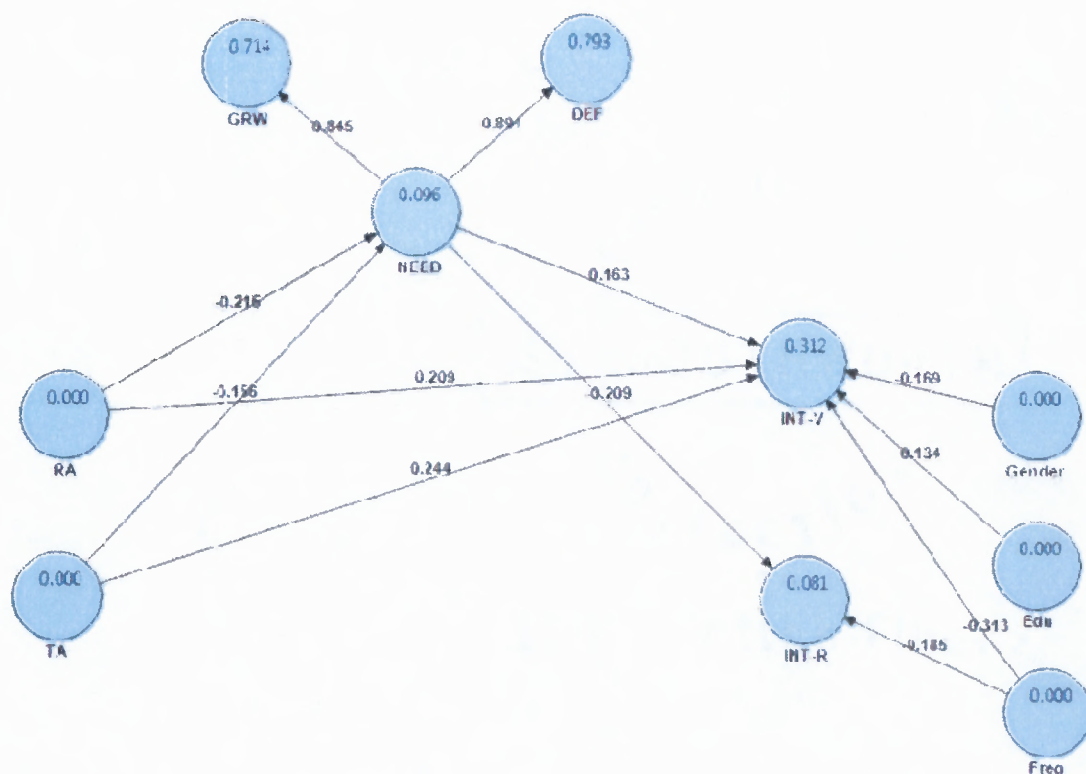
Figure 6.11 The hierarchical model showing the effects of moderating variables gender, level of education, and usage frequency.

The results of the moderator effects as summarized in Table 6.15 indicate that gender, level of education, and usage frequency are important moderators for the relationships between need satisfaction, relational affordances, transactional affordances and consumer's intention to purchase virtual products. The usage frequency also strongly moderates for the relationships between need satisfaction, relational affordances, transactional affordances and consumer's intention to purchase real world products in Second Life. In other words, the strength of these relationships varies with gender, level of education, and usage frequency of the users.

Table 6.15 Summary of the Moderator Effects for the VWCA Model

Hypothesis Number	Dependent Variables	Independent Variables	Moderators	Explanations
H1.1	Intention to purchase virtual products	Need Satisfaction	Gender, Education, Usage Frequency	Effect stronger for women, users who have higher level of education, and less frequent users
H 1.2	Intention to purchase real world products	Need Satisfaction	Usage Frequency	Effect stronger for less frequent users
H5.1	Intention to purchase virtual products	Relational Affordances	Gender, Education, Usage Frequency	Effect stronger for women, users who have higher level of education, and less frequent users
H7.1	Intention to purchase virtual products	Transactional Affordances	Gender, Education, Usage Frequency	Effect stronger for women, users who have higher level of education, and less frequent users

The results conclude that gender and usage frequency affect the relationship between relational affordance and intention to purchase, which is consistent to the previous research findings that gender and experience with the systems affect the

relationship between social influence, which has similar concept to relational affordances, and behavioral intention (Venkatesh et al., 2003).

In sum, the influence of need satisfaction, relational affordances, and transactional affordances on intention to purchase virtual products will be moderated by gender, user's level of education, and usage frequency, such that the effect will be stronger for women, users who have a higher level of education, and less frequent users. In addition, the influence of need satisfaction on intention to purchase real world products will be moderated by usage frequency, such that the effect will be stronger for less frequent users.

For the model based on inexperienced participants, the results of the PLS path analysis reveal that all moderating variables, except for education, are significantly affected the intention to purchase virtual products (see Figure 6.12). The model with moderator effects reveals a higher R-squared of 26.20%. The results conclude that women are more likely to shop in Second Life than men (t-value = 2.72, p < .01). The older participants are less likely to shop in Second Life (t-value = 2.49, p < .05). Furthermore, the participants who use Second Life for a long time are more likely to shop (t = 2.99, p < .01). This result is opposite to the usage frequency effect, which shows that the more frequently the participants use Second Life, the less likely their intentions to shop (t = 2.45, p < .05). The summary of the moderator effects of the model based on inexperienced users is illustrated in Table 6.16.
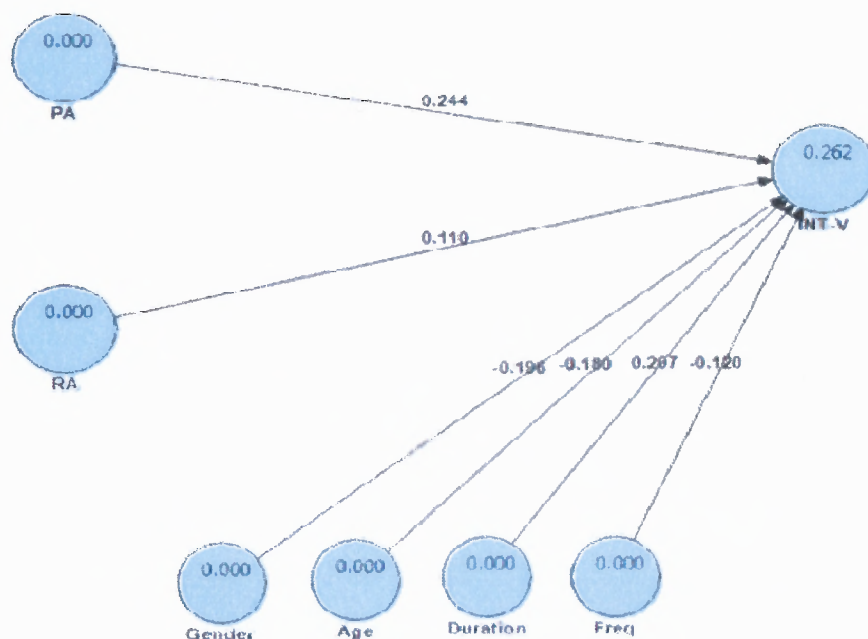
Figure 6.12 The model based on inexperienced users showing the effects of moderating variables.

Table 6.16 Summary of the Moderator Effects for the Model Based on Inexperienced Users

Hypothesis Number	Dependent Variables	Independent Variables	Moderators	Explanations
H3.1	Intention to purchase virtual products	Physical Affordances	Gender, Age, Usage Duration, Usage Frequency	Effect stronger for women, younger users, users who spend more time using the system, and less frequent users
H5.1	Intention to purchase virtual products	Relational Affordances	Gender, Age, Usage Duration, Usage Frequency	Effect stronger for women, younger users, users who spend more time using the system, and less frequent users

The results conclude that gender, age, usage duration, and usage frequency affect the relationship between physical affordance and intention to purchase virtual products, and the relationship between relational affordance and intention to purchase virtual products. In conclusion, the influence of physical affordances and relational affordances

on intention to purchase virtual products will be moderated by gender, age, usage duration, and usage frequency, such that the effect will be stronger for women, younger users, users who spend more time using the system, and less frequent users

6.6 Summary of Path Analysis and Hypotheses Testing

6.6.1 Results of Hypotheses Testing

The results of hypotheses testing obtained from the two analyses methods are very similar but not identical. This is because the measurement models of the main research framework (VWCA) obtained from the two analyses methods are different. The covariance-based Structural Equation Modeling (SEM) analysis is based on the measurement model obtained from the results of Confirmatory Factor Analysis (CFA) described in Chapter 5. This measurement model consists of seven latent factors, which are physical affordances (PA), relational affordances (RA), transactional affordances (TA), relationship-based trust (TRUST), need satisfaction (NEED), intention to purchase virtual products (INT_V), and intention to purchase real world products (INT_R).

On the other hand, the PLS's measurement model consists of nine variables, which are physical affordances (PA), relational affordances (RA), transactional affordances (TA), benevolence trust (BEN), credibility trust (CRE), deficiency need satisfaction (DEF), growth need satisfaction (GRW), intention to purchase virtual products (INT_V), and intention to purchase real world products (INT_R). The major difference is the fragmentation of relationship-based trust and need satisfaction variables into two sub-dimensions, which actually is consistent with the initial research presumptions that needs and trusting beliefs are divided into two conceptual dimensions.

However, the results of CFA in Chapter 5 suggest that only seven factors are extracted and both trusting belief and need satisfaction variables are unidimensional. Therefore, the results obtained from PLS path analysis is more preferred.

PLS path analysis reveals more detail about the results of hypotheses testing. Although the result of hypothesis 1.1, which states that need satisfaction predicts the intention to make a purchase of virtual products, is support, the PLS technique suggests that this relationship is actually partially supported. Specifically, there is only a relationship between deficiency need satisfaction and intention to purchase virtual products that is significant. On the other hand, the relationship between growth need satisfaction and intention to purchase virtual products is not significant. The results from the PLS method conclude that only the deficiency need creates the intention to buy the virtual goods. Similarly, the result of hypothesis 1.2 reports the same finding that only deficiency need creates the intention to buy real world products.

More interestingly, the result of hypothesis 5.2 obtained from two analysis methods is also different. Although this hypothesis is identically stated, the result from covariance-based SEM supports the hypothesis but not the result from PLS. This is because PLS usually underestimate the path coefficients of parameter estimates (Chin, 1998; Hsu, 2006). Thus, the result of this hypothesis testing when using PLS is not significant.

6.6.2 Conclusions of the Research Model

Other than using the covariance-based SEM and PLS-based SEM methods to test the causal relationships between variables, they are also well-known in developing a predictive theoretical model. There are various indicators that these statistical techniques

help determine whether the theoretical model is in a good fit. As described earlier in this chapter, the results obtained require an understanding of the way to interpret the meaning of each indicator produced from these two different techniques.

Covariance-based SEM method is performed by Statistical Analysis Software (SAS). The results provide many quality criteria relating to the model fit statistics, other than the coefficient of determination (R^2), such as the Goodness-of Fit Index (GFI), Non-Normed Fit Index (NNFI), Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI).

On the other hand, PLS-based SEM is performed by SmartPLS software. The outcomes indicate the R-squared, Average Variance Extracted (AVE), and significant t-values calculated from a bootstrap method. Table 6.17 shows the comparison of the results obtained from these two analysis techniques for both the main research model (VWCA) and the model based on inexperienced user group.

The results of R-squared of intention to purchase virtual products (INT_V), and intention to purchase real world products (INT_R) obtained from both statistical techniques are different. Specifically, the R-squared obtained from covariance-based SEM is higher than the R-squared obtained from the PLS path analysis due to the different measurement structure of these two different models as will be discussed later in Chapter 7. The results of the fit indices obtained from covariance-based method reveal a slightly lower than a generally accepted model fit level, which should be greater than .90. Similarly, PLS also reports only a moderate fit, as shown by the GoF less than the excellent fit value of .36.

Table 6.17 Fit Summary of the Research Models

Virtual World Commerce Adoption Models (VWCA)					
Indicator	MAIN (SEM)	MAIN (PLS)	REV-SEM	REV-PLS	HI-MODEL after dropped some variables	HI-MODEL + Moderators
R-squared						
- INT_V	22.93%	18.49%	21.02%	18.47%	17.04%	31.24%
- INT_R	9.59%	12.13%	9.52%	12.21%	4.75%	8.12%
Fit index						
- GFI	.8389	-	.8539	-	-	-
- AGFI	.8002	-	.8174	-	-	-
- CFI	.8914	-	.9091	-	-	-
- NFI	.8101	-	.8265	-	-	-
- NNFI	.8752	-	.8948	-	-	-
- RMSEA	.0682	-	.0626	-	-	-
- PNFI	.7054	-	.7146	-	-	-
- GoF	-	.2692	-	.3232	.2699	.5255
Inexperienced User Models						
Indicator		Inexp (SEM)		Inexp (PLS)		Inexp (PLS) + Moderators
R-squared						
- INT_V		12.47%		13.45%		26.20%
- INT_R		5.43%		3.67%		-
Fit index						
- GFI		.8079		-		-
- AGFI		.7097		-		-
- CFI		.8451		-		-
- NFI		.7392		-		-
- NNFI		.7934		-		-
- RMSEA		.1092		-		-
- PNFI		.5544		-		-
- GoF		-		.2455		.3017

The revised models obtained from both analysis methods are not better in terms of R-squared. The modification index (obtained from covariance-based SEM) and the correlation matrix (obtained from PLS-based SEM) suggest adding the paths from physical affordances (PA) to relationship-based trust and from transactional affordances (TA) to relationship-based trust, which yield a higher R-squared for endogenous TRUST variable in REV-SEM model and for endogenous benevolence trust (BEN) and credibility trust (CRE) variables in REV-PLS models. Because of the higher R-squared

on relationship-based trust, the overall model fit indices are improved for both revised models.

A hierarchical PLS model is tested due to the first-order variables of trusting belief construct (consisting of benevolence and credibility trust) and need satisfaction construct (consisting of deficiency need and growth need satisfaction) are based on the same theoretical concepts of their corresponding higher-order variables. Specifically, benevolence trust and credibility trust are based on trust theory (e.g., McKnight et al., 2000; Pavlou and Fygenson, 2006). Likewise, deficiency need and growth need variables are based on theory of human motivations (Maslow, 1943). The results show a lower R-squared of intention to purchase virtual products (INT_V), and intention to purchase real world products (INT_R) due to second-order predictors: relationship-based trust (TRUST) and need satisfaction (NEED). However, the global fit indicator is improved and indicates a moderately good fit. The hierarchical model is retested by excluding any insignificant constructs, including relationship-based trust and physical affordances, from the model. The results yield no better in terms of R-squared and GoF.

For the model based on inexperienced user group, the result of R-squared obtained from PLS-based SEM is much better. This is due to more significant paths resulting from using PLS method since the measurement model is usually inflated component loadings due to the inclusion of error variance (Rouse and Corbitt, 2008). As a result, a higher number of significant components of physical affordance and relational affordance variables is obtained. Therefore, the value of R-squared, in this case, may be overestimated.

The moderator effects of gender, age, level of education, usage duration, and usage frequency are tested using PLS path analysis. The final hierarchical model, which shows the best results of the model fit is selected to test for the moderator effects. The results find that gender, level of education, and usage frequency significantly affect the dependent variables of the model. Oppositely, the test of moderator effects for the inexperienced user model reveals that all moderating variables, except the level of education, significantly affect the intention to purchase virtual products.

In sum, the best research model obtained from two different statistical techniques described in this chapter is the final hierarchical model (HI-Model) that includes the moderating variables (i.e., gender, levels of education, and usage frequency) as shown in Figure 6.11. The variables of the model explain a quite large variance proportion and the global fit index is relatively very good.

CHAPTER 7

CONCLUSIONS

7.1 Overview

This dissertation was written during the rise and fall of many virtual companies in Second Life. During this long period of time, Second Life has changed substantially from an unfamiliar world for most people to an innovative and lively world that connects businesses and communities of people around the world. Although Second Life is a very resource-intensive system requiring a higher standard of system hardware and network platform to operate than a more simple social networking system like Twitter (Twitter.com) and Facebook (Facebook.com), its rich environment has started to rebound business operations in the past few years and attracted users from around the world to create, innovate, design, incorporate, and collaborate[26].

This dissertation begins with examining the general characteristics of the virtual environment, the system functionalities, and the user interface that relates to business functions. Interviews were conducted with users to examine their online behaviors. The studies aim to develop the theoretical concept of virtual world commerce adoption. Various factors determining the adoption of the virtual world commerce are examined, including the perceived affordance of virtual environment, the satisfaction of the consumer's needs, and the relationship-based trusting beliefs. The concepts have some

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[26] All, A. Second Life Making a Corporate Comeback from *IT Business Edge*, Oct 2009, source: http://www.itbusinessedge.com/cm/blogs/all/second-life-making-a-corporate-comeback/?cs=36752, retrieved October, 2009.
Morrison, S. A Second Chance for Second Life from *Wall Street Journal*, Aug 2009, source: http://webreprints.djreprints.com/2252701367864.pdf, retrieved October, 2009.

causal links to the theory of planned behavior or TPB (Ajzen, 1991) and the idea of goal-directed behavior (Bagozzi, 2007b).

The dependent variable of this dissertation is the behavioral intention to purchase, referring to the likelihood that a person will engage in business transactions in the virtual world. The need satisfaction variable implies that the adoption of the virtual world commerce, in other words, the intention to purchase, is depended on the desires (or needs) that consumers have. Perceived affordances relate to the concepts of behavioral belief and control belief of the TPB because these variables involve the psychological state of the perception about the possible outcomes and the ability to control any actions when the system functions are available. Finally, the concept of trusting belief is similar to the concept of normative beliefs of TPB, in which it relates to the expectations of other people's behavior.

This dissertation focuses on Second Life, a three-dimensional virtual world developed by Linden Research Inc. Second Life is known for its superior communication platform that integrates the three dimensional graphical interface with the text-based chat, VOIP, and video functions. Users experience rich contents and interactive communication not found in other static web-based social software. Due to Second Life's success, many companies are interested in using this type of platform to drive their business functions. In addition, Second Life's explosive growth in recent years creates opportunities for business to establish a connection with their customers, test their product prototypes, get early feedback on product design, and promote their brands, using available media resources in-world.

In recent years, the size of the virtual economy has expanded substantially. Many of the world's leading companies, such as IBM, have allocated more than $10 million to virtual-world development[27]. Consequently, the World Bank, Nike, Dell, Disney, BMW, Reuters, and Unilever have set up shops in Second Life. Many other companies even see the possibility to make profits from the new line of virtual products. However, for many, income from trading virtual goods in Second Life is not substantial and as a result will fail in the long run. Many of them disappeared while many others emerged. Most users use this platform for their enjoyment rather than seeking products and services they need. Many of the participants interviewed enjoy spending a small amount of money in Second Life but not above their monetary thresholds. Some users report that they would probably spend more money in the virtual world if the platform had a streamlined purchasing process, and more secure economy and inventory system.

The researcher hopes that future developments of the virtual economy become more innovative so that it better facilitates business to be more flexible and efficient, particularly in terms of cost reduction, acceleration of product design, business-consumer collaboration, service improvement and, ultimately, real world product and service trading.

This chapter summarizes the main research model obtained from the various studies of this dissertation, as well as suggests implications for businesses and creators. The chapter is organized in the following manner. The next section discusses the results of the main study, in which the final research framework is summarized and the research findings are discussed. Next, the third section explains contributions and implications of

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[27] Mahaley, S. A Second Look at Second Life from *Chief Learning Officer (CIO)*, May 2009, source: http://www.clomedia.com, retrieved October, 2009.

this research. The fourth section discusses difficulties and limitations. And finally, this chapter ends with future research directions.

7.2 Discussion on the Main Study Results

7.2.1 Final Research Framework

The initial research framework as depicted in Figure 2.18 of Chapter 2 and the final research framework of Virtual World Commerce Adoption (VWCA) as depicted in Figure 6.11 of Chapter 6 are illustrated again in Figure 7.1 and Figure 7.2, respectively. The model that includes higher-order variables and moderator variables is selected as the final research framework. This final model is the most predictive model that contains more significant relationships than the revised models obtained from covariance-based SEM and PLS path analysis methods. Moreover, the results also show that the model can explain more variance for intention to purchase virtual products (INT_V). The coefficient of determination (R^2) is relatively large (.3124), which means all variables in the model explain 31.24 percent of the total variance. The study also finds that the model fits the data very well as seen from the global fit index (GoF) of 0.5255. The measurement and structural models are also compliant with the theoretical background underlining the main variables of interest. Specifically, the second-order variables, trusting belief and need satisfaction, are significantly explained by their first-order sub-constructs.

The final model, however, does not show the relationship between relationship-based trust and intention to purchase. Therefore, trust variable is excluded in the final model. This result is contrasted to the initial research hypothesis and the previous research on trust in e-commerce (e.g., Pavlou and Fygenson, 2006), which suggest that

trust is related to intention to purchase from the vendor's websites. On the other hand, the final research model suggests that relationships between perceived relational affordances and intention to purchase, and between perceived transactional affordances and intention to purchase are mediated by the need satisfaction variables. These relationships are complaint with the initial research hypotheses and can conclude that perceived relational affordances and perceived transactional affordances are important factors in predicting intention to purchase in the virtual world. This result also support the previous research in goal-directed behavior (Bagozzi, 2007b), which suggests that goal-directed behavior is vital for tracing the behavior that involves identified needs and desires that users generally have.
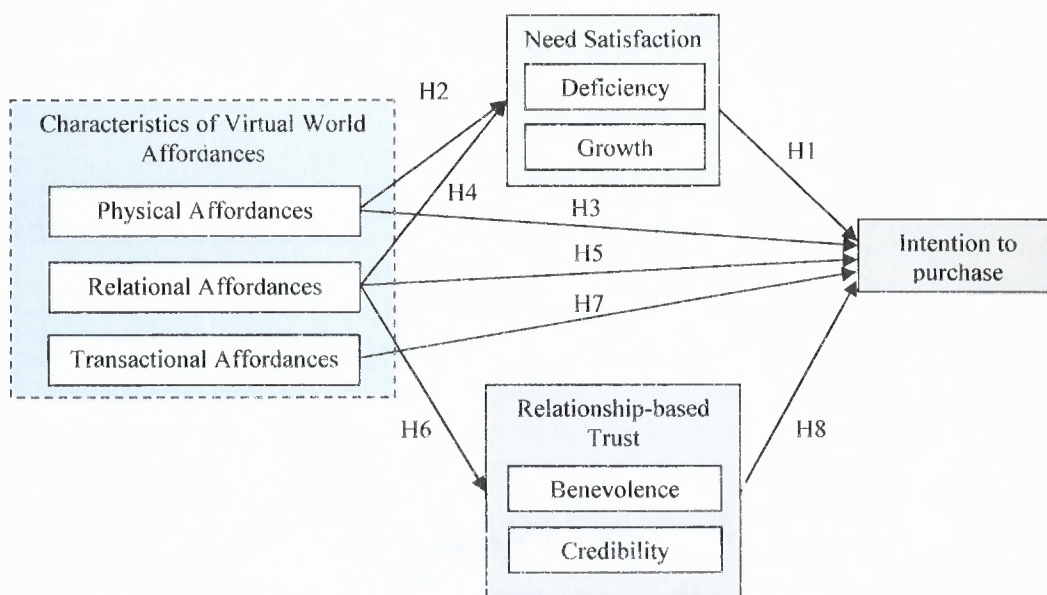
Figure 7.1 Initial Virtual World Commerce Adoption (VWCA) model.
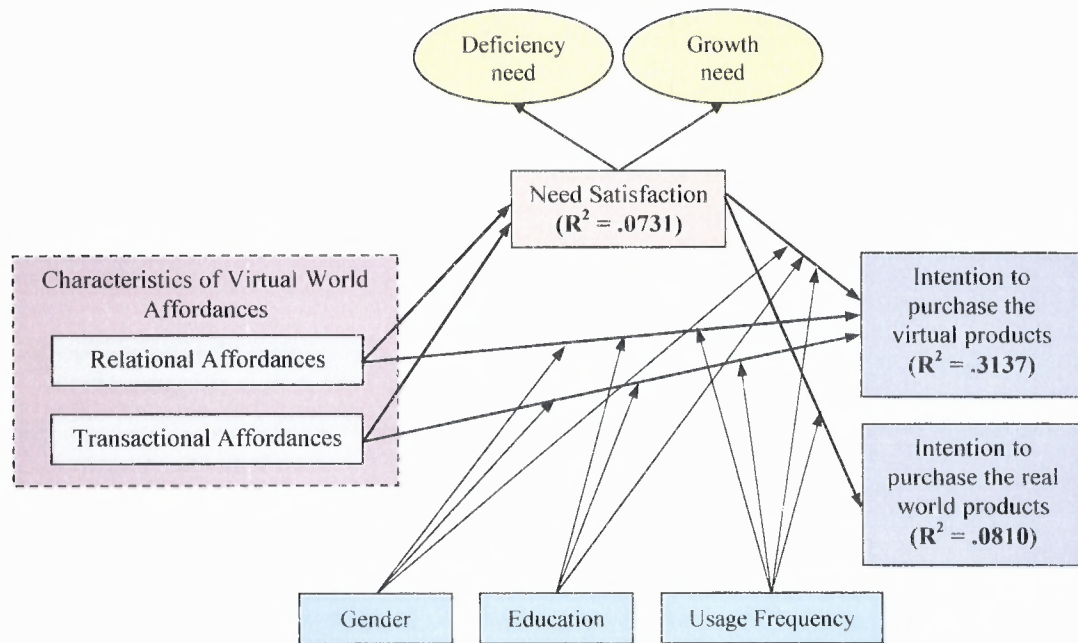
Figure 7.2 Virtual World Commerce Adoption (VWCA) model.

As will be discussed in the next section, this dissertation suggests adding new variable(s) that relates to other variables in the model, particularly the dependent variables. For instance, the candidate variable(s) may relate to service quality and/or perceived risk, so that relationships between the trusting belief variables and the dependent variables are intervened.

7.2.2 Research Findings

The main study employs second-generation prediction techniques, including covariance-based and component-based Structural Equation Modeling (SEM). The results of hypotheses testing and research models obtained from these two techniques have been compared (see Table 6.17 in Chapter 6). Generally, the frameworks suggested by both statistical techniques are very similar as shown in Figures 7.3 and 7.4. One reason why the results are almost identical is due to the raw data being treated for missing values and

normalized. Also the effect of multicollinearity of the data is not significant. Therefore, using the PLS-based SEM method does not yield a significantly better result than using the covariance-based SEM. Moreover, the sample size is not small as to see a benefit of using PLS method in data prediction. It is widely acceptable in many research areas that PLS-based path analysis is suitable for a relatively small sample population (Hsu et al., 2006). However, much of the previous research asserts that PLS-based technique is preferred for a research that has a predictive purpose (e.g., Chin, 1988).
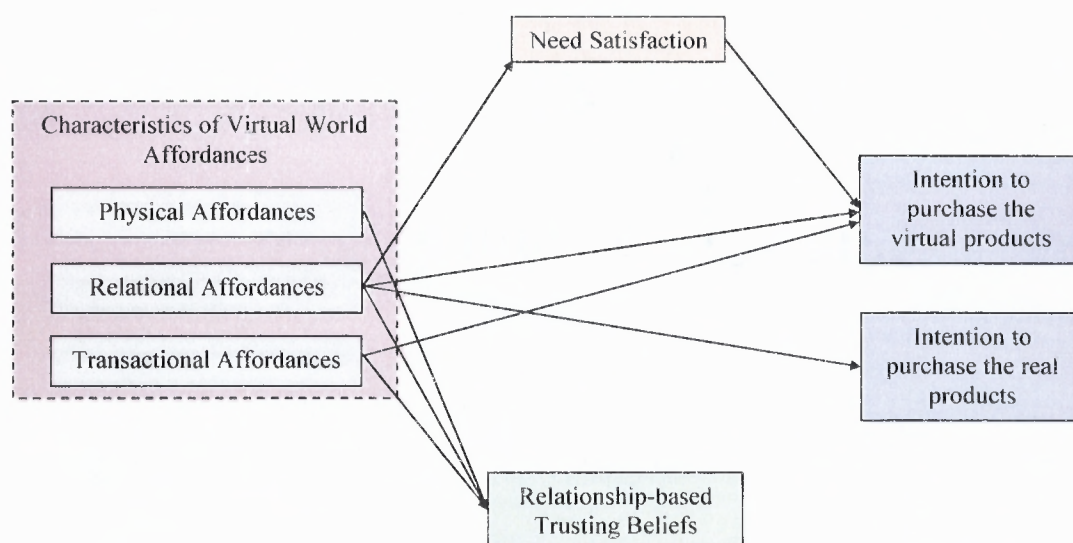
Figure 7.3 Final model obtained from covarianced-based Structural Equation Modeling (SEM).

The results from covariance-based SEM reveal that relational affordance is a relatively strong predictor of intention to purchase virtual products and real world products. However, the PLS-based SEM results oppose that the relationship between relational affordances and intention to purchase real world products is mediated by need satisfaction. Perceived relational affordance is a perception that the property of the virtual world related to communication and interaction functions and environments enhances the

ability for the people to predict an outcome of their interactions (e.g., establish relationships, make friends, etc). Furthermore, the result indicates that the more the system affords the users to interact, the higher the probability for them to engage in business transactions. The results from the interview also support this finding. Many participants generally get involved in a social unit at the beginning of their experiences with Second Life. Social influence is a major influence on purchasing behavior. As many participants are likely to modify their avatars to look more attractive or at least enable them to get along with other users, there is much chance that the virtual merchants can expose these users to their innovative products and/or services.
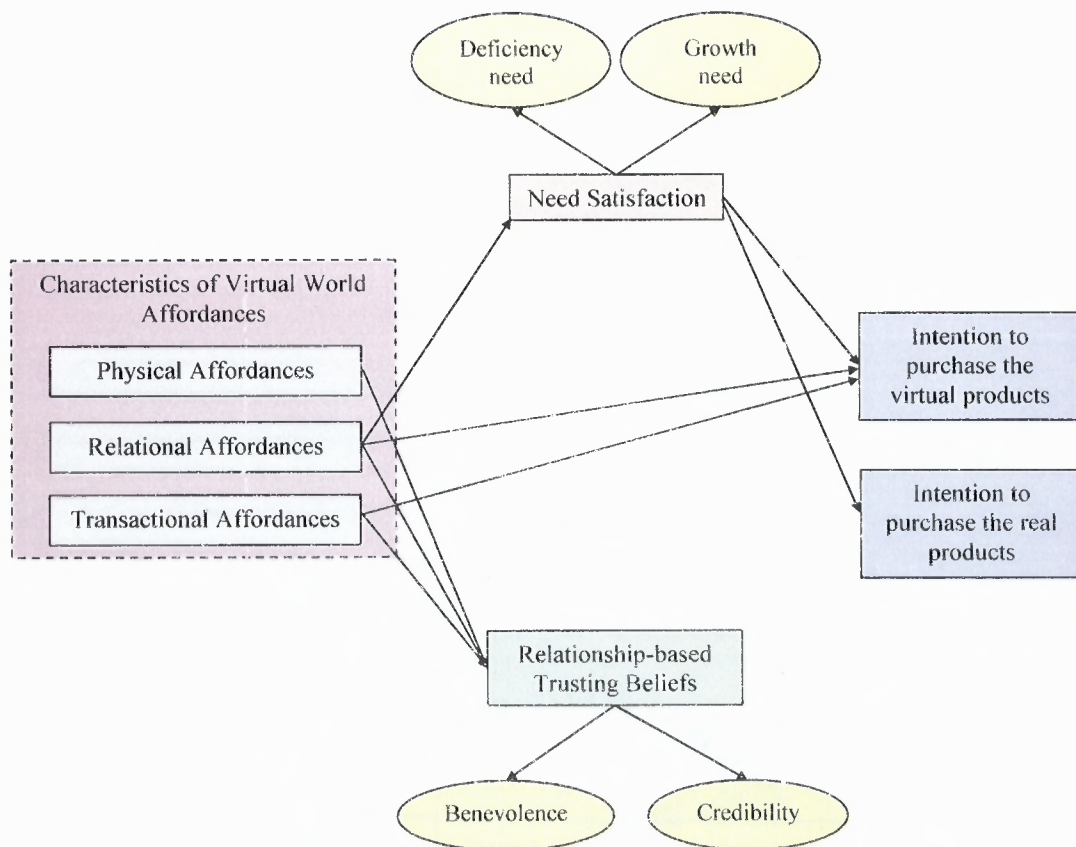
Figure 7.4 Final model obtained from component-based (PLS) Structural Equation Modeling (SEM).

The results of the main study also find that the ability to interact with other users and the ability to perform business transactions based on the affordance of transactional functions are crucial for general users. Users do not like an unreliable and unpredictable purchasing process. In other words, most users want to know exactly how to perform the transactions within the virtual environment. If the systems can explicitly guide them through the process, they generally feel secure and likely to make a purchase. For instance, the design of an inventory system that links with the purchasing process allows users to understand that the new folder containing the virtual contents or products they purchased will be generated automatically in their inventory systems. Therefore, the user can locate the new products they purchased immediately. The interview results also reveal similar findings regarding the purchasing process that many participants are satisfied with the purchasing process of Second Life because of its simplicity and instantaneity. The users can obtain the products immediately after they click to purchase. However, some participants complain about the reliability of the Second Life's database systems in maintaining their virtual inventories since many of them experience an inventory loss.

Although not previously hypothesized, the results of the main study find that all of the perceived affordance variables (i.e., physical affordances, relational affordances, and transactional affordances) are strongly related to trusting belief, which is a higher-order variable of benevolence trust and credibility trust in the model suggested by PLS-based SEM method (see Figure 7.3). These findings conclude that the affective and utility of the system environment, as seen from the design of user interface, the graphical representations of the virtual contents, and the understandable system functions are major

determinants of trust creation. The results also imply that the design of virtual products and virtual stores, as well as the supportive communication and economic functions, are vital for users in establishing trust towards the virtual merchant and the virtual world's systems in general.

Nevertheless, the results find that trust does not significantly predict the intention to purchase in this environment. The results of the interviews and the open-ended questions also support the rejection of this hypothesis. Based on the interviews, many participants are generally concerned more about the familiarity with the merchants, their performances, and the quality of their products and services. In addition, the results also imply that trust created from social exchange process is not involved in the early stages of virtual trading in Second Life because only a small amount of money is involved in product possession. As aforementioned in the preliminary studies' results, some participants are more concerned about their monetary thresholds when making a purchase in Second Life.

Although trust has been extensively studied in e-commerce (e.g, Gefen et al., 2003; McKnight et al., 2000) and other organizational systems (e.g., Doney and Cannon, 1997; Mayer et al., 1995), trust in the virtual world context is related more to the technical issues such as system's security, privacy, and anonymity. The interviews show that the participants are more concerned about identity and financial information protections. Users want to assure that their personal information will not be shared with the third-parties and is safe from risks and intrusions. Moreover, trust is required when the situation is involved with uncertainty and risks (Jarvenpaa and Tractinsky, 1999; Pavlou, 2003). Therefore, trust is related to the security of Second Life's system in

general, but not a particular transactional activity with a virtual merchant. Note that the measurement scales of trusting belief variables are mainly focus on trust toward the individual merchants' benevolence and credibility that users have experienced.

The results of the main study indicate that need satisfaction mediates the relationship between relational affordances and intention to purchase virtual products. The results of this mediating effect obtained from the PLS-based SEM also include the relationship between relational affordances and intention to purchase real world products. These findings imply that goal-driven process is a crucial factor in determining the system adoption. The need satisfaction variables, measured by the Need Satisfaction Index (NSI) or the deficiency of need scores multiplied by the importance score, are negatively correlated with relational affordance, positively correlated with intention to purchase virtual products, and negatively correlated with intention to purchase real world products. These results have to be cautiously interpreted since Need Satisfaction Index (NSI) is derived from a gap between the desire (or expectation) and the actual experience (or perceived performance). Firstly, the negative relationship between relational affordance and need satisfaction suggests that the more the system is designed to enable social interaction and communication among users, the more likely that the consumers' needs are deficient. In other words, consumers who interact more will create more needs or motivations to purchase products. For instance, they may feel that acquiring products, such as virtual housing, will make them fulfill their social needs because they can have a place for parties with friends. The positive relationship between need satisfaction and intention to purchase virtual products implies that the more the deficiency of needs they have, the higher the possibility to engage in a business transaction or a purchase of virtual

products. On the other hand, the negative relationship between need satisfaction and intention to purchase real world products implies that the more the deficiency of need they have, the less likely they make a purchase of real world products. This finding may be due to an unavailability of the real world products in Second Life during the time when this dissertation is conducted. However, this relationship may be changed if there is more availability of the real world products in Second Life in the future. Recent development of a three-dimensional virtual supermarket in Croatia[28], Trillenium.com, is an example of the evolution of virtual world for real world product trading.

Lastly, the results obtained from different user groups imply different situations of system adoption by novices versus experienced users. The survey of experienced users in Second Life assumes that the users have some knowledge gained from their experiences with business transactions. Therefore, these users already established a kind of motivations or the desire in possessing the virtual (or real) products. Based on the results obtained from the main theoretical framework, these motivations come from social unit they involved or their belongingness with other users or social groups prior making the transactions. In addition, the supportive design of system's functions in transactional process is another important factor that facilitates users in making business transactions. Oppositely, those who do not have experience usually do not concern about using this platform to purchase products if they have not yet established relationship with any other users. The results suggest that relational affordances lead to intention to purchase for novices. Therefore, these novices will have more intention to purchase if they already establish or get involve in relationship with the others.

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[28] Croatian 3D shopping center Trillenium gets €1 million funding, http://paidcontent.co.uk/article/419-croation-3d-shopping-centre-trillenium-gets-1-million-funding/, retrieved November, 2009.

In sum, the success of business in the virtual world depends mostly on the ability of the system in affording users in interactions. Social influence directly encourages users to engage with transactions in the virtual world, while it also indirectly enhances users to make a purchase by establishing a kind of motivations or needs in purchasing products so that the users feel that they fulfill their needs.

7.2.3 Issues about R-Squared and Model Comparisons

The results of the main study obtained from both covariance-based SEM and PLS-based SEM methods reveal slightly low values of R-squared or the coefficient of determination (see Table 6.17 in Chapter 6). The R-squared of the main research model, using covariance-based SEM, is 22.93% for endogenous intention to purchase virtual products. The revised model obtained from the same statistical technique reveals a slightly lower value of R-squared. This is because the new path relationships between physical affordances and trust (PA → TRUST), and between transactional affordances and trust (TA → TRUST) added to the model do not correlate with the dependent variables. This revised model results to a higher value of R-squared of the endogenous trusting belief variable, but not the values of R-squared of the intention to purchase variables.

Likewise, the R-squared values obtained from PLS-path analysis method are even lower than those obtained from the covariance-based SEM. This is because the models obtained from the PLS technique ignore the effect of standard errors of the parameter estimated. Hence, the R-squared between these two methods cannot be compared. In general, the PLS path analysis is more beneficial for the model predictiveness than the covariance-based SEM. The results obtained from PLS path analysis mostly ignore the interpretation of R-squared, but are concerned more with path coefficients. Chen (1988)

suggests that the structural paths should be around .20 and ideally above .30 in order to be considered as meaningful. Some structural paths may be slightly below .20 but still significant due to the "crud" factor where "everything correlates to some extent with everything else" (Meehl, 1990, p. 204) or due to "some complex unknown network of genetic and environmental factors (p. 209)."

According to the R-squared, which reveals small to medium effect sizes for endogenous variables of the proposed model, new variable(s) can be added into the model to improve the value of R-squared. Principally, when more variables are included in the model and those variables are correlated with a dependent variable, the value of R-squared is increased. The results of the qualitative studies mention that service quality encourages consumers to engage in business transactions. In addition, the results also indicate that the extent of risk and monetary thresholds are a concern of many participants. Alternatively, main variables of TPB (i.e., attitude, perceived behavioral control, and subjective norm) can be added to the model. Therefore, either or all of these variables can be added to the model to improve the R-squared.

Note that R-squared is one of many indicators to measure the Goodness-of-Fit. Much of the recent research that uses a novel statistical technique, such as covariance-based SEM, pay less intention to the R-squared as there are some other important indicators that describe the Goodness-of-Fit better (Chin, 1988). These indicators should be considered simultaneously with the R-squared before concluding if the model structure fit the data well. For instance, adding new variable(s) to the model may improve the R-squared, but not some other statistical coefficients that measure the model fit (such as CFI) and/or the model simplicity (such as PNFI).

7.3 Contributions and Implications of the Research

Based on the theory of affordances (Gibson, 1977) and design perspectives of affordance systems (Norman, 1988, 1999), this dissertation proposes three major types of perceived affordances, including perceived physical affordances, perceived relational affordances, and perceived transactional affordances (Olapiriyakul and Widmeyer, 2009). This dissertation also contributes to the research in this area by the development of the measurement scales of these three affordance constructs.

The perceived physical affordances are related to the presence of physical and graphical dimensions, shape, texture, color, and properties of the virtual objects and the environment, as well as the perception of action possibility when the users see those screen-based objects. The perceived relational affordances are dependent mostly on the availability of the functions that allow users to interact and communicate with the others. In particular, relational affordances are related to an ability to perceive a presence of social entities, emotional status, facial express, and ability to interact with other social entities. In addition, perceived relational affordances also involve the possibility to create social relationships when the system allows users to detect the status of other social entities in proximity. Lastly, perceived transactional affordances are related to the perception of action possibility in making a business transaction in the virtual world. Transactional affordances also involve the ability of the users in making business transactions, predicting the outcomes of transactions, and knowing the current transactional situations.

Physical Affordances	→	Perceived Actionability Navigation, Control and Usability Ease of Use, Understandability
Relational Affordances	→	Sociability Social Presence Emotional Detection, Understandability
Transactional Affordances	→	Transactional Ability Ease of Transactional Process Awareness of transactional status

Figure 7.5 Perceived affordance dimensions.

The design of virtual stores and virtual objects that enhances perceived affordances is essential for users to understand the nature of the system's usability. The virtual real estate that offers a housing design service, for instance, needs to consider the affordances when designing objects and places to convey appropriate information to the users. For instance, the design of stairways must be composed of appropriate shapes, colors, and patterns to enable users to recognize them correctly. Moreover, stairways must inherit with appropriate functionalities, such as transportation of avatars in going up and down, etc. Therefore, the good design of affordance objects must guide users to the most influential action they can implement by using the appropriate shape, texture, color, and pattern, etc. Nike is an example of a real world business that successfully markets the virtual shoes that help residents run faster in Second Life (Hemp, 2006). The design of virtual shoes by Nike not only affords users better control of their avatars' movements, but also enhances a new ability in taking actions (i.e., walk and run faster than normal).

The design of a spatial trading environment that supports multiple users in making transactions applies the concept of object-based model of distributed systems (Benford and Fahlén, 1993). The awareness of active users and the spatial proximity of the objects

are vital in designing the virtual commercial platform. In particular, the awareness of avatars in proximity, along with affective characteristics of those avatars, can induce an initial establishment for business relationships.

The difference between the perceived relational and the perceived transaction affordances is mainly focused on the different target outcomes of the behaviors. The primary concern of the perceived relational affordances is the ability to support users to initiate social relationships with other users, especially the ability to extend social and emotional status using both verbal and emotional languages. Perceived transactional affordances are concerned with the ability to initiate interactions that relate to business transactions, especially in exchanging information about products and/or services, and in making a transaction. Transactions in the virtual world can be fulfilled by both the social interactions (e.g., consumer-to-consumer trade), and the availability of transactional systems, such as an instant currency converter, a fund transferring system, and a secure payment process. Users must perceive the transactional affordances of the virtual environment when making an exchange of virtual money and/or virtual products.

While many researchers doubt that a dubious economy of virtual worlds can create a real business opportunity (e.g., Swaminathan, 2007), there are many propitious opportunities that lead to successful real business operations in the future, for instance:

- The advancement and innovation of web technology (e.g., Web 3.0) and graphical technology that incorporates the key features of user-generated content and social networking (as seen on the Web 2.0), business functions and virtual economy, with the simulated virtual environment.

- The greater capacity of memory and network bandwidth and the affordable high-resolution graphic hardware that enables users to possess high performance technology.

- The growing popularity of digital products and digital, especially multimedia content, movies, music, e-books and so on.

- The scarcity of worldwide resources (such as energy resources) in the future and the essential need to reduce cost of business operations that will force many companies to seek a new way to reach global consumers.

According to the results of the case study in Second Life and the potential of virtual worlds in supporting future business, this dissertation suggests the following implications for the virtual businesses, creators, and system developers, as summarized in the framework in Figure 7.6. The suggestions for business implications can be viewed in the following three perspectives:

1. **Individual-level components:** Concern with the relationship establishment, and the products and services available meet the need of individual consumers.

2. **Corporate-level components:** Involve store management, store's image, reputation creations, and management strategy.

3. **System-level components:** Concern with the design that afford large number of users, usability, and quality of the virtual world's systems (e.g., security, controllability, and navigation).
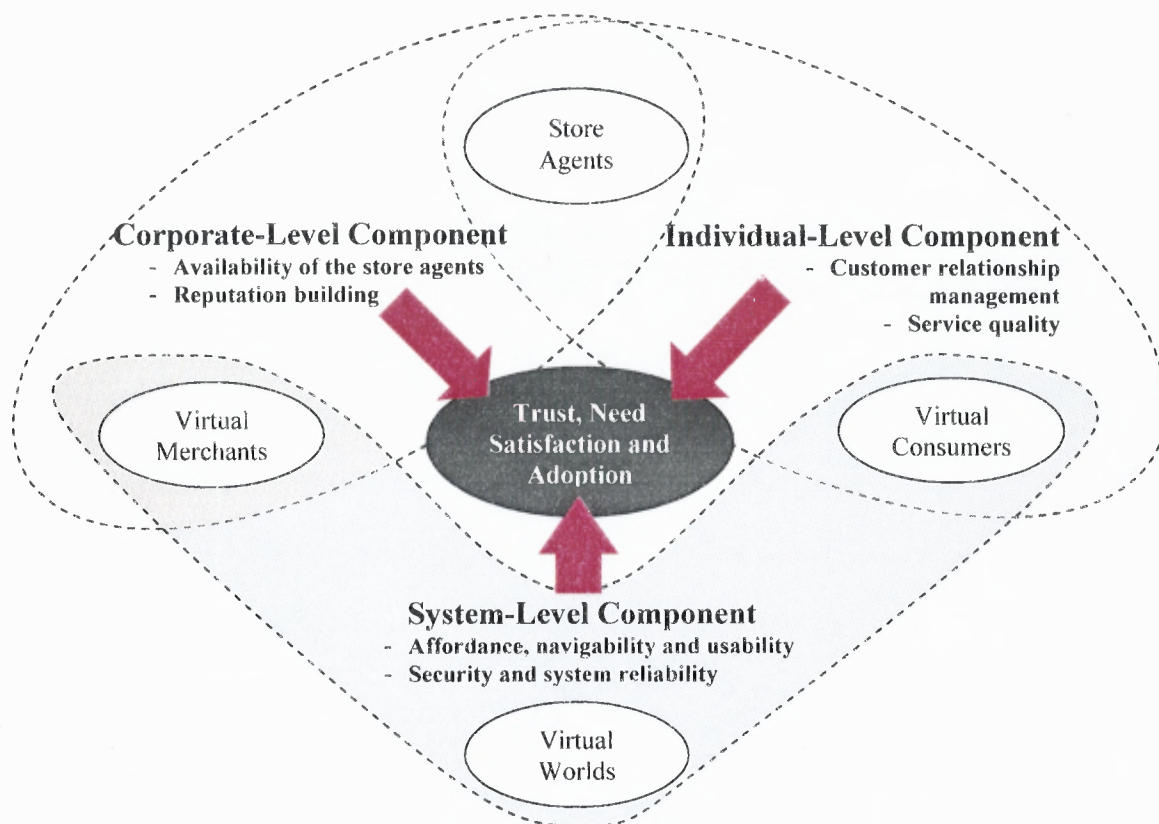
Figure 7.6 Business model of virtual world commerce.

Individual-Level Components

Individual component concerns about the establishment of initial relationship with the customers by the virtual business. This can be done achieved though communication and service from virtual staffs. As found from the main study that SL affords users to interact and relationship establishment, business should take this advantage from the system to provide good service to individual customers. Also using the design tools to create novel products that meet individual's needs. However, the results of the preliminary studies indicate that the majority of the virtual stores are under-staffed or lack virtual agent presence. This result creates a feeling of uncertainty and anxiety for consumers who visit the virtual stores. Recruiting current users who actively engage in the virtual world is

another alternative to staff virtual stores. Virtual stores should have sufficient virtual staffs to run and to take care of customer service. The virtual agents must identify themselves explicitly as the store's representatives. Furthermore, using an active service strategy to approach individual consumers who visit the store, rather than an inactive strategy, can engender trust and satisfaction, as well as encourage intention to purchase.

In addition, it is also essential that the company produces products or provides services that meet customer's needs and expectations. Most of the consumers are in demand of good quality and novel designed products. Special service offering, such as customization of the product for individual consumers, is another strategy that can impress many customers. As found from the interview, there is no customization of the products available in many stores. This can actually imply that most of the virtual stores are not utilize the system's feature effectively in the product design.

Since virtual worlds simulate social and business situations of in the real world, the most important determinant of trust, satisfaction, and intention to purchase is to establish an initial relationship by using a direct contact. The rich environment of virtual worlds allows users to perceive social presence and, particularly, enables virtual merchants to observe and track down behaviors of consumers. Reputation of the virtual stores in providing good services and creative products are major reasons why some virtual stores are listed on the popular places. Other than that, excellent product design and product presentation also persuade visitors to purchase. Clearly, good services, convenience in communication, and proper product design are undoubtedly required for businesses in the virtual world.

Corporate-Level Components

Corporate-level components involve the management strategy in creating store's reputation and good image. Virtual stores should have a manager who controls important functions, such as recruitment and quality improvement. The store's appearance or the store's image is also imperative. The store's appearance and the product advertisement must convey the core business values, as well as inform consumers about the products and services that the store offers. Furthermore, the availability of contact information and/or an inquiry box can increase the credibility of the store and enhance trust and satisfaction, as well as create an intention to purchase in this initial stage of virtual world commerce, where the absence of other product evaluation systems is known.

Other than the routine tasks regarding the store management, a manager is also responsible for building up the reputation of the virtual store. For instance, good product quality and creative design are demanding by many customers. Good service, as already mentioned, special promotions, and product campaigns must be advertised regularly to inform consumers of special products or events. And these certainly enhance store's reputation. The interview result found that the good reputation of the store is easily spread in this environment through the word-of-mouth. Manager must also recognize that word-of-mouth is a very powerful tool for a successful business in the virtual world. Therefore, it is wise to take this opportunity to pay attention on the product design, and the store's design that affords customers in engaging in business process.

System-Level Components

System components are not controlled by virtual stores. The studies, particularly the interviews of Second Life residents, obtain many complaints about delays and lags

resulting from a huge amount of graphical uploading during the avatar movement. The extent of the delays is also dependent on the amount of user traffic. Therefore, the store can manage the amount of traffic by designing the virtual facilities to diverge users, so that they do not overload at any single location. For instance, the store can create multiple duplicate product displays or have many point-of-sales in separate virtual venues, so that consumers can go around to many facilities. This is a way to reduce the delay of the graphical uploading.

Although Second Life and many other virtual worlds have grown substantially with the massive number of users and the amount of digital contents, the database does not grow proportionally with these huge expansions. Second Life has been developed by a company where no other parties control the process except the company itself. Therefore, it is necessary that the company have a careful plan for database's expansion and security. Without a vigilant plan, this problem is persistent as long as the numbers of users and businesses continue to grow.

In addition, the improvement of system's capacity will greatly influence the quality of the virtual products. For instance, Second Life has its own building and developing tools. Better building tools and the ease of using these tools to accommodate the designers and creators in the product design, will enhance more perceived affordances of the products. Similarly, better building tools also enhance the affordances of the virtual environment. Therefore, usability and efficiency of the available development tools are crucial determinants for individual's business success as well.

7.4 Limitations

This dissertation has the following three major limitations. First, the generalizability of this dissertation may only be applicable to Second Life. More research in other virtual worlds should be conducted to confirm the results obtained from this dissertation. In addition, the research constructs proposed in this dissertation are based upon the corresponding ones from e-commerce research. Therefore, other new variables that represent factors influencing adoptions solely for virtual world commerce should be introduced and examined in the future.

Second, though money incentive is a good strategy in recruiting subjects and minimizing time for research conducted within the virtual world environment, it can create some bias on the results. It is possible that the participants took the survey only for money. Some results obtained from participants who have monetary desire may not reflect their actual experience and are hard to detect.

Finally, the relative newness of Second Life's virtual commerce platform comparing to general Web-based commerce platform also means that users may reflect their experiences with the traditional commerce platform when answering the survey questions. Therefore, there might be some errors due to the corresponding answers that do not reflect the real users' experience with the virtual commerce platform of Second Life.

7.5 Future Research

In the pace of the internet era, there is always a new innovation that makes an impossible thing possible. Commerce over the internet has developed and evolved over times, from the initiations of Electronic Data Interchange (EDI) and Electronic Fund Transfer (EFT) that allow business to make a purchase order electronically, to a fully-integrated economic platform of today's e-commerce. In the era of second-generation of the internet (or Web 2.0), users around the world connect, share, interact, and communicate via self-generated platforms and networking systems. Commerce activities are inevitably involved. Nowadays, as the performance of graphic technology increases and the price is much lower, people seek more interactive web platforms rather than a static platform. Commerce activities still infiltrate into these interactive systems.

Although the amount of research in virtual world commerce is obviously less than the research in web-based e-commerce, there is a possibility that this research will attract more interest in the near future. Future research in this area should focus more on developing the business model of the virtual companies and virtual world commerce in general. Other factors than those proposed in this dissertation should be examined. For instance, such factors as service quality, perceived enjoyment, perceived risk, and the main theses of system adoption theories should be examined and tested.

Researchers should also find the distinction and the resemblance between virtual world commerce and static web commerce to understand the research context more clearly. Experimental research is more suitable for comparative study. Research using experimental design can be conducted to measure users' perceptions and behavioral changes. Lab experimentation is recommended in this case. However, it is important for

research with a confirmatory purpose that the research subjects are actual users or consumers who are the target for the system use.

This dissertation is conducted based on a single-case study of Second Life. Future research in other virtual worlds is required to validate the theoretical model proposed in this dissertation. Other than cross-sectional research, it is vital to conduct longitudinal research to detect behavioral changes. For instance, consumers' behaviors and attitudes (such as trust and behavioral intention) before and after the users experienced the systems are different due to the knowledge gained over time (McKnight et al., 2002b). Therefore, it is important to divide consumers who are new to the commerce process from those who already experienced the process. The longitudinal study is beneficial to track behavioral and attitudinal changes and allow researchers understand how time can bias the results found from cross-sectional research.

Cross-cultural study is another research area that is important to information system study. Cross-cultural study (e.g., Jarvenpaa and Tractinsky, 1999) allows researchers to understand the difference and the similarity regarding the behaviors of the research subjects who are from different cultural groups. For instance, the research should include questions regarding the country of origin or the ethnicity of the participants. Therefore, the research can control the effect of cultural differences.

Finally, future research should consider any other success scenarios of virtual world adoption, whether they are the research in social and educational areas. More understanding about successful adoption of various activities in the virtual world may help researchers better understand the nature of the users, their norms, and values.

APPENDIX A

CONSENT FORMS

NEW JERSEY INSTITUTE OF TECHNOLOGY
323 MARTIN LUTHER KING BLVD.
NEWARK, NJ 07102

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Trust and Consumer Adoption of Virtual Commerce: The
Qualitative
Study

RESEARCH STUDY:
I have been asked to participate in a research study under the direction of Dr. George
Widmeyer. Other professional persons who work with him as study staff may assist to act
for him.

PURPOSE:
The purpose of this study is to investigate consumer's trusting attitude towards the virtual
company and its representative (virtual agent), as well as to examine the potential of
virtual product or service purchasing within the virtual world.

DURATION:
My participation will last for 20-30 minutes

PROCEDURES:
I have been told that, during the course of this study, the following will occur:
I will be requested to answer the question by using text-based chat with the interviewer in
the virtual world. No real name will be asked by interviewer except my avatar name that
appears on the virtual world will be collected.

PARTICIPANTS:
I will be one of about 25 participants in this study.

EXCLUSIONS:
You must be 18 years or above to participate in this study.

N J I T
New Jersey Institute &
Technology University

Approved by the NJIT IRB on 2/16/08.
Modifications may not be made to this consent form without NJIT IRB approval.

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RISK/DISCOMFORTS:
There may be risks and discomforts that are not yet known. I fully recognize that there are risks that I may be exposed to by volunteering in this study which are inherent in participating in any study. I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in this study.

POSSIBLE BENEFITS:
Results of the study may help to shape laws and policies in the future, and to help our society to understand and use new technology wisely.

CONFIDENTIALITY:
Every effort will be made to maintain the confidentiality of my study records. This confidentiality includes:
1. I have been informed about the fact that there is always the risk of intrusion by outside agents (i.e., hacking) and, therefore the possibility of being identified exists, however, the researcher has attempted to protect my confidentiality by using the "secure" https server throughout the research process.
2. If the findings from the study are published, I will not be identified by real name.
3. My identity will remain confidential unless disclosure is required by law.

PAYMENT FOR PARTICIPATION:
I have been told that I will receive 500 Linden Dollars compensation for my participation in this study.

RIGHT TO REFUSE OR WITHDRAW:
I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

INDIVIDUAL TO CONTACT:
If I have any questions about my treatment or research procedures, I understand that I should contact the principal investigator at:
George Widmeyer:
Email: Widmeyer@njit.edu
Phone: 973-596-5897
(He is a professor in the Information Systems Department, NJIT)

N J I T
New Jersey's Science & Technology University

Approved by the NJIT IRB on 2/16/08.
Modifications may not be made to this consent form without NJIT IRB approval.

If I have any addition questions about my rights as a research subject, I may contact:
Dawn Hall Apgar, PhD, IRB Chair
dawn.apgar@njit.edu
Chair, IRB
DD Planning Institute - CABSR
Campbell 330
New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982

I have read this entire form, or it has been read to me, and I understand it completely. All of my questions regarding this form or this study have been answered to my complete satisfaction.

PLEASE TYPE "I AGREE' ON THE CHAT DIALOGUE BOX IF YOU WANT TO PARTICIPATE. OTHERWISE, PLEASE TYPE "I DO NOT AGREE" IF YOU DO NOT WANT TO PARTICIPATE IN THIS STUDY.

NEW JERSEY INSTITUTE OF TECHNOLOGY
323 MARTIN LUTHER KING BLVD.
NEWARK, NJ 07102

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Trust and Consumer Adoption of Virtual Commerce: A Pilot Study

RESEARCH STUDY:
I have been asked to participate in a research study under the direction of Dr. George Widmeyer. Other professional persons who work with him as study staff may assist to act for him.

PURPOSE:
The growing residents of virtual worlds such as Second Life (SL) has created the new social and economic activities in which people around the world can directly contact each other with no constraint of geographical boundary. The distribution of in-world currency has been a foundation of new virtual economy, which will consequently create new business opportunity. Many companies have established their businesses in the virtual world to expand their product and service channels, give information to potential customers, and gain valuable feedback from their existing customers.

This pilot project aims at investigating consumer's trusting attitude towards the virtual company and its representative (virtual agent), as well as examining the potential of virtual product or service purchasing within the virtual world.

DURATION: My participation in this study will last for 30-35 minutes.

PROCEDURES:
I have been told that, during the course of this study, the following will occur:
1. I will be asked to access to either (a) the web-based questionnaire, which I have to be away from the virtual world environment or (b) an avatar bot, an automated-survey systems in the form of researcher avatar, which I can answer the survey directly through the message scripts that will automatically run in the virtual world.

N J I T
New Jersey Science &
Technology University

2. I will be requested to answer the questionnaire items. I may be asked to provide my avatar name but no real name or other identity will be required to be filled out in the questionnaire.

PARTICIPANTS:
I will be one of about 300 participants in this study.

EXCLUSIONS:
You must be 18 years or above to participate in this study.

RISK/DISCOMFORTS:
There may be risks and discomforts that are not yet known. I fully recognize that there are risks that I may be exposed to by volunteering in this study which are inherent in participating in any study. I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in this study.

POSSIBLE BENEFITS:
Results of the study may help to shape laws and policies in the future, and to help our society to understand and use new technology wisely.

CONFIDENTIALITY:
Every effort will be made to maintain the confidentiality of my study records. This confidentiality includes:
1. I have been informed about the fact that there is always the risk of intrusion by outside agents (i.e., hacking) and, therefore the possibility of being identified exists, however, the researcher has attempted to protect my confidentiality by using the "secure" https server throughout the research process.
2. If the findings from the study are published, I will not be identified by real name.
3. My identity will remain confidential unless disclosure is required by law.

PAYMENT FOR PARTICIPATION:
I have been told that I will receive 300 Linden Dollars compensation for my participation in this study.

RIGHT TO REFUSE OR WITHDRAW:
I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

N J I T
New Jersey Science &
Technology University

Approved by the NJIT IRB on 9/26/08.
Modifications may not be made to this consent form without NJIT IRB approval.

INDIVIDUAL TO CONTACT:
If I have any questions about my treatment or research procedures, I understand that I should contact the principal investigator at:
George Widmeyer
Email: Widmeyer@njit.edu
Phone: 973-596-5897
(He is a professor in the Information Systems Department, NJIT)

If I have any addition questions about my rights as a research subject, I may contact:
Dawn Hall Apgar, PhD, IRB Chair
dawn.apgar@njit.edu
Chair, IRB
DD Planning Institute - CABSR
Campbell 330
New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982

I have read this entire form, or it has been read to me, and I understand it completely. All of my questions regarding this form or this study have been answered to my complete satisfaction. I am indicating my agreement to participate in this research study by selecting the "ACCEPT" option below.

    ☐ ACCEPT   ☐ DO NOT ACCEPT

N J I T
New Jersey's Science &
Technology University

Approved by the NJIT IRB on 9/26/08.
Modifications may not be made to this consent form without NJIT IRB approval.

NEW JERSEY INSTITUTE OF TECHNOLOGY
323 MARTIN LUTHER KING BLVD.
NEWARK, NJ 07102

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Need Satisfaction and Adoption of Virtual World Commerce

RESEARCH STUDY:

I have been asked to participate in a research study under the direction of Dr. George Widmeyer. Other professional persons who work with him as study staff may assist to act for him.

PURPOSE:

The growing number of residents of virtual worlds such as Second Life (SL) has created new social and economic activities in which people around the world can directly contact each other. The distribution of in-world currency is a foundation of a new virtual economy, which consequently creates new business opportunities. Many companies have established their businesses in the virtual worlds to expand their products and service channels, give information to potential customers, and gain valuable feedback from their existing customers.

This research aims at investigating consumer's attitudes towards the virtual world as well as examining the potential of the virtual world in supporting business transactions.

DURATION:

My participation in this study will last for about 30 minutes.

PROCEDURES:

I have been told that, during the course of this study, the following will occur:
1. I will be asked to access a web-based questionnaire, during which time I have to be away from the virtual world environment.
2. I will be requested to answer the questionnaire items. I may be asked to provide my avatar name but no real name or other identity will be required to be filled out in the questionnaire.

PARTICIPANTS:

I will be one of about 1,000 residents of the virtual worlds who are participating in this study.

EXCLUSIONS:

You must be 18 years or above to participate in this study.

N J I T

RISK/DISCOMFORTS:

There may be risks and discomforts that are not yet known.

I fully recognize that there are risks that I may be exposed to by volunteering in this study which are inherent in participating in any study. I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in this study.

POSSIBLE BENEFITS:

Results of the research may help to shape laws and policies in the future. and to help our society to understand and use new technology wisely.

CONFIDENTIALITY:

Every effort will be made to maintain the confidentiality of my study records. This confidentiality includes:

1. I have been informed about the fact that there is always the risk of intrusion by outside agents (i.e.. hacking) and. therefore the possibility of being identified exists. however. the researcher has attempted to protect my confidentiality by using the "secure" https server throughout the research process.
2. If the findings from the study are published. I will not be identified by real name.
3. My identity will remain confidential unless disclosure is required by law.

PAYMENT FOR PARTICIPATION:

I have been told that I will receive 300 Linden Dollars compensation for my participation in this study.

RIGHT TO REFUSE OR WITHDRAW:

I understand that my participation is voluntary and I may refuse to participate. or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

INDIVIDUAL TO CONTACT:

If I have any questions about my treatment or research procedures. I understand that I should contact the principal investigator at:

George Widmeyer.
Email: Widmeyer@njit.edu
Phone: 973-596-5897
(He is a professor in the Information Systems Department, NJIT)

N J I T

If I have any addition questions about my rights as a research subject, I may contact:

Dawn Hall Apgar, PhD, IRB Chair
dawn.apgar@njit.edu
Chair, IRB
DD Planning Institute - CABSR
Campbell 330
New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982

I have read this entire form, or it has been read to me, and I understand it completely. All of my questions regarding this form or this study have been answered to my complete satisfaction. I am indicating my agreement to participate in this research study by selecting the "ACCEPT" option below.

☐ ACCEPT
☐ DO NOT ACCEPT

N J I T

APPENDIX B

INTERVIEW QUESTIONS AND QUESTIONNAIRES

B.1 Interview Questions for the Preliminary Study 1

The following are questions used for interviews of Second Life users:

1. How long have you used Second Life Virtual World?

2. How long did it take for you to get familiar with the system?

3. In general, what are you looking for in the Second Life Virtual World? or What kind of activity would you like to do?

4. How comfortable or difficult do you feel when using Second Life for interaction?

5. Do you have any problems in navigating your avatar (or browsing Second Life)?

6. Do you have any problems in using Second Life in communication? such as text chat, voice chat, video, IM, email, gestures, etc.

7. Have you had experience in purchasing virtual/real products or using the services of any virtual store?

[If answer Yes]

8A-1 How can you obtain products and/or services you want?

8A-2 Is there any one to assist you when purchasing/using service?

8A-3 How confident are you when there is someone assists you in obtaining products/ services? Why? And why not?

8A-4 Will you trust the virtual agent/representative of a virtual store who assists you? Why? And why not?

8A-5 How comfortable do you feel when using SL in making business transactions (sending money, buying Lindens, etc)? Any problems you have encountered so far?

[If answer NO]

8B-1 Will you plan to purchase/use any service in any virtual store in Second Life? Why? Or why not?

8B-2 Will you feel secure enough if you have to purchase or use any service that will cost your money in Second Life? Why? And why not?

9. If you can contact store representatives (avatars) or the virtual store directly, do you think this will help improve your confidence in purchasing products/services of the virtual store? Why? And why not?

10. Do you think asking for some suggestions from the virtual store/virtual agent before purchasing is beneficial? Why? And why not?

11. From your experience, how was the service quality of the virtual agent/store?

12. In overall, were you satisfied with the product/service that the virtual store/virtual agent provided you?

13. How enjoyable do you feel it is when purchasing items in Second life, compared with purchasing items on the Internet?

B.2 Questionnaire for the Pilot Study

Part I: Demographic Information

Directions

This part of the questionnaire asks you to describe the general demographic data about yourself and your experience with the Second Life. Please select one of the answers that most applicable to you.

1. Your avatar name is: _____(Optional)_____

2. Your gender is: __Female   __ Male

3. Your age is:

__ 18-23   __ 24-29   __ 30-35   __ 36-40   __ Over 40

4. What is the level of education you have completed?

__ Some high school   __ High school grad

__ Some college   __ College grad

__ Post-graduate work   __ Post-graduate degree

5. How long have you used Second Life?

__ Less than 1 week   __ 1 week to 1 month

__ 1 to 6 months   __ 6 months to 1 year

__ More than 1 year

6. How often do you use Second Life?

__ Everyday   __ 2 to 3 times a week

__ Once a week   __ Once a month

__ Less than once a month

7. In a typical week, how much time do you spend using Second Life?

__ Less than 1 hours   __ 1 hour to 10 hours

__ 10 hours to 20 hours   __ 20 hours to 30 hours

__ More than 30 hours

8. Have you ever had experience in making business transactions (such as purchasing items, using service from virtual sotre, spending money, etc) in Second Life?

__ Yes   __ No   __ Don't' remember

If YES, please specify at least one virtual store that you used to make business transactions with:

_____

Part II: Directions

Based on your experience with the virtual store specified previously (or please give us your opinion if you never had experience in making business transaction with the virtual store), please rate on each of the following dimensions by check on one of the choices that you think it is the most accurate with your opinion.

Using Second Life (SL) and its embedded communication functions (such as textbased chat, instant messaging, and voice chat)..._[The scales are: Strongly disagree, Disagree, Indifferent, Agree, Strongly agree, and Don't know]_

9. Allows me to interact with other people in easy manner.

10. Enables me to talk with other people about my personal interests, problems, issues, etc.

11. Encourages me to get together with the group of people to have enjoyment and fun.

12. Enables me to attend social and/or entertainment events.

13. Encourages me to get together with other family member and/or friends.

When using Second Life and its supplementary tools for making business transaction (such as Linden currency exchange, cash purchase, credit card purchase, etc), ... _[The scales are: Strongly disagree, Disagree, Indifferent, Agree, Strongly agree, and Don't know]_

14. I feel that the system support for making business transaction.

15. The system allows me to spend virtual currency in ease manner.

16. The system allows me to directly contact or exchange in business activity with the virtual store/virtual agent.

17. I require only minimal time in completing transaction or purchasing/using service of the virtual store/virtual agent.

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Part III: Directions

Based on your experience with the virtual store specified previously (or please give us your opinion if you never had experience in making business transaction with the virtual store), please rate on each of the following dimensions by check on one of the choices that you think it is the most accurate with your opinion.

The following questions relate to your attitude towards the virtual business/virtual agent that you have experienced *[The scales are: Strongly disagree, Disagree, Indifferent, Agree, Strongly agree, and Don't know]*

18. I believe that the virtual store/virtual agent would act in my best interest.

19. If I require help, the virtual store/virtual agent would do its best to help me.

20. The virtual store/virtual agent is interested in my wellbeing, not just its own.

21. I believe that the virtual store/virtual agent is sincere.

22. The virtual store/virtual agent is truthful in its dealings with me.

23. I believe that the virtual store/virtual agent is honest.

24. I expect that the virtual store/virtual agent will keep promise.

25. I feel that the virtual store/virtual agent is reliable.

26. The virtual store/virtual agent understand the market they work in.

27. The virtual store/virtual agent is very knowledgeable.

28. The virtual store/virtual agent is competent and effective in providing service.

29. The virtual store/virtual agent has the skills and expertise to perform transaction in an expected manner.

Part IV: Directions

Based on your experience with the virtual store specified previously (or please give us your opinion if you never had experience in making business transaction with the virtual store), please rate on each of the following dimensions by check on one of the choices that you think it is the most accurate with your opinion.

Based on previous experience with virtual store/virtual agent,

30. I ...*(definitely would not/ probably would not/ might or might not/ probably would/ definitely would/ not sure)*...**buy or use the service offered by virtual store/virtual agent again (in the near future).**

Part V: Directions

Based on your experience with the virtual store specified previously, please choose one answer for the following questions. *If you never have experience in making business transaction with the virtual store, please choose "N/A"*

Please rate the following questions:

31. In overall, I....*(definitely dissatisfied/ dissatisfied/ neither dissatisfied nor satisfied/ satisfied/ definitely satisfied)*.....**the product/service I received from the virtual store/virtual agent.**

32. The product and/or service I obtained from the virtual store/virtual agent....*(definitely dissatisfied/ dissatisfied/ neither dissatisfied nor satisfied/ satisfied/ definitely satisfied)*....**my needs.**

Part VII: Directions

Based on your experience with the Second Life (SL), please choose one answer for the following questions.

When using Second Life (SL).... *[The scales are: Strongly disagree, Disagree, Indifferent, Agree, Strongly agree, and Don't know]*

33. I find the program easy to use.

34. I find it easy to become skillful at using the system.

35. I find the program easy to navigate.

36. I find the program easy to learn to operate.

37. I can quickly accomplish what I need to do at the virtual store.

38. I can easily found specific information from the virtual store.

B.3 Questionnaire for the Main Study

Demographics

1. Your avatar name is: _____(Optional)_____

2. (In real life) you are: __Female   __ Male

3. Your age is:

    __ 18-23   __ 24-29   __ 30-35   __ 36-40   __ Over 40

4. What is the highest level of education you have completed?

    __ Some high school   __ High school grad

    __ Some college   __ College grad

    __ Post-graduate degree

Usages

5. How long have you been an active user of Second Life?

    __ Less than 1 week   __ 1 week to 1 month

    __ 1 to 6 months   __ 6 months to 1 year

    __ More than 1 year

6. How often do you use Second Life?

    __ Several times a day   __ Several times a week

    __ Once a week   __ Less than a few times per month

    __ Less than once a month

Topic Questions

When I was in the Second Life environment... *[The scales are: Strongly Disagree, Disagree, Indifferent, Agree and Strongly Agree]*

7. I found that the program functions (or menus) allowed me to do things with ease.

8. I found that the program functions (or menus) supported me in navigation and control of my avatar.

9. I found the program functions (and menus) allowed me to understand their operations.

10. I was able to predict the outcome of my actions when I saw the program's functions (or menus).

Please rate the following questions: *[The scales are (Do not intend) 1/ 2 / 3 / 4 / 5 / 6 / 7 (Really intend) / Don't know]*

11. I...to use Second Life in the next month to purchase "virtual" goods or services (e.g., clothes for my avatar, virtual home design service).

12. I...to use Second Life in the next month to purchase "real world" goods or services (e.g., clothes for me, consulting and investing service).

13. I enjoyed reading Weblog on the Internet.**

Second Life's interface functions and social tools (such as chat, instant messaging, call, gesture, fly and other functions on screen)... *[The scales are: Strongly Disagree, Disagree, Indifferent, Agree and Strongly Agree]*

14. Enabled me to have a casual conversation with other people.

15. Enabled me to know if I would be able to get together with the group of people.

16. Enabled me to know how others feel emotionally.

17. Enabled me to understand the state of mind of the people I interacted with.

18. Enabled me to establish close relationships with other people.

How important are these to me? *[The scales are (Not important at all) 1 / 2 / 3 / 4 / 5 / 6 / 7 (very important) / Don't know]*

19. The opportunity to develop close friendship with other people.

20. The sense of self-respect while I am in Second Life.

21. The opportunity to have my choice in expressing my "true self" through my avatar.

22. The feeling of pleasure and enjoyment while I am in Second Life.

23. The feeling of self-fulfillment I perceive while I am in Second Life.

In the following questions, please compare your expectations (how much this should be?) and your experience (how much is there now?) in using Second Life to engage in activities as mentioned in the following statements:

24. The opportunity to develop close friendship with other people.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

25. The sense of self-respect while I am in Second Life.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

26. The opportunity to have my choice in expressing my "true self" through my avatar.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

27. The feeling of pleasure and enjoyment while I am in Second Life.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

28. The feeling of self-fulfillment I perceive while I am in Second Life.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

Please answer the following questions: *[The scales are (Very unlikely) 1/ 2 / 3 / 4 / 5 / 6 / 7 (Very likely) / Don't know]*

29. In the next 3 months, I am...to foresee purchasing "virtual" goods or services (e.g., clothes for my avatar, virtual home design service) in Second Life.

30. In the next 3 months, I am...to foresee purchasing "real world" goods or services (e.g., clothes for me, consulting and investing service) in Second Life.

31. Have you ever had experience in making business transactions (such as purchasing items, receiving services from virtual stores, transferring money, etc) in Second Life?

    __ Yes   __ No   __ Don't remember

Second Life's transactional functions such as Lindex function of currency exchange, buy and purchase functions, etc...*[The scales are: Strongly Disagree, Disagree, Indifferent, Agree and Strongly Agree]*

32. Allowed me to understand the process of money transfer and/or money exchange.

33. Allowed me to know the steps I should do when purchasing a product, transferring money, and buying virtual currency.

34. Enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase.

35. Enabled me to easily view my money balance.

Please answer the following questions based on your experience and attitudes towards the virtual stores. *[The scales are: Strongly Disagree, Disagree, Indifferent, Agree and Strongly Agree]*

36. I <u>do not</u> believe that the virtual stores (and staffs) would act in my best interest.*

37. If I required assistance, the virtual stores (and staffs) would do their best to help me.

38. The virtual stores (and staffs) were truthful in dealings with me.

39. The virtual stores (and staffs) were unlikely to act opportunistically, even given the chance.

40. I feel that the virtual stores (and staffs) <u>were not</u> credible.*

41. The virtual stores (and staffs) understood the market in which they work.

42. The virtual stores (and staffs) had skills and expertise in running their businesses.

43. The virtual stores (and staffs) were competent and effective in providing products and/or services.

44. I really like watching news clips from YouTube.

How important are these to me? *[The scales are (Not important at all) 1 / 2 / 3 / 4 / 5 / 6 / 7 (very important) / Don't know]*

45. The quality of products/services in Second Life.

46. The products/services from virtual stores in Second Life meet my needs.

47. The feeling of security from threats and/or uncertainties when using Second Life.

In the following questions, please compare your expectations (how much this should be?) and your experience (how much is there now?) in using Second Life to engage in activities as mentioned in the following statements:

48. The quality of products/services in Second Life.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

49. The products/services from virtual stores in Second Life meet my needs.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

50. The feeling of security from threats and/or uncertainties when using Second Life.

How much this should be?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

How much is there now?: (Bad/Low) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Good/High) / Don't know

Please select the one that is most applicable to you..._[The scales are: (Definitely will not) 1 / 2 / 3 / 4 / 5 / 6 / 7 (Definitely will) / Don't know]_

51. I...use Second Life to purchase "virtual" goods (e.g., clothes for my avatar) or obtain services (e.g., interior design for virtual property) from the virtual stores again.

52. I...use Second Life to purchase "real world" goods (e.g., clothes for me) or obtain services (e.g., investing and consulting service) from the virtual stores again.

Open-ended Questions

53. What is the one thing that you like the most about shopping in the virtual world?

_____

_____

54. What is the most important barrier or shortcoming that decreases your willingness to use Second Life (particularly, to buy things)?

_____

_____

* The reverse wordings questions.

** The scales for detecting CMV.

APPENDIX C

OPERATIONALIZATION OF RESEARCH VARIABLES

Table C.1 Operationalization of Technology Adoption

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Davis (1989)	Empirical study using an interview of 40 students and a questionnaire survey of 107 students who using a word processing program, WriteOne.	Behavioral expectations of respondents' own future system use behavior.	Intention to use	1. Frequency in which the respondent currently uses WriteOne (frequent/infrequent). 2. Current use of WriteOne (not at all/ less than once a week/ about once a week/ 2-3 times a week/ 4-6 times a week/ about once a day/ more than once a day).
Gefen, Karahanna and Straub (2003b)	A questionnaire survey using Amazon.com as an experimental site		Purchase intention	1. I would use my credit card to purchase from Amazon.com. 2. I am very likely to buy books from Amazon.com
Jarvenpaa, Tractinsky and Vitale (2000)	Experimental survey using online book sellers and online travel service		Willingness to buy	1. How likely is it that you would return to this store's web site? (very likely / very unlikely). 2. How likely is that you would consider purchasing from this store in the next 3 months? (very unlikely / very likely). 3. How likely is it that you would consider purchasing from this store in the next year? (very unlikely / very likely).

Table C.1 Operationalization of Technology Adoption (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Pavlou (2003)	Experiental survey	The consumer's intent to engage in an online exchange relationship with a Web retailer, such as sharing business information, maintaining business relationships, and conducting business transactions.	Intention to transact	1. Given the chance, I intend to use this retailer's website. 2. Given the chance, I predict that I should use this retailer's website in the future. 3. It is likely that I will transact with this web retailer in the future.
Nicolaou and McKnight (2006)	Experimental design with a questionnaire survey	Intent to employ the exchange in the future.	Intention to use	1. If I was faced with a similar purchasing decision in the future, I would use this data exchange again. 2. If a similar ordering need arises in the future, I would feel comfortable using this data exchange again to place my order. 3. I would recommend use of this data exchange to other colleagues who may be faced with similar ordering needs as the one described in my case.
Venkatesh, Morris, Davis and Davis (2003)	Longitudinal field study in four organizations		Behavioral Intention to use	1. I intend to use the systems in the next (m) months. 2. I predict I would use the system in the next (m) months. 3. I plan to use the system in the next (m) months.

Table C.2 Operationalization of Need Satisfaction

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Chung-Herrera (2007)	Satisfaction in service industry settings	Focus group, customer needs survey (empirical study)	Security need - the need too feel secure and unthreatened by physical, psychological, or economic harm in service transaction. Esteem need - the need to have one's self-esteem or self-worth maintained and enhanced. Justice need - the need to be treated in a fair and equitable way compared to other similar customers.	*Security* - Physical safety. - Psychological Safety. *Esteem* - To be treated as an important customer. - To receive the same service or product as another customer with the same financial profile. - To be treated with respect. - To receive the same courteous treatment as other customers. *Justice* - To have your feelings validated. - To experience the same service prodcedures as other customers. *Trust* - To feel like you can trust the employees in word and action. - Freedom from economic harm. - To be told the truth about any service failure.

Table C.2 Operationalization of Need Satisfaction (Continued)

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Deci, Ryan, Gagné, Leone and Kornazheva (2001)	Job satisfaction in organization	Empirical survey of employees in an organization	Autonomy, relatedness, competence	*Autonomy* - I feel like I can make a lot of inputs in deciding how my job gets done. *Relatedness* - I really like the people I work with. *Competence* - I enjoy the challenge my work provided.
Oliver (1981)	Satisfaction in retail settings	Conceptual idea	Expectation-disconfirmation, satisfaction and need	*Expectation* - I will be created courtesy by the sales clerks (not at all likely/very likely). - If I complain, I will get a favorable company response (no chance/certain). - If I return an item, store X will give me a refund (0 times in 10/10 times in 10). *Disconfirmation* - This (product, store, attribute, feature, etc) was (worse than expect/ just as expected/better than expected).
Porter (1961)	Psychological need satisfaction in organizational settings	Conceptual idea	Security need, social need, esteem need, autonomy need and self actualization need	*Security* - The feeling of security in my management position. *Social* - The opportunity, in my management position, to give help to other people. - The opportunity to develop close friendships in my management position.

Table C.2 Operationalization of Need Satisfaction (Continued)

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Porter (1961) - continued				*Esteem* - The feeling of self-esteem a person gets from being in my management position. - The prestige of my management position inside the company (that is, the regard received from others in the company). - The prestige of my management position outside the company (that is, the regard received from others not in the company). *Autonomy* - The authority connected with my management position. - The opportunity for independent thought and action in my management position. - The opportunity in The determination of methods and procedures. *Self-actualization* - The opportunity for personal growth and development in my management position. - The feeling of self-fulfillment a person gets from being in my management position. - The feeling of worthwhile accomplishment in my management position.

Table C.2 Operationalization of Need Satisfaction (Continued)

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Sheldon, Elliot, Kim and Kasser (2001)	Psychological need satisfaction	Two empirical studies at universities in the U.S. and south Korea	Autonomy, competence, relatedness and self-esteem	During this event I felt.... *Autonomy* - That my choice was based on my true interests and values. - Free to do things my own way. - That my choice expressed my "true self." *Competence* - That I was successfully completing difficult tasks and projects. - That I was taking on and mastering hard challenges. - Very capable in what I did. *Relatedness* - A sense of contact with people who care for me, and whom I care for. - Close and connected with other people who are important to me. - A strong sense of intimacy with the people I spent time with. *Self-actualization* - That I was "becoming who I really am." - A sense of deeper purpose in life. - A deeper understanding of myself and my place in the universe. *Physical thriving* - That I got enough exercise and was in excellent physical condition. - That my body was getting just what it needed. - A strong sense of physical well-being.

Table C.2 Operationalization of Need Satisfaction (Continued)

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Sheldon, Elliot, Kim and Kasser (2001) - contnued				*Pleasure - stimulation* - That I was experience new sensations and activities. - Intense physical pleasure and enjoyment. - That I had found new sources and types of stimulation for myself. *Money - luxury* - Able to buy most of the things I want. - That I had nice things and possessions. - That I go plenty of money. *Security* - That my life was structured and predictable. - Glad that I have a comfortable set of routines and habits. - Safe from threats and uncertainties. *Self-esteem* - That I had many positive qualities. - Quite satisfied with who I am. - A strong sense of self-respect. *Popularity - influence* - That I was a person whose advice others seek out and follow. - That I strongly influenced other's beliefs and behavior. - That I had strong impact on what other people did.

Table C.2 Operationalization of Need Satisfaction (Continued)

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Sirgy, Cole, Kosenko, Meadow, Rahtz, Cicic, Xi Jin, Yarsuvat, Blenkhorn and Nagpal (1995)	Quality of life (life satisfaction) - satisfaction of human development needs in a community or society	Questionnaire surveys using consumer panel samples (542 households) and student samples (234 students).	Security need, social need, esteem need and self-actualization need	- The feeling of having been secure. - The feeling of having given to (and having received help from) others. - The feeling of having developed close friendships. - The feeling of having been "in-the-know." - The feeling of self-esteem (pride) a person has about oneself. - The feeling of prestige (reputation) one person has about oneself. - The feeling of having experienced independent thought and action. - The feeling of having determined my life course. - The feeling of having experienced personal growth and development. - The feeling of having experienced self-fulfillment. - The feeling of having had worthwhile accomplishments.

Table C.2 Operationalization of Need Satisfaction (Continued)

Study (authors, year)	Research Area	Empirical Settings /Conceptual Idea	Operationalization	Measurement Items
Water and Roach (1973)	Job satisfaction/ Psychological need satisfaction	A questionnaire survey of 101 managerial level personnel	Security needs, social needs, esteem needs, autonomy needs and self-actualization needs	*Security* - The feeling of security in my position. *Social* - The opportunity to develop close friendship in my position. - The opportunity, in my position, to give help to other people. *Esteem* - The feeling of self-esteem a person gets from being in my position . - The prestige of my position inside the company. - The prestige of my position outside the company. *Autonomy* - The authority connected with my position. - The opportunity for independent thought and action in my position. - The opportunity in my position for participation in the determination of methods and procedure. *Self-actualization* - The opportunity for personal growth and development in my position. - The feeling of self-fulfillment a person gets from being in my position. - The feeling of worthwhile accomplishment in my position.

Table C.3 Operationalization of Affordance-Related Variables

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Adams, Nelson and Todd (1992)	Empirical studies using a questionnaire survey and experimental design		Ease of Use	1. Easy to learn. 2. Clear and understandable. 3. Easy to become skillful. 4. Easy to use. 5. Controllable. 6. Easy to remember.
Benbunan-Fich (2001)	Protocal analysis of selected website	The extent to which the user and the system can communicate clearly and without misunderstandings through the interface.	Usability	1. Simplicity of the product menus. 2. Simplicity of the path to products. 3. Supporting users with helpful categorization of merchandise. 4. Support for personalizing or narrowing product lists. 5. Versatility and support in the form of product pictures. 6. Support for reading and learning about products. 7. Obviousness of order buttons/links. 8. Supporting users by providing a compare feature. 9. Dissatisfaction with recurring security messages. 10. Support for understanding the requirements of the ordering process. 11. Versatility of the ordering process. 12. Feedback on saving items in the shopping list. 13. Obviousness and accessibility of a running total. 14. Support for users who want to continue shopping. 15. Reversibility of actions

Table C.3 Operationalization of Affordance-Related Variables (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Davis, Bagozzi and Warshaw (1989)	Empirical study using an interview of 40 students and a questionnaire survey of 107 students who using a word processing program, WriteOne.	The degree to which perspective user expects the target system to be free of effort.	Ease of Use	1. Learning to operate WriteOne would be easy for me. 2. I would find it easy to get WriteOne to do what I want it to do. 3. It would be easy for me to become skillful at using WriteOne. 4. I would find WriteOne easy to use.
Kreijns, Kirschner, Jochems and Van Buuren (2004)	Questionnaire survey conducted in computer supported collaborative learning enviornment	The degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships.	Social presence	1. When I have real-time conversations in this CSCL environment, I have my communication partner in my mind's eye. 2. When I have asynchronous conversations in this CSCL environment, I also have my communication partner in my mind's eye. 3. When I have real-time conversations in this CSCL environment, I feel that I deal with very real persons and not with abstract anonymous persons. 4. When I have asynchronous conversations in this CSCL environment, I also feel that I deal with very real persons and not with abstract anonymous persons. 5. Real-time conversations in this CSCL environment can hardly be distinguished from face-to-face conversations.

Table C.3 Operationalization of Affordance-Related Variables (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Kreijns, Kirschner, Jochems and Van Buuren (2004) - continued		The extent that the environment can differ in their ability to facilitate the emergence of a social space, the human network of social relationships between group members which is embedded in group structures of norms and values, rules and roles, beliefs, and ideals.	Sociability	1. This CSCL environment enables me to easily contact my team mates. 2. I do not feel lonely in this CSCL environment. 3. This CSCL environment enables me to get a good impression of my team mates. 4. This CSCL environment allows spontaneous informal conversations. 5. This CSCL environment enables us to develop into a well performing team. 6. This CSCL environment enables me to develop good work. 7. This CSCL environment enables me to identify myself with the team. 8. I feel comfortable with this CSCL environment. 9. This CSCL environment allows for non task-related conversations. 10. This CSCL environment enables me to make close friendships with my team mates.
Kumar and Benbasat (2006)	Experimental design	A degree to which a medium allows an individual to establish a personal connection with others.	Social Presence	1. There is a sense of human contact in the website. 2. There is a sense of personalness in the website. 3. There is a sense of sociability in the website. 4. There is a sense of human warmth in the website. 5. There is a sense of sensitivity in the website.

Table C.3 Operationalization of Affordance-Related Variables (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Moore and Benbasat (1991)	Conceptual idea	The degree to which an individual believes that using a particular system would be free of physical and mental effort.	Perceived Ease of Use	1. I believe that a PWS is cumbersome to use. 2. My using a PWS requires a lot of mental effort. 3. Using a PWS is often frustrating. 4. I believe that it is easy to get a PWS to do what I want it to do. 5. Overall, I believe that a PWS is easy to use. 6. Learning to operate a PWS is easy for me.
		The degree to which use of an innovation is perceived to enhance one's image or status in one's social system.	Image	1. Using a PWS improves my image within the organization. 2. Because of my use of a PWS, others in my organization see me as a more valuable employee. 3. People in my organization who use a PWS have more prestige than those who do not. 4. People in my organization who use a PWS have a high profile. 5. Having a PWS is a status symbol in my organization.

Table C.3 Operationalization of Affordance-Related Variables (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Qiu and Benbasat (2005)	Experimental design using Amazon.com	The extent to which users sense the existence of other people or intelligent minds in distant locations	Social Presence	1. I felt that the interaction with the customer service represetntative was (cold/warm). 2. I felt that the interaction with the customer service represetntative was (distant/close). 3. I felt that the interaction with the customer service represetntative was (dehumanizing/humanizing). 4. I felt that the interaction with the customer service represetntative was (inexpressive/expressive). 5. I felt that the interaction with the customer service represetntative was unemotional/emotional). 6. I felt that the interaction with the customer service represetntative was (insensitive/sensitive).
Venkatesh, Morris, Davis and Davis (2003)	Meta-analysis/Conceptual idea	Judgment of one's ability to use a technology (e.g., computer) to accomplish a particular job or task.	Self-efficacy	I could complete a job or task using the system… 1. If there was no one around to tell me what to do as I go. 2. If I could call someone for help if I got stuck. 3. If I had a lot of time to complete the job for which the software was provided. 4. If I had just the built-in help facility for assistance.

Table C.3 Operationalization of Affordance-Related Variables (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Venkatesh, Morris, Davis and Davis (2003) - continued		The degree to which an individual perceives that important others believe he or she should use the new system.	Social Influence	1. People who influence my behavior think that I should use the system. 2. People who are important to me think that I should use the system. 3. The senior management of this business has been helpful in the use of the system. 4. In general, the organization has supported the use of the system.
Palmer (2002)	Empirical study using a survey of web users	consistency of the interface, response time, mapping and metaphors, interaction styles, and multimedia and audiovisual	Usability	1. The amount of information displayed on the screen was (inadequate/adequate) 2. The sequence of obtaining information was (confusing/clear). 3. The information on succeeding links from the initial page was (predictable/ unpredictable). 4. The Web site was (frustrating/satisfying) 5. The layout of pages made tasks easier (never/ always). 6. The speed in which the computer provided information was (fast enough/too slow). 7. The rate at which the information was displayed was (fast enough/too slow).

Table C.4 Operationalization Of Trust

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Ba and Pavlou (2002)	Buyer-seller relationships /Field studies on Ebay	Subjective assessment of one party that another party will perform a particular transaction according to her/his confident expectations, in an uncertainty environment.	Credibility	1. I think this seller is honest. 2. I believe this seller will deliver to me the product I purchase according to the posted delivery terms and conditions. 3. I believe this seller will deliver to me a product that matches the posted description.
Butler and Cantrell (1984)	Interpersonal trust in organizational settings/conceptual		Integrity, competent, consistent, loyalty and openness	
Doney and Canon (1997)	Buyer-seller relationships /Conceptual	Perceived credibility (integrity) and benevolence.	Honesty, caring, trustworthy	
Gambetta (1988)	Interpersonal relationship /Conceptual	Probability that a person with whom we are in contact will perform an action beneficial or at least not detrimental is high enough for us to consider engaging in some form of cooperation with him.		
Gefen, Karahanna and Straub (2003)	Business-to-Consumer (B2C) Website /Laboratory experiment of 213 US business school students	A set of specific beliefs that leads to trusting intentions or intentions to use of B2C Website.	Integrity, benevolence, ability and predictability	Based on my experience with online vendor in the past... 1. I know it is honest. 2. I know it cares about customers. 3. I know it is not opportunistic. 4. I know it is predictable. 5. I know it knows its market.

Table C.4 Operationalization Of Trust (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Hosmer (1995)	Literature review /Conceptual	Reliance by one person, group, or firm upon a voluntarily accepted duty on the part of another person, group, or firm to recognize and protect the rights and interests of all others engaged in a joint endeavor or economic exchange.		
Jarvenpaa and Tractinsky (1999)	E-commerce Websites/ Cross-cultural study of 382 students from two countries (Australia and Israel)	Willingness to rely on the seller and take action in circumstances where such action makes the consumer vulnerable to the seller.	Trustworthiness	1. This store is trustworthy. 2. This store wants to be known as one who keeps promises and commitments. 3. I trust this store keeps my best interest in mind.
Komiak, Wang and Benbasat (2005)	E-commerce /Experimental survey of 100 research participants	(Cognitive-based) Trustor's rational expectations that a trustee will have the necessary attributes to be relied upon. (Emotional-based) Feeling of secure and comfortable about relying on the trustee.	Cognitive-based trust and emotional-based trust	*Cognitive-based - competence* 1. This RA is a real expert in assessing products. 2. This RA has good knowledge about products. *Cognitive-based - integrity* 1. This RA provides unbiased product recommendation. 2. This RA is honest. 3. I consider this RA to be of integrity. *Emotional-based* 1. I feel secure about relying on this RA for my decision. 2. I feel comfortable about relying on this RA for my decision. 3. I feel content about relying on this RA for my decision.

Table C.4 Operationalization Of Trust (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Luhmann (1988)	Social life/Conceptual	Willingness to behave based on expectation about the behavior of others when considering the risk involved.		
Mayer et al. (1995)	Interpersonal trust in organizational settings/conceptual	Willingness to be vulnerable to another party.	Ability, benevolence and integrity	
McAllister (1995)	Interpersonal trust in organizational settings/conceptual	Willingness to depend upon another.	Cognitive-based Trust (ability, trust, monitor), affect-based trust (feelings, emotional investment)	
McKnight, Choudhury and Kacmar (2002)	E-commerce (www.LegalAdvice.com)/Experimental study of 1403 student subjects from three universities	Willingness to depend.	Benevolence, competence and integrity	1. I believe that LegalAdvice.com would act in my best interest. 2. If I required help, LegalAdvice.com would do its best to help me. 3. LegalAdvice.com is interested in my well being, not just its own. 4. LegalAdvice.com is truthful in its dealings with me. 5. I would characterize LegalAdvice.com as honest. 6. LegalAdvice.com would keep its commitments. 7. LegalAdvice.com is sincere and genuine. 8. LegalAdvice.com is competent and effective in providing legal advice. 9. LegalAdvice.com performs its role of giving legal advice very well. 10. Overall, LegalAdvice.com is a capable and proficient Internet legal advice provider. 11. In general, LegalAdvice.com is very knowledgeable about the lab.

Table C.4 Operationalization Of Trust (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
McKnight, Cummings and Chervany (1998)	Interpersonal trust in organizational settings/conceptual	Willingness to depend on another party.	Benevolence, competence, honesty and predictability	
Mishra (1990)	Interpersonal trust in organizational settings/conceptual	One party's willingness to be vulnerable to another party.	Competence, openness, concern and reliability	
Moorman et al. (1992)	Business Relationship	Willingness to depend.		
Morgan and Hunt (1994)	Business Relationship	Willingness to depend on a party in whom one has confidence.		
Pavlou (2002)	buyer-seller relationships /Experimental of 102 organizational buyers	The subjective belief with which organizational members collectively assess that a population of organizations will perform potential transactions according to their confident expectations, irrespective of their ability to fully monitor them.	Credibility and benevolence	*Credibility -* 1. Sellers in this B2B marketplace are likely to be honest in dealing with buyers. 2. Promises made by sellers are likely to be reliable. 3. Sellers in this B2B marketplace are likely to make false claims. 4. sellers are likely to be open with buyers if problems occur. *Benevolence -* 1. Sellers in this B2B marketplace are likely to care for buyers' welfare. 2. If there is a problem, sellers in this B2B marketplace are likely to go out on a limb of buyers. 3. I feel that sellers in this B2B marketplace are likely to make sacrifices for buyers if needed.

Table C.4 Operationalization Of Trust (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Pavlou and Dimoka (2006)	Online auction /Empirical study of 420 sellers	A buyer's belief that a transaction with a seller will occur in a manner consistent with her confident expectations.	Credibility and benevolence	*Credibility -* 1. I believe that this seller will deliver to me a product that matches the posted description. 2. I believe this seller will deliver to me a product according to the posted delivery terms and conditions. 3. This seller is likely to be reliable. 4. This seller is likely to be credible. *Benevolence -* 1. This seller is likely to care for my welfare. 2. If there is a problem with my transaction, this seller will go out on a limb for me. 3. This seller is likely to make sacrifice for me if needed. 4. This seller is unlikely to act opportunistically, even given the chance. 5. This seller is likely to keep my best interests in mind.
Pavlou and Gefen (2004)	Online auctions /Longitudinal study of 274 buyers of Amazon marketplace	The buyer's subjective belief that online transactions with seller in a specific marketplace will occur in a manner consistent with his/her expectations of trustworthy behavior.	Trust as a specific belief (credibility, reliability, trustworthiness)	*Trust in sellers -* Sellers in Amazon's auctions are in general 1. dependable. 2. reliable. 3. honest. 4. trustworthy. *Trust in intermediary -* 1. As an auction host/intermediary, Amazon can be trusted at all times. 2. As an auction host/intermediary, Amazon can be counted on to do what is right.

Table C.4 Operationalization Of Trust (Continued)

Study (authors, year)	Empirical Settings /Conceptual Idea	Conceptualization	Operationalization	Measurement Items
Pavlou and Gefen (2004) - continued				3. As an auction host/intermediary, Amazon has high integrity. 4. Amazon is a competent and knowledgeable auction host/intermediary. *Propensity to trust -* Most Internet retailers and auction sellers… 1. are reliable. 2. keep promises and commitments. 3. are honest.
Rampel et al. (1985)	Interpersonal relationship /Conceptual	Willingness to depend based on a generalized expectation/confidence about what others will do.	Overall trust, benevolence, predictability and honesty	
Rotter (1971)	Social life /Conceptual	Expectation that one's word or promise can be relied upon.		
Schurr and Ozanne (1985)	Buyer-seller relationships	Belief that promises are reliable and obligations will be fulfilled		
Shankar, Urban and Sultan (2002)	Online trust /Conceptual		reliability/ believability, emotional comfort, quality/ competence and benevolence	
Wang and Benbasat (2007)	E-commerce/ Experimental of 120 students from US university	Willingness to follow an advice from recommendation agent.	Benevolence, competence and integrity	
Zucker (1986)	Business relationship/ Conceptual	Set of expectations, an implicit contract.		

ANALYSIS OF MISSING DATA

The table below provides a summary of missing data for the demographic questions, usage, and measurement items of the research constructs.

	Valid obtained	Missing	Percent of missing
Gender	307	0	0
Age	307	0	0
Level of Education	307	0	0
Duration	307	0	0
Frequency	307	0	0
(PA1) I found that program functions (or menus) allowed me to do things with ease.	303	4	1.30
(PA2) I found that the program functions (or menus) supported me in navigation and control of my avatar.	305	2	0.65
(PA3) I found that the program functions (or menus) allowed me to understand their operations.	304	3	0.98
(PA4) I was able to predict the outcome of my actions when I saw the program's functions (or menus).	299	8	2.61
(RA1) Second Life...enabled me to have a casual conversation with other people.	304	3	0.98
(RA2) Second Life...enabled me to know if I would be able to get together with the group of people.	295	12	3.91
(RA3) Second Life...enabled me to know how others feel emotionally.	299	8	2.61
(RA4) Second Life...enabled me to understand the state of mind of the people I interacted with.	294	13	4.23
(RA5) Second Life...enabled me to establish close relationships with other people.	298	9	2.93
(TA1) Second Life...allowed me to understand the process of money transfer and/or money exchange.	220	6	2.65

	Valid obtained	Missing	Percent of missing
(TA2) Second Life...allowed me to know the steps I should do when purchasing a product, transferring money, and buying virtual currency.	221	5	2.21
(TA3) Second Life...enabled me to know exactly the items (or digital contents) I would obtain if I made a purchase.	223	3	1.33
(TA4) Second Life...enabled me to easily view my money balance.	222	4	1.77
SL allows me to directly contact or exchange in business activity with the virtual store.	48	2	4.00
SL requires only minimal time in completing a transaction.	47	3	6.00
I believe that the virtual store would act on my best interest.	48	2	4.00
If I require help, the virtual store would do its best to help me.	49	1	2.00
The virtual store is interested in my well-being, not just its own.	45	5	10.00
I believe that the virtual store is sincere.	47	3	6.00
The virtual store is truthful in its dealings with me.	46	4	8.00
The virtual store is honest.	47	3	6.00
I expect that virtual store will keep promise.	50	0	0
The virtual store is reliable.	47	3	6.00
The virtual store understands the market it works on.	47	3	6.00
The virtual store is very knowledgeable.	48	2	4.00
The virtual store is competent and effective in providing service.	49	1	2.00
The virtual store has skills and expertise to perform transactions.	46	4	8.00
In overall, I ...(definitely dissatisfied/definitely satisfied)... the product/service from the virtual store/agents.	80	9	10.11

	Valid obtained	Missing	Percent of missing
The product and/or service offered by the virtual store …(definitely dissatisfied/definitely satisfied)… my needs.	78	11	12.36
I … (definitely would not/definitely would)… buy a product or obtain a service from a virtual store in the near future.	80	9	10.11

APPENDIX E

SAS 9.1 RESULTS OF NORMALITY TEST

Variable: Physical Affordances

Moments			
N	307	Sum Weights	307
Mean	11.5311726	Sum Observations	3540.07
Std Deviation	2.34038094	Variance	5.47738293
Skewness	-0.9931617	Kurtosis	1.42653078
Uncorrected SS	42497.2375	Corrected SS	1676.07918
Coeff Variation	20.2961226	Std Error Mean	0.1335726

Tests for Normality				
Test		Statistic	p Value	
Shapiro-Wilk	W	0.913346	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.175476	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.570926	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	8.345818	Pr > A-Sq	<0.0050

Variable: Physical Affordances (Squared Term)

Moments			
N	307	Sum Weights	307
Mean	46.9216612	Sum Observations	14404.95
Std Deviation	16.0935517	Variance	259.002407
Skewness	-0.2674613	Kurtosis	0.08088891
Uncorrected SS	755158.921	Corrected SS	79254.7365
Coeff Variation	34.298768	Std Error Mean	0.91850751

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.954607	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.137784	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.953103	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	5.023729	Pr > A-Sq	<0.0050

Variable: Relational Affordances

Moments			
N	307	Sum Weights	307
Mean	11.5731922	Sum Observations	3552.97
Std Deviation	2.57747576	Variance	6.64338128
Skewness	-0.660559	Kurtosis	0.11970998
Uncorrected SS	43152.0793	Corrected SS	2032.87467
Coeff Variation	22.2710875	Std Error Mean	0.14710431

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.941646	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.145565	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.718829	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	4.7562	Pr > A-Sq	<0.0050

Variable: Transactional Affordances

Moments			
N	226	Sum Weights	226
Mean	12.0157965	Sum Observations	2715.57
Std Deviation	2.32804287	Variance	5.41978359
Skewness	-0.9820893	Kurtosis	1.76532318
Uncorrected SS	33849.1877	Corrected SS	1219.45131
Coeff Variation	19.3748527	Std Error Mean	0.15485911

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.893676	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.196408	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.270616	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	7.062139	Pr > A-Sq	<0.0050

Variable: Transactional Affordances (Third Power Term)

Moments			
N	226	Sum Weights	226
Mean	220.05208	Sum Observations	49731.77
Std Deviation	99.1164907	Variance	9824.07873
Skewness	0.20112229	Kurtosis	-0.7286073
Uncorrected SS	13153997.1	Corrected SS	2210417.71
Coeff Variation	45.0422877	Std Error Mean	6.59313089

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.911678	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.21319	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.458547	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	8.257029	Pr > A-Sq	<0.0050

Variable: Benevolence Trust

Moments			
N	226	Sum Weights	226
Mean	14.1652212	Sum Observations	3201.34
Std Deviation	2.61970875	Variance	6.86287395
Skewness	-0.1456945	Kurtosis	-0.1488871
Uncorrected SS	46891.836	Corrected SS	1544.14664
Coeff Variation	18.4939487	Std Error Mean	0.17426043

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.977608	Pr < W	0.0012
Kolmogorov-Smirnov	D	0.103175	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.360303	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	1.911193	Pr > A-Sq	<0.0050

Variable: Credibility Trust

Moments			
N	226	Sum Weights	226
Mean	15.145885	Sum Observations	3422.97
Std Deviation	2.72598514	Variance	7.43099499
Skewness	-0.5693706	Kurtosis	0.75053051
Uncorrected SS	53515.8837	Corrected SS	1671.97387
Coeff Variation	17.9981899	Std Error Mean	0.18132983

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.961727	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.114133	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.426258	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	2.29343	Pr > A-Sq	<0.0050

Variable: Growth Need

Moments			
N	307	Sum Weights	307
Mean	21.2976547	Sum Observations	6538.38
Std Deviation	22.1734286	Variance	491.660938
Skewness	1.59905576	Kurtosis	3.05113046
Uncorrected SS	289700.407	Corrected SS	150448.247
Coeff Variation	104.112067	Std Error Mean	1.26550442

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.843821	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.168401	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.901021	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	11.95639	Pr > A-Sq	<0.0050

Variable: Growth Need (Cubed Root Term)

Moments			
N	307	Sum Weights	307
Mean	4.66013029	Sum Observations	1430.66
Std Deviation	3.63219563	Variance	13.1928451
Skewness	0.4474962	Kurtosis	-0.5914256
Uncorrected SS	10704.0726	Corrected SS	4037.01059
Coeff Variation	77.9419329	Std Error Mean	0.20730035

Tests for Normality				
Test		Statistic	p Value	
Shapiro-Wilk	W	0.943768	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.099745	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.438577	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	3.933185	Pr > A-Sq	<0.0050

Variable: Deficiency Need

Moments			
N	226	Sum Weights	226
Mean	23.2422566	Sum Observations	5252.75
Std Deviation	20.3808279	Variance	415.378147
Skewness	1.24447578	Kurtosis	2.18411896
Uncorrected SS	215545.847	Corrected SS	93460.0831
Coeff Variation	87.6886795	Std Error Mean	1.35571251

Tests for Normality				
Test		Statistic	p Value	
Shapiro-Wilk	W	0.901037	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.12706	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.61685	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	4.426294	Pr > A-Sq	<0.0050

Variable: Deficiency Need (Cubed Root Term)

Moments			
N	226	Sum Weights	226
Mean	4.35327434	Sum Observations	983.84
Std Deviation	2.70951966	Variance	7.34149679
Skewness	-0.3198008	Kurtosis	-1.0181077
Uncorrected SS	5934.7622	Corrected SS	1651.83678
Coeff Variation	62.2409582	Std Error Mean	0.18023457

Tests for Normality				
Test		Statistic	p Value	
Shapiro-Wilk	W	0.929805	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.122927	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.679644	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	5.057639	Pr > A-Sq	<0.0050

Variable: Intention to Purchase

Moments			
N	307	Sum Weights	307
Mean	24.8383388	Sum Observations	7625.37
Std Deviation	8.36956103	Variance	70.0495518
Skewness	-0.0308626	Kurtosis	-0.1969991
Uncorrected SS	210836.686	Corrected SS	21435.1629
Coeff Variation	33.6961385	Std Error Mean	0.47767608

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.980062	Pr < W	0.0003
Kolmogorov-Smirnov	D	0.081871	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.423495	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	2.17253	Pr > A-Sq	<0.0050

Variable: Markers

Moments			
N	307	Sum Weights	307
Mean	6.6019544	Sum Observations	2026.8
Std Deviation	1.71313708	Variance	2.93483865
Skewness	-0.3679101	Kurtosis	0.09064277
Uncorrected SS	14278.9018	Corrected SS	898.060627
Coeff Variation	25.9489384	Std Error Mean	0.0977739

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.962555	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.137898	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.747047	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	4.125612	Pr > A-Sq	<0.0050

SAS 9.1 RESULTS OF HETEROSCEDASTICITY TEST

```
The REG Procedure
Model: Physical_Affordances
Dependent Variable: Intention
```

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	1.53	0.4664

```
Model: Relational_Affordances
Dependent Variable: Intention
```

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	0.81	0.6665

```
Model: Transactional_Affordances
Dependent Variable: Intention
```

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	2.98	0.2256

```
Model: Benevolence_Trust
Dependent Variable: Intention
```

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	0.77	0.6814

```
Model: Credibility_Trust
Dependent Variable: Intention
```

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	2.89	0.2353

Model: Growth_Need
Dependent Variable: Intention

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	8.35	0.0154

Model: Deficiency_Need
Dependent Variable: Intention

Test of First and Second Moment Specification

DF	Chi-Square	Pr > ChiSq
2	6.04	0.0488

APPENDIX G

SAS 9.1 RESULTS OF COVARIANCE-BASED PATH ANALYSIS

G.1 Covariance-Based SEM for the Main Research Model

Fit Function	2.5724
Goodness of Fit Index =GFI)	0.8389
GFI Adjusted for Degrees of =reedom (AGFI)	0.8002
Root Mean Square Residual =RMR)	7.6214
Parsimonious GFI (Mulaik, =989)	0.7305
Chi-Square	578.7863
Chi-Square DF	283
Pr > Chi-Square	<.0001
Independence Model =hi-Square	3047.4
Independence Model Chi-Square =F	325
RMSEA Estimate	0.0682
RMSEA 90% Lower Confidence =imit	0.0602
RMSEA 90% Upper Confidence =imit	0.0761
ECVI Estimate	3.2593
ECVI 90% Lower Confidence =imit	2.9602
ECVI 90% Upper Confidence =imit	3.5979
Probability of Close Fit	0.0001
Bentler's Comparative Fit =ndex	0.8914
Normal Theory Reweighted LS Chi-Square	558.5655
Akaike's Information =riterion	12.7863
Bozdogan's (1987) CAIC	-1238.2252
Schwarz's Bayesian =riterion	-955.2252
McDonald's (1989) =entrality	0.5198
Bentler & Bonett's (1980) =on-normed Index	0.8752
Bentler & Bonett's (1980) =FI	0.8101
James, Mulaik, & Brett =1982) Parsimonious NFI	0.7054
Z-Test of Wilson & =ilferty (1931)	9.6397
Bollen (1986) Normed Index =ho1	0.7819
Bollen (1988) Non-normed Index =elta2	0.8930
Hoelter's (1983) Critical =	127

Latent Variable Equations with =stimates

```
FD      =  0.4765 * FB  +  1.0000   d1
Std Err    0.1023   p1
t Value    4.6563

FE      = 0.00127 * FA  + -0.6102 * FB  + 1.0000   d2
Std Err    0.0174   p2      0.1896   p3
t Value    0.0729          -3.2188

FF      = -0.1895 * FD  +  0.1758 * FE  +  0.0259 * FA  +  0.5330 * FB  +  0.0104 * FC  + 1.0000   d3
Std Err    0.1341   p7       0.0831   p8      0.0193   p4     0.1983   p5     0.00338  p6
t Value   -1.4124            2.1140            1.3464           2.6884          3.0711

FG      = -0.0153 * FD  + -0.1330 * FE  +  0.0141 * FA  +  0.5336 * FB  +  0.00624 * FC  + 1.0000   d4
Std Err    0.1905   p12      0.1159   p13     0.0274   p9     0.2767   p10    0.00470  p11
t Value   -0.0801           -1.1478            0.5146           1.9285          1.3261
```

Latent Variable Equations with Standardized Estimates

```
FD =   0.3902 * FB  +  0.9207   d1
                p1

FE = 0.00627 * FA  + -0.3038 * FB  +  0.9534   d2
                p2             p3

FF =  -0.1070 * FD  +  0.1633 * FE  +  0.1193 * FA  +  0.2466 * FB  +  0.2776 * FC  + 0.8779   d3
                p7             p8             p4             p5             p6

FG = -0.00623 * FD  + -0.0893 * FE  +  0.0468 * FA  +  0.1783 * FB  +  0.1206 * FC  + 0.9509   d4
                p12            p13            p9             p10            p11
```

G.2 Covariance-Based SEM for the Revised Model

Fit Function	2.3492
Goodness of Fit Index =GFI)	0.8539
GFI Adjusted for Degrees of =reedom (AGFI)	0.8174
Root Mean Square Residual =RMR)	7.2213
Parsimonious GFI (Mulaik, =989)	0.7383
Chi-Square	528.5701
Chi-Square DF	281
Pr > Chi-Square	<.0001
Independence Model =hi-Square	3047.4
Independence Model Chi-Square =F	325
RMSEA Estimate	0.0626
RMSEA 90% Lower Confidence =imit	0.0543
RMSEA 90% Upper Confidence =imit	0.0707
ECVI Estimate	3.0563
ECVI 90% Lower Confidence =imit	2.7767
ECVI 90% Upper Confidence =imit	3.3758
Probability of Close Fit	0.0068
Bentler's Comparative Fit =ndex	0.9091
Normal Theory Reweighted LS Chi-Square	498.7420
Akaike's Information =riterion	-33.4299
Bozdogan's (1987) CAIC	-1275.6002
Schwarz's Bayesian =riterion	-994.6002
McDonald's (1989) =entrality	0.5783
Bentler & Bonett's (1980) =on-normed Index	0.8948
Bentler & Bonett's (1980) =FI	0.8265
James, Mulaik, & Brett =1982) Parsimonious NFI	0.7146
Z-Test of Wilson & =ilferty (1931)	8.3643
Bollen (1986) Normed Index =ho1	0.7994
Bollen (1988) Non-normed Index =elta2	0.9105
Hoelter's (1983) Critical =	138

Latent Variable Equations with =stimates

FD	=	0.0325 * FA	+	0.1927 * FB	+	0.00753 * FC	+	1.0000	d1									
Std Err		0.0103	p14	0.0904	p7	0.00182	p15											
t Value		3.1676		2.1329		4.1330												
FE	=	-0.00234 * FA	+	-0.5941 * FB	+	1.0000	d2											
Std Err		0.0168	p1	0.1891	p4													
t Value		-0.1391		-3.1413														
FF	=	-0.2585 * FD	+	0.1744 * FE	+	0.0298 * FA	+	0.5327 * FB	+	0.0113 * FC	+	1.0000	d3					
Std Err		0.1654	p12	0.0830	p10	0.0197	p2	0.1861	p5	0.00363	p8							
t Value		-1.5627		2.1008		1.5144		2.8625		3.1106								
FG	=	-0.0473 * FD	+	-0.1335 * FE	+	0.0157 * FA	+	0.5411 * FB	+	0.00671 * FC	+	1.0000	d4					
Std Err		0.2334	p13	0.1157	p11	0.0279	p3	0.2585	p6	0.00503	p9							
t Value		-0.2026		-1.1532		0.5636		2.0935		1.3357								

Latent Variable Equations with Standardized Estimates

FD = 0.2689 * FA + 0.1553 * FB + 0.3565 * FC + 0.7836   d1
            p14   p7   p15

FE = -0.0118 * FA + -0.2916 * FB + 0.9553   d2
            p1   p4

FF = -0.1481 * FD + 0.1639 * FE + 0.1414 * FA + 0.2458 * FB + 0.3062 * FC + 0.8887   d3
            p12   p10   p2   p5   p8

FG = -0.0193 * FD + -0.0895 * FE + 0.0531 * FA + 0.1781 * FB + 0.1300 * FC + 0.9512   d4
            p13   p11   p3   p6   p9

G.3 Covariance-Based SEM for the Model Based on Inexperienced Users

Fit Function	2.1990
Goodness of Fit Index =GFI)	0.8079
GFI Adjusted for Degrees of =reedom (AGFI)	0.7097
Root Mean Square Residual =RMR)	0.6718
Parsimonious GFI (Mulaik, =989)	0.6059
Chi-Square	175.9170
Chi-Square DF	90
Pr > Chi-Square	<.0001
Independence Model =hi-Square	674.58
Independence Model Chi-Square =F	120
RMSEA Estimate	0.1092
RMSEA 90% Lower Confidence =imit	0.0851
RMSEA 90% Upper Confidence =imit	0.1331
ECVI Estimate	3.6593
ECVI 90% Lower Confidence =imit	3.2164
ECVI 90% Upper Confidence =imit	4.2284
Probability of Close Fit	0.0001
Bentler's Comparative Fit =ndex	0.8451
Normal Theory Reweighted LS Chi-Square	152.1719
Akaike's Information =riterion	-4.0830
Bozdogan's (1987) CAIC	-309.5834
Schwarz's Bayesian =riterion	-219.5834
McDonald's (1989) =entrality	0.5884
Bentler & Bonett's (1980) =on-normed Index	0.7934
Bentler & Bonett's (1980) =FI	0.7392
James, Mulaik, & Brett =1982) Parsimonious NFI	0.5544
Z-Test of Wilson & =ilferty (1931)	5.0873
Bollen (1986) Normed Index =ho1	0.6523
Bollen (1988) Non-normed Index =elta2	0.8530
Hoelter's (1983) Critical =	53

Latent Variable Equations with =stimates

```
FC      = -0.00300 * FA +  -0.1256 * FB + 1.0000    d1
Std Err    0.0219   p3      0.1626   p6
t Value   -0.1369            -0.7724
FD      =  0.1482 * FC + 0.00801 * FA + 0.7720 * FB + 1.0000   d2
Std Err    0.2767   p1      0.0432   p4    0.3239   p7
t Value    0.5357            0.1852         2.3833
FE      =  0.2801 * FC +  -0.0146 * FA + 0.3521 * FB + 1.0000   d3
Std Err    0.2161   p2      0.0339   p5    0.2543   p8
t Value    1.2962            -0.4304        1.3849
```

Latent Variable Equations with Standardized Estimates

```
FC = -0.0206 * FA + -0.1190 * FB + 0.9917    d1
            p3              p6
FD =  0.0698 * FC +  0.0258 * FA + 0.3441 * FB + 0.9355   d2
            p1              p4              p7
FE =  0.1670 * FC + -0.0596 * FA + 0.1988 * FB + 0.9725   d3
            p2              p5              p8
```

APPENDIX H

SMARTPLS RESULTS OF PLS-BASED PATH ANALYSIS

H.1 PLS-Based SEM for the Direct Effect

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
INT-R	0.803075	0.924329	0.069301	0.876810
INT-V	0.808942	0.926987	0.153111	0.881645
PA	0.655125	0.883531		0.826663
RA	0.633649	0.873504		0.807248
TA	0.755068	0.902343		0.837405

	Communality	Redundancy
INT-R	0.803075	0.013481
INT-V	0.808942	0.033540
PA	0.655125	
RA	0.633650	
TA	0.755068	

Total Effects

	INT-R	INT-V	PA	RA
INT-R				
INT-V				
PA	0.059527	0.098188		
RA	0.155626	0.202992		
TA	0.117243	0.196166		

	TA
INT-R	
INT-V	
PA	
RA	
TA	

Bootstrapping (Cases = 100, Samples = 500)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
PA -> INT-R	0.059527	0.068159	0.127654	0.127654
PA -> INT-V	0.098188	0.108941	0.102917	0.102917
RA -> INT-R	0.155626	0.158959	0.112961	0.112961
RA -> INT-V	0.202992	0.220917	0.103943	0.103943
TA -> INT-R	0.117243	0.118536	0.135788	0.135788
TA -> INT-V	0.196166	0.194680	0.097967	0.097967

	T Statistics (|O/STERR|)
PA -> INT-R	0.466314
PA -> INT-V	0.954050
RA -> INT-R	1.377697
RA -> INT-V	1.952918
TA -> INT-R	0.863430
TA -> INT-V	2.002377

Bootstrapping (Cases = 200, Samples = 2000)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
PA -> INT-R	0.059527	0.062410	0.082980	0.082980
PA -> INT-V	0.098188	0.108310	0.076640	0.076640
RA -> INT-R	0.155626	0.162276	0.075677	0.075677
RA -> INT-V	0.202992	0.208256	0.076445	0.076445
TA -> INT-R	0.117243	0.120160	0.091135	0.091135
TA -> INT-V	0.196166	0.195361	0.070168	0.070168

	T Statistics (|O/STERR|)
PA -> INT-R	0.717359
PA -> INT-V	1.281167
RA -> INT-R	2.056441
RA -> INT-V	2.655402
TA -> INT-R	1.286472
TA -> INT-V	2.795665

H.2 PLS-Based SEM for the Main Research Model

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
BEN	0.631164	0.834015	0.121597	0.694841
CRE	0.741321	0.895524	0.131485	0.823692
DEF	0.701681	0.875428	0.020989	0.788666
GRW	0.628382	0.833652	0.035569	0.718609
INT-R	0.802769	0.924186	0.121346	0.876810
INT-V	0.808902	0.926967	0.184898	0.881645
PA	0.653970	0.882976		0.826663
RA	0.633915	0.873579		0.807248
TA	0.755066	0.902342		0.837405

	Communality	Redundancy
BEN	0.631164	0.076797
CRE	0.741321	0.097237
DEF	0.701681	0.014135
GRW	0.628382	0.018481
INT-R	0.802769	-0.042927
INT-V	0.808902	-0.005193
PA	0.653970	
RA	0.633915	
TA	0.755066	

Total Effects

	BEN	CRE	DEF	GRW
BEN				
CRE				
DEF				
GRW				
INT-R				
INT-V				
PA			-0.144877	
RA	0.348707	0.362608		-0.188597
TA				

	INT-R	INT-V	PA	RA
BEN	-0.182551	-0.022306		
CRE	0.076357	-0.014392		
DEF	-0.220772	0.168677		
GRW	0.015566	0.026282		
INT-R				
INT-V				
PA	0.127978	0.074956		
RA	0.088400	0.230838		
TA	0.094500	0.241541		

	TA
BEN	
CRE	
DEF	
GRW	
INT-R	
INT-V	
PA	
RA	
TA	

Bootstrapping (Cases = 100, Samples = 500)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
BEN -> INT-R	-0.182551	-0.171727	0.179808	0.179808
BEN -> INT-V	-0.022306	-0.014767	0.125148	0.125148
CRE -> INT-R	0.076357	0.065578	0.146097	0.146097
CRE -> INT-V	-0.014392	-0.029807	0.138536	0.138536
DEF -> INT-R	-0.220772	-0.228827	0.125460	0.125460
DEF -> INT-V	0.168677	0.163213	0.111537	0.111537
GRW -> INT-R	0.015566	0.010111	0.124576	0.124576
GRW -> INT-V	0.026282	0.030225	0.109361	0.109361
PA -> DEF	-0.144877	-0.149133	0.122775	0.122775
PA -> INT-R	0.095993	0.092488	0.123765	0.123765
PA -> INT-V	0.099393	0.114654	0.119596	0.119596
RA -> BEN	0.348707	0.351318	0.099831	0.099831
RA -> CRE	0.362608	0.365457	0.098197	0.098197
RA -> GRW	-0.188597	-0.198362	0.127357	0.127357
RA -> INT-R	0.127305	0.132972	0.115096	0.115096
RA -> INT-V	0.248792	0.258746	0.110164	0.110164
TA -> INT-R	0.094500	0.098433	0.125298	0.125298
TA -> INT-V	0.241541	0.234722	0.100727	0.100727

	T Statistics (|O/STERR|)
BEN -> INT-R	1.015255
BEN -> INT-V	0.178241
CRE -> INT-R	0.522646
CRE -> INT-V	0.103887
DEF -> INT-R	1.759708
DEF -> INT-V	1.512306
GRW -> INT-R	0.124950
GRW -> INT-V	0.240322
PA -> DEF	1.180018
PA -> INT-R	0.775611
PA -> INT-V	0.831078
RA -> BEN	3.492982
RA -> CRE	3.692669
RA -> GRW	1.480858
RA -> INT-R	1.106076
RA -> INT-V	2.258382
TA -> INT-R	0.754204
TA -> INT-V	2.397980

Bootstrapping (Cases = 200, Samples = 2000)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
BEN -> INT-R	-0.182551	-0.178427	0.108442	0.108442
BEN -> INT-V	-0.022306	-0.019584	0.090216	0.090216
CRE -> INT-R	0.076357	0.075111	0.095152	0.095152
CRE -> INT-V	-0.014392	-0.021840	0.090757	0.090757
DEF -> INT-R	-0.220772	-0.226142	0.085966	0.085966
DEF -> INT-V	0.168677	0.165705	0.079357	0.079357
GRW -> INT-R	0.015566	0.011116	0.084222	0.084222
GRW -> INT-V	0.026282	0.027541	0.073551	0.073551
PA -> DEF	-0.144877	-0.153906	0.079284	0.079284
PA -> INT-R	0.095993	0.094589	0.080146	0.080146
PA -> INT-V	0.099393	0.108559	0.083710	0.083710
RA -> BEN	0.348707	0.356556	0.069060	0.069060
RA -> CRE	0.362608	0.368979	0.069861	0.069861
RA -> GRW	-0.188597	-0.198783	0.075723	0.075723
RA -> INT-R	0.127305	0.128858	0.077337	0.077337
RA -> INT-V	0.248792	0.253956	0.077029	0.077029
TA -> INT-R	0.094500	0.096090	0.088640	0.088640
TA -> INT-V	0.241541	0.244683	0.070081	0.070081

	T Statistics (|O/STERR|)
BEN -> INT-R	1.683393
BEN -> INT-V	0.247256
CRE -> INT-R	0.802471
CRE -> INT-V	0.158579
DEF -> INT-R	2.568137
DEF -> INT-V	2.125561
GRW -> INT-R	0.184817
GRW -> INT-V	0.357328
PA -> DEF	1.827308
PA -> INT-R	1.197739
PA -> INT-V	1.187348
RA -> BEN	5.049322
RA -> CRE	5.190404
RA -> GRW	2.490632
RA -> INT-R	1.646112
RA -> INT-V	3.229844
TA -> INT-R	1.066104
TA -> INT-V	3.446578

H.3 PLS-Based SEM for the Revised Research Model

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
BEN	0.628667	0.833522	0.249580	0.694841
CRE	0.741256	0.895517	0.276389	0.823692
DEF	0.701619	0.875383	0.019060	0.788666
GRW	0.628371	0.833644	0.035518	0.718609
INT-R	0.802742	0.924173	0.122097	0.876810
INT-V	0.808884	0.926960	0.184747	0.881645
PA	0.656531	0.884257		0.826663
RA	0.633867	0.873561		0.807248
TA	0.755188	0.902404		0.837405

	Communality	Redundancy
BEN	0.628668	0.090077
CRE	0.741256	0.086573
DEF	0.701619	0.012817
GRW	0.628371	0.018451
INT-R	0.802742	-0.043719
INT-V	0.808884	-0.003261
PA	0.656531	
RA	0.633867	
TA	0.755188	

Total Effects

	BEN	CRE	DEF	GRW
BEN				
CRE				
DEF				
GRW				
INT-R				
INT-V				
PA	0.255170	0.200294	-0.138060	
RA	0.154506	0.160886		-0.188463
TA	0.228898	0.306948		

	INT-R	INT-V	PA	RA
BEN	-0.188174	-0.013739		
CRE	0.078227	-0.019723		
DEF	-0.221405	0.168664		
GRW	0.016841	0.027029		
INT-R				
INT-V				
PA	0.089548	0.068292		
RA	0.109493	0.238621		
TA	0.079540	0.231324		

	TA
BEN	
CRE	
DEF	
GRW	
INT-R	
INT-V	
PA	
RA	
TA	

Bootstrapping (Cases = 100, Samples = 500)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
BEN -> INT-R	-0.188174	-0.180794	0.151095	0.151095
BEN -> INT-V	-0.013739	-0.012847	0.119482	0.119482
CRE -> INT-R	0.078227	0.068337	0.131847	0.131847
CRE -> INT-V	-0.019723	-0.026114	0.124402	0.124402
DEF -> INT-R	-0.221405	-0.226670	0.129047	0.129047
DEF -> INT-V	0.168664	0.156288	0.121241	0.121241
GRW -> INT-R	0.016841	0.020027	0.130181	0.130181
GRW -> INT-V	0.027029	0.034266	0.111610	0.111610
PA -> BEN	0.255170	0.266242	0.101967	0.101967
PA -> CRE	0.200294	0.208675	0.104446	0.104446
PA -> DEF	-0.138060	-0.149569	0.114823	0.114823
PA -> INT-R	0.091329	0.090767	0.123737	0.123737
PA -> INT-V	0.099034	0.100168	0.120729	0.120729
RA -> BEN	0.154506	0.159564	0.106095	0.106095
RA -> CRE	0.160886	0.165837	0.107855	0.107855
RA -> GRW	-0.188463	-0.192082	0.123482	0.123482
RA -> INT-R	0.129155	0.129664	0.116463	0.116463
RA -> INT-V	0.249011	0.259666	0.111677	0.111677
TA -> BEN	0.228698	0.227645	0.106432	0.106432
TA -> CRE	0.306948	0.297246	0.095756	0.095756
TA -> INT-R	0.098602	0.102076	0.123869	0.123869
TA -> INT-V	0.240523	0.239358	0.099173	0.099173

	T Statistics (|O/STERR|)
BEN -> INT-R	1.245401
BEN -> INT-V	0.114987
CRE -> INT-R	0.593313
CRE -> INT-V	0.158543
DEF -> INT-R	1.715690
DEF -> INT-V	1.391140
GRW -> INT-R	0.129365
GRW -> INT-V	0.242173
PA -> BEN	2.502480
PA -> CRE	1.917689
PA -> DEF	1.202374
PA -> INT-R	0.738089
PA -> INT-V	0.820299
RA -> BEN	1.456298
RA -> CRE	1.491688
RA -> GRW	1.526241
RA -> INT-R	1.108789
RA -> INT-V	2.229752
TA -> BEN	2.150647
TA -> CRE	3.205507
TA -> INT-R	0.796017
TA -> INT-V	2.425283

Bootstrapping (Cases = 200, Samples = 2000)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
BEN -> INT-R	-0.186174	-0.177379	0.102677	0.102677
BEN -> INT-V	-0.013739	-0.015239	0.085776	0.085776
CRE -> INT-R	0.078227	0.074315	0.096101	0.096101
CRE -> INT-V	-0.019723	-0.021676	0.084509	0.084509
DEF -> INT-R	-0.221405	-0.224392	0.084288	0.084288
DEF -> INT-V	0.168664	0.168656	0.079402	0.079402
GRW -> INT-R	0.016841	0.011320	0.085120	0.085120
GRW -> INT-V	0.027029	0.030271	0.074479	0.074479
PA -> BEN	0.255170	0.261983	0.071306	0.071306
PA -> CRE	0.200294	0.207157	0.071575	0.071575
PA -> DEF	-0.138060	-0.143427	0.079148	0.079148
PA -> INT-R	0.091329	0.092136	0.081252	0.081252
PA -> INT-V	0.099034	0.106200	0.083674	0.083674
RA -> BEN	0.154506	0.154046	0.075456	0.075456
RA -> CRE	0.160856	0.160244	0.076481	0.076481
RA -> GRW	-0.188463	-0.197864	0.076588	0.076588
RA -> INT-R	0.129155	0.128717	0.076341	0.076341
RA -> INT-V	0.249011	0.254642	0.074807	0.074807
TA -> BEN	0.228898	0.228360	0.071633	0.071633
TA -> CRE	0.306948	0.303926	0.067219	0.067219
TA -> INT-R	0.098602	0.099430	0.088970	0.088970
TA -> INT-V	0.240523	0.240587	0.073303	0.073303

	T Statistics (|O/STERR|)
BEN -> INT-R	1.832690
BEN -> INT-V	0.160173
CRE -> INT-R	0.814005
CRE -> INT-V	0.233384
DEF -> INT-R	2.626779
DEF -> INT-V	2.124171
GRW -> INT-R	0.197847
GRW -> INT-V	0.362906
PA -> BEN	3.578519
PA -> CRE	2.798380
PA -> DEF	1.744327
PA -> INT-R	1.124021
PA -> INT-V	1.183564
RA -> BEN	2.047560
RA -> CRE	2.103604
RA -> GRW	2.460749
RA -> INT-R	1.691821
RA -> INT-V	3.328710
TA -> BEN	3.195414
TA -> CRE	4.566391
TA -> INT-R	1.108255
TA -> INT-V	3.281206

H.4 PLS-Based SEM for the Hierarchical Model

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
BEN	0.631685	0.832808	0.781867	0.694841
CRE	0.741282	0.895517	0.849400	0.823692
DEF	0.704060	0.876894	0.790970	0.788666
GRW	0.642957	0.842731	0.717047	0.718609
INT-R	0.803089	0.924342	0.092878	0.876810
INT-V	0.809014	0.927013	0.178766	0.881645
NEED	0.508612	0.860396	0.073840	0.804601
PA	0.656383	0.884176		0.826663
RA	0.635091	0.874021		0.807248
TA	0.755176	0.902398		0.837405
TRUST	0.561487	0.882658	0.317082	0.837739

	Communality	Redundancy
BEN	0.631685	0.493764
CRE	0.741282	0.628644
DEF	0.704060	0.556417
GRW	0.642957	0.460109
INT-R	0.803089	0.034854
INT-V	0.809014	-0.010784
NEED	0.508612	0.000583
PA	0.656383	
RA	0.635091	
TA	0.755176	
TRUST	0.561487	0.087407

Total Effects

	BEN	CRE	DEF	GRW
BEN				
CRE				
DEF				
GRW				
INT-R				
INT-V				
NEED			0.889365	0.846786
PA	0.217939	0.227156	-0.004697	-0.004472
RA	0.156593	0.163216	-0.239780	-0.228300
TA	0.262467	0.273568		
TRUST	0.884232	0.921629		

	INT-R	INT-V	NEED	PA
BEN				
CRE				
DEF				
GRW				
INT-R				
INT-V				
NEED	-0.160066	0.159843		
PA	0.062844	0.090930	-0.005281	
RA	0.166156	0.192789	-0.269608	
TA	0.092400	0.223715		
TRUST	-0.054577	-0.054689		

	RA	TA	TRUST
BEN			
CRE			
DEF			
GRW			
INT-R			
INT-V			
NEED			
PA			0.246473
RA			0.177095
TA			0.296831
TRUST			

Bootstrap (Cases = 100, Samples = 500)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
NEED -> DEF	0.889365	0.891166	0.022327	0.022327
NEED -> GRW	0.846786	0.846735	0.036325	0.036325
NEED -> INT-R	-0.160066	-0.162530	0.109662	0.109662
NEED -> INT-V	0.159843	0.160455	0.093527	0.093527
PA -> INT-R	0.075451	0.077845	0.121463	0.121463
PA -> INT-V	0.105254	0.107926	0.114971	0.114971
PA -> NEED	-0.005281	-0.003302	0.124074	0.124074
PA -> TRUST	0.246473	0.257161	0.098114	0.098114
RA -> INT-R	0.132686	0.134720	0.113661	0.113661
RA -> INT-V	0.245569	0.254189	0.111971	0.111971
RA -> NEED	-0.269606	-0.272397	0.113096	0.113096
RA -> TRUST	0.177095	0.166772	0.106119	0.106119
TA -> INT-R	0.108600	0.109286	0.127423	0.127423
TA -> INT-V	0.239949	0.241879	0.107733	0.107733
TA -> TRUST	0.296831	0.295477	0.098092	0.098092
TRUST -> BEN	0.884232	0.885656	0.024877	0.024877
TRUST -> CRE	0.921629	0.921667	0.016455	0.016455
TRUST -> INT-R	-0.054577	-0.043943	0.119145	0.119145
TRUST -> INT-V	-0.054689	-0.047843	0.110344	0.110344

	T Statistics (|O/STERR|)
NEED -> DEF	39.833417
NEED -> GRW	23.311199
NEED -> INT-R	1.459635
NEED -> INT-V	1.709063
PA -> INT-R	0.621183
PA -> INT-V	0.915477
PA -> NEED	0.042566
PA -> TRUST	2.512102
RA -> INT-R	1.167210
RA -> INT-V	2.193141
RA -> NEED	2.383833
RA -> TRUST	1.668841
TA -> INT-R	0.852285
TA -> INT-V	2.227248
TA -> TRUST	3.026057
TRUST -> BEN	35.544464
TRUST -> CRE	56.009111
TRUST -> INT-R	0.458072
TRUST -> INT-V	0.495621

Bootstrap (Cases = 200, Samples = 2000)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
NEED -> DEF	0.889365	0.889634	0.014658	0.014658
NEED -> GRW	0.846786	0.846573	0.025067	0.025067
NEED -> INT-R	-0.160066	-0.162626	0.072241	0.072241
NEED -> INT-V	0.159843	0.159219	0.063807	0.063807
PA -> INT-R	0.075451	0.074735	0.082820	0.082820
PA -> INT-V	0.105254	0.109715	0.084026	0.084026
PA -> NEED	-0.005281	-0.006692	0.082446	0.082446
PA -> TRUST	0.246473	0.250125	0.068855	0.068855
RA -> INT-R	0.132666	0.137275	0.079356	0.079356
RA -> INT-V	0.245569	0.248655	0.078066	0.078066
RA -> NEED	-0.269608	-0.270483	0.077592	0.077592
RA -> TRUST	0.177095	0.176199	0.072988	0.072988
TA -> INT-R	0.108600	0.106445	0.090495	0.090495
TA -> INT-V	0.239949	0.241113	0.074010	0.074010
TA -> TRUST	0.296831	0.295746	0.069469	0.069469
TRUST -> BEN	0.884232	0.885951	0.018204	0.018204
TRUST -> CRE	0.921629	0.922395	0.012313	0.012313
TRUST -> INT-R	-0.054577	-0.054729	0.081449	0.081449
TRUST -> INT-V	-0.054689	-0.057499	0.079309	0.079309

	T Statistics (|O/STERR|)
NEED -> DEF	60.675666
NEED -> GRW	33.760907
NEED -> INT-R	2.215731
NEED -> INT-V	2.505115
PA -> INT-R	0.911024
PA -> INT-V	1.252624
PA -> NEED	0.064059
PA -> TRUST	3.579607
RA -> INT-R	1.671792
RA -> INT-V	3.144858
RA -> NEED	3.474662
RA -> TRUST	2.426372
TA -> INT-R	1.200065
TA -> INT-V	3.242117
TA -> TRUST	4.272824
TRUST -> BEN	48.574390
TRUST -> CRE	74.848627
TRUST -> INT-R	0.670076
TRUST -> INT-V	0.689566

H.5 PLS-Based SEM Model after Excluding Some Variables

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
DEF	0.704055	0.876894	0.793413	0.788666
GRW	0.642956	0.842744	0.714351	0.718609
INT-R	0.802019	0.923885	0.047526	0.876810
INT-V	0.808875	0.926953	0.170445	0.881645
NEED	0.508592	0.860386	0.096293	0.804601
RA	0.636371	0.874430		0.807248
TA	0.755156	0.902356		0.837405

	Communality	Redundancy
DEF	0.704055	0.558105
GRW	0.642956	0.458359
INT-R	0.802019	0.037499
INT-V	0.808875	-0.013397
NEED	0.508592	0.036357
RA	0.636371	
TA	0.755156	

Total Effects

	DEF	GRW	INT-R	INT-V
DEF				
GRW				
INT-R				
INT-V				
NEED	0.890737	0.845193	-0.218004	0.172219
RA	-0.191169	-0.181395	0.046788	0.224355
TA	-0.138680	-0.131589	0.033941	0.230420

	NEED	RA	TA
DEF			
GRW			
INT-R			
INT-V			
NEED			
RA	-0.214619		
TA	-0.155691		

Bootstrapping

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
NEED -> DEF	0.890737	0.891529	0.014539	0.014539
NEED -> GRW	0.845193	0.845044	0.025235	0.025235
NEED -> INT-R	-0.218004	-0.226825	0.063643	0.063643
NEED -> INT-V	0.172219	0.176296	0.064823	0.064823
RA -> INT-V	0.261317	0.267333	0.071532	0.071532
RA -> NEED	-0.214619	-0.216463	0.084835	0.084835
TA -> INT-V	0.257233	0.262066	0.069344	0.069344
TA -> NEED	-0.155691	-0.157591	0.078678	0.078678

	T Statistics (|O/STERR|)
NEED -> DEF	61.266113
NEED -> GRW	33.492863
NEED -> INT-R	3.425400
NEED -> INT-V	2.656751
RA -> INT-V	3.653155
RA -> NEED	2.529838
TA -> INT-V	3.709505
TA -> NEED	1.978840

H.6 PLS-Based SEM for the Model Based on Inexperienced Users

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
INT-R	0.794871	0.920688	0.037624	0.871004
INT-V	0.760736	0.905076	0.134566	0.847218
NEED	0.629595	0.834557	0.080927	0.726204
PA	0.646464	0.878750		0.836337
RA	0.678790	0.893971		0.843898

	Communality	Redundancy
INT-R	0.794871	0.013495
INT-V	0.760736	-0.007134
NEED	0.629595	0.029437
PA	0.646465	
RA	0.678791	

Total Effects

	INT-R	INT-V	NEED	PA
INT-R				
INT-V				
NEED	0.162521	0.059660		
PA	-0.068603	0.248791	-0.166153	
RA	0.123587	0.183532	-0.174901	

	RA
INT-R	
INT-V	
NEED	
PA	
RA	

Bootstrapping (Cases = 100, Samples = 500)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
NEED -> INT-R	0.162521	0.165037	0.150840	0.150840
NEED -> INT-V	0.059660	0.066238	0.114159	0.114159
PA -> INT-R	-0.041600	-0.042718	0.142214	0.142214
PA -> INT-V	0.258703	0.262976	0.116569	0.116569
PA -> NEED	-0.166153	-0.159080	0.136274	0.136274
RA -> INT-R	0.152012	0.159552	0.147908	0.147908
RA -> INT-V	0.193967	0.207390	0.107695	0.107695
RA -> NEED	-0.174901	-0.191283	0.151540	0.151540

	T Statistics (|O/STERR|)
NEED -> INT-R	1.077437
NEED -> INT-V	0.522600
PA -> INT-R	0.292514
PA -> INT-V	2.219307
PA -> NEED	1.219250
RA -> INT-R	1.027745
RA -> INT-V	1.801073
RA -> NEED	1.154161

Bootstrapping (Cases = 200, Samples = 2000)

Path Coefficients (Mean, STDEV, T-values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
NEED -> INT-R	0.162521	0.163233	0.108269	0.108269
NEED -> INT-V	0.059660	0.063793	0.080854	0.080854
PA -> INT-R	-0.041600	-0.039076	0.095828	0.095828
PA -> INT-V	0.258703	0.267047	0.071285	0.071285
PA -> NEED	-0.166153	-0.166834	0.091460	0.091460
RA -> INT-R	0.152012	0.154764	0.091641	0.091641
RA -> INT-V	0.193967	0.198623	0.071532	0.071532
RA -> NEED	-0.174901	-0.182252	0.105245	0.105245

	T Statistics (|O/STERR|)
NEED -> INT-R	1.501089
NEED -> INT-V	0.737868
PA -> INT-R	0.434106
PA -> INT-V	3.629128
PA -> NEED	1.816678
RA -> INT-R	1.658773
RA -> INT-V	2.711606
RA -> NEED	1.661848

APPENDIX I

IRB APPROVAL FORMS

NJIT NEW JERSEY INSTITUTE OF TECHNOLOGY

Institutional Review Board: HHS FWA 00003246

Notice of Approval

IRB Protocol Number: E112-08

Principal Investigators: George Widmeyer, Information Systems
Title: Trust and Consumer Adoption of Virtual Commerce:
                                          The Qualitative Study
Performance Site(s): NJIT/Off-Campus Sponsor Protocol Number (if applicable):
Type of Review: FULL [ ]   EXPEDITED [X]
Type of Approval: NEW [X]   RENEWAL [ ]   MINOR REVISION [ ]
Approval Date: February 16, 2008   Expiration Date: February 15, 2009

1. **ADVERSE EVENTS:** Any adverse event(s) or unexpected event(s) that occur in conjunction with this study must be reported to the IRB Office immediately (973) 642-7616.

2. **RENEWAL:** Approval is valid until the expiration date on the protocol. You are required to apply to the IRB for a renewal prior to your expiration date for as long as the study is active. It is your responsibility to ensure that you receive and submit the renewal in a timely manner.

3. **CONSENT:** All subjects must receive a copy of the consent form as submitted.

4. **SUBJECTS:** Number of subjects approved: 25.

5. The investigator(s) did not participate in the review, discussion, or vote of this protocol.

6. **APPROVAL IS GRANTED ON THE CONDITION THAT ANY DEVIATION FROM THE PROTOCOL WILL BE SUBMITTED, IN WRITING, TO THE IRB FOR SEPARATE REVIEW AND APPROVAL.**

Dawn Hall Apgar

Dawn Hall Apgar, PhD, LSW, ACSW, Chair IRB   February 16, 2008

NJIT NEW JERSEY INSTITUTE OF TECHNOLOGY

Institutional Review Board: HHS FWA 00003246

Notice of Approval

IRB Protocol Number: E113-08

Principal Investigators: George Widmeyer, Information Systems
Title: Trust and Consumer Adoption of Virtual Commerce: A Pilot Study
Performance Site(s):   NJIT/Off-Campus Sponsor Protocol Number (if applicable):
Type of Review: FULL [ ]   EXPEDITED [X]
Type of Approval: NEW [X]   RENEWAL [ ]   MINOR REVISION [ ]
Approval Date: February 17, 2008   Expiration Date: February 16, 2009
1. **ADVERSE EVENTS:** Any adverse event(s) or unexpected event(s) that occur in conjunction with this study must be reported to the IRB Office immediately (973) 642-7616.
2. **RENEWAL:** Approval is valid until the expiration date on the protocol. You are required to apply to the IRB for a renewal prior to your expiration date for as long as the study is active. It is your responsibility to ensure that you receive and submit the renewal in a timely manner.
3. **CONSENT:** All subjects must receive a copy of the consent form as submitted.
4. **SUBJECTS:** Number of subjects approved: 100.
5. The investigator(s) did not participate in the review, discussion, or vote of this protocol.
6. **APPROVAL IS GRANTED ON THE CONDITION THAT ANY DEVIATION FROM THE PROTOCOL WILL BE SUBMITTED, IN WRITING, TO THE IRB FOR SEPARATE REVIEW AND APPROVAL.**

Dawn Hall Apgar

Dawn Hall Apgar, PhD, LSW, ACSW, Chair IRB   February 17, 2008

NJIT NEW JERSEY INSTITUTE OF TECHNOLOGY

Institutional Review Board: HHS FWA 00003246

Notice of Approval

IRB Protocol Number: E113-08

Principal Investigators: George Widmeyer, Information Systems
Title: Trust and Consumer Adoption of Virtual Commerce:
                                A Pilot Study
Performance Site(s): NJIT/Off-Campus Sponsor Protocol Number (if applicable):
Type of Review: FULL [ ]   EXPEDITED [X]
Type of Approval: NEW [ ]   RENEWAL [X]   REVISION [X]
Approval Date: September 26, 2008   Expiration Date: September 25, 2009

1. **ADVERSE EVENTS:** Any adverse event(s) or unexpected event(s) that occur in conjunction with this study must be reported to the IRB Office immediately (973) 642-7616.

2. **RENEWAL:** Approval is valid until the expiration date on the protocol. You are required to apply to the IRB for a renewal prior to your expiration date for as long as the study is active. It is your responsibility to ensure that you submit the renewal in a timely manner.

3. **CONSENT:** All subjects must receive a copy of the consent form as submitted. Indications of consent must be kept on file with the principal investigator.

4. **SUBJECTS:** Number of subjects approved: 300.

5. The investigator(s) did not participate in the review, discussion, or vote of this protocol.

6. **APPROVAL IS GRANTED ON THE CONDITION THAT ANY DEVIATION FROM THE PROTOCOL WILL BE SUBMITTED, IN WRITING, TO THE IRB FOR SEPARATE REVIEW AND APPROVAL.**

Dawn Hall Apgar

Dawn Hall Apgar, PhD, LSW, ACSW, Chair IRB   September 26, 2008

NJIT NEW JERSEY INSTITUTE OF TECHNOLOGY
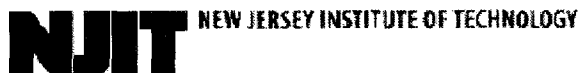
Institutional Review Board: HHS FWA 00003246
Notice of Approval
IRB Protocol Number: E133-09

Principal Investigators: George Widmeyer and Roxanne Hiltz
                           Information Systems

Title: Need Satisfaction and Adoption of Virtual World Commerce

Performance Site(s): NJIT   Sponsor Protocol Number (if applicable):

Type of Review: FULL [ ]   EXPEDITED [X]

Type of Approval: NEW [X]   RENEWAL [ ]   REVISION [ ]

Approval Date: April 28, 2009   Expiration Date: April 27, 2010

1. **ADVERSE EVENTS:** Any adverse event(s) or unexpected event(s) that occur in conjunction with this study must be reported to the IRB Office immediately (973) 642-7616.

2. **RENEWAL:** Approval is valid until the expiration date on the protocol. You are required to apply to the IRB for a renewal prior to your expiration date for as long as the study is active. It is your responsibility to ensure that you submit the renewal in a timely manner.

3. **CONSENT:** All subjects must receive a copy of the consent form as submitted. Copies of signed consent forms must be kept on file with the principal investigator.

4. **SUBJECTS:** Number of subjects approved: 1,000.

5. The investigator(s) did not participate in the review, discussion, or vote of this protocol.

6. **APPROVAL IS GRANTED ON THE CONDITION THAT ANY DEVIATION FROM THE PROTOCOL WILL BE SUBMITTED, IN WRITING, TO THE IRB FOR SEPARATE REVIEW AND APPROVAL.**

Dawn Hall Apgar

Dawn Hall Apgar, PhD, LSW, ACSW, Chair IRB   April 28, 2009

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