ASSESSING THE INFLUENCE OF E-COMMERCE ITEM RECOMMENDER SYSTEMS ON USER CONTINUANCE INTENTION FOR FUTURE USE OF RECOMMENDER SYSTEM

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ABSTRACT

ASSESSING THE INFLUENCE OF E-COMMERCE ITEM RECOMMENDER SYSTEMS ON USER CONTINUANCE INTENTION FOR FUTURE USE OF RECOMMENDER SYSTEM

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In recent years, there are several research studies on initial adaptation of information systems using recommender agents. This study, however, investigates the post-adaption behavior of users of such systems. As online e-commerce service websites are attracting users, existence of a recommender technology plays a substantial role in encouraging users to continue using system by helping them to discover and find items which they may interested and subsequently prefer to purchase. Researchers found that acquiring a new customer for a specific service or product costs five times more than retaining existing customer.

Recommender systems are sophisticated, intelligent and automated software which help customers to make an ideal decision by providing high quality recommendations for them. Using online costumer behavior tracking or gain information from them, recommender

systems provide the most interesting service or products to customers. Implementing recommender systems increases online retailer's sales as well as their customer's loyalty. The main objective of this study is to assess the influence of e-commerce product recommender systems on consumer's continuance intention to use of information system in future. The proposed model in this study consists of four constructs including quality of decision, decision effort, overall satisfaction and continuance intention to use information system.

Keywords: IS Continuance, Continuance Intention, ECM-IT, Recommender Systems

ÖZ

E-TİCARETTE KULLANILAN ÖNERİ SİSTEMLERİNİN ETİKLERI KULLANICININ ERTELEME NIYETININ ÜZERINA GELECEKTE DEĞERLENDİRİLMESİ

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Öneri sistemleri kullanan bilgi sistemlerinin ilk benimsenmesi üzerinde çok sayıda araştırma yapmıştır. Ancak kullanıcıların çevrimiçi hizmetleri kabulünden sonra bu sistemleri kullanmalarının devamı problemin başka bir boyutudur. Bu tezin amacı çevrimiçi hizmetler alanında kullanıcıların kabul sonrası davranışı araştırmaktır. Çevrimiçi e-ticaret hizmeti web siteleri kullanıcıların ilgisini çekmektedir. Öneri teknolojisinin varlığı kullanıcılara tercih öğeleri keşfetmek ve ürün bulmak için yardımcı olarak kullanıcıları sistemi kullanmaya devam etmek için teşvikde önemli bir rol oynar. Araştırmacılar belirli bir hizmet için yeni müşteri bulmanın mevcut müşterilerin kullanıma devamında beş kat daha fazla maliyetli olduğunu göstermişlerdir.

Öneri sistemleri gelişmiş, akıllı ve kullanıcılar için yüksek kaliteli öneriler sağlayarak ideal bir karar vermekte yardımcı yazılımlardır. Çevrimiçi müşteri davranışlarını izleyerek veya onlardan bilgi alarak, öneri sistemleri müşterilerine en ilginç hizmet veya ürün sunmaktadırlar. Öneri sistemleri kullanmak çevrimiçi perakendesatışı artırmanın yanı sıra müşteri sadakatini de artırır. Bu çalışmanın temel amacı, öneri sistemi kullanımının tüketicinin gelecekte aynı e-ticaret servisimnin kullanmaya devamı niyetine etkisi değerlendirmektir. Bu çalışmada önerilen model kararın kalitesi, karar için gerekli çaba, genel memnuniyet, ve sunulan sistemleri kullanmaya devamı niyeti olmak üzere dört yapıdan oluşmaktadır.

Anahtar Kelimeler: IS Devamı, Süreklilik Niyet, ECM-IT, Öneri Sistemleri

To my beloved wife Maryam EKHTIARI

&

My Family

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASP	Active Server Pages
AZHITECHS	Azerbaijan High Technologies
B2C	Business to Consumer
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
E-Commerce	Electronic Commerce
ECM	Expectation-Confirmation Model
ECM-IT	Expectation-Confirmation Model of Information technology continuance
ECT	Expectation-Confirmation Theory
IS	Information Systems
IT	Information Technology
LCD	Liquid Crystal Display
METU	Middle East Technical University
ROI	Return on Investment
SEM	Structural Equation Modeling
TAM	Technology Acceptance Model
URL	Uniform Resource Locator

CHAPTER I

INTRODUCTION

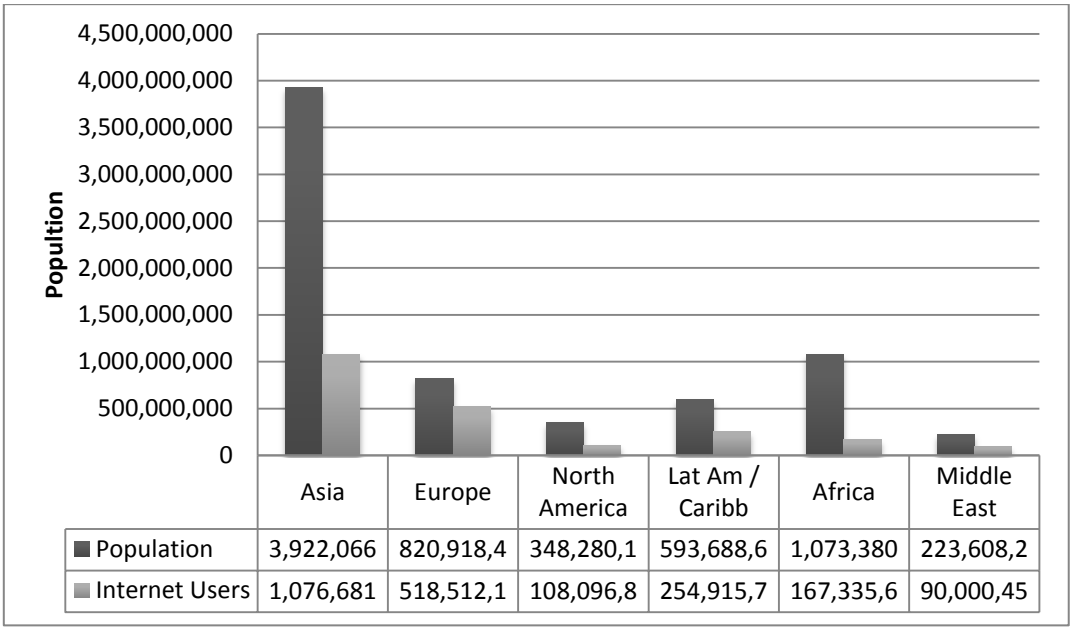
This chapter makes a short introduction to information systems continuance as well as recommender systems. Objectives of this study, research questions, scope of study and structure of thesis will be discussed in this chapter.

1.1 Introduction

E-commerce portals provide millions of users through internet with a diversity of chances to purchase or sell product or service and exchange goods. Many websites worldwide like eBay.com, Alibaba.com, Amazon.com, Itunes.com and etc. are the popular examples of e-commerce websites. No need to say, these websites required to be accepted initially by users in order to develop their business; however, the main determinant of e-commerce websites' success is the continuance intention of their users toward using that website.

The number of internet users has been increased significantly from 2000 till now. Table 1 illustrates the number of internet users in each region. Regarding world sat, number of internet users increased more than five times in last decade. As a result, owners of e-commerce websites realized the value of potential consumers over internet and began to attract more and more users to their portals.

Table 1- World Internet Usage and Population Statistics



	Asia	Europe	North America	Lat Am / Caribb	Africa	Middle East
Population	3,922,066	820,918,4	348,280,1	593,688,6	1,073,380	223,608,2
Internet Users	1,076,681	518,512,1	108,096,8	254,915,7	167,335,6	90,000,45

For online e-commerce businesses attracting new users to their websites isn't a competitive or comparative advantage any longer; however, it is an essential factor of survival and successfulness which should have customer's loyalty afterward in today's hectic business environment.

This opportunity is more crucial for those e-commerce websites and online retailers which their target customers located in Asia mostly. Regarding to "Internet World Stats" report in June 2012, more than 44 percent of internet users' distribution allocated to Asians. Figure 1 illustrates distribution of internet users and categorization of them by regions. Also according to Forrester research, it is estimated that by the end of 2014, the amount of online sales will pass 250 billion dollars only in USA. There is such estimation for Western Europe which stated that the amount of online sales will pass 156 billion dollars by 2014. Comparing with the population of Asia, this number for Asia has been estimated to be more than USA and Western Europe.

Internet Users Distribution by World Regions

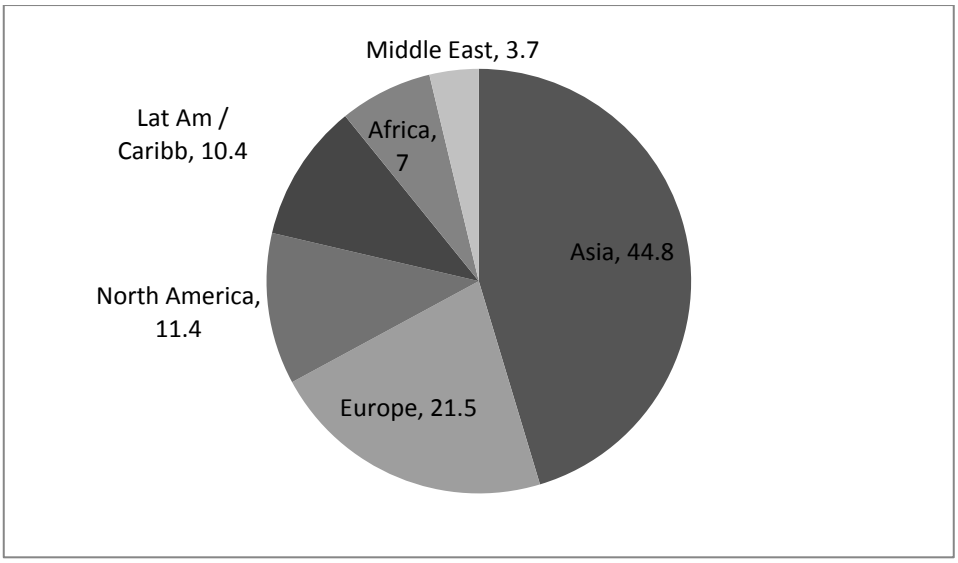


Figure 1 – Internet world stat's Internet Users Distribution by World Regions

E-commerce websites are able to introduce their service or products for all of the internet users now and make their products available for customer worldwide. A prime example of Alibaba.com story may shed some lights on this issue. A heavy duty car manufacturer in Iran needs some spare parts for its customer service centers. That spare part is manufactured in India and China. Iranian customer could easily search and find the most appropriate product with highest quality and lowest price. Then it could make online transaction with producer in China or India by using Alibaba.com.

On the other hand, success of such websites or services is highly dependent on customer's repurchasing intention. In fact, nowadays customers face with major vast of online services and many products on the internet which encounter them many difficulties for choosing the product or using the service that meet all of their needs. The main reason of this difficulty is the nature of online environment. Not existence of professional person or sales representative to ask for advice, reputation of e-commerce portal and credence of

user to service of website are some examples of customer's difficulty while using an online service or purchasing a product online.

Generally, when a user feels he/she benefits from using a website or purchasing an item, he or she finds usage of that website easy, called perceived ease of use in TAM model, then consumer loyalty associated with his/her usage or purchase experience with website. One of the best ways for maximizing customer benefits includes offering a lot of system features like high quality recommendations. Using a system which could provide easily accessible recommendations for customers could increase satisfaction of users. That's called "Recommender system".

Recommender systems are sophisticated, intelligent and automated software which help customers to make an ideal decision by providing high quality recommendations for them. Using online costumer behavior tracking or gaining information from them, they provide the most interesting service or products to customers, recommender systems do (Jannach et. al, 2011). In fact, consciously or unconsciously, many of internet users faced with recommender systems during usage of an online service, purchasing a product online or even net surfing. For instance, users may see recommender system of YouTube.com, the world's most famous online video community. Personalized categories of videos are recommended to visitors based on their recent activities on website. When a user signed in to YouTube.com and started to search a specific topic, for example "Wild Dog Attacking", a set of recommended videos appears on the right-side box of user's profile after a while which recommended other related videos like "Wild Animal Attacking" or "Wild Dog Footages" that user may be interested. Using this kind of recommender systems will increase the satisfaction of user with service using.

According to Bhattacherjees' 2001 model of IS continuance, this satisfaction leads to continuance intention. Using intelligent methods and techniques, recommender systems try to attract attention of user to the given service or product. As a result, perceived usefulness and perceived ease of use increased which have positive effects on user satisfaction. In fact, the more successful a recommender system implemented, the better results got in business. Also by implementing a recommender system, sales of e-

commerce websites is increased by assisting consumers to find the item, product or service that meet their requirements and match their criteria.

In their study Chiasson et al., (2002) found that by utilizing an appropriate recommender system, decision quality of customers will be increased by recommending services or products in which consumers may be interested. In another studies, it is found that decision effort of consumers is reduced by utilizing such systems (Hostler et al., 2005; Pedersen, 2000). In purchasing a product over internet, decision effort refers to time spent by customers for making a decision and the extent of item look for (Xiao &Benbasat 2007). Additionally, utilizing such systems decrease the final number of items that consumer should analyze (Dellaert & Haubl 2005).

Putting all above-mentioned factors into consideration, it could be found that by integrating recommender systems into e-commerce website boring job of visiting, sorting, screening and filtering of products is shifted from website owners and admins to that intelligent software so customer' quality of decision will be increased by saving this time. Subsequently, overall satisfaction of customers increased. Hence, online retailers and e-commerce websites owners should associate such intelligent software to their portals in order to increase the overall satisfaction of customers and their ROI consequently.

1.2 Study Objectives

Assessing the impact of knowledge-based e-commerce item recommender systems on continuance intention of online user to use information system in the future is the main objective of this research and success criteria of this study is to find any relationship between them.

1.3 Research Questions

This study tries to investigate the answer of following question:

1. In an e-commerce websites, does any relationship exist between knowledge-based recommender systems' use and searching effort of customers?

2. In an e-commerce websites, does any relationship exist between knowledge-based recommender systems' use and online customers' quality of decision?

3. Does the degree of decision quality have any relationship with overall satisfaction of online customers?

4. Does the degree of decision effort have any relationship with overall satisfaction of online customers?

5. In an e-commerce websites, does any relationship exist between knowledge-based recommender systems' use and online customers' continuance intention?

1.4 Scope of Study

Exploring boundaries of e-commerce item recommender systems' influence on online customers' continuance intention are restricted to proposed model constructs. An e-commerce online portal of Mercedes Benz trucks manufacturer in Iran is used in order to examine the proposed model. Users purchase customer service items online on website. In total 351 number of company customers participated in this survey.

1.5 Significance of the Study

Having conducted a lot of research on initial adoption of information systems using recommender agents by researchers recently, this study would rather investigate the post-adoption behavior of users in the field of online services. A literature review of IS continuance and recommender systems studies demonstrated that there are few number of studies which focus on post-adoption of users with an IS using recommender systems.

Another significance of this study is utilizing a real-world system to assessing the conceptual model. As many researchers stated in their studies, the result of analysis in simulated websites may be completely different with a real-world portal.

1.6 Study Progression

A quantitative research is employed on this study. The following figure illustrates the process of research in this study.

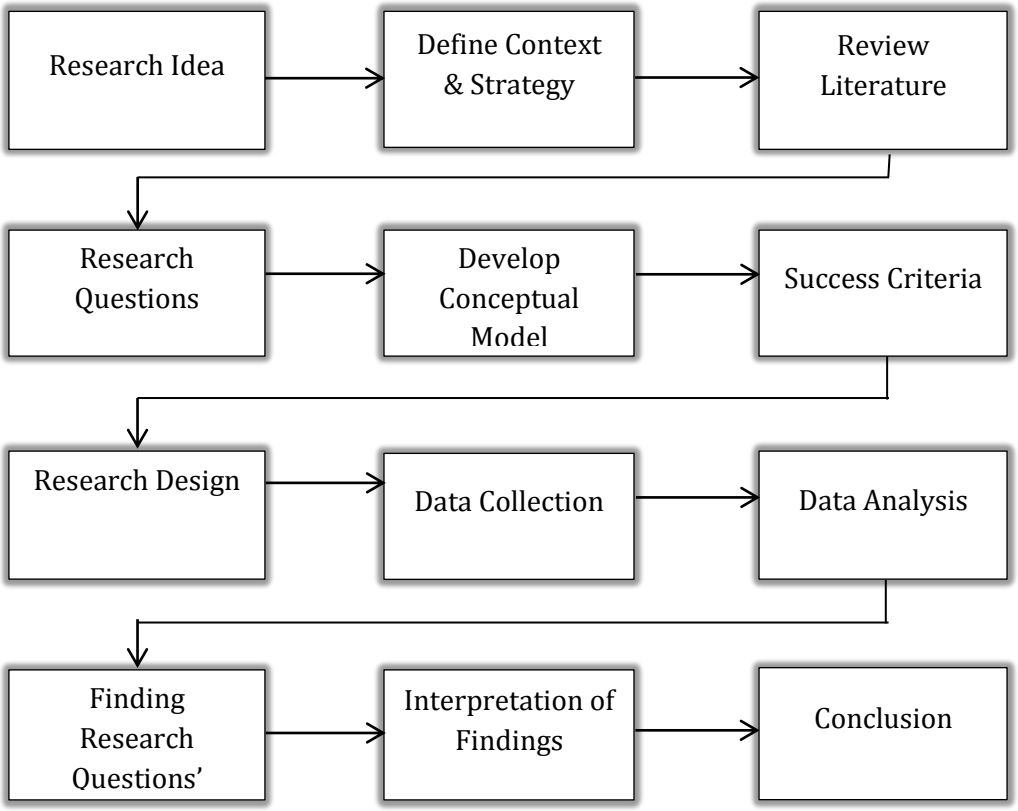


Figure 2- Study Progression

1.7 Thesis Overview

This study consists of six chapters. In chapter 1, a brief introduction of ECM-IT and recommender systems is given. Also objectives of study, research questions and scope of study are discussed in this chapter.

Chapter 2 represents the literature review of IS continuance model as well as recommender systems. The background of Bhattacherjee's post-adoption model, previous studies conducted on ECM-IT, recommender systems' common types and prior studies of them explained in this chapter.

Research model and proposed conceptual model will be discussed in chapter 3. Also definitions of proposed model constructs are given in this chapter.

The methodology of research is presented in chapter 4. Study settings, developed websites, data collection and analysis of data are discussed in this chapter.

Analysis of gathered data is presented in chapter 5. In this chapter, essential statistical techniques are used to analysis of collected. Also this chapter explains the results of data analysis.

In chapter 6, conclusion of this study, limitations, contributions and possible future works are discussed.

CHAPTER II

LITERATURE REVIEW

This chapter provides a general review of the information systems continuance literature as well as recommender systems. Figure 3 illustrates the abstract structure of literature review. This chapter is divided into three sections. First subsection presents a generic view of information systems continuance. Previous studies on information systems continuance are discussed in this subsection too. In second subsection different types of recommender systems are discussed. Finally, prior studies on recommender systems will be discussed in this subsection.

2.1. General overview of information systems continuance

This section is divided into two parts. Since the main concept of IS continuance model originally determined from Expectation - Confirmation Theory of Oliver, in first subsection the ECT is discussed. What's more with the consideration of that using the Bhattacherjee (2001) IS continuance model is foundation of proposed model in next chapter, in second subsection, IS continuance model is discussed.

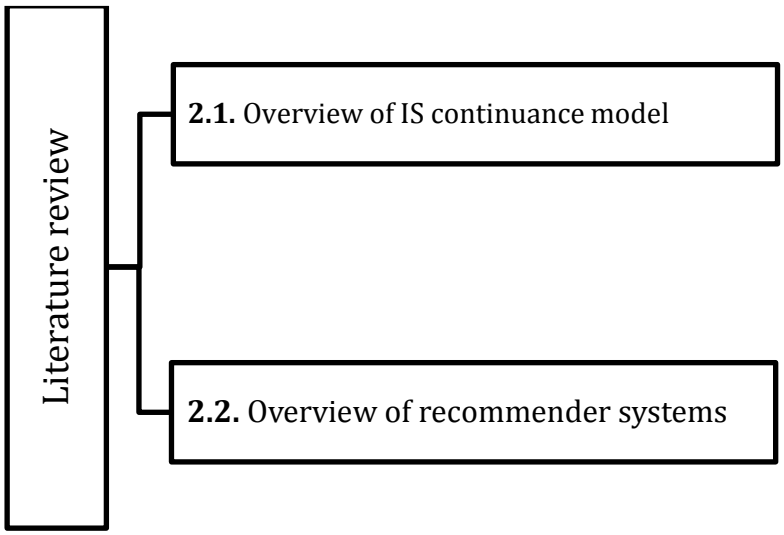


Figure 3 – General structure of Literature review

2.1.1 Expectation Confirmation Theory

Initial acceptance does not warrantee continued usage. Models like TAM (Technology Acceptance Model, Davis, F. D., et al. 1989), TPB (Theory of Planned Behavior, Ajzen I, 1991), UTAUT (Unified Theory of Acceptance and Use of Technology, Venkatesh V. et al. 2003) and TRA (Theory of Reasoned Action, Ajzen I, et al. 1980) could not explain post adoption stages of usage because their main focus is on initial adoption. One of the most important theories of marketing which could anticipate and explicate consumers' satisfaction with service or product is expectation disconfirmation theory (e.g., Oliver 1980; Patterson et al. 1997). Latterly, users' satisfaction of information technology explained by EDT (Bhattacherjee 2001a, 2001b; Bhattacherjee and Premkumar 2004; Susarla et al.2003; Hsu et al. 2004; Khalifa and Liu 2003, 2002). Figure 4 illustrates the key constructs of EDT.

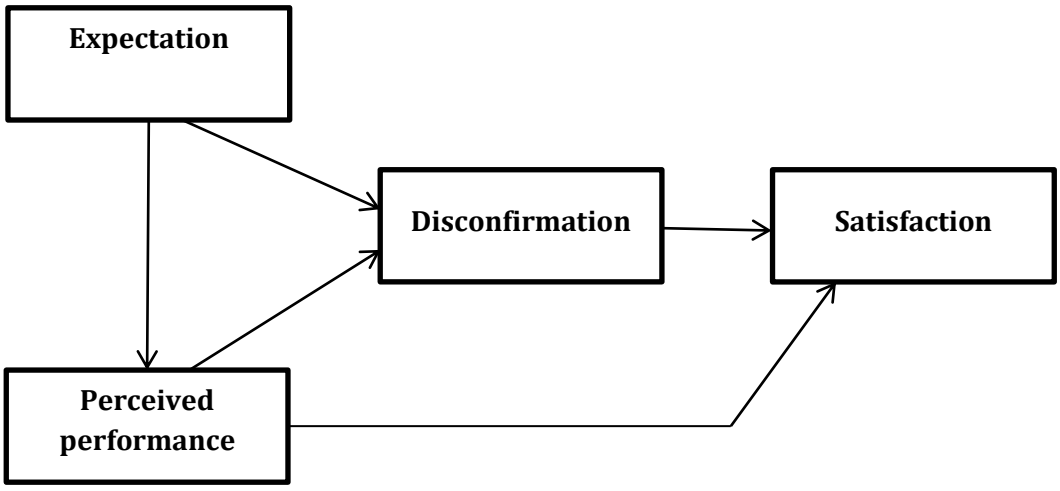


Figure 4 - Expectation confirmation theory (Oliver 1980)

According to EDT, firstly, users form an initial expectation which depends on their desirable expectations from product or service. Secondly, they form post-usage perceptions which contribute performance of the system. In this level, users start to make a comparison between real performance of system and their initial expectations which is called disconfirmation of expectations (Bhattacherjee and Premkumar 2004; Oliver 1980; Spreng and Page 2003). When a user's disconfirmation is positive, it means that performance was better than what he/she expected. Similarly when a user's disconfirmation is negative, it means that performance was worse than what he/she expected. In other words, the more performance user perceived, the better results got in the satisfaction (Yi 1990).

Information technology satisfaction of users has been explained by EDT. (Bhattacherjee 2001a, Bhattacherjee and Premkumar 2004, Susarla et al. 2003, Hsu et al. 2004, Khalifa and Liu 2003, 2002; Bhattacherjee 2001a). Expectations-confirmation theory postulated that expectations, joined with perceived performance, lead to post-purchase satisfaction. Positive or negative disconfirmation among performance and expectations mediated this effect (Oliver, 1980; Spreng et al., 1996).

The EDT model consists of four constructs including initial expectations, performance, disconfirmation, and satisfaction. Anticipated behavior reflected by expectations

(Churchill and Suprenant, 1982). Disconfirmation is theorized to influence satisfaction, so that negative disconfirmation leads to dissatisfaction and vice versa.

The expectation confirmation theory was usually used in different post purchase contexts to look into satisfaction of consumer and repurchase decision in the literature of consumer behavior (Oliver, 1980, 1993).

The expectation confirmation paradigm usually investigates satisfaction of consumers as well as repeating decision or repurchasing in consumer behavior literature (Oliver, 1993). Forasmuch as individuals' decision of continuing usage of an IS is similar to repurchasing decision of consumers, the expectation confirmation model (ECM) proposed by Bhattacherjee in order to explicate IS continuance in the IT literature.

Based on ECM, the following three variables affect the intention of users to continue using an IS: Level of user's satisfaction, perceived usefulness which represents the post-adoption expectation and extent of confirmation of user's initial expectation.

Figure 5 illustrates the main constructs of ECT. There is a five-step process which explains behavior of users from expectation to reuse or repurchase intention (Bhattacherjee, 2001a; Chiu et al., 2005). Firstly, prior to product's purchase or usage of specific service, users form an initial expectation of service or product. Secondly, after acceptance, they use the service or product. During the period of initial consumption, perceptions of its performance were formed by them. Thirdly, a comparison between user's perceptions of performance and their initial expectation was made by users. In this level, the extent to which consumer's initial expectations are confirmed was determined. Perceived performance could be exceed expectations which means that expectations are positive disconfirmed or could be lessened than expectations which means that expectations are negatively disconfirmed, or could be equal with expectations which illustrates that expectations confirmed. Fourthly, feeling of satisfaction or dissatisfaction was formed by users based on their disconfirmation level. Finally, an intention to repurchase of product or reuse of service was formed by satisfied users. Dissatisfied consumers discontinue repurchase or reuse.

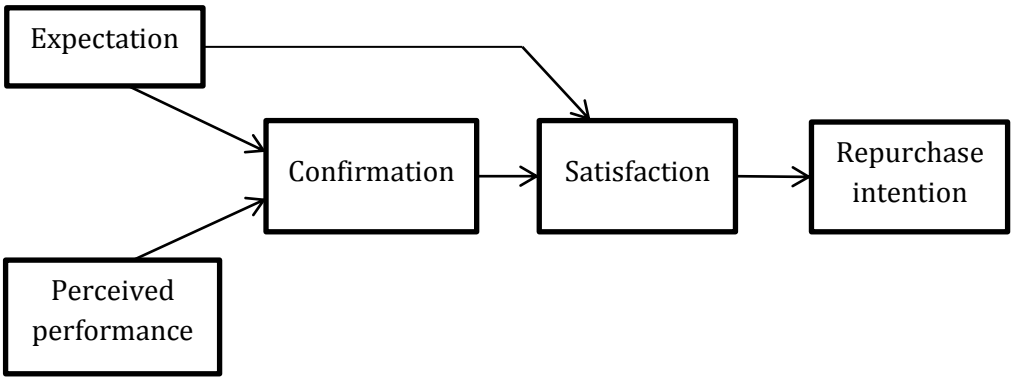


Figure 5 - Expectation Confirmation Theory

According to ECT, intention of users to continue using a specific service or repurchase a product determined by the level of their satisfaction (Anderson and Sullivan, 1993). Hence, the higher performance of a service or product was perceived, the better confirmation achieved by consumers. Also the lower expectation leads to better confirmation too.

2.1.2. IS Continuance model

Underestimating the significance of users' intention to continued usage of an information system is not logical. Have information systems' owners realized the value of IS usage continuance they would have focused on this issue much more meticulously. Viability of every information system in long term depends heavily on its users' intention to reuse that system (Bhattacherjee, 2001). Initial acceptance of an information system is imperative to its success; however, perennial use of an IS is more crucial rather than initial acceptance of it.

Previously, Technology Acceptance Model (TAM) has been played a flourishing role in anticipating of IS acceptance (Venkatesh et al., 2000). With emersion of new technologies in IT, researchers could not explain the reason of discontinuing some users from using specific technology while they've initially accepted it. This divergence is referable to previous studies which consider continuance as extended version of acceptance behaviors (Karahanna et al. 1999; Davis et al. 1989;). Bhattacherjee in 2001 examined that why

initial adoption doesn't warrantee post adoption of IS usage so he applied the EDT to IT field.

Putting significant differences between continued usage and initial adoption in IT literature into consideration, Bhattacherjee proposed Expectation Confirmation Model of IT usage (ECM-IT) and tested it empirically. Figure 6 illustrates the key constructs of ECM-IT. The expectancy-confirmation paradigm is the basis of ECM-IT. IS continuance model considers decision of users to continue an IS similar to decision of users to repurchase a product. With this in mind, ECM-IT anticipates users' intention to continue using an IS with following antecedent factors: satisfaction of user with IS, user confirmation's extent and perceived usefulness which explains post-adoption expectations. Although ECM-IT inherits its structure from expectancy-confirmation paradigm, there are some crucial differences between it and Bhattacherjee's model.

Firstly, in ECM-IT, perceived usefulness illustrates post-adoption expectation. This selection returns to expectation's definition (W.O. Bearden, 1983; G.A. Churchill Jr. et al., 1982). Regarding this definition, IS continuance model consider perceived usefulness as the expectation's measure. The main reason of this selection is that perceived usefulness presents itself as the most salient and consistent factor among all of the cognitive beliefs which contributed in IS adoption context which determines the intention of users overtime (F.D. Davis et al., 1989; E. Karahanna et al., 1999; Venkatesh, 1999).

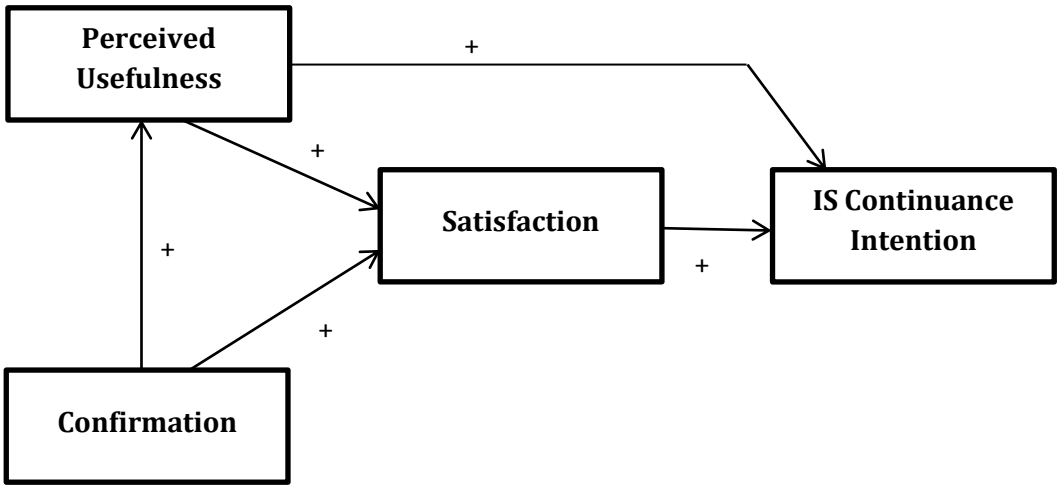


Figure 6 - Expectation Confirmation Model of continued IT usage (ECM-IT)

Secondly, the primary focus of ECM-IT is on post-adoption expectation. The expectation of consumer in expectancy-confirmation paradigm is pre-purchase expectation. The role of pre-purchase expectation was extended as a reference's frame which determines disconfirmation level as well as satisfaction in next stage (post-purchase stage). It should be noted that expectation of a user toward an IS before using it is different from those expectation toward using IS after using it and gaining experience from its usage (Bhattacherjee, 2001; E. Karahanna et al., 1999; R.H. Fazio et al., 1981). In other words, since individuals gain experiences during usage of a specific IS, expectations of users are updated while using an IS. In fact, inexplicit premise of expectancy-confirmation paradigm which considers pre-purchase expectations of users based on the test reports of third-part, manufacturers information and media sources, is one of the most incompetency of it (Y. Yi, 1990). The major satisfaction determinant for consumers is expectations which gained by direct experiences of consumers (S.A. LaTour et al., 1980). With this in mind, ECM-IT hypothesizes that the most important factor in determining satisfaction decisions of information technology systems users or IS users is post-adoption expectation.

Thirdly, perceived performance was omitted in ECM-IT. IS continuance model theorizes that the perceived performance's effect is gained by confirmation already (A.

Bhattacherjee, 2001). Also Y. Yi stated that confirmation construct mediated perceived performance's exclusion from ECM-IT (Y. Yi, 1990).

Regarding to Figure 6, there are five relationships in ECM-IT. First, satisfaction of user has positive impact on his/her IS usage continuance intention. In the literature of satisfaction, level of consumer's satisfaction is the primary determinant in decisions of users to continue using of service or repurchase products (P.G. Patterson et al., 1997).

Next, perceived usefulness and level of confirmation of users are two important satisfaction's factors. User's confirmation affects satisfaction level of them positively. This is because that confirmation of users connotes that expected benefits achieved by him or her via experience usage of IS. According Helson's theory of adaptation level, like expectancy-confirmation paradigm, perceived usefulness construct positively influence satisfaction (H. Helson, 1964).

R.L. Oliver found that there is a direct relationship between the extent to which users' expectation is and the level of subsequent satisfaction in consumer behavior literature (R.L. Oliver et al., 1988).

What's more, in IT adoption literature, perceived usefulness considered as the most crucial determinant in determining intention of users for adoption (F.D. Davis et al., 1989; V. Venkatesh et al., 2000; S. Taylor et al., 1995). Putting these facts into consideration the following conclusion can be drawn about the ECM-IT that there is a positive link between perceived usefulness and user's intention to continue IS usage hypothesized by model.

Lastly, ECM-IT hypothesized a direct positive link from confirmation to perceived usefulness. According to Bhattacherjee 2001, confirmation experience adjusted perceived usefulness (A. Bhattacherjee, 2001).

It seems that ECM-IT requires empirical tests using various IT contexts to be a comprehensive model. Also ECM-IT should be compared with other continuance models in order to uncover its comparative utility for finding the IS continuance usage behavior.

To sum up, continuance in IS field has received approximately limited attentions from researchers in IS field than adoption does. Most previous studies on IS usage concentrated

on the initial acceptance of it; however, the number of papers which have focused on post-adoption stage has been increasing recently (e.g., Larsen et al., 2009; Guinea & Markus, 2009; Thong et al., 2006; Kim & Son, 2009; Limayem et al., 2008; Hayashi et al., 2004). Consequently, a clear differentiation between IS continuance use and IS adoption could not be found based on studies on initial adoption of IS. Unlike to the number of publications which is in initial technology acceptance context, IS continuance has not reached to desirable level of attention yet (Larsen et al. 2009).

2.2 Overview of recommender systems

This section is divided into two parts. Different types of recommender systems are discussed in first subsection. In second subsection, prior studies on recommender systems will be discussed.

2.2.1 Different types of Recommender systems

Intelligent software which tries to collect data from users directly or indirectly called recommender system. Recommender systems recommend items to users of specific system based on user's requirements, priorities, pattern of usage and selections. Recommender systems aim to help, guide and support users during the process of making online decisions (Jannach et al., 2011). Recommender systems supply users by high quality and easily accessible recommendations. Maybe users encounter different kinds of recommender systems during purchasing music, accessories, cosmetics, electronic devices, movie or other products over internet. There are four kinds of recommender systems which are well-known: collaborative filtering, knowledge-based, content-based filtering (CF) and hybrid models. Figure 7 illustrates the most common recommender systems as discussed above.

2.2.1.1 Collaborative Filtering (CF)

Collaborative filtering recommender systems suggest items to users based on rating of other customers with similar and related tastes (Hostler et al., 2011). This type of recommending is like when we talk with friends or relatives about our experiences on devices we have bought or music we have listen. In fact we use collaborative filtering recommender system in our life. Then, we discover friends who their styles and tastes are

like us. We use their recommendations and advice for future decisions in order to get better result on similar issues.

"Word of mouth" is the expression Shardanand used for collaborative filtering idea. In fact, people prefer recommendations of other people whom have similar tastes rather than whom they did not share similar styles. (Shardanand & Maes, 1995).

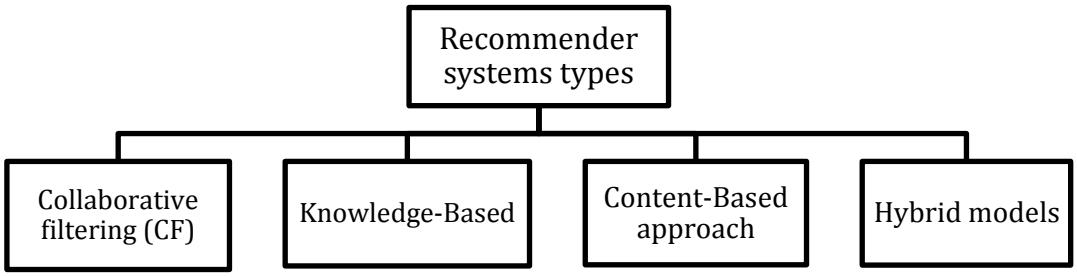


Figure 7 - Types of recommender systems

Statistical formulas used in collaborative filtering recommender systems to determine similar-taste customers. In order to be an effective system, customers should have a unique history of purchasing or rate some items which they have experienced. So reference customers were collected by collaborative filtering and items recommended to users based on the rating scores of customers. Since the product's content has not considered in recommending process, the rating of customers for items is the main factor of collaborative filtering effectiveness. Suggestions of collaborative filtering presented via system to customers may be entirely different with products of which the customers rated higher previously because suggestions of system are based on item's scores of rating rather than product's options and features. System could not recommend useful items if the number of rating per customers was low or users' rating were imprecisely or the number of rating per each item was low (Schafer et al., 2007). To sum up, collaborative filtering recommender systems needs more and more rating by users as input which leads to useful, effectiveness and related recommendations.

2.2.1.2 Knowledge-Based

This type of recommender systems does not require any pre-established user preferences or ratings for items. Knowledge-based recommender systems are ideal for those products like computers, mobiles, cars and etc. since consumers should consider various features of these items which differ from other consumer prefers (Chun et al., 2001). Collaborative filtering recommender systems recommend items based on assigned ratings. It means that product's content is not involved in process of recommendation. On the other, content-based approach, consider profiles of users and product content for suggesting an item to customers; this kind of recommender system will be discussed elaborative in next section. Using these approaches sometimes led to undesired consequences. In his study, Burke (2000) explained that in order to recommend suitable items for the users, recommender system needs definite number of ratings from a specific user in order to realize the pattern of customer's ratings. Another problem backs to development of technology and its fast growing speed; that is, a certain product's rating may be outdated. Electronic devices are one example of these products. In this situation, after a while, ratings may not be valid (Jannach et al., 2011). Both above-mentioned problems lead to undesired and irrelative suggestions. The solution for these problems is utilizing knowledge-based recommender system because neither item's ratings nor user characteristics and specifications have not considered by this system.

By using knowledge-based systems, users define their needs and system starts to search database with predefined queries moreover it suggests the most related product for user needs. For example, a consumer wants to buy a new spare part. He or she chooses the definite features of that spare part. These attributes could be its price, efficiency, usage and etc. System presents the most suitable item by considering specifications that user entered. Also the features of desired spare part could be revised by customer in order to get other alternatives. In this process, a strong interaction required between consumer and recommender system. In knowledge-based recommender systems, consumers are regarded as an integral component of system (Burke, 2000). In their study, Chun et al., (2001) stated that knowledge-based recommender system should have excellent item domain knowledge, which required to be saved, engineered and organized in an easily retrievable way.

2.2.1.3 Content-Based approach

Another common type of recommender systems is content-based approach (content-based filtering). Characteristics and information of items are the key factors in content-based approach. In other words, product features with profile of customers considered by content-based systems during suggestion products to them. User's interests profile was built by system using specifications and properties of items and these profiles are utilized to recommend new products to users. Items rated by users previously as discussed (Mladenic, 1999). Put differently, while system recommends products to customers, users' profile features matched with item's content.

While there are many advantages for content-based recommender systems, several disadvantages still existed in this system. Frist, today's technology is not so advanced that could identify attributes of some products like aroma and taste of them. So system could not match these attributes with user profiles and subsequently its recommendations will be wrong. Second, there is a high dependency between relevant recommending of content-based recommender systems and users' rating items. Third, there is a tendency towards suggested products for being similar with prior products which were rated. This tendency rooted in recommender system's tendency to suggesting items with high score against profile of users. Lastly, there is no guarantee that all of the users give feedback or correct feedback to the products they had purchased or experienced so it demands on rating by users (Balanbonvic & Shoham, 1997).

Having discussed the content-based and collaborate recommender systems from that point of view, there are some differences between them. Firstly, even with one user it could work, content-based recommender system could. Then system does not depend on large number of users as well as large number of ratings; however, collaborative systems depend on large number of users or large number of ratings (Jannach et al., 2011). Secondly, the main focus of content-based recommender system is on similarity of products while the primary focus of collaborative recommender system is on similarity of customers. Thirdly, the items recommended by content-based systems match to profile of users likely; however, the expected quality may not match with item's quality. On the other hand, the items recommended by collaborative filtering recommender system are

based on evaluation of users regarding items so it is possible that product's quality had shown by their evaluations. Then in collaborative recommender systems quality could be considered (Funakoshi & Ohguru, 2000).

2.2.1.4 Hybrid Models

When a user rates few items, it makes that user's categorization difficult. This problem called new user problem. Also when an item got few ratings, it reduces its chance to be recommended. This problem called new item problem. In fact, when two clear problems occurred while they are related it is called ramp-up (Burke, 2002). It could be said that there is some limitations on each recommender approach has; ramp-up is one of them. New product problem, cold start, new customer problem, sparsity, attribute analysis and limited content are some examples of these limitations. In other words, the lower number of customers' tastes are determined, the less number of users benefit from recommender system. Put it another way, there should be the reasonable number of products got rated by other users in order to make system able to provide helpful recommendations for given user (Burke, 2000).

Content-based techniques suffers from start-up problems that is content-based recommender systems need to enough users for rating so that it could classify that specific user and process of recommendation is limited by suggested product's features (Burke, 2002). Ramp-up problems of collaborative filtering techniques mentioned above. In addition, a certain item's features like music, electronic device, movie and etc. couldn't identified by current technology in content-based techniques.

With combining different techniques of recommending into one model most of the problems which were mentioned above will be solved. The goal is to generate better recommendation and more precise one. For instance, process of recommendation could be enhanced via combining content-based techniques and collaborative-filtering when knowledge about taste, behavior, smell and etc. for big community of other customers is known as well as item's detailed information (Jannach et al., 2011).

As another example, in order to overcome the above-mentioned problem, cold start, content-based approach, collaborative filtering and demographic techniques are combined.

Categorization of customers based on their personal features and generating suggestions called demographic recommendation techniques. New customers are categorized in different clusters and products are recommended accordingly on the basis of the cluster of specific user by using demographic characteristics (Chikhaoui et al., 2011). Also merging content-based recommender techniques and collaborative recommender techniques could be done by different ways. One way is that they implement individually then the results merged together (Puntheeranurak & Tsuji, 2007). Incorporation of one technique characteristics into other one is another way.

2.2.2 Prior Studies on Recommender Systems

Prior studies conducted in recommender systems' filed are discussed in this subsection. In recommender systems' literature, there are many of studies which tries to make recommender systems effective and efficient but like other studies many of them have communal vital restrictions. In fact, these recommender systems should be used as tool of marketing but they used like practical sales people. An important reason of this situation is that prior studies suggest models which only concentrate on behavioral outcomes of users. In other words, they did not consider the integrated procedures. Different facets of recommender systems are analyzed by written papers. Most of these studies focus on influence of recommender systems on online consumer behavior and evaluations of recommender systems by users.

In recommender systems' literature in e-commerce context, six online store websites examined using different recommender systems techniques in order to increase ROI of website (Schafer et al., 1999). The automation degree, to the extent which user effort needed by recommender system to generate recommendation, and persistence degree, the measurement of whether suggestions are generated by current session of users or current session with his/her history. , were classified. Some other studies, focused on adoption of IS using recommender systems and analyzed the influence of recommender agents on acceptance of specific technology.

This subsection focuses on literature review of recommender systems' influence on decision quality and decision effort factors since both of these factors used in developed model. In consumer behavior literature, recommender systems impact on decision making

of consumers during purchasing process has been researched. The main relation which analyzed by researchers is relation of recommender system's use and other decision making process factors like quality of decision, decision effort, duration of decision, product searching time, effectiveness of product promotion and product search.

Quality of decision for online consumers is one of the primary determinants that recommender systems' use tries to impact on it. After process of online purchasing, quality of decision refers to subjective or objective quality of user's purchasing decision (Xiao et al., 2007).

After implementing recommender systems, consumer's quality of decision measured by several ways in recommender systems literature. The most common method which is implemented in order to measuring quality of decision is finding how closely choice of consumers from the alternative set matches to ideal result (Hostler et al., 2005).

Several researchers investigated recommender systems influence on online customer's quality of decision. Quality of decision's objective measurement conducted via examining purchased product's type which is could be dominated, when there are other alternative products that one of their specifications' quality is higher than it, or non-dominated, when the features of product are equal or are not lower than other products' in addition one of the features of product should be higher than other products' in terms of quality (Haubl et al., 2000). Haubl proofed statistically that in recommender systems' existence the amount of non-dominated items increases but when the recommender systems were not utilized the amount of dominated products increased. (Haubl et al., 2000).

Score of one and zero was assigned to user's selected product attributes by Hostler et al. (2005). Score one determines presence of specific attribute. On the other hand, score zero means attribute of that product is absent. Decision quality's calculation was done by totality score by understanding if the selected product by user has attributes specified or not. Hostler et al., (2005) prove that decision quality of shopping-experienced participants who were assisted by any kind of recommender system increased rather than not assisted participants by recommender system. As another method, they find answer of this question for measuring online consumers' quality of decision that if users face a new

chance to selecting a product, whether they substitute to another item and change their selection. If user selects another item, then it is supposed to be a sign of poor quality of decision. Haubl et al., (2000) proved that by utilizing recommender system, the participant's number who decided to switch their selection to another item, while giving a chance to do this, was less rather than recommender system's absence.

Swaminathan (2003) in his study statistically prove that when the product's risk is greater also when user has not salient knowledge about item's category that she or he wants to purchase, recommender systems' usage increases decision quality of online customers. Uncertainty's of customers' perception was called perceived risk. Uncertainty may happen after buying the specific product.

Influence of recommender systems on decision making effort of consumers is one of the other primary topics that researchers investigated. In online environment, decision effort of consumers could be measured via computing total duration which is required to reach final decision (Xiao et al., 2007). Number of searched items and accumulated necessary required information are indicator of broad or extent of item search.

In his study Pederson (2000) proved that information searching time of users of virtual consumer banking website whom assisted by recommender system are less. Amount of reduction in end user's consumed time for making a decision for purchasing an item or product and its searching time through using recommender systems was tested by Hostler. In his study, the required time to choose an online store to shopping and required time to find and choose a product on selected online store aggregated and called amount of time. Hostler et al., (2005) illustrates statistically substantial discrepancy in duration of making a decision among recommender systems-assisted participants and those who not assisted. Also they found that performance of consumers was increased by using recommender systems and save their time.

Although there are many studies which confirm above findings, some studies did not confirm them. For instance, Olson et al., (2002) found that participants who assisted by recommender systems had longer perceived decision time. They proposed that this time

may be increased because of entering weights or scores to system for getting high quality recommendations.

As mentioned, extent of item search is another determinant of decision making effort of online users. In order to analyze relationship of recommender system usage and item search's extent many studies conducted by researchers. In brief, users cross a process with two stages while purchasing. Firstly, available items evaluated by them, Then potential products which are candidate of being purchased are identified. Secondly, the purchase-candidate products are evaluated much more meticulously via comparing attributes of products and make a decision for purchasing. The process above let the customers to focus on related products, products that meet their requirements (Haubl & Trifts, 2000).

CHAPTER III

RESEARCH MODEL AND HYPOTHESES

This chapter explains proposed model for this study by incorporating ECM-IT model and factors related to use of knowledge-based recommender systems. The main objective of the study is to assess the influence of knowledge-based e-commerce product recommender systems on consumer's continuance intention to use of information system in future.

3.1 Conceptual Model of Continuance Intention to Use Recommender System

Initial use of any kind of information technology does not indicate its successful adoption by targeted user; however, what indicates its successful adoption is continuous use of such technologies. What this study aims to investigate is that which factors affect online consumers' intention to use information system in their subsequent shopping over internet. In order to identify these factors previous conceptual and empirical researches in recommender systems has been reviewed. In addition, an Expectation-Confirmation Model of IS Continuance (Bhattacherjee, 2001) is also utilized in developing a conceptual model. A proposed model is presented in Figure 8.

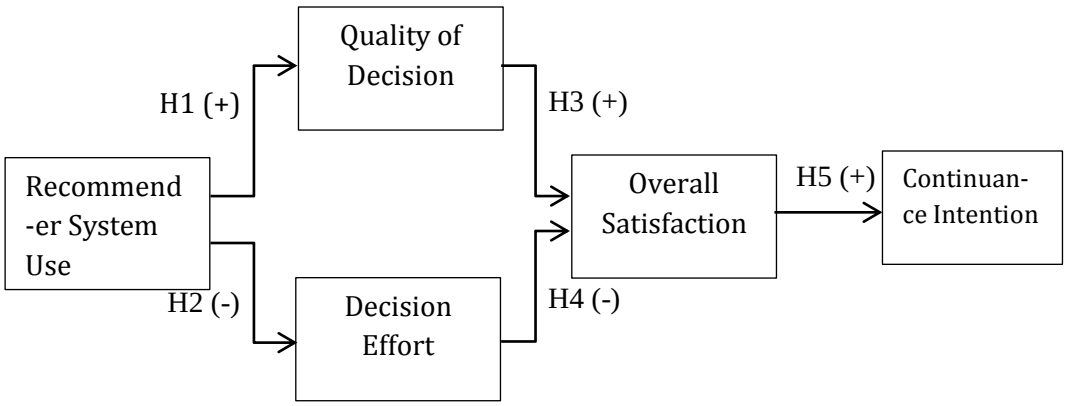


Figure 8 - Conceptual Model of Continuance Intention to Use Information System

3.1.1 Constructs of the Proposed Model

There are 4 constructs in the conceptual model: quality of decision, decision effort, overall satisfaction and continuance intention to use information system.

Decision Quality

An objective or subjective quality of users' purchase called decision quality (Xiao et al., 2007). Researchers, in prior studies, analyzed existence of any correlation between use of recommender systems and quality of decision for online consumer via conducting either objective or subjective studies.

In the recommender systems' literature, subjective achieves to measure quality of decision via considering the level of users' confidence in online purchasing decision. Consumer who assisted by recommender systems were more confident in making decision for purchasing rather than non-recommender system case (Olson et al., 2002; Haubl et al., 2000); however, some study's result disagree with this view (Vijayasarathy et al., 2001).

In the recommender systems' literature, objective achieves to measure quality of decision for consumer which is integration of domination of user purchases or non-domination of items between alternatives, gaining the attributes that consumer expected the final product in order to calculating summation score for final product via giving score 1 which means attribute exists or assigning 0 which means attribute does not exist, then gives a chance to consumer to final product changing that he or she wants to purchase with other product, and gaining information of preference from the consumers to calculate final product's cordiality to that specific consumer. Recommender systems increase decision quality of users via increasing the amount of non-dominated products in alternative set (Haubl et al., 2000). Additionally, the number of consumers who eager to change his or her opinion and bought another item when system proposed a chance to change item is less by utilizing recommender system than not utilizing recommender system (Haubl et al., 2000; Olson et al., 2002). Recommender system assisted consumers made better final decision than non-recommender systems users (Hostler et al., 2005).

Based on the discussion above it is proposed that:

Hypothesis 1: Use of knowledge-based recommender system is positively related to user's quality of decision.

Decision Effort

Decision effort refers to amount effort exerted by the user in processing information, evaluating the given alternatives and making final decision on which product to purchase and it is generally measured by decision time and the extent of product search (Xiao & Benbasat, 2007). Consumers who assisted by a specific recommender systems spent less time in selecting item for purchasing rather than consumers who are not assisted by recommender systems considerably (Pedersen, 2000; Hostler et al. 2005). Product search's extent as a effort's measure analyzed by and the outcomes showed that recommender systems assisted consumers analyzed fewer item details in virtual online store than the consumers who had not use such systems (Haubl & Trifts, 2000)

Therefore, it is proposed that:

Hypothesis 2: Use of knowledge-based recommender system is negatively related to decision effort of user.

Overall Satisfaction

Overall satisfaction in this context refers to user's satisfaction with recommender system's performance as an effort saving tool, user's decision-making process assisted by such system and decision quality of the user as a result of recommender systems effectiveness. In this research, constructs predicted to have effect on overall satisfaction are: decision quality and decision effort of the user.

Decision quality of the user depends on how closely items recommended by recommender system match to users preferences and how effectively recommender system meets user's needs. If the system recommends the most suitable items to user based on his or her preferences then decision quality of the user will increase as a result of recommender system. Therefore, decision quality of the user can be considered as a measure of recommender system effectiveness. Put it another way, effectiveness of the system defines the level of users' decision quality.

System effectiveness is one of the widely used measures of system success and it is generally measured in terms on how well system achieves its predefined objectives such as improving decision quality, user learning and decision time (Parikh & Fazlollahi, 2002). Parikh & Fazlollahi (2002) have conducted an empirical study to show whether there exist any correlation between decision quality as one of the objective measure of system effectiveness and user satisfaction with six measurement dimensions. Even though adjusted R2 values have indicated there exist weak relationship between them, F values are higher than critical F value suggesting that there is statistically significant relationship between decision quality and user satisfaction as an overall construct. In another study, Huffman & Hochster (2007) tested whether there is any correlation between relevance of the results returned by the system and user satisfaction. Result of the study has shown that

there is strong correlation between relevance of the results and ultimate user satisfaction. Johnson et al. (2003) also found significant correlation between system effectiveness and user satisfaction. Users that are recommended items which match his preferences more accurately will make a decision by choosing the more appropriate alternative(s) and his overall satisfaction level will increase as a result of his perceived decision quality.

Based on the discussion above, it is proposed that:

Hypothesis 3: Decision quality of user is positively related to overall satisfaction with recommender system.

In their study, Bechwati & Xia (2003) analyzed whether user perceives work performed by recommender system as an effort and whether this perception impacts their satisfaction with the decision process. Their study result has shown that consumers in an online environment perceive recommender system's work as an effort saving tool and user's satisfaction with decision process is positively related with their perception of effort saved by such system. In another study Felfering & Gula (2006) compared knowledge-based recommender application with pure product list and their study result showed that participants who used recommender application were significantly more satisfied with decision making process and had a significantly higher increase in satisfaction due to interaction process.

Therefore, it is proposed that:

Hypothesis 4: Decision effort of user is negatively related to overall satisfaction with recommender system.

Continuance Intention

Continuance intention refers to users' intention to continue using recommender systems in their future shopping activities. Even though initial acceptance of any Information System

is an important factor in realizing its success, its long-term success is not determined by its initial use but its long-term continued use (Bhattacherjee, 2001).

Among several factors satisfaction plays an important role in users' loyalty and continuous use of services provided by the online merchants. In the literature, it is possible to find empirical studies showing the positive correlation between user satisfaction and loyalty to provider's services (Mittal & Kamakura, 2001; Helgesen, 2006; Mosahab et al., 2010; Almahamid & Rub, 2011; Hostler et al., 2012). Hostler et al. (2012) have used simulated shopping environment with an integrated recommender system in order to test the impact of recommender system in online shopping environment. Their study result has shown that customer satisfaction with recommender system integrated website is a significant predictor of consumer loyalty to the website. An Expectation Confirmation Model of IS Continuance by Bhattacherjee (2001) also states that users satisfaction with IS use is positively associated with their continuance intention.

Thus, it is proposed that:

Hypothesis 5: Users overall satisfaction level with the system is positively related to user continuance intention.

CHAPTER IV

RESEARCH METHODOLOGY

This chapter aims to explain this study's research methodology. This chapter consists of following subsections: (a) settings of study, experimental design, online e-commerce website and study data collection, (b) consent of Mercedes Benz truck manufacturer in Iran for this study, (c) sample selection of study and (d) data analysis. Figure 9 illustrates methodology's structure.

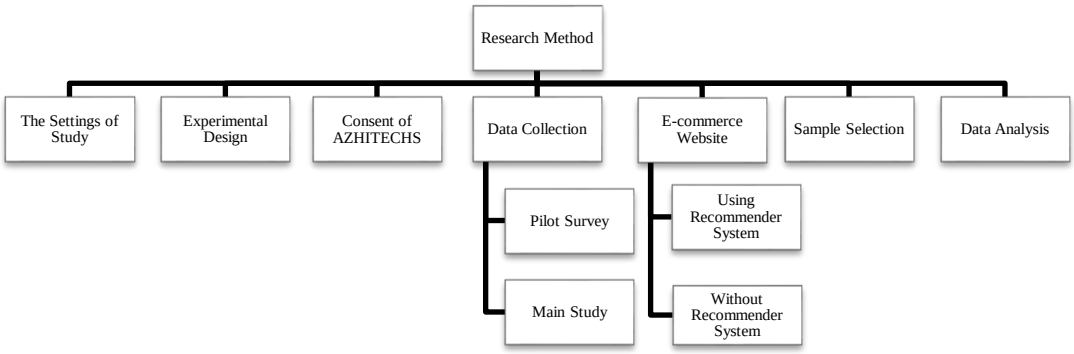


Figure 9 - Research Methodology Structure

The aim of this study is to examine effect of knowledge-based recommender systems' utilization on online customers' continuance intention for further use. So, in order to reach this purpose the relations between use of recommender system and quality of decision and

decision effort, quality of decision and overall satisfaction, decision effort and overall satisfaction and overall satisfaction and continuance intention are examined. The present study consists of two phases. In order to investigate measurements used in this study, a pilot study was conducted in first phase. In second phase, the conceptual model is tested.

4.1 The Settings of Study

This study has been conducted at Azerbaijan High Technologies (AZHITECHS) Company's customer service located in Tabriz, Iran. Company of AZHITECHS has been developed from 2005 in order to optimization of Iran's transportation system with European trucks and prospered to being exclusive official Mercedes Benz trucks ,MAZ trucks and MAZ-MAN trucks from 2008 in Iran. Recently, AZHITECHS started to sell its spare parts through a B2C website to consumers. An online B2C e-commerce website was selected for this study because online shopping websites' success and profit is highly dependent on customers' intention to continue using it. Simplicity of access to customers, database and website server is another reason for choosing this website. Respondents of this survey were consumers of the online e-commerce website of one of the largest truck manufacturers in the Iran. Azhitechs offers its consumers services like online ordering, online shopping, managing accounts, contacting representative, helping online, insurance, after sales services, etc., in its website. Participants of this study were customers of website who purchase truck spare parts online from different cities of Iran. Participants had understanding or experience of purchasing an item from representative exclusive portal. In addition, all of the participants had knowledge of computer. Since Iran's official language is Persian, directions and pilot survey have been carried out in Persian.

The measures which were employed in this research are drawn from IS continuance and decision making process literature then adapted into this study. Table 2 illustrates the sources of items which were included in this study.

Table 2 - Measurement Items and Their Sources

Measurement Items	Source
Quality of Decision	Lerzan et al., 2011
Decision Effort	Nada et al., 2003
Overall Satisfaction	Bhattacherjee, 2001b
Continuance Intention	Bhattacherjee, 2001b

4.2 Experimental Design

2^k between-subject factorial design had been associated with this study's experimental strategy in order to analyze the influence of recommender systems on continuance intention of both groups' participants.

In order to examine the proposed conceptual model, data collection performed by surveying. As discussed, two different e-commerce portals had been developed. The framework of implementation was ASP.NET which is a server-side web application. First website has been integrated with (knowledge-based) recommender system. A knowledge-based system was selected for this website. On the other hand, second website was not integrated to any kind of recommender system and utilized basic filtering only. In order to omit design effect on customer's satisfaction and their continuance intention, graphic design of both websites is same

Participants were invited by phone calls from customer service agents to participate in the survey. Additionally, guide posters were designed and installed in all 17 representatives. Figure 10 illustrates the posters designed for new system. One of the URLs, recommender system-assisted websites and not-assisted one, were sent randomly to participants who accepted to participate in survey.

In order to encourage customers to participate in survey, AZHITECHS offers thirty percent discount on new LCD motorized roof monitors for first 20 users who purchase their order from newly-developed website and participate in survey.

Figure 10 - Poster designed for customers

Prior to start experiment, participants informed about aims of study. In this websites, they should purchase just one heavy-duty truck part. All guidelines and instructions on using website have been elucidated to them either by guide posters or directions in website. Participants have been told to input their chassis number and passwords to the website; they have been instructed to use their chassis number in questionnaire file too. Prior to this survey, all customers purchased truck spare parts from this website without being assisted by recommender systems. Customer service website just performed routine basic filtering to find final product. Also regarding to transactions performed by customers in website after 3 months of system implementation, it is assumed that initial adoption was done for users so the factors like perceived usefulness and perceived ease of use were overlooked in conceptual model (Bhattacherjee 2001).

In order to test the result of study, data sets of each group has been collected separately during survey. Items of pretest survey are illustrated in Appendix A. Also log data of e-commerce website users saved to database by website.

4.3 Permission of Company and Ethical Issues

Prior to conducting the survey with customers of AZHITECHS, this study has consented to be conducted at customer service office of company. The survey of this thesis was approved by CEO of AZHITECHS at 07 March 2013. (Appendix C)

4.4 Experimental E-commerce Website

This section explains two e-commerce websites; first website had been integrated with recommender system and second website only performed some routine basic filtering as past.

4.4.1 E-commerce Website Utilized with Recommender Systems

Internal structure of e-commerce website is explained in this subsection. At web site's doorway page, system welcomes customers. Figure 11 depicted the doorway page. Since all of the customers had experience of shopping from this website previously, only a brief instruction about heavy-duty truck parts is given in doorway page. Next in order, customers were guided to enter their exclusive chassis number and their passwords and then choose category of spare parts they are interested. This doorway page is same in both recommender assisted website and simple one. Then, customers instructed to login to website by clicking on login button which placed at the bottom of the text boxes.

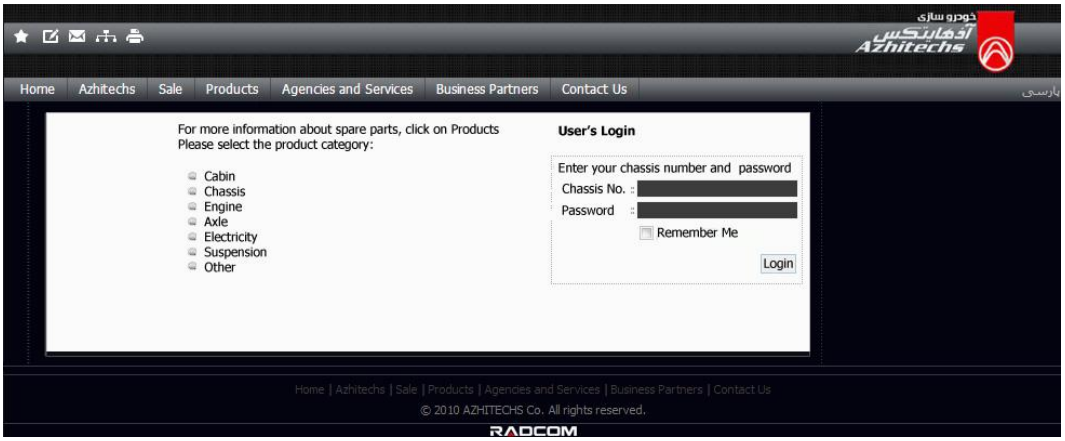


Figure 11 - Recommender System Assisted Portal Door Way

In next page of website, customers should follow steps to complete their shopping in recommender systems-assisted system. These steps illustrated in Figure 12. Customers

could navigate to any step by using site map. Participants were asked to answer 6 questions. The questions include usage type, price range, guarantee duration, condition, manufacturer and installation.

The recommender system used in this study is a constraint-based recommender system which is developed by Chun and Hong i (2001). Constraint-based recommender system is a type of knowledge-based recommender system that generates suggestions based on explicitly rules. In his book, "Recommender systems: An introduction", Jannach et al. (2011) represented constraint-based recommender system as a constraint satisfaction problem (CSP) and could be solved in conjunctive queries' form or via constraint solver. The reason to choose constraint-based knowledge-based recommender system is convenience of data collection. So since application of them is easy, this recommender system was selected. Also in other types of recommender systems such as collaborative filtering, a great number of ratings required for items; so regarding to the major vast of spare parts available in website's database and limited number of participants, application of such systems was infeasible in this study.

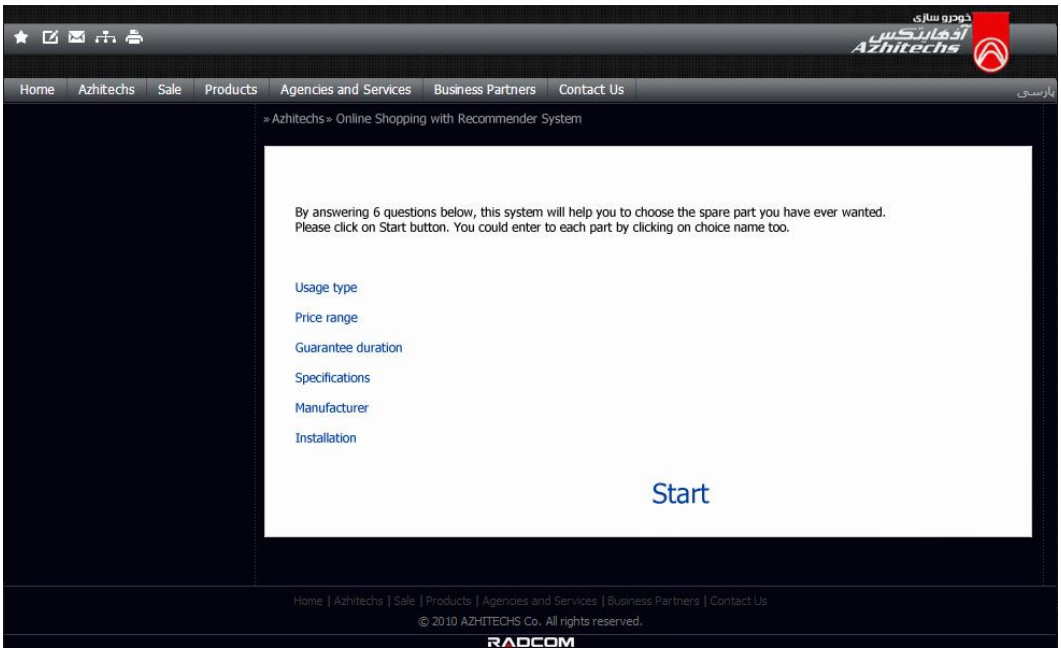


Figure 12 - Steps Required to Purchasing an Item

After capturing participants' answer by system, it starts to search among 3100 spare parts which were stored in database. Subsequently, system suggests the most suitable product to customer. Database of both recommender system-assisted website and not-assisted one are same. Spare parts are divided into 15 categories based on their functionality like suspension, electric, gearbox, chassis, axles, steering, cabin, regulators and etc. Figure 13 illustrates the brands that are available at website to be purchased. These specifications arranged and determined by company customer services.

Figure 13 - Brands of Available Spare Parts in E-commerce Website

In knowledge-based recommender systems there should be a high interaction between user and system. In not-assisted e-commerce website, system just performs routine simple filtering which means that it focuses on specifications of product only. So this kind of system did not consider experience or knowledge of users with product.

In addition to collecting participant's desired technical details for demanding product, recommender system-assisted website tries to ask apprehensible questions from customers in order to collect requirements of them. These answers play a critical role in quality of recommender system's suggestion. As it shown in Figure 14, easily-understandable questions were asked from users. For those customers who were not familiar with the technical terms of related product, system predicts a solution. Users could saw the definition of terms by keeping the mouse icon on word for 1 second. By clicking on "Products" button at the top of the page, participants could see all available parts on website.

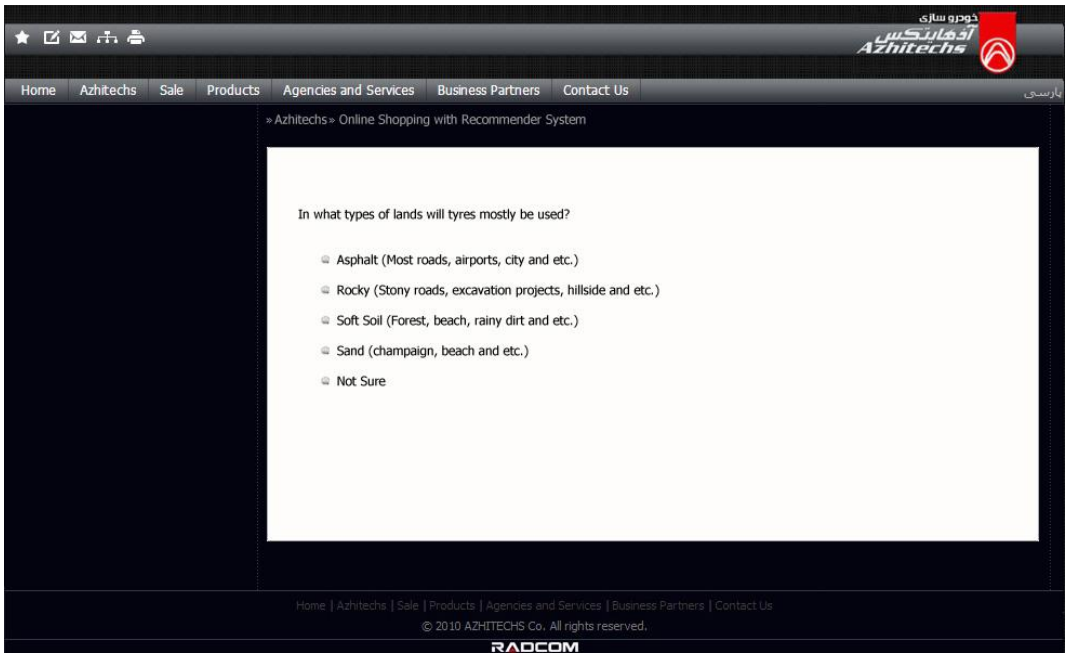


Figure 14 - Recommender System (usage step)

As it shown in Figure 15, when a confliction happened between customers' selected categories, system informs him/her about this problem with stating the clear reason of this confliction. Then system gives the instructions to correct the decision. System shows the number of conflicts, and then, explains to users that which of its selections cause this confliction. Such conflict detection is not available in simple filtering. Finally, system wants user to decide between recommended choices.

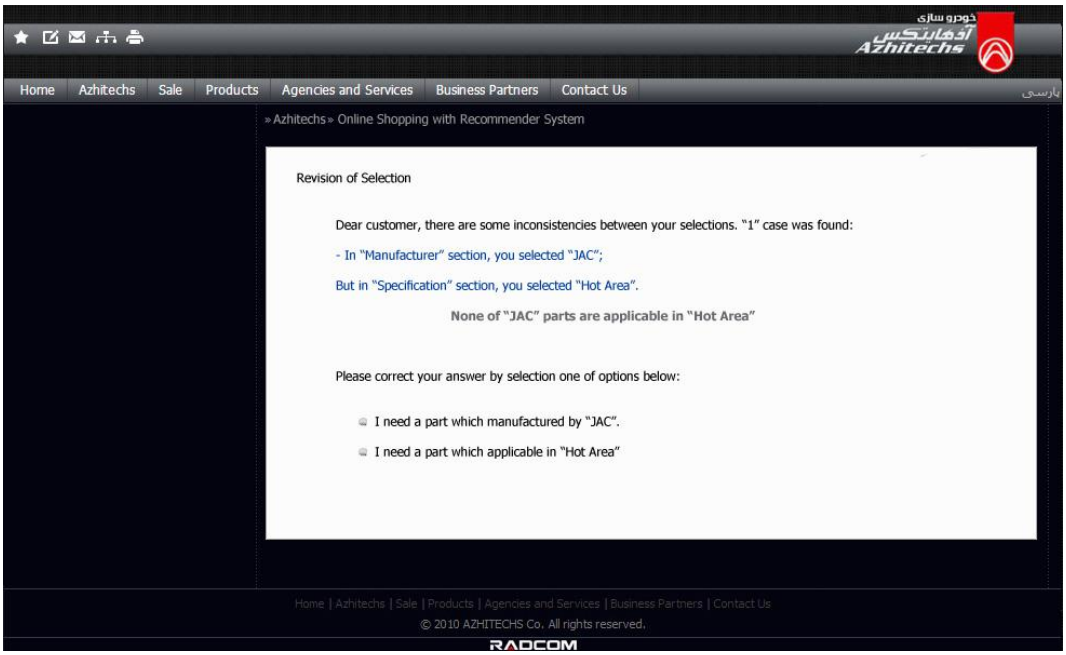


Figure 15 - Recommender System (conflict notification)

The interface of purchasing the product that recommended by recommender system is given in Figure 16. All of the product specifications explained in this page as well as reason of recommendation.

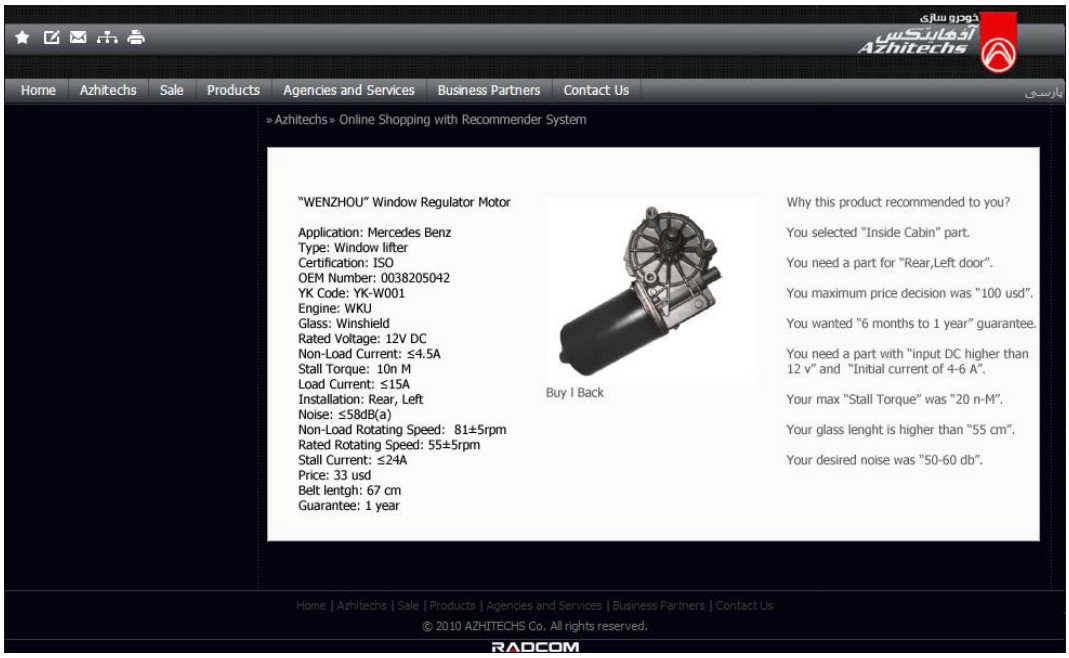


Figure 16 - Recommender System (purchasing step)

4.4.2 E-commerce Website without utilizing Recommender Systems

The other e-commerce website did not utilize any kind of recommender system. Doorway, whole design, menus and etc. is the same as the first portal. The functionality of this e-commerce website is like most other similar e-commerce websites. Prior to this study, all customers encounter with this website without help of intelligent system. They select spare parts by using spare part filtering functionality which allows them to input technical details of element they are interested in. The function of this system is just searching across spare parts' database and retrieving items based on customer's input. Customers could sort found items using spare part sorting functionality.

Such e-commerce websites suppose that customers have item domain knowledge. Also they assume that customers expected to buy appropriate item with the help of item filtering functionality. A prime example of recommender system-assisted website may shed some lights on this issue. In recommender system-assisted website, one customer input to system that he or she needs an inter cooler for truck which employed in hot areas.

Constraint-based intelligent software searches the part's database for intercoolers which meet the hot area application's requirements. On the other hand, in second website, customers themselves require to know the item requirements for hot area application. Also customers should choose that requirement among given options.

As discussed, not all customers have knowledge of spare part domain; hence, those customers who utilize basic filtering systems finish up with inappropriate or completely wrong item some times. By utilizing such systems, customers sometimes concentrate on item attributes which are not really meet their need but that specifications seem significant to the user and they make a decision on which item they will purchase based on that features and attributes by overlooking their demands.

User interface of discussed e-commerce website is illustrated in Figure 17. As stated, the product databases of both recommender system-assisted website and not-assisted are same. So, customers of second website search desired spare part among 3100 available product in store. Just like recommender system-assisted site, spare parts are divided into 15 categories. Customers are required to have in-depth knowledge of given categories' technical specifications in order to select the right spare part for their trucks.

By utilizing the basic filtering system, customers should find and buy the spare part which is thought to meet their requirements. As first website, customers could refer to products section to find more information about specification of parts. Also customers could select two or more products in order to compare them. By this comparison, specifications of all selected spare parts will be illustrated side by side.

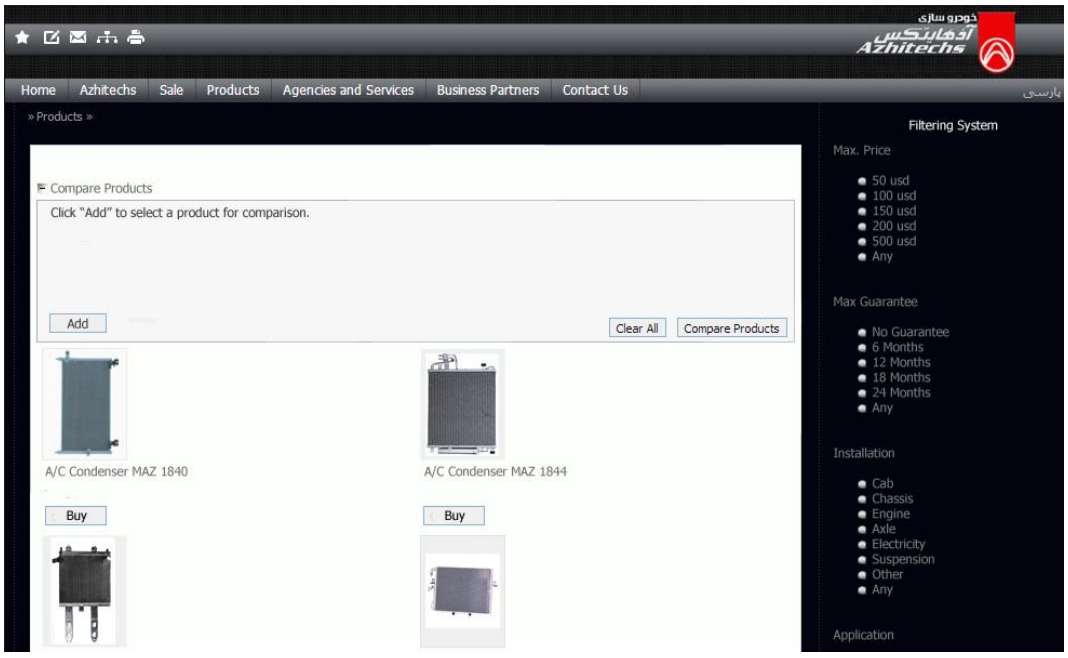


Figure 17 - Not Recommender System-Assisted Website

4.5 Data Collection

The customers and customer service agencies of AZHITECHS Company were selected to validate proposed model. Essential data for this research was gathered in Iran's big cities like Tehran, Tabriz, Mashhad and Esfahan where most trucks, buses and trailers of AZHITECHS were sold. In order to reduce survey costs and get faster responses from participants, an online survey is selected for utilizing in data collection of this study. Also this kind of survey is selected because consumers' online (purchasing) behavior was the aim of this study. All participants indicated their comfortableness with the procedure of filling out surveys. Participants were invited to take part in survey via phone. The URL of e-commerce website in addition online survey questionnaire was sent to those customers who responded to participate in this survey. In two months period, 356 volunteers completed the survey.

4.6 Study Sample

The procedure of selecting units from a specific interested population called “Sampling”. Sample study results could be reasoned out back to population that sample is selected. Non-probability sampling is chosen for this study because all data were randomly collected without utilizing any specific algorithm. Pilot samples and main study samples are two samples that used in this research which are independent.

4.6.1 Pilot Study Sample

For examining the proposed model’s measures, the pilot study was conducted. Also in order to check comprehensibility of survey instruction, correctness of survey wording, reliability and validity of results and effectiveness of statistical processes pilot survey is conducted. 32 participants from AZHITECHS customers participated in pilot survey. The return rate was 91.4 % (32 out of 35).The scales of study were translated from English to Persian. Based on received feedbacks from pilot participants, essential modifications were made to questions of survey and instructions of experiment procedure.

Questionnaires of pilot survey consist of all involved measures in study were distributed to customers in Tabriz, Tehran and Ardabil based on their availability by e-mail. All subjects were notified about the voluntary quiddity of the involvement in the study, the goal and study process. It is also guaranteed that all of the responses will be private. Participants were given one week in order to complete pilot questionnaire.

Cronbach's alpha is calculated for items of questionnaire for testing items’ internal consistency which measure the same construct. The factor loading in the range of 70 to 80 percent, leads to good internal consistency while indicator of excellent internal consistency is a loading more than 80 percent. The results of alpha tests showed that alpha values of all constructs are more than 70 percent, which is the indicator of good internal consistency for all constructs. Because of sample size prerequisites factorial validity cannot be evaluated at pilot study.

4.6.2 Main Study Sample

After removing outliers, 351 customers of AZHITECHS participated in main study survey. The return rate was 86.6 % (351 out of 405). Treatment group consists of 203

participants and control group consists of 148 participants. Responses were given on a 5-point scale ranging from 1 for strongly disagree to 5 for strongly agree. The main survey items are given in Appendix B.

4.7 Data Analyses

In the study, two group membership variables (Recommender System-assisted, not assisted) were identified. There were 4 dependent variables including decision quality, decision effort, overall satisfaction and continuance intention.

Because of the nature of this study which is in the field of IS, structural equation modeling procedure is selected for analyzing proposed model. SEM (Structural Equation Modeling) could incorporate previous knowledge to the analysis for the confirmatory goals and it can model abstract concepts and unobservable constructs. Moreover by utilizing SEM measurement errors could be applied in the model.

In order to find any mean differences among dependent variables, this study tries to measure various dependent variables in recommender system-assisted and not assisted customers. Parametric statistics is not used in initial analysis of Likert scalar data. Parametric statistics are used in individual item's analysis because variables of Likert scale represent an implicit continuous measure usually. So, in order to test the hypotheses of study, both parametric statistical tools and non-parametric statistical tools are utilized.

Also in experimental studies, independence of observation could be said to be met when the unit of experimental and analysis unit are the same. In this research, analysis unit is each customer while the unit of experimental is each unimpaired group. Since analysis unit and experimental unit are not the same, no claim about observation's independence could be generated.

CHAPTER V

DATA ANALYSIS

This chapter presents this study's statistical analysis. All essential statistics conducted by IBM SPSS 20, Amos 21 and Minitab 16.

5.1 Preliminary Analysis

Collected data's descriptive analysis is given in this subsection. Demographic frequencies, outliers, missing data, distribution of data and finally, homogeneity test between groups are presented in this part.

5.1.1 Demographic frequencies

The research original data sample, after missing data and outliers' removal, was composed of 351 customers of AZHITECHS from various cities of Iran. Male and female customers' frequency statistics are illustrated in Table 3.

Table 3 - Overall Gender frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	170	48.5	48.5	48.5
	Male	181	51.5	51.5	100.0
	Total	351	100.0	100.0	

Participants of this study are divided into two groups: treatment and control group. There are 203 customers in recommender system-assisted (treatment) group and 148 customers in not-recommender-system-assisted (control) group. Treatment and control groups' gender frequencies are presented in Table 4 and Table 5.

Table 4 - Treatment group gender frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	97	47.7	47.7	47.7
	Male	106	52.3	52.3	100.0
	Total	203	100.0	100.0	

Table 5 - Control group gender frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	73	49.3	49.3	49.3
	Male	75	50.7	50.7	100.0
	Total	148	100.0	100.0	

Also age frequencies of treatment and control groups are illustrated in Table 6. In treatment group (recommender system-assisted) frequency of age 30 is the maximum with a percentage 13.4. On the other hand, in control group frequency of age 26 is the maximum one with the percentage of 15.5. Most of customers are at the age of 26 and 30 respectively (14.0 % and 11.1 %).

Table 6 - Age frequencies

Age		Frequency of treatment group	Treatment group (%)	Frequency of control group	Control group (%)	Total frequencies	Total (%)
Valid	23	4	2.0	3	2.0	7	2.0
	24	11	5.4	18	12.2	29	8.3
	25	18	8.9	13	8.8	31	8.8
	26	29	14.3	24	16.2	53	15.1
	27	19	9.4	19	12.8	38	10.8
	28	15	7.4	9	6.1	24	6.8
	29	15	7.4	8	5.4	23	6.6
	30	25	12.3	13	8.8	38	10.8
	31	14	6.9	6	4.1	20	5.7
	32	4	2.0	6	4.1	10	2.8
	33	6	3.0	-	-	6	1.7
	34	10	4.9	8	5.4	18	5.1
	35	9	4.4	7	4.7	16	4.6
	36	8	3.9	7	4.7	15	4.3
	37	9	4.4	6	4.1	15	4.3
	38	2	1.0	-	-	2	0.6
	39	3	1.5	1	0.7	4	1.1
	40	1	.5	-	-	1	0.3
	41	1	.5	-	-	1	0.3
	Total	203	100.0	148		351	100.0

5.1.2 Data Cleaning

Since outliers have severe adverse impacts in the result of data analysis, the first step in analyzing dataset of this study was removing the outliers. In statistics, an observation which is numerically far away from residue of data called an outlier. Outliers are checked by boxplots as reported in Pallant (2007). Although in 5 questions of questionnaire answer

choices were reversed, the process of outliers removing revealed two outliers which were taken away from the dataset.

In statistics, when participants skip giving response to questionnaire items or fail in answering them, missing value or missing data was occurred. The number of survey scores' missing values was small on each variable. Associated with each variable's missing values, percentage was less than 0.8 and hence there seems to be no uncomfortableness to replace missing values with series mean value (Tabachnick et al., 2007). Identifying missing data as well as handling them properly is crucial for getting valid results from study. Eliminating out of range values, wrong entries and handling missing variables was done based on the principles recommended in Tabachnick and Fidell (2007).

5.1.3 Homogeneity Test

In order to find any possible differences between control group and treatment group on different areas, customers should answer a pretest containing 8 questions before starting the purchasing session. The eight questions of pretest asked about customer's computer knowledge level, use of internet level, visiting any kind of e-commerce websites frequency, frequency of shopping item from internet, truck spare part knowledge level, frequency of using spare parts and etc. In order to test possible differences between groups, Mann-Whitney U test is performed. This test is a non-parametric test and data have not been required to follow a normal distribution.

All of the prerequisites of running the Mann-Whitney U test including existence of one dichotomous independent variable, one ordinal dependent variable, samples independence and equal variances among groups are met. For last issue which is the equality of variances, Levene's test was used and the results are illustrated in Table 7.

Table 7 - Levene's Test Results

ANOVA

		Total Squares	df	Mean Square	F	Sig.
How long do you use computer?	Between Groups	1.186	1	0.186	.233	.634
	Within Groups	106.727	350	5.082		
	Total	107.913	351			
In a day, how many hours of internet surfing do you spend?	Between Groups	3.494	1	3.494	5.451	.130
	Within Groups	13.462	350	.641		
	Total	16.957	351			
In a day, how many hours do you use computer?	Between Groups	1.804	1	1.804	9.842	.692
	Within Groups	3.848	350	.183		
	Total	5.652	351			
How often do you buy an item from online e-commerce websites?	Between Groups	2.161	1	2.161	4.204	.053
	Within Groups	10.795	350	.514		
	Total	12.957	351			
How often do you see any kind of e-commerce websites?	Between Groups	1.435	1	1.435	1.435	.244
	Within Groups	21.000	350	1.000		
	Total	22.435	351			
Rank your knowledge level with truck spare parts	Between Groups	3.494	1	3.494	4.202	.053
	Within Groups	17.462	350	.832		
	Total	20.957	351			
Rank your usage experience with truck spare parts	Between Groups	5.481	1	5.481	3.549	.973
	Within Groups	32.432	350	1.544		
	Total	37.913	351			
How often do you dealt with truck spare parts?	Between Groups	1.147	1	1.147	1.026	.323
	Within Groups	23.462	350	1.117		
	Total	24.609	351			

Regarding to Table 7, in all of the pretest items' value of Sig. is more than 0.05 so it shows that treatment group and control group variances are statistically equal so the running of Non-Parametric Mann-Whitney U test is conceivable.

The Mann-Whitney U test (also called the Wilcoxon-Mann-Whitney test), unlike the independent-samples t-test, allows to draw various results about data based on the assumptions about data's distribution. These results could range from only stating if the two populations vary through to determining whether there are differences in medians among groups. The mean rank list and Mann-Whitney U test results are listed in Appendix D and E.

The Mann-Whitney U test is conducted by IBM SPSS 20. Table 8 illustrates the summary of findings. Regarding to the results of Mann-Whitney U test, p value of pretest items are more than 0.05 (Asymptotic Sig. is higher than 0.05). So it could be said that no important difference exists between control group's scores and treatment group's scores for items like usage of computer, internet, online purchasing experience and truck spare part experience.

Table 8 - Results of Mann-Whitney U test

Items of pretest	Asymp. Sig.
Computer Experience	0.554
Computer Usage Frequency	0.108
Internet Usage Frequency	0.135
Visiting E-commerce Websites Frequency	0.264
Online Purchasing Frequency	0.506
Truck Parts Knowledge Level	0.800
Truck Parts Experience	0.350
Truck Parts Usage Frequency	0.346

5.2 Hypotheses Testing

Since there are 4 factors that involved in determining continuance intention, 2^4 factorial design was employed in this study. Regarding to hypotheses, Use of recommender system, Quality of decision, Decision effort and Overall satisfaction are the factors influencing Continuance intention. In order to explore factors' association with continuance intention, each factor was assigned just two levels. The goal of factorial design is to find those factors that might be significant for the response in this experiment. For denoting the each

factors' high and low level, the levels referred as +1 for high and -1 for low in order to find interaction between factors.

5.2.1 Confirmatory Factor Analysis

In order to demonstrate evidences that whether the constructs of developed model are really assessed, the confirmatory factor analysis was conducted. The first step is to being assured about assumption related to descriptive statistics. The overall descriptive are given in Table 9.

Table 9 - Descriptive Statistics and Reliability Coefficients

	N	Min	Max	Mean	SD	Skew.	Kurt.	Alpha
DecQua	351	2.20	5.00	3.91	.77	-.35	-.18	.88
DecEff	351	1.75	5.00	3.61	.69	-.17	.05	.84
OveSat	351	1.15	5.00	3.55	.65	-.50	.47	.83
ConInt	351	2.40	5.00	3.99	.85	-.31	-.02	.92

Note. DecQua: Decision Quality, DecEff: Decision Effort, OveSat: Overall Satisfaction, ConInt: Continuance Intention

As discussed, values of skewness and kurtosis indicate all observed variables' normal distribution. Additionally, regarding to negative value of all skewness values, it is concluded that all distributions were skewed in the same direction. Thus, as Tabachnick et al., (2007) stated it could be said that linearity assumption be met. Also checking univariate outliers are performed by utilizing boxplots. There were five univariate outliers for all observed variables. Checking of multivariate outliers was performed by the way of Mahalanbios distance (Pallant, 2007). There were not any multivariate outliers in all observed variables. The outlier cases were excluded from the data. In order to check the existence of multicollinearity, correlations among variables should be checked. Table 10 illustrates correlation matrix. As it could be seen, all correlations were significant and

none of them is too high. Hence multicollinearity was not the case for observed variables. Putting all above-mentioned issues into consideration, the following conclusion can be drawn that the confirmatory factor analysis assumptions are not violated.

Table 10 - Correlation matrix of dependent variables

Variables	Number of Items	Reliability	DecQua	DecEff	OveSat
DecQua	6	.85			
DecEff	4	.82	.375*		
OveSat	6	.87	.591*	.660*	
ConInt	4	.88	.458*	.382*	.561*

Note. DecQua: Decision Quality, DecEff: Decision Effort, OveSat: Overall Satisfaction, ConInt: Continuance Intention
* Correlation is significant at the 0.01 level (2-tailed).

Validity of convergent was assessed for the measurement scales by using criteria proposed by Fornell and Larcker: (a) all indicator factor loadings should be significant and be more than 0.7, (b) reliabilities of construct should be more than 0.80, and (c) average variance extracted by every construct should be more than variance due to error of measurement for that construct (i.e., average variance extracted should be more than 0.50). Regarding Table 10 all these three conditions were met for validity of convergent.

5.2.2 Confirmatory Factor Analysis Results

As stated before, validity of four measurement scales (Quality of Decision, Decision Effort, Overall Satisfaction and IS continuance intention) was assessed by Confirmatory Factor Analysis. Every scale item is modeled as it assumed latent construct's reflective indicator. All constructs are allowed for covarying in the Confirmatory Factor Analysis model. Maximum likelihood approach was used for model estimation, with the input of correlation matrix. Figure 18 illustrates the initial model which came in good fit for model variables.

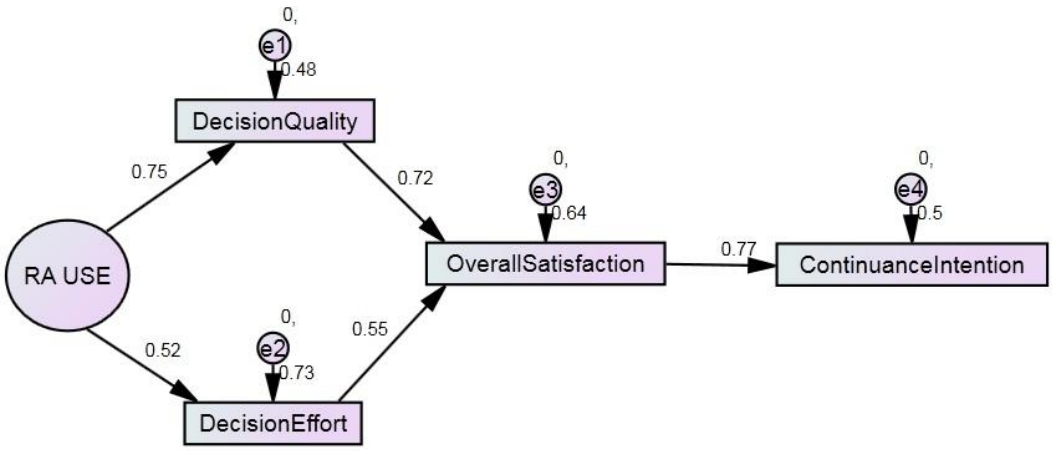


Figure 18 - Model's fitness with data with the standardized regression coefficients

The model showed above resulted in no good fit among developed model and observed data (X^2= 47.50, p = 0.00, GFI= 0.93; AGFI= 0.87; RMSEA= 0,078; SRMR= 0.055). X^2 is the Chi-Square value which is the common measure for assessing overall model fit. This value evaluates the discrepancy's magnitude fitted covariances matrices and sample. (Hu et al., 1999). Goodness of Fit statistic or GFI is an interchangeable to Chi-Square test. It calculates the variance's proportion that is accounted for by the covariance of estimated population (Tabachnick et al., 2007). Adjusted goodness of fit statistic or AGFI adjusts the goodness of fit based on freedom degrees, with more saturant models decreasing fit (Tabachnick et al., 2007). The value of RMSEA illustrates how well the structural model with chosen parameter estimates could fit the matrix of population's covariance (Byrne, 1998). Standardized root mean square residual or SRMR is square root of difference between remaining of the matrix of sample covariance and the hypothesized covariance model (Diamantopoulos and Siguaw, 2000).

In conclusion, in order to verify whether the using of recommender systems affect four constructs, the CFA was performed. All constructs of model are correlated.

The hypotheses provided earlier are collectively tested by using SEM (Structural Equation Modeling) approach. Regarding to Bentler et al., (1980) SEM approach is especially suitable for justified models theoretically testing like was the model in this study.

Like in confirmatory factor analysis every indicator has been modeled in reflective way so all constructs are linked as proposed model. The estimation of model was done by utilizing maximum likelihood approach. The structural model's goodness of fit is comparable with previous confirmatory factor analysis results. As seen in Figure 19, model $\chi 2/df$ is 1.717 ($\chi 2 = 116.76$; df = 68), NNFI is 0.93, in addition CFI is 0.95. According to these metrics, there is sufficient fit between observed data and hypothesized model. Hypothesized associations' path significance in this study and the value of R^2 via each path are tested too. Figure 19 illustrates path significances and path coefficients as reported in AMOS. At $p < 0.01$, all hypothesized paths are significant.

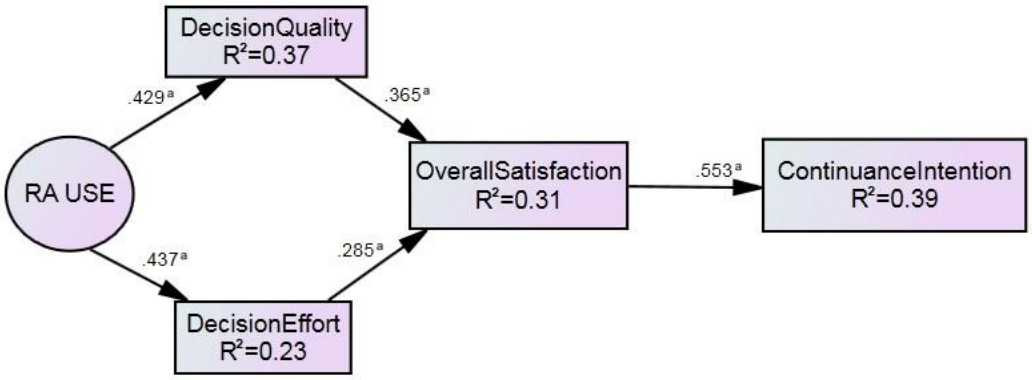


Figure 19 - Research Model EQS Analysis

5.3 Interaction between Factors

In order to investigate interaction effects between factors, full two-level factorial design of this study was analyzed (Box et al., 1978). The experiments factorial design needs parameter's experiment series combinations in which all of the possibilities were considered via the parameters' variation. The required number of experiments is given by the equation of 2^N where n is the number of factors. Minitab 16 was utilized for

performing factorial design analysis. Table 11 illustrates the factor levels for Recommender system use, Decision quality, Decision effort and Overall satisfaction.

Table 11 - Factor Levels in 2x4 design

Factor	Key	Low	High
Recommender system use	A	-1	1
Decision effort	B	Less than 3	More than 3
Decision quality	C	Less than 3	More than 3
Overall satisfaction	D	Less than 3	More than 3

There were four factors: A, B, C, D and two levels: low (-1, minimum), high (+1, maximum) in the 2^4 factorial design. Since the forced choice methodology is not utilized in this study, all the possible responses equal to three were assumed as high response; however, there was not such response in final data table. Data table of factorial design is given in Table 12.

Regarding to the nature of surveying, replicating of runs is impossible. In statistical testing, lack of replication may cause some potential problems. For instance error's internal estimation or pure error's estimations is admitted by replicating. As another example, without replication, fitting full model lead to the freedom's zero degrees for error. One of the best-known preferred potential solutions for this problem is effects' normal probability plotting (Daniels, 1959). According to Daniels (1959) effects that are insignificant are distributed normally with mean zero, constant variance of σ^2 so those effects which are significant are not distributed normally and consequently have nonzero mean.

For this reason, if a specific factor turns out to be "not significant" either like main effect or like any interaction effect's part in the normal probability plot of effects, then that factor was dropped from the experiment completely.

Table 12 – Matrix of Statistical Design and Experiments' Results

A	B	C	D	Response
-1	-1	-1	-1	2.20
1	-1	-1	-1	3.12
-1	1	-1	-1	2.54
1	1	-1	-1	3.25
-1	-1	1	-1	2.33
1	-1	1	-1	3.48
-1	1	1	-1	3.10
1	1	1	-1	3.71
-1	-1	-1	1	2.63
1	-1	-1	1	3.78
-1	1	-1	1	2.88
1	1	-1	1	3.77
-1	-1	1	1	2.67
1	-1	1	1	4.26
-1	1	1	1	3.96
1	1	1	1	4.76

In order to analyze factorial design, data should follow the normal distribution. Figure 20 show normal probability plot of data. The results of normal plot of standardized effects revealed that all factors involving in the amount of continuance intention are significant except decision effort. Figure 21 illustrates the normal plot of standardized effects for factors. As seen in Figure 21, factors A, C and D which were assigned to Recommender system use, Decision quality and overall satisfaction are significant which means that they have significant effect on the response which is continuance intention here.

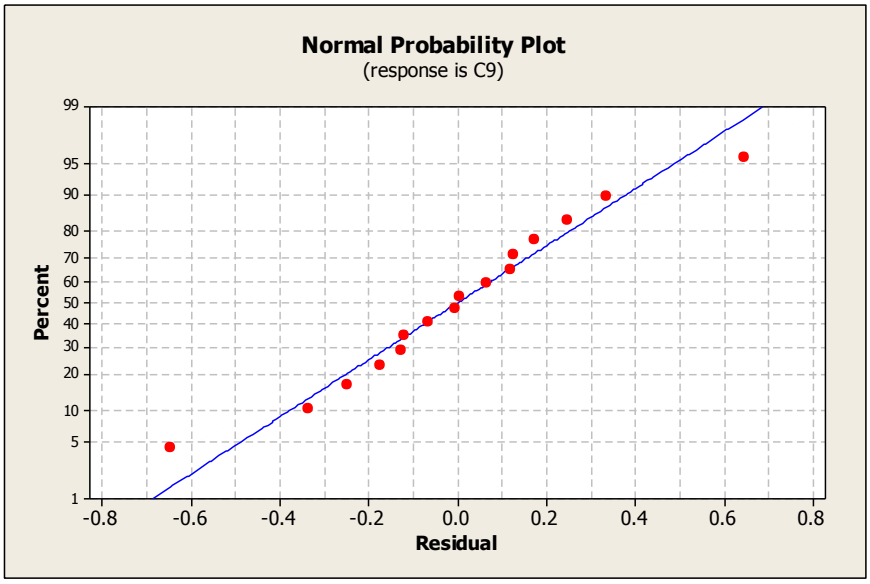


Figure 20 - Normal Probability Plot

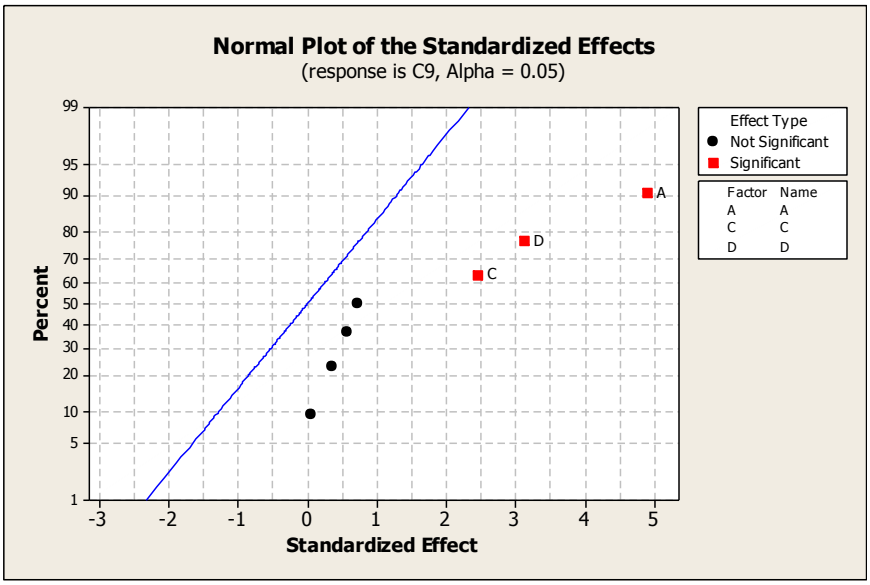


Figure 21 - Normal Plot of the Standardized Effects

The factor "Decision effort" turns out to be insignificant because both main effect of decision effort in addition any interaction combination including decision effort factor fall along the straight line. This means that factor "decision effort" could be dropped from the factorial fit analysis. Hence, these insignificant effects can be combined to create an estimate of error. So the four factors with two levels (2^4) factorial design with only one observation per cell could be transformed to a three factor with two levels (2^3) factorial design with 2 replications per cell.

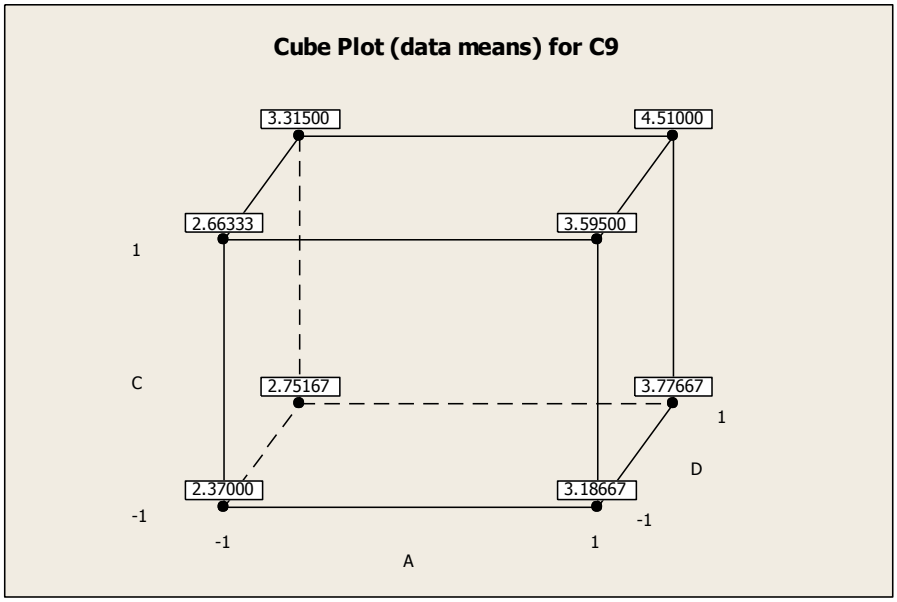


Figure 22 - Cube Plot (Data Means) for Continuance Intention

From the results of Cube plot of continuance intention, it could be found that the response, which is the degree of customers' continuance intention for future use of website has the maximum level when all 3 factors of A,C and D which represent recommender system use, decision quality and overall satisfaction are high. In other words, when a user purchase an item from e-commerce website with assistance of recommender system, the high level of decision quality and overall satisfaction lead to the highest degree of continuance intention (4.51000).

CHAPTER VI

DISCUSSION AND CONCLUSION

Discussion about statistical analysis of study, conclusion of study and suggestions for future works are given in this chapter.

6.1 Summary of Findings

In the literature of IS continuance, there are various articles which assess the continuance intention of users toward using the system in future. Salient percent of these papers utilize a simulated experimental system for evaluating their proposed models. This study utilizes a real-world e-commerce website. That is to say, rather than asking users to use the testable information systems, face them with a real-world system. In real-world experiments, model constructs could be measured more effectively. Especially in e-commerce websites like online shopping stores, online auctions and etc. the result of tests and surveys in simulated system may be completely different from real-world system since in later one participants should pay for product or service. Consequently, the result of survey is more trustworthy. Another disadvantage of using a temporary experimental system is that participants may tend to answer questions superficially and did not consider the survey seriously.

To overcome these problems, a real-world system provide better results for study especially in this case, Azhitechs website, which users need to purchase different products frequently from this portal, the answers of participants are more reliable than other systems which were developed just for specific study.

This study evaluated the impact of knowledge-based e-commerce item recommender system on continuance intention of users. This research assessed quality of decision, search effort, overall satisfaction and continuance intention of consumers. The study's proposed hypotheses have been tested. Table 9 illustrated the results of hypotheses tests.

Table 13 - Study findings

Hypotheses	Results
H1: Use of knowledge-based recommender system is positively related to user's quality of decision.	$H1_0$
H2: Use of knowledge-based recommender system is negatively related to decision effort of user.	$H2_0$
H3: Decision quality of user is positively related to overall satisfaction with recommender system.	$H3_0$
H4: Decision effort of user is negatively related to overall satisfaction with recommender system.	$H4_0$
H5: Users overall satisfaction level with the system is positively related to user continuance intention.	$H5_0$

Statistical tests results illustrated a positive relationship between knowledge-based recommender system usage and quality of decision. In other words, quality of decision or in some papers called decision confidence which is determined by the level of users' confidence in online purchasing has been increased in recommender systems-assisted website. Users who assisted by such system were more confident in their decision while purchasing an item rather than non-recommender system website users and the selection changing rate was lower in former group. This result is same as the findings of Haublet al. (2000) and Olson et al. (2002); however, some study's findings contradict with this research's findings. For instance, Vijayasarathy et al. (2001) showed that use of recommender system has not any relationship with users' quality of decision. The effect of decision quality on continuance intention is significant too. Which means that by increasing the amount of decision quality level, the intention of customers to continue using website will be increased.

Statistical tests showed that there is negative relationship between knowledge-based recommender system usage and search effort. In other words, recommender system decreased the search effort of customers by helping them to find the ideal product which meets their requirements. The results of Haubl et al., (2000) confirm this and showed that customers of recommender system-assisted systems reviewed fewer item details rather than users who had not been helped via such recommender system. In interaction analysis, decision effort turned out to be insignificant. It means that the highness or lowness of decision effort have not significant effect on continuance intention.

Statistical tests results indicated a positive relationship between quality of decision and overall satisfaction also they illustrated that there is a negative relationship between search effort and overall satisfaction. In treatment group users who purchased from recommender system-assisted website stated high level of confidence in their decisions. As expected, customers of simple website stated high level of search effort which leads to lower satisfaction. These are the same results as the results of Haubl et al., (2000) and Bhattacherjee (2001).

Also according to the result of statistical tests, it could be understood that continuance intention of customers substantially influenced by their overall satisfaction level. These result also disclosed high intention toward continue system in those customers who satisfied with operation of e-commerce website integrated by recommender system. This finding is like what Bhattacherjee (2001) proved. The effect of overall satisfaction on continuance intention of users is significant. In other words, the more level of satisfaction customers perceived, the higher intention to continuance customers have.

6.2 Conclusion

The aim of this study is assessing the influence of knowledge-based e-commerce item recommender system on continuance intention of users. The findings of this study illustrated that recommender systems have important influence over customers' quality of decision, search effort, overall satisfaction and continuance intention for using information system.

In this study, statistical tests findings illustrated that number of unconfident customers with their final selection items are statistically importantly less in knowledge-based recommender systems' existence rather than absence of it. In other words, many of customers were helped by recommender system believed that their final choice was an ideal item also they preferred not to change their decision by randomly recommended products by system. This behavior determines confidence in decision. As another factor of decision quality, which was not considered in this study, purchase of recommended item by customers could be putted into consideration. Also according to the findings of statistical tests, customers who of recommender system-assisted website had statistically importantly less search effort rather than simple website. It means that by utilizing recommender system, customers search fewer pages and consume less time for purchasing an item.

Overall satisfaction and continuance intention of customers could be considered as overall continuance intention measure while using a system. Statistical tests demonstrated that customers of recommender system-assisted website satisfied statistically importantly more than non-recommender system website users. Also the level of continuance intention for users of former website is distinctively higher than users of later system. In brief, customers who utilized recommender system for their purchasing stated more overall satisfaction and continuance intention toward using the system in future.

Putting all above-mentioned factors into consideration the following conclusion can be drawn about the impact of knowledge-based recommender systems on continuance intention of users. Utilizing recommender system increases the intentions of customers toward continue using it by decreasing search effort, increasing quality of decision, overall satisfaction and continuance intention.

6.3 Study contribution

In order to retaining existing customers, owners of e-commerce websites utilize many tools and plans to make customers satisfied. This study evaluates the impact of knowledge-based recommender system on continuance intention of online customers. Findings of this research contributes to applicable literature by demonstrating that such recommender systems increases continuance intention of online customers by increasing

quality of decision, overall satisfaction and by decreasing search effort while purchasing a product over internet. Results of this study can be considered by owners of e-commerce websites by helping them to understand that how much integrating intelligent system to e-commerce portal could be beneficial. Details are given in the text and the main points include developing a wholesome continuance model based on ECM-IS comprising 4 factors covering various dimensions of post-adoption behavior of online consumers, developing revised and refined measurement items for assessing model predictors, evaluating the interactions of the factors affecting the continuance intention and finding statistically significant relationship among factors influencing continuance intention

6.4 Study Limitations and Directions for Future Research

Various limitations were involved in this study. Firstly, participants of this study were limited to customers of AZHITECHS Company. It might be beneficial to replicate this research with other population groups. Also customers of this company deal with big heavy duty cars and their parts. It would be better to analyze various domains of products and target groups.

Secondly, since the gathered data is subjective, perceived effort was assessed in this study, not actual effort. It is advisable to assess the actual search effort using objective data in future works.

Thirdly, for analyzing continuance intention in this study only one kind of intelligent system (knowledge-based) was utilized. In future works, other types of recommender systems like hybrid systems, content-based systems and etc. could be utilized.

Fourthly, only private sector users' attitudes were assessed in this study. It might be beneficial to collect data from public sectors users in future research. Additionally in order to generalizing findings of study, both public and private sector users could be compared.

Fifthly, in future research, the proposed model could be improved by adding other impressive factors of continuance intention like perceived usefulness, loyalty incentives, information quality and etc. Also the research findings are affected by the system's nature and the costumers' computer background in some ways. Future research could examine

various types of e-commerce websites and compare the findings for better generalizability.

Lastly, moderating factors' possible effects has not considered in this study results. Moderating factors like part expertise of customers, product complexity, product type, purchasing perceived risk, customers' familiarity with intelligent systems like recommender systems could be considered in future works.

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APPENDICES

APPENDIX A – ITEMS OF PRETEST SURVEY

1) 1. Chassis Number

_____

2) Age / Gender

_____

3) How long do you use computer?

_____

4) In a day, how many hours of internet surfing do you spend?

( ) 1 hour or less

( ) 2 – 3 hours

( ) 4 – 6 hours

( ) More than 6 hours

5) In a day, how many hours do you use computer?

( ) 1 hour or less

( ) 2 – 3 hours

( ) 4– 6 hours

( ) More than 6 hours

6) How often do you buy an item from online e-commerce websites?

( ) Always

( ) Often

( ) Frequently

( ) Occasionally

( ) Rarely

7) How often do you see any kind of e-commerce websites?

( ) Extremely often

( ) Often

( ) Frequently

( ) Rarely

( ) Never

8) Rank your knowledge level with truck spare parts (Rank from 1[Little] to 5[advanced]).

_____

9) Rank your usage experience with truck spare parts (Rank from 1[Little] to 5[advanced]).

_____

10) How often do you dealt with truck spare parts?

( ) Always

( ) Often

( ) Frequently

( ) Occasionally

( ) Rarely

APPENDIX B - MAIN SURVEY ITEMS

The customers reported their agreement level with the provided statement on a likert 5-scale from "Strongly Disagree" to "Strongly Agree".

Overall Satisfaction Measurements:

- This system is one of the best ways to choose a spare part for truck.

- If I could do it over again, I would rather not use this system to purchase a spare part for truck (R).

- I am not happy that I used this system to purchase a truck spare part (R).

- This system is very useful in assisting me to choose the best spare part to suit my requirements.

- If I had to select a spare part in future, and a system such as this was available, I would be very likely to use it.

- If my friend was looking for information in order to purchase a truck spare part, and I knew that a system such as this was available, I would be very likely to recommend this system to him.

Search Effort Measurements:

- This e-commerce website saved me a lot of effort in choosing spare part.

- I found it very useful to refer to such a shopping system.

- This e-commerce website performed a work on my behalf that I could not have done by myself.

- I do not think that using such a system can save me a lot of effort (R).

Continuance Intention Measurements:

- I intend to continue using such e-commerce website rather than discontinue its use.

- My intentions are to continue using such e-commerce websites rather than use any alternative means.

- If I could, I would like to discontinue my use of such e-commerce websites (R).

- I will strongly recommend others to use such an e-commerce websites.

Decision Quality Measurements:

- I am confident that I selected the best spare part to suit my truck's needs.

- I am confident that I selected the spare part which best matches my preferences.

- I am not confident that I selected the best spare part (R).

- There are probably other spare parts I should have examined more closely.

- I would select this same part if I had to make the decision again.

- This is clearly the best spare part available for my budget.

APPENDIX C – ETHICAL CLEARENCE

2013 March 07

To: whom it may concern

From: Esmaeel Akbar Pour Paydar

Azhitechs Chief Excutive Officer

Subject: **Permission for conducting survey in customer service representative of AZHITECHS**

Our employee Masoud Shahmanzari, CIO of company, has been allowed to conduct survey of his master thesis titled "Assessing the influence of e-commerce product recommender systems on user continuance intention" in customer service center.

Bests

Esmaeel Akbar Pour Paydar

2013/03/07

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APPENDIX D - PRETEST ITEMS' MEAN RANK

Ranks

	Group	N	Mean Rank	Sum of Ranks
How long do you use computer?	1	203	112.86	22910.50
	2	148	111.21	16459.00
	Total	351		
In a day, how many hours of internet surfing do you spend?	1	203	118.64	24084.00
	2	148	115.08	17031.50
	Total	351		
In a day, how many hours do you use computer?	1	203	119.05	24167.00
	2	148	114.71	16977.00
	Total	351		
How often do you buy an item from online e-commerce websites?	1	203	113.55	23050.50
	2	148	110.58	16365.50
	Total	351		
How often do you see any kind of e-commerce websites?	1	203	114.64	23272.00
	2	148	108.58	16070.00
	Total	351		
Rank your knowledge level with truck spare parts	1	203	114.68	23280.00
	2	148	110.54	16360.00
	Total	351		
Rank your usage experience with truck spare parts	1	203	111.82	22699.50
	2	148	109.42	16194.00
	Total	351		
How often do you dealt with truck spare parts?	1	203	110.77	22486.00
	2	148	113.13	16743.00
	Total	351		

APPENDIX E - MANN-WHITNEY U TEST FOR PRETEST ITEMS

Test Statistics[a]

	How long do you use computer?	In a day, how many hours of internet surfing do you spend?	In a day, how many hours do you use computer?	How often do you buy an item from online e-commerce websites?	How often do you see any kind of e-commerce websites?	Rank your knowledge level with truck spare parts	Rank your usage experience with truck spare parts	How often do you dealt with truck spare parts?
Mann-Whitney U	5610.500	2915.000	3364.500	4968.000	3743.000	3651.500	3571.000	5200.500
Wilcoxon W	13427.500	13819.000	11209.500	12730.000	11575.000	11420.500	11346.000	11853.500
Z	-.592	-2.650	-2.113	-1.117	-1.910	-.907	-1.957	-.942
Asymp. Sig. (2-tailed)	.554	.108	.135	.264	.506	.800	.350	.346

a. Grouping Variable: groups

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : ……Shahmanzari…….

Adı : ……Masoud…….

Bölümü : ……Information Systems……...

TEZİN ADI (İngilizce) : ASSESSING THE INFLUENCE OF E-COMMERCE ITEM RECOMMENDER SYSTEMS ON USER CONTINUANCE INTENTION FOR FUTURE USE OF RECOMMENDER SYSTEM.

TEZİN TÜRÜ : Yüksek Lisans ■ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir (1) yıl süreyle fotokopi alınamaz. ☐

TEZİN KÜTÜPHANEYE TESLİM TARİHİ : …….