THE EFFECTIVE SECURITY MEASURES AGAINTS INTERNET FRAUD

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ABSTRACT

The prevalent use of internet has led to the increase of internet frauds. A particular attention should be paid to internet direct transaction frauds because internet direct transactions are convenient and simple with no fee. The simple procedures and the absence agents, in other hand, proved few security measures to protect the users. With such risks, internet direct transaction frauds are soaring in recent years. The aim of this study is, therefore, to explain the background of internet direct transaction frauds, to classify actual fraud cases by types, and to suggest the effective security measures to prevent the frauds. To prevent the internet direct transaction frauds in advance, in conclusion, it is necessary to check the fraud history, to meet face-to-face on site, check the item, and pay, or use escrow services. And a specific law should be made for establishing strict punishment rules and compensation measures.

Keywords: Cyber crime, Internet direct transaction, Internet fraud, Security Measures

1. INTRODUCTION

As the internet transactions have been pervasive, we are facing unexpected problems such as internet fraudulences and insecure transactions. Now is the moment that we need more systematic security in internet transactions. The survey in July 2014 shows that the internet use rate of Koreans accounts for 83.6% [6]. Now, people can use the internet whenever they want and wherever they are. It has had a great influence on the economy, society, and cultural activities. The traditional way of transactions has been increasingly turning to internet transactions.

Even though the internet transactions have provided much convenience, it also has several weaknesses. Particularly internet direct transaction websites connect users via vast networks without trade agents, standard policies and security systems to protect people, for which internet frauds have continually occurred.

According to the Korean National Police Agency, 56,667 internet fraud cases were reported in 2014, and especially, 4,891 internet direct transaction frauds were detected from May to October in a crackdown period of 2014. The number of the internet direct transaction fraud cases is much more than 1,648 hacking cases in 2014 and accounts for the largest number in the whole cyber crimes [7].

The internet transactions transcend the limits of time and space, which makes it easy to damage anyone regardless of where and when and difficult to identify who they are, accommodate a myriad of people to buy and sell with each other, and guarantee anonymity to

all of the users—all these factors contribute to the great number of the internet direct transaction frauds.

Existing studies on the internet transaction frauds have addressed a variety of the frauds comprehensively, but this study distinctively focuses on the internet direct transaction frauds. The objective of this study is to grasp the stark reality of the soaring internet direct transaction frauds in recent days, to categorize the types of the frauds, to identify the root causes of the internet direct transaction frauds, and to suggest the effective security measures to prevent the internet direct transaction frauds.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

2. 1 Internet Frauds

The internet fraud is simply to cheat victims and take profits from them using internet. Therefore, internet frauds should include the legal factor of fraud in the internet. Fraud is "the crime of cheating somebody in order to get money or goods illegally (Article 347 of Criminal Law)." The legal requirements of frauds include cheating behavior, loss of money of a victim, and monetary gain of a perpetrator. So the internet fraud is the crime based on the internet that deceives people into believing that they can get products or services they want and cheats money out of them.

The causes of the mounting internet frauds have the unique characteristics: non-confrontation, anonymity, professionalism, and transcendence beyond time and space [10]. In particular, the non-confrontation and anonymity that hide users' identity are the main reasons to induce people to commit cyber crimes in general, and internet frauds in particular [3]. In the internet, self-consciousness and self-control over desire and impulse become low, which facilitates cyber crimes including internet frauds . Also, the point that cyber space is not the real world drives people to feel a relatively little guilt and strong impulse to perpetrate a crime.

Increasing internet frauds accordingly lead to lots of researches on the internet frauds [3]. These studies are mostly made in developed countries with a high rate of the internet use. However, in recent years, emerging IT-oriented countries like India have conducted such studies. Internet auctions are one of the main topics in the field of the internet frauds. Aleem and Antwi-Boasiako [1] and Bay [2], and Noufidali et al.[9] concentrated on internet auction frauds.

2.2 Internet direct transaction frauds

The types of internet frauds vary: internet auction frauds, sales frauds of general items, internet service frauds, internet bank frauds, and so on. Unlike these, internet direct transaction fraud refers to the fraud by direct transactions between individuals without going through a brokerage agency. Since they can reduce distribution cost as they do not communicate through a brokerage agency, the percentage of internet direct transactions is growing in E-commerce. Internet direct transactions have been expanding to include not only

electronic devices such as cell phones and laptops but also agro-fishery products, condominium voucher, and even foreign currencies and real estates.[8]

Many internet direct transaction frauds have so far occurred through used product-selling websites. As users would like to have transactions for used products at lower price, the cases in which buyers make the payment without any security measures but end up suffering a monetary loss keep increasing in number. Moreover, because offenders commit the frauds with a systematic and intelligent technique these days, there are more cases of facing loss if a buyer is not careful for even a brief moment.

However, there are relatively a few studies on internet direct transaction frauds. Burgard & Schlembach (2013) examined the problems of internet fraud damages from the perspective of criminology, divided internet fraud damages into three stages based on Goffman's 'Frame Analysis' theory [4]. The first stage is that a buyer's caution and vigilance are weakened as they go through an abnormal social experience, and the second stage is that a criminal and a victim keep interacting with each other and successfully carry on a transaction. Finally, the damage occurs as the victim realizes the fraud. The stages of "being hooked on, staying attuned, and then cooling out to reality with the sense of victimization" can also be applied to the cases of internet direct transaction frauds [4].

Most studies related to internet direct transaction frauds address the methods of frauds and the causes of damages from the view of fraud preventions. Grazioli&Jarvenpaa (2003) claim that fraud offenders use seven tactics of masking, dazzling, decoying, mimicking, inventing, relabeling, and double play (leaking of fabricated information) in internet fraud, and then present precautions for each [5]. However, since the fraud methods suggested here focused on E-commerce frauds in general, the methods that can be applied to internet direct transaction frauds are limited to masking, decoying, mimicking, inventing, etc.

In addition, by concentrating the research on the causes of the fraud victimization during internet direct transactions, Xiao &Benbasat presented vague information, omission of important information, and forged information as the core elements of internet direct transaction online frauds [11]. Their research is meaningful as it identified the risk factors and detailed means of internet direct transaction frauds and organized the detailed forms accordingly, thereby presenting a damage prevention model and a damage response model. However, their research mainly covered the transactions between internet transaction websites and individuals instead of internet direct transactions; thus it is difficult to regard it as a study completely about internet direct transaction fraud.

3. CURRENT STATUS OF INTERNET DIRECT TRANSACTION DAMAGES

3.1 Increase of the internet use

The fundamental reason that internet direct transaction frauds are soaring is the huge increase of the internet use. According to the 2014 survey on the Internet Use, the internet use rate of

Koreans within the past month is 83.6%. While the entire ratio of people who have experienced the internet is 85.9%, the use rate within the past month is 83.6%, indicating that the internet use has become more prevalent. Similarly, the internet use rate within the past week is 79.2%, showing that almost all Koreans use the internet in their everyday life [6].

Based on the standard of the International Telecommunications Union (ITU), the change in the number of internet users in Korea has increased steadily over the past 10 years. As the number of internet users has been slowly increasing since 2010 without a huge change, it is judged that the number of internet users has almost reached saturation.

Cyber crimes including internet frauds keep increasing in Korea. The cyber crimes in 2010 had increased by 26.4% in 2013. While cyber terrors such as hacking and virus spread had decreased by 43% from 2010 to 2013, internet frauds had heavily increased by 82% over three years [7]. This indicates that the predominant use of internet led to the increase of the regular cyber crimes such as internet frauds which only require common internet knowledge different from cyber terrors that require hacking and other relatively specialized techniques.

The types of internet frauds are composed of internet direct transaction frauds, internet shopping mall frauds, internet game frauds, and other internet frauds. The fact that internet direct transaction frauds take up 80% of the total internet frauds indicates that it is a very serious problem. In addition, the internet direct transaction frauds demonstrates that internet direct transaction frauds are becoming more intelligent. The suspect arrested by the police had first asked for and gotten the bank account number of the internet seller, who was intending to sell a mobile gift card. Next, the suspect told this account number to another victim of internet direct transaction frauds as if it was his own, and made the victim pay for the purchase. When the fraud victim sent the payment to the seller of mobile gift card, the seller obviously thought that it was the payment for buying the gift card and sent it to the suspect, who took it instead of the actual payer.

According to the statistics by 'The Cheat,' a website for sharing information about the internet direct transaction fraud cases, the number of internet direct transaction frauds increased by 504% from 2006 to 2014—from 6,332 cases in 2006 to 38,240 in 2014. The amount of damages grew by more than five times—from 2.4 billion won in 2006 to 11.3 billion won in 2014.

For the types of fraud items, cell phones and related devices were the most common. 24,561 fraud cases of mobile devices were reported from 2006 to 2014, which was much higher than 13,691 fraud cases of tickets or gift cards—the second common type. The number increased by more than 10 times to 8,629 cases in 2014 from 762 in 2006. It is assumed that this is because the smart phone is an indispensable item in present-day life and the newest smart phones are expensive. The temptation to buy the latest model at a low price leads to fraud damages.

Likewise, the fraud cases of tickets or gift cards have greatly increased these days. While the number of fraud reports of those products was only 152 in 2006, it increased by almost 30 times to 4,479 cases in 2014. In contrast, MP3 players and electronic dictionaries were the most common items of fraud reports from 2008 to 2010, but not a single fraud case has been reported since 2013. This is probably because people do not feel the need to purchase an MP3 player or electronic dictionary separately, as the functions of smart phones have become more diversified to contain MP3 player and electronic dictionary functions as well. Also, the number of fraud reports for cameras consistently increased until 2010, but it is decreasing or staying the same from 2011. This is also due to the significant enhancement of camera performance in smart phones.

4. CASE ANALYSIS BY TYPES

4.1 The case that a seller does not send a proper product

The fraud incident occurred in early April 2015 can be considered as one of the most typical case examples of internet direct transaction frauds. A victim found a camera that caught his fancy through 'Joonggo Nara,' a website designed for transactions of used products, talked to the suspect on the phone, checked his ID card, bankbook, business card, etc., and made a deposit to his bank account. However, the victim could not receive the item, lost contact with him, and thus reported to the police. A similar case is that after watching an internet post that someone wanted to sell an unopened tablet PC at a low price, a victim called the suspect, checked a photo of his driving license on cell phone, and made a deposit to his account, but ended up not receiving it.

Making a prepayment of the half price and then paying the rest after receiving item payers ordered are also a common way of internet direct transactions. While buyers feel a little reassured and make the payment because it is only the half amount. However, the offenders' original goal was taking only the prepaid amount, they severs connect with the buyers after receiving the prepayment. When a man in his 30s posted that he would like to buy automobile tires on a used product-selling website in early April 2014, he received a contact that someone would like to sell the tires. He intended to deposit the remaining amount of money after making the half payment and receiving the items, but the seller disappeared without trace after taking money.

A case in which a seller cajole the buyer into having a direct dealing in a promised place, and then deceiving the buyer into remitting a half payment online as he cannot meet up due to an urgent business, is a very common type of the internet direct transaction frauds. In order to reassure victims, some fraud offenders tell them their addresses or ask the victims to search their name on 'The Cheat,'. In addition, tricking people who ordered into thinking that the items will be arrived by showing the invoice number, and then taking money also belong to the case of receiving money but not sending the items.

The so-called 'Cool Dealing', a method of buying and selling items without any safeguards and doubt, is definitely a way of increasing the possibility of the internet direct transaction frauds. Usually, buyers who have never experienced the frauds while buying products without any countermeasures or who choose such dealing method after checking users' IDs with good sales records may encounter the fraud. The offenders can reassure the buyers through the means of stealing user IDs or faking the sales records, and take the payments.

4.2 The case that a seller sends an irrelevant product

There are also many cases of receiving products but they are not the same as the original order. A lady ordered a used brand-name bag and made a deposit of 1,000 US dollars in early April 2014, but what she actually received was a box carrying a carton of soymilk and a worn-out blanket. After checking that the item was shipped, she felt reassured, but a useless product that was completely different from what she ordered was delivered.

A similar case is that a buyer posted on an used product-selling website that he wanted to purchase a camera, received a contact from someone who was willing to sell one at a low price, decided to buy it, and sent money after checking the picture of delivery invoice taken by a cell phone, only to receive an entirely different things. On the next day of making the payment to the requested bank account, the buyer received a delivery box, but the box stored newspapers and a pack of milk instead of a camera.

4.3 The case that a seller sends a fake

By abusing the fact that it is hard to distinguish an original from an imitation for bags or clothes, some sellers send imitations instead of originals. Although sales and distribution of imitations are illegal, the cases of cheating and selling them as originals are not a few.

A victim purchased famous brand clothes five times on a used product- selling website from December 2014 to January 2015, but all of them were proved to be imitations when checked later on. Believing that the seller directly imported the clothes from an original store in Japan, the person made a deposit of 2,500 US dollars in total and received the clothes. At first, the buyer wore the clothes, thinking that they were originals, but began to doubt. Eventually, the victim had the clothes checked by an expert and found out that they were all knockoffs.

5. POLICY PROPOSAL AND CONCLUSION

The biggest reason that internet direct transaction frauds are soaring is that the use of the internet has become more generalized. Due to the increased penetration rate of mobile IT devices along with the use of the internet, people can search and order any products they want regardless of where and when. The increase of internet direct transactions through used product-selling websites has led to the increase of internet direct transaction frauds. Despite the risk of the frauds, the users of internet direct transactions are soaring in number because

internet direct transactions enable fast and convenient transactions, due to the simplified procedures and the absence of commission as there are no agents. However, simple procedures and the lack of agents mean that there are few security systems to protect the users.

Therefore, this study aims to explain the background of internet direct transaction frauds, to classify actual fraud cases by types, to show the amount of damage from the internet direct transaction frauds, and present the seriousness of the problem, through the penetration rate of the internet and IT devices, and the percentage of the internet users using the internet for transactions, etc.
The security measures for damage relief when internet direct transaction frauds occur are still very inadequate. The managers of internet direct transaction websites only provide places for users to have direct transactions and do not have the authority to monitor and restrict users. Also, victims must go through many different steps and prepare evidence on their own to report the frauds. Although it is possible to apply for the suspension of payments or refund, there is also a high chance of being rejected. In addition, since there are no laws designed only for the internet direct transaction frauds, criminals cannot be punished strictly even if they are caught, and the compensation for damages is not an obligation. Victims must reach a mutual consent or file a civil suit against the fraud criminal to receive the compensation for damage, which is a very complicated and time-consuming process. The fact it is difficult for victims to receive the higher amount of compensation than the amount of the actual damages indicates that it is necessary to take special security measures against the internet direct transaction frauds.

Not only the punishment on damage but also the compensation for victims should be clearly defined. Currently, victims must reach an agreement in compensation with fraud criminals or file a civil lawsuit to receive it. However, victims are mostly unable to reach the agreement as it is not obligatory, and the compensation that can be received through civil lawsuit is very small amount for the complicated and time-consuming procedure. The fraud criminals' goal of the internet direct transaction frauds is to gain a pecuniary advantage in an easy way by deception. Thus, setting the fine much heavier than the monetary gain from the fraud, and making the offenders pay victims compensations will help suppress the criminal motives. Furthermore, instead of entrusting the job to set the amount of fine to the authority of prosecutors in summary indictments, a standardized penalty rule should be created for offenders to clearly know the fine and compensation they should pay, when arrested.

After all, it is important to prevent the internet direct transaction frauds in advance, because victims can hardly receive monetary and time compensation appropriately as of now. For the prevention, it is necessary to check the fraud history by searching the sellers' bank account numbers and phone numbers on 'The Cheat' or 'Cyber Cop' before sending money for the internet direct transactions. Moreover, the safest way is to meet face-to-face on site, check the item, and pay, or use escrow services. And a specific law should be made for establishing strict punishment rules and compensation measures to reduce the multiplying internet direct

transaction frauds.

Acknowledgment

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WEBSITES PRIVACY: FROM ACTUAL SAUDI eGOVERNMENT USERS' PERSPECTIVE

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ABSTRACT

This paper reports the results of evaluating Saudi government websites in terms of having a visible privacy statement, as well as eGovernment actual users on privacy issues. 174 websites representing 100% of government websites listed in the Saudi National eGovernment Portal were checked, and the result was disappointing. Only 44% of the websites checked have a visible privacy statement, 39% do not, and 17% did not respond. Also, different labels were used to present the privacy statement, which is inconsistent with the fundamental principles of government websites design. On the other hand, 53 participated in this study, in which 44 were found to be eGovernemnt users. Those users, male and female, in general did not have enough knowledge about their privacy rights, but they share the same concern about their personal information, especially male users. Moreover, in general, they started using eGovernment websites for multiple purposes without looking for the available privacy statement. To some extent, they feel safe when providing their information. The study finding shows that more attention should be given to privacy issues to ensure the success of the eGovernemnt project.

Key words: eGovernment, Privacy, Saudi Arabia eGovernment, eGovernment non-technical barriers.

INTRODUCTION

The term eGovernment has been widely used in almost all countries around the world to describe the use of Information and Communication Technology (ICT) in the public sector. eGovernment application has been seen as a tool that can help government to increase transparency, improve government services and save government finance. Yet, the percentage of successful eGovernment initiatives globally is low, in particular in developing countries. Several reasons have been identified in several areas including: ICT Infrastructure, political, social and organizational factors that can lead to a total or partial failure. In developing countries, in particular Arab countries, the most prevalent factors causing the failure of eGovernment initiatives have been linked to non-technical issues including privacy and security.

Several studies show that trust becomes an issue to Saudi people when connecting with eCommerce and eGovernment in two ways: Internet trust and government trust. In the area of Internet trust, the 2007 CITC report shows that 29% believed using the Internet for shopping is not safe [1]. Alharby in his study on eCommerce in Saudi Arabia found that privacy and security were among the greatest barriers to eCommerce adoption in the century [2]. Likewise, Alotaibi, in her study on eGovernment trust, found that the majority of Saudi Internet users surveyed were concerned about privacy and security when connecting with

government online [3]. Also, the level of trust varies from government agency to government agency because of personal experience and stories or reported stories from family, friends or the media. Also, Sait et al., found a positive relationship between Internet users who strongly support the adoption of eCommerce in the country and the privacy and security issues [4]. Alhazani in her study on Saudi government websites, primarily the Saudi ministries, found that only four of the twenty-two ministries provide a visible privacy policy statement on their website [5].

In eGovernemnt website design best practices, it is clear that having a visible privacy statement is one of most important criteria used to measure the government websites. For example, in the UK, the Guidelines for UK government websites: Framework for local government; Quality Framework for UK Government Website Design: Usability issues for government websites; and, Guidelines for UK Government websites: Illustrated handbook for Web management teams pointed out that a visible privacy statement must be provided [6, 7, and 8]. Similarly, in Australia, the ACT Government Website Guidelines published by the Office of Information Technology and Multimedia; Website Navigation; Information Architecture and Implementing an Effective Website Search by Australian Government Information Management Office indicated that each website must have a visible privacy statement [9, 10]. Likewise, www.usability.gov, which is a guide for developing usable and useful US government websites, the availability of a visible privacy statement is mandatory for all US government websites [11]. Therefore, the present study has been designed mainly to exam the Saudi government websites in terms of providing visible privacy statements and to generate a profile of the expected users of eGovernment in Saudi Arabia to identify the major concerns related to privacy issues.

1. Related Work

Privacy and security are always discussed together under the name of user trust, which is addressed in the literature as a technical barrier [12]. Also, as non-technical barriers mainly users believe in government privacy practice and government website security [13]. AL-Busaidy and Weerakkody reveal that trust refers to the user's belief in security and privacy in using electronic transactions via an official government website [14]. In the eGovernment context, privacy refers to the credible government protection of the personal information of citizens [15]. Similarly, the GIPL reveals that in the context of eGovernment and eCommerce, the right to privacy is the right to control the use of personal information that is disclosed to others [16].

Much has been written on users' belief in privacy and security, as they have been classified among the greatest eGovernment barriers [15, 17, 16, 18, and 19]. A study conducted in 2007 by the AGIMO on Australians' use and satisfaction with eGovernment services indicated that government agencies can encourage up to 6% of Internet users to use the available government electronic services by considering privacy issues and having visible privacy statements [20]. Also, Taylor Nelson Sofres in their annual global report on online eGovernment found that 23% of eGovernment users felt unsafe concerning providing personal information, and this increased to 25% in 2003 [21]. The concern about privacy is subject to not only individuals but also businesses. For example, 21% of Small and Medium Sized Enterprises (SMEs) in the UK were most concerned about privacy, and 28% were concerned about security when conducting transactions with the government through electronic means [22]. The result of these studies supports Culnan and Armstrong who believed that citizens are more likely to disclose personal information once they have been informed of the agency's privacy practices [23].

These studies show the significance of these issues among eGovernment users in countries that have long histories of practicing privacy since the 1960s and early 1970s [24]. Thus, the Data Protection Act has been adopted by many developed countries across the world. For example, in the UK the Data Protection Act of 1998 was approved to repeal the Data Protection Act of 1984 and the Access to Personal Files Act 1987. It has eight principles covering manual and automatic processes of personal data, which are based on three concepts: purpose of collecting personal data, fairness to be collected for legitimate purposes and transparency, and the right of users to have which data collected [24]. Interestingly, in some parts of the world the privacy concept is seen as a Western concept [25]. This could be true as this part of the world has a long history of democracy and has several pieces of legislation that have been approved accordingly.

However, many people around the world do not share this same history of democracy, and yet they now share many things in common with Western societies, and thus several concepts that were born in developed countries have become global concepts as a result of the development of ICT and the advent of the Internet, and this includes the privacy concept. What was previously of no concern in several developing countries has become a necessity. Hussein, in his study on eGovernment in Jordan, indicated that there is a concern among citizens about privacy because the government collects a large amount of personal information about its citizens, which could be used inappropriately [26]. In Bahrain, 82% of Bahraini residents, who did not participate in eCommerce, refrained from doing so due to non-technical barriers, including the privacy issue [27].

METHODILOGY

This study is descriptive in general, and two methods were adopted. First, the 174 government websites listed in the Saudi National eGovernment Portal < http://www.saudi.gov.sa/ > were checked. This was done by accessing the government agency directory in the portal, which is divided into 14 sections, each containing websites of numerous government agencies. This directory contains almost all the various types of government websites. Next was to access each site's interface to see if the agency has a visible privacy statement which is a legal statement that informs the website's users as to how the personal information they provide will be used, disclosed, and managed. Based on the finding of the websites checked, a questionnaire was developed in order to meet the aim and objectives of the study regarding privacy considerations of expected users of eGovernemnt. The questionnaire is comprised of different types of questions, such as those requiring yes/no responses, multiple choice responses and Likert scale responses divided into two sections: section one is about personal information and contains five questions. Section two is about the eGovernment users participants' opinions regarding privacy issues when using Saudi government websites, and this section contains six questions. The questionnaire was distributed online, and SPSS 15.5 was used to analysis the data. Frequencies and basic techniques had been adopted, mainly cross tabulation. Tables and figures were used to display and summarize the findings. The data used in this study for both methods were collected between August 1 and 10, 2014.

RESULT AND DISCUSSION

The result of evaluating the 174 Saudi government websites in terms of having visible privacy statements in general is disappointing, taking into consideration that the

eGovernment project in the country was established in 2005. The result shows that 44% (76) of the websites checked have a visible privacy statement and 39% (68) do not, and the rest of the websites (30) representing (17%) did not respond. The following figure shows the evaluation result by the categorization of the directory.
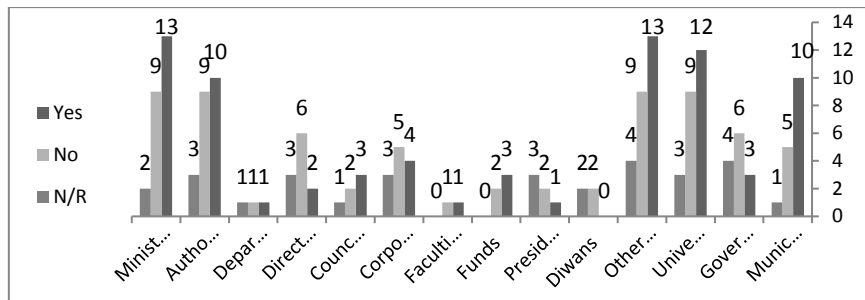

Figure 1: Availability of privacy statement

Regarding the terminology used to present the statement, it was clear that there is no standard term used. For example, in English (privacy statement) is the standard term used to inform the website's users as to how the personal information they provide will be used, disclosed, and managed; however, in Arabic more than one term can be used to represent the same concept of privacy. The most commonly used terminology, about 70%, used within these websites when translated into English is "privacy statement". Other terms included: privacy approach, privacy document, privacy statement document and privacy. This is something unacceptable as these websites should use standard clear labels, which has been recommended when designing government websites. On the other hand, the privacy statement in these websites varies from site to site, and this is because until now there is no specific data protection act in the country and the privacy statement provided in these websites is built based on several laws, specifically al-Shariʿah principles (Noor Al-Fawzan and Omar Elsayed, 2012).

For the questionnaire, the following table shows the demographic characteristic of the participants:

Table 1:Demographic characteristics of the participants				
	eGov Users		**Non Users**	
	N	*%*	*N*	*%*
Gender				
Male	28	90%	3	10%
Female	16	73%	6	27%
Demographic characteristics of the eGov users participants				
Age				
20-29	32	73%		
30-39	12	27%		
40-49	0	0%		
Over 50	0	0%		
Education level				
Basic	0	0%		

Secondary	10	23%
Undergraduate	34	77%
Postgraduate	0	0%
Internet experience		
Year >	0	0%
1-2	0	0%
3 <	44	100%

Out of 31 male participated in this study, 28 had used government websites compared to 3 who had not. For females, as can be seen, 16 out of 22 female participants had used government websites compared to 6 who had not. For the purpose of the study, only actual eGovernment users were included. First, there is a slight difference between males and females regarding knowing their privacy right when accessing government websites with a mean value of 2.21 and 2.56 respectively for males and females. Regarding their consideration about their privacy during use of government websites (e.g., registration, conducting transaction via government websites male are more concern with a mean value of 4.18 and 3.88 respectively for males and females. On the other hand, the majority rarely looked at the privacy statement before providing their personal information as 4%, 32%, 39%, and 25% respectively for always, often, sometimes, rarely and never. Moreover, there was no difference among participants regarding their feeling when providing their personal information when using government websites with a mean value of 3.23. However, regarding their thought of the amount of personal information they have to provide when registering or conducting electronic transaction with government agencies, as well as their thought of the availability with a mean value of 2.25 and 2.18.

CONCLUSION

Privacy is one of the most important factors affecting the use of eGovernment services, which can lead to a total or partial failure. In developing countries, the situation is more complex as these countries have not developed their policy and law yet. The key point here is that eGovernemnt is not just about technologies; it is about changing the way in which government works. Non-technical barriers, including privacy, should have considerable attention as technical aspects. In this study, as can be seen, the results of government websites evaluation is disappointing, and this is because the eGovernment project was established in 2005 and up to now the fundamental aspects of any government websites have not yet been met. Moreover, although participants in this study were somewhat satisfied with Saudi government websites' performance in terms of privacy issues, more work is needed. A privacy act needs to be developed, as well as to be available within all government websites with standard terminology used. Also, people's privacy needs to be protected, and this is the role of government to increase the awareness of how people can protect their personal information.

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KNOWLEDGE MANAGEMENT AND LEARNING CULTURE IN HIGHER EDUCATION

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ABSTRACT

This study concentrates on finding the relationship between organizational learning culture and knowledge management in order to introduce a model of knowledge management with regard to the effect of organizational learning culture. The seven hypotheses of this study tested 42 relationships between organizational learning culture dimensions and knowledge management dimensions. Sixteen branches of Islamic Azad universities in Esfahan, Iran, were selected for data gathering. These universities have 1562 faculty members. Based on Kukran formula, the designed sample size was 226 persons. Data analysis was done using Structural Equation Modelling. Following confirmatory factor analyzing), and modifications made in the model, hypothesis testing was done. Based on seven hypotheses, 19 out of 42 relationships were supported and others were not supported in the place of study. The findings showed that creating an opportunity for continuous learning had an effect on knowledge identification, utilization and knowledge sharing. Developing the culture of inquiry and dialogue had an effect on knowledge creation and knowledge storage. Encouraging team learning had an effect on knowledge identification, creation, utilization and knowledge storage. Empowering others had an effect only on knowledge identification. Developing a systematic training had an effect on knowledge identification and creation. Developing a systematic communication had an effect on knowledge creation, utilization and knowledge sharing. Strategic leadership had an effect on knowledge utilization and knowledge creation. A model of the relationship between organizational learning culture and knowledge management was developed which can be utilized by universities in order to increase their knowledge management system by paying more attention to organizational learning culture.

INTRODUCTION

In this era which has been called the era of knowledge, knowledge and knowledge management are introduced as the strategic sources for every organization, especially for universities. On the other hand, many researchers are of this belief that one of the important factors in knowledge management development is organizational culture (Lee & Lee, 2007; Zaim, Taoglu, & Zaim, 2007). In addition, having a good learning culture that can support the knowledge management is quite necessary in an organization.

While there are many researches about the relationship between organizational culture and organizational learning with knowledge management, there is a lack of study about the relationship between organizational learning culture and knowledge management.

In this study, after reviewing several researches on knowledge management and organizational learning culture, the influence of organizational learning culture in knowledge management is investigated in Azad Universities in Esfahan. Esfahan is the second largest city in Iran. This study can help the universities' executives to recognize the organizational learning culture factors which influence the knowledge management process. Therefore, it can help them reach the best strategies for their knowledge management plans.

Organizational Learning Culture (OLC) and Knowledge Management (KM)
Knowledge management is one of the important factors in competitive advantages. In fact, many opportunities for developing human resource performance and competitive advantages are created by knowledge management. Pauleen and Manson's research showed that the most important barrier for knowledge management implementation in organizations is cultural and managerial factors (Pauleen & Manson, 2002). In addition, Monavarian (2006) in his research on the knowledge management illustrated that cultural factors are important parameters in knowledge management implementation. He also introduced organizational culture, information technology, human resources and training as the factors which have a positive effect on knowledge management.

Nemati (2006) explained that the biggest challenge of knowledge management in Iran's higher education is a cultural one. Many higher education professionals believe that universities are the main organization for promoting the learning process in the society. They must transform the society to a learning society, create the culture of knowledge sharing, and utilize knowledge management strategy efficiently.

Organizational Learning Culture and Knowledge Management In Universities
Through a successful implementation of knowledge management and use of its potentials, acquiring competitive advantage and knowledge development capabilities would be easier for universities. While there are many researches on knowledge management and its operative factors, the effect of OLC dimensions of knowledge management is an area which has received less attention. Nevertheless, reviewing the researches related to knowledge management and/or organizational learning culture, particularly the ones focusing on universities, would be useful for the current study.

Mosavi Khatir et al. (2009) investigated in their research the factors affecting the success of knowledge management in several Iranian universities. They concluded that universities use factors such as culture, leadership, technology, process, training, learning and structure at less than average rate. Another study at some large universities in Iran (including University of Tehran, University of Esfahan, Tarbiyat Moddares University, Alzahra University, University of Mazandaran, University of Gilan, University of Yazd, University of Arak, and Razi University) showed that these universities are not in good condition with regards to the level of knowledge management indicators (Madhooshi & Niyazi, 2011). In fact, most research about the relationship between organizational culture, organizational learning and knowledge management, were done in the industrial arena. Therefore, a study of the important process of knowledge management in universities, and finding these relationships within universities seem to be of vital importance (Gholtash, Salehi, Javdani, & Sina, 2011).Holowzki (2002), in his research, investigated the organizational culture and knowledge management in Oregon University. He concluded that as knowledge management can be a competitive advantage, organizational culture also determines the corporate strategy. He also explained that focus on organizational culture is a key concept of knowledge management (Holowzki, 2002). Furthermore, the research results of Kantrobanda (2004) showed that the most essential factors influencing knowledge management processes are empowering human resource and

organizational learning. Pajohan (2009), investigated the relationship between organizational culture and knowledge management implementation in Islamic Azad University of Tehran, Iran. The result of his research indicated that there is a significant relationship between organizational culture and knowledge management implementation.

Parham (2010), in his research at Shahid Chamran University in Ahvaz, Iran investigated the with regard to of this university for implementation of knowledge management models regarding the seven factors, including: internal processes, technology, culture, measurement, human resources and leadership. The results indicated that none of the key factors for knowledge management implementation were at a satisfactory level.

The results of a research done by Abdullah (2008) in a number of higher education organization in Malaysia showed that users' knowledge of implementation and usage of knowledge management system was not acceptable. The fundamental constructs for knowledge management in Tabriz University, Iran have been studied by Adineh Ghahremani et al. (2011). They concluded that use of four constructs, including organizational culture, organizational structure, process, and financial support was not at a satisfactory level, while use of human resource and technology seemed to be in a better condition. Gholtash et al. (2011), found a strong relationship between organizational culture, organizational learning and knowledge management in Islamic Azad University of Marvdasht, Iran. In addition, King (2009) concluded in his research that organizational learning is a complementary element of knowledge management.

In a research in several public and private (Azad) universities in Iran, Doaee and Dehghani (2011) showed that in public universities, knowledge management is highly considered by managers and planners while in private (Azad) universities, knowledge management dimensions are not at the desirable level. He also noticed that there is a gap between employees' expectations and perceptions.

Organizational Learning Culture Dimensions
While organizational learning culture facilitates efficient adaptations to challenging environments, it also extensively helps in the ongoing development of an organization (Cunningham & Gerrard, 2000). This learning ability has to be the continuing and driving force for all organizations in order to adjust to any unexpected changes in the environment. There is a link between organizational learning culture and employee and organizational performance, and also psychological and economic outcomes (Pantouvakis & Bouranta, 2013).
Watkins and Marsick (2003) stated that organizational learning culture is more associated to the learning organization's concept. They proposed an integrated model and specified seven dimensions of a learning organization culture which are: Continuous learning, Inquiry and dialogue, Team learning, Embedded system, Empowerment, System connection (in this study it is called "systematic communication"), and Strategic leadership.

Knowledge Management Dimensions
Knowledge management is illustrated as a multidimensional construct with a great quantity of interrelated characteristic (Darroch, 2003). In fact, the definition of knowledge management changes from organization to organization, even from program to program (Call, 2005). For the purposes of this paper, knowledge management process is defined as "the procedures that identify, create, and organize the necessary knowledge; that will storage and share the knowledge, and finally apply or utilize knowledge in the organizations." This study used

following dimensions of knowledge management: Knowledge identification, Knowledge creation, Knowledge organization, Knowledge storage, Knowledge sharing, Knowledge utilization (Probst, 1999).

Hypotheses
The main hypothesis of this research is: "Organizational learning culture has a positive effect on knowledge management". To test this main hypothesis, 7 sub-hypotheses were posed as follows:

H1: Creating an opportunity for continuous learning has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

H2: Developing the culture of inquiry and dialogue has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

H3: Encouraging team learning has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

H4: Empowering others has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

H5: Developing a systematic training has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

H6: Developing a systematic communication has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

H7: Developing the strategic leadership has a positive effect on knowledge identification, creation, organizing, storage, sharing, and utilization, respectively.

METHODOLOGY

This study was done in 16 Islamic Azad universities in Esfahan, Iran. Esfahan is one of the largest cities in Iran, with 23 branches and 6 centers of Islamic Azad University. The sixteen branches chosen for data gathering are ranked as comprehensive, very large, large and medium sized branches, and others are small sized. These universities have 1562 faculty members. In order to calculate the sample size, this study used a pilot study. For the pilot study, 30 questionnaires were distributed in some related universities. Therefore, the adequate sample size calculated by the Kukran formula was 226 people.

To get the proper number of respondents, 250 questionnaires were distributed in selected universities. 142 questionnaires were returned after approximately two months. From this amount, 11 questionnaires were incomplete. In addition, since no major changes were made to the questionnaire following the pilot survey, these questionnaires (30) were also included in the final total of the collected questionnaires. Therefore, the usable questionnaires for analysis were 161 which represent a response rate of 71 percent.

The questionnaire's items were adapted from previous studies and modified for use in this study. Organizational learning culture was assessed by the 21 items of the questionnaire from research by Watkins and Marsick (2003). Knowledge management items were derived from the knowledge management assessment instrument by Liebowitz (2004) and knowledge sharing practice questionnaire by De Vries et al. (2006).

RESULTS AND DISCUSSION

Ahead of the gathering of the data, a reliability test was done using Cronbach's alpha value. The test showed the over level of 0.7 for each contract which indicated that the questionnaire was reliable. Structural equation modeling was used to analyze the model. First, the

measurement model was examined in order to instrument validation, followed by an analysis of the structural model for testing association's hypotheses. The measurement models with all thirteen constructs were evaluated using confirmatory factor analysis. While testing each variable separately showed a good model fit, evaluating the total measurement model showed that CIMIN/df is the only indicator with an acceptable value (less than 3), and other indicators did not have acceptable values as is illustrated in Figure 1 (AGFI = 0.640, GFI = 0.695, CFI=0.641, TLI= 594, and RMSEA = 0.084). Therefore, the model needed modification.

As the estimates showed, the correlation between KO and ID was more than 1. Therefore, one of them must be dropped from the model. As the main focus of this study is on organizational learning culture, it would be better not to drop the pertinent construct. Therefore, KO was the construct which was decided to be dropped. The results of the model estimate, after dropping the KO, did not show good model fit indicators. Therefore, more modification was needed. The results of item correlation showed that there were high correlations between some items. As a result, some of these items, including the first item of inquiry and dialogue (ID1), the third item of team learning, the first item of systematic communication (SC1), the third item of knowledge storage (KS3), the third item of team learning (TL3), and the first item of knowledge creation (KC1), were deleted from the model, step by step. Apart from the AGFI, which is a little less than 0.8, the model showed the best fit indices.
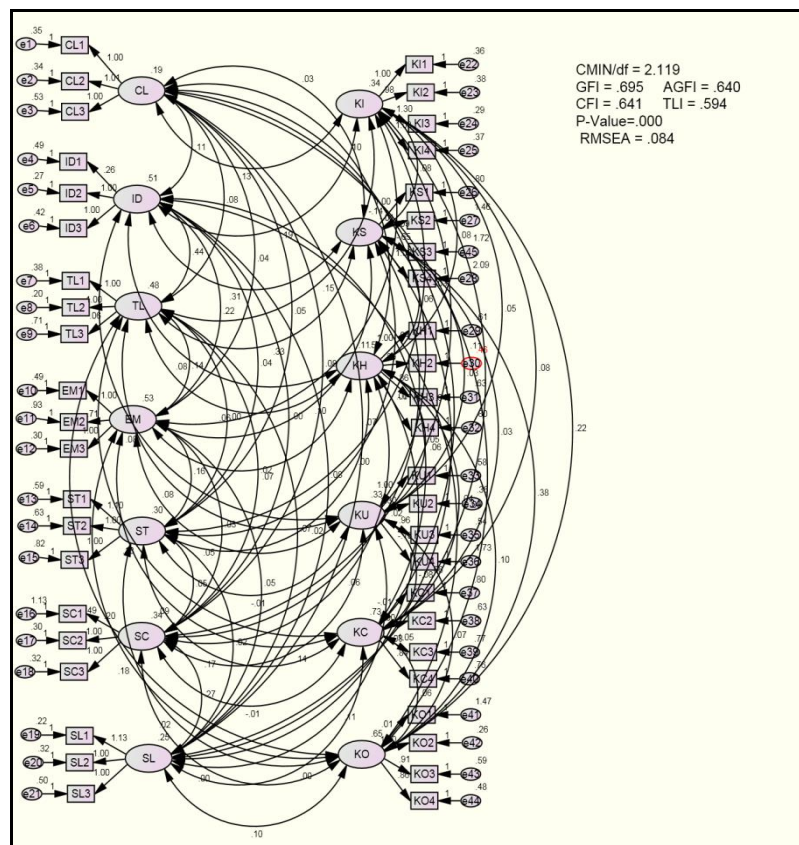

Figure 1. Measurement model

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Ahead of dropping one construct (KO) and five items (ID1,SC1,KC1,KS3, TL3), the model was fitted and the structural model was developed to test the hypotheses (Figure 2). Since one of the constructs (KO) was deleted from the model, the hypotheses also decreased to 6.
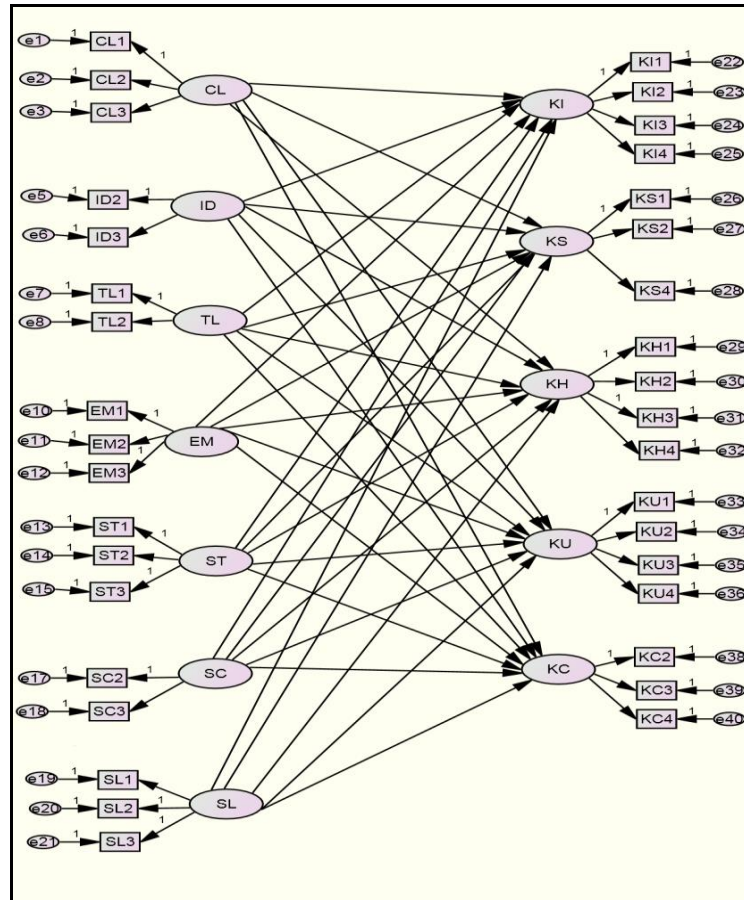
Figure 2. Structural model

Multiple regression analysis was applied to examine the significance of each hypothesis. The results of regression analysis are represented in Table 3. This table shows that some of relationships have a P-value more than 0.05, as highlighted in grey. Relations with values more than 0.05 are not significant, and must be deleted from the model. Therefore, these relations need to be deleted from the model. It would be better to leave out the parameters step by step. By following such a method, one of the variables may remain in the model.

To have the significant regression weights the relations with a P-value more than 0.5, 0.2 and 0.07 were deleted in three steps. These relations were included KS-ST, KS-EM, KC-CL, KC-EM, KU-ST, KH-SL, KS-ST, KS-EM, KC-CL, KC-EM, KU-ST, KH-SL. Final structural model is illustrated in figure 3.

Table 2. Regression weights for the structural model

			Estimate	S.E.	P
KS	<---	TL	.899	.081	<0.001
KS	<---	EM	.036	.070	.605
KS	<---	ST	.090	.150	.549
KS	<---	SC	.154	.140	.270
KH	<---	SC	.184	.101	.068
KH	<---	ST	.122	.085	.149

|			Estimate	S.E.	P
KH	<---	EM	.051	.037	.172
KH	<---	TL	.022	.031	.478
KH	<---	CL	.363	.183	.048
KI	<---	CL	1.282	.303	<0.001
KS	<---	CL	.351	.181	.052
KU	<---	CL	.956	.280	<0.001
KC	<---	CL	.126	.280	.653
KI	<---	ID	.058	.067	.386
KS	<---	ID	.258	.075	<0.001
KH	<---	ID	.031	.034	.360
KU	<---	ID	.077	.080	.335
KC	<---	ID	.586	.120	<0.001
KI	<---	TL	.131	.064	.042
KU	<---	TL	.157	.077	.043
KC	<---	TL	.680	.115	<0.001
KI	<---	EM	.136	.064	.036
KU	<---	EM	.067	.076	.377
KC	<---	EM	.007	.105	.945
KI	<---	ST	.323	.156	.039
KU	<---	ST	.035	.172	.840
KC	<---	ST	1.627	.357	<0.001
KU	<---	SC	1.263	.237	<0.001
KC	<---	SC	1.139	.261	<0.001
KH	<---	SL	.002	.045	.957
KS	<---	SL	.111	.106	.293
KU	<---	SL	.208	.117	.075
KC	<---	SL	.500	.166	.003
KI	<---	SC	.756	.168	<0.001
KI	<---	SL	.532	.113	<0.001
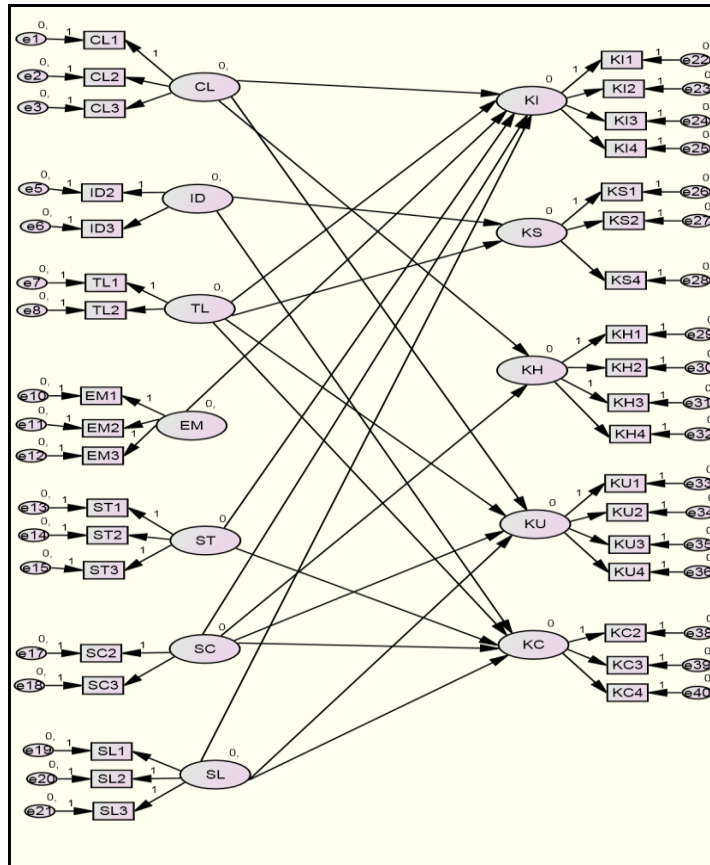
Figure 3. Final structural model

9. Conclusion and Recommendation

The findings show that creating an opportunity for continuous learning have an effect on knowledge identification, utilization, and sharing. Developing the culture of inquiry and dialogue has an effect on knowledge creation and knowledge storage. Encouraging team learning has an effect on knowledge identification, creation, utilization, and knowledge storage. Empowering others has an effect only on knowledge identification. Developing a systematic training has an effect on knowledge identification and creation. Developing a systematic communication has an effect on knowledge creation, utilization and knowledge sharing. Strategic leadership has an effect on knowledge utilization and knowledge creation. Therefore, 19 relationships were supported and 16 relationships were not supported in the places of the study. The final accepted model of this study is shown in Figure 4. Although, theoretically, this study proposed a research model for empirical studies on linking organizational learning culture with knowledge management, the most important advantages rendered by this study come from a practical perspective. From a practical perspective, the model of this study shows how universities' managers can increase the knowledge management through developing organizational learning culture dimensions. The reason for the rejected relationships can be investigated by other researchers. In addition, the research model can be tested further by using samples from other countries or organizations. Future studies can also gather longitudinal data to examine the relationship between variables.
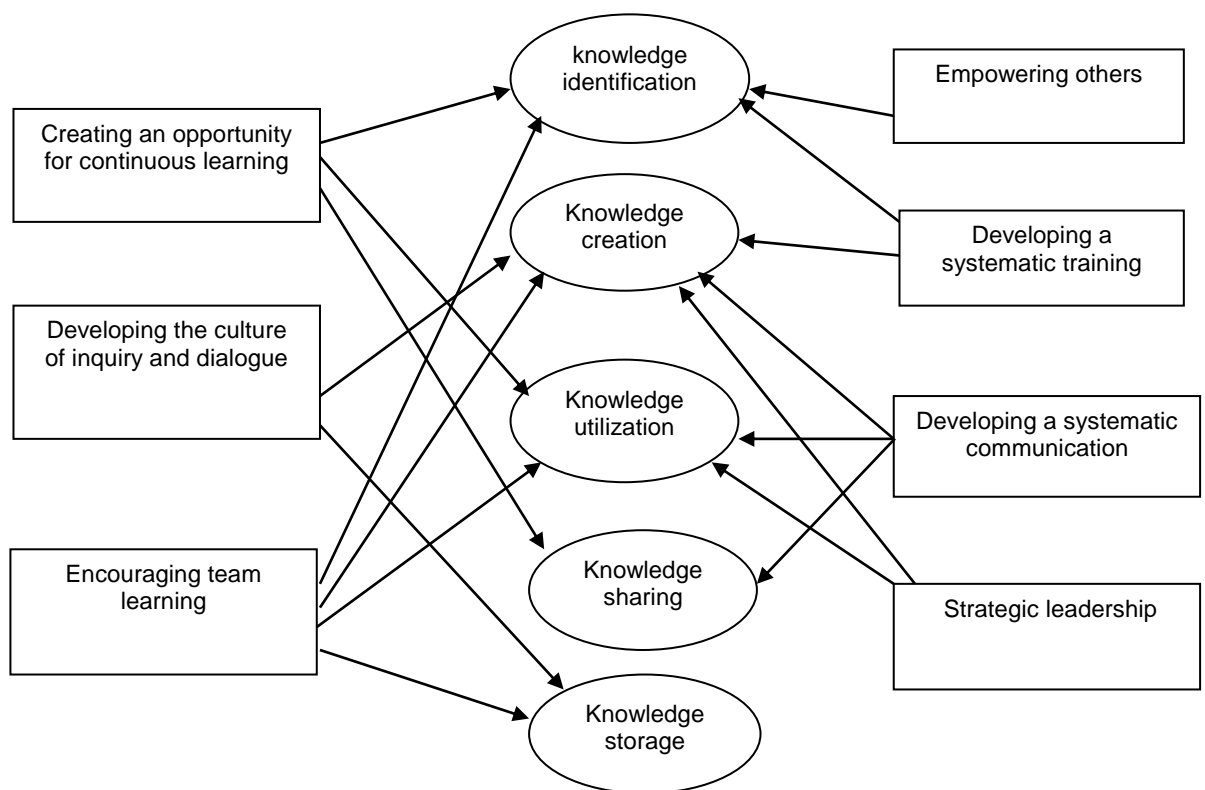
Figure 4. A Model of organizational learning culture and knowledge management

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Appendix

 AGFI   - Adjusted Goodness-of-Fit Index
AMOS   - Analysis of Moment Structure
CFA   - Confirmatory Factor Analysis
CFI   - Comparative Fit Index
CL   - Continuous Learning
Df   - Degree of freedom
EM   - Empowering Others
GFI   - Goodness-of-Fit Index
ID   - Inquiry and Dialogue
KC   - Knowledge Creation
KI   - Knowledge Identification
KO   - Knowledge Organizing
KH   - Knowledge Sharing
KS   - Knowledge Storage
KU   - Knowledge Utilization
RMSEA - Root Mean Square Error of Approximation
SEM   - Structural Equation Modelling

SC   - System Communication
SL   - Strategic Leadership
SPSS   - Statistical Package for the Social Sciences
ST   - Systematic Training
TL   - Team Learning
TLI   - Tucker Lewis Index

A PARSIMONIOUS ADOPTION MODEL FOR THE EDUCATIONA ENVIRONMENT E-SERVICES USABLE FOR IT MANAGERS

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ABSTRACT

Abstract: Societies are changing, as new electronic services are introduced with a rapid pace. Th real challenge for the implementers of these services is to have enough users. It is obvious that an e-Service without users would be a failure. Users adoption to an innovation is very important for the researchers. There are many factors which might influence on the users' intention to use an e-Service and finding these factors is the researchers goal. There are several models to be consider as the adoption model for the new services but implementers are not sure which model is best for their environment. This study tries to find the most influencing adoption factors and will propose and test an adoption model for an educational environment. Qualitative (Interviews) and quantitative (questionnaires) are used to find the important factors influencing the adoption of users. This study is performed in Islamic Azad University-Dehaghan branch between December 2013 and January 2014. First, information Technology managers involving Information Services development were interviewed to find the most influencing factors from the literature review. Second, the proposed model was tested and at last the final adoption model of the study is proposed. This model has one dependent and three independent variables. "Perceived Usefulness", "Observability", and "Compatibility" were the three independent factors. The dependent factor is "Intention to Use". Considering the three important factors of this study would help the implementers of e-Services in education centres in the similar environments, and they can introduce more successful e-Services

INTRODUCTION

Users' Adoption to a technology is becoming a critical issue in societies. This issue is becoming more important in developing countries as these countries have to use innovations that are not developed inside their countries and the cost of these technologies are not low (Carter & Belanger 2005). Therefore, organizations' managers must be careful when they want to implement new technologies. If they want to enjoy the benefits of new technologies, they must consider their users behaviors and they have to be aware about the factors that have impact on their adoption. Several adoption models has been introduced by the researchers all over the world but none of them has been known as a standard adoption model. User's behaviours are dissimilar as their environment, culture, and other conditions are different. Many adoption model comprising several factors were introduced by the researchers but we are still try to find better model for a specific technology.

Universities are implementing e-Services and they want to increase users' number of the e-Services, therefore they need to understand user's behavior and predict how they adopt to a

technology. It is very important for an e-Service to have enough users and this is a key issue for a system to be successful (Davis, 1989). The largest university in Iran is implementing several e-Services for both their students and stuffs. This study is trying to find important adoption factors for the e-services of an education system. Moreover, by comprising these factors an adoption factor will be introduced. This study is trying to use only the most important factors and to present a parsimonious model.

Students and staffs are using e-Services in the university and several new e-Services are being implemented and developed inside the university. One of the issues that must be considered before implementation of the services is the usage rate of the services. Therefore, using adoption models to predict and explain the users behavior is important for the IT managers. This study uses TAM as a model that has been used and tested by many researchers and will integrate it with other important factors. These factors will be revealed by interviewees.

LITERATURE REVIEW

While new technologies are rapidly introducing and these technologies have different characteristics and moreover every society has its own (and sometimes unique) situation, study about the users' needs and their behavior are very essential for the implementers of these new technologies. There is a need to introduce prudent adoption model for these technologies (Carter & Belanger 2005).

While introducing TAM, Davis proposed two factors as the factors that can explain the usage of a system (Davis, 1989) and these factors are perceived ease of use (PEOU) and perceived usefulness (PU). Many researchers have used TAM and other related models to examine adoption of new technologies (Orgeron, 2008). It has been proven that TAM is useful to explain users' intention to use a technology (Legris et al. 2003).
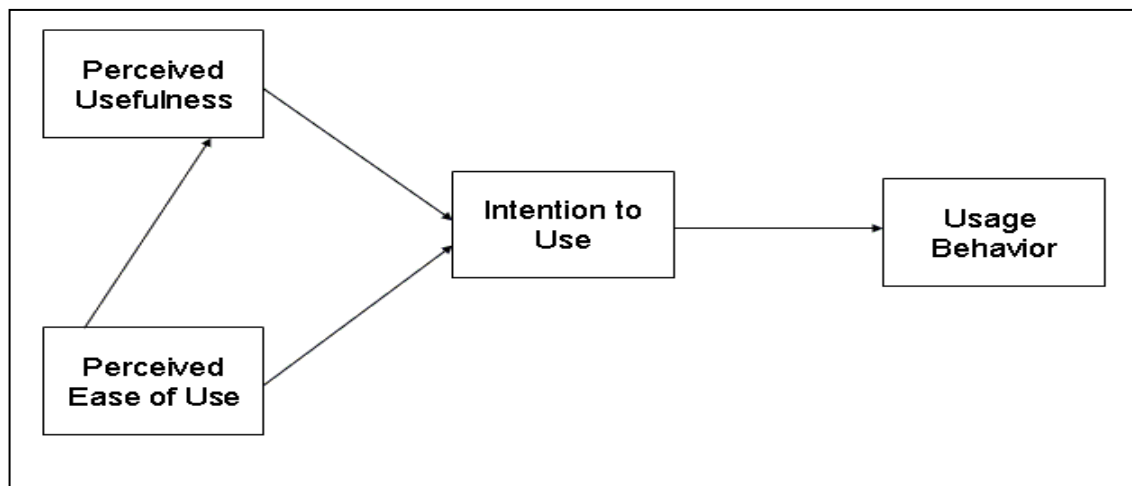

Figure 1. Technology Acceptance Model (Davis, 1989)

However, there are several theories used to explain the users adoption, Technology Acceptance Model (TAM) is one of the most used theory to predict users behavior (Shajari and Mehrabani, 2015). This model was proposed by Davis in 1989 with two main factors: Perceived usefulness and perceived ease of use (Figure 1). Perceived usefulness is "the belief that using a particular system would enhance one's job performance" (Davis, 1989). Perceived

ease of use was defined as "one's perceptions of the amount of effort required to use the system" (Davis, 1989, Venkatesh V. et al, 2003). TAM specify that these two factors directly will impact on the intention to use (ITU) a system.

Another model which is used to specify adoption of a system was introduced by Rogers. He named it diffusion of innovation (DOI). DOI (Figure 2) have five constructs: Relative advantages, complexity, compatibility, trialability and observability (Venkatesh V. *et al*, 2003). Two first factors in this model show the same concept that has been used in TAM.
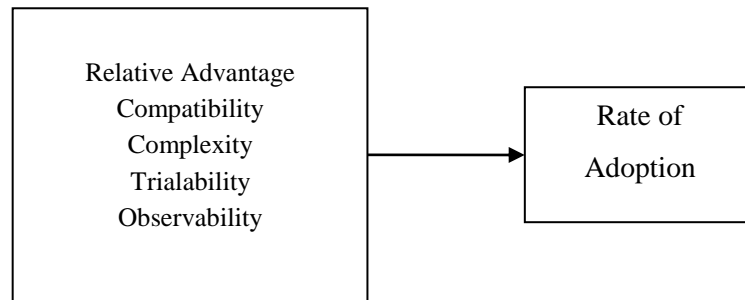

Figure 2. Diffusion of Innovation (Rogers, 2003)

In the year 2003 another adoption model was presented by Venkatesh et al. (Orgeron, 2008) which is the Unified Theory of Acceptance and Use of Technology (UTAUT) and consist of three factors (effort expectancy, performance expectancy and social influence) with direct effect on the usage intention (Figure 3). In this model there are two constructs with the same concept as TAM and DOI which are effort expectancy and performance expectancy.
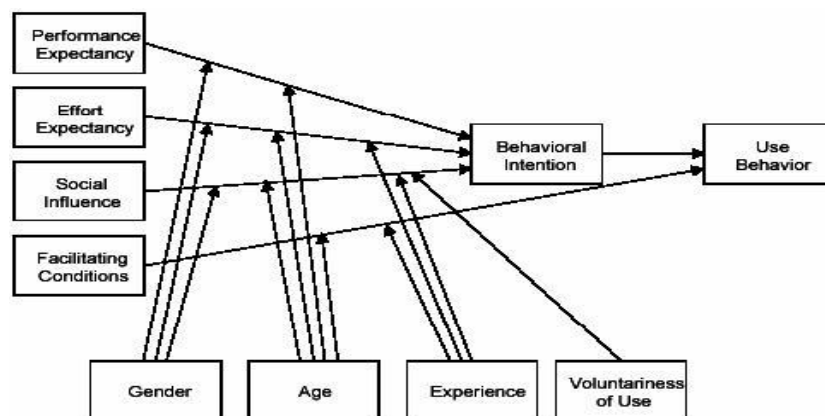

Figure 3. Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)

3. Research Objective

The research main objectives are: (1) To bring out important adoption factors in an educational environment; (2) To present an adoption model for an educational environment. This is done by examining TAM and several related adoption factors, introduced in previous years.

4. Proposed Model

Based on the literature review and an qualitative research an adoption model is proposed for Islamic Azad University as an educational environment in Iran (Shajari and Mehrabani, 2015). The model is presented in Figure 4. The model has a dependent variable (DV) which is intention to use and four independent variables from previous known adoption models. These factors are perceived ease of use, perceived usefulness, observability, and compatibility.
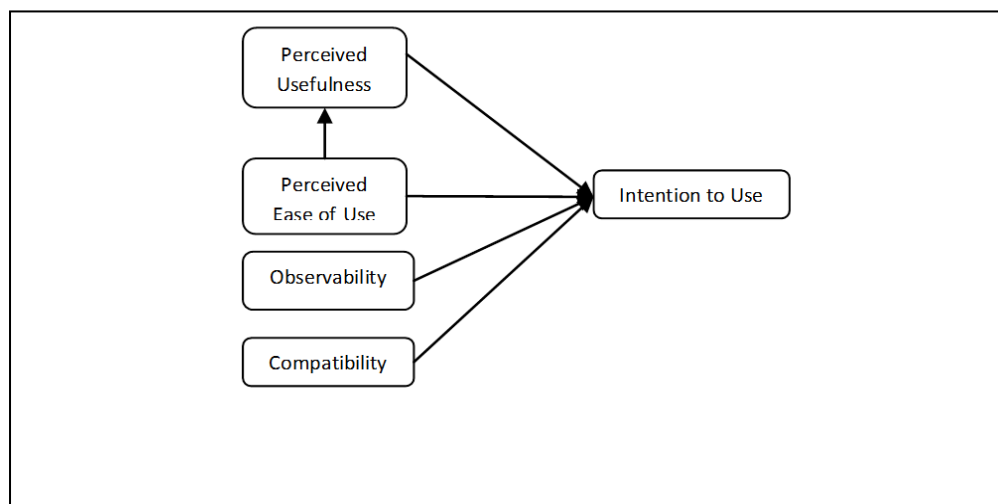

Figure 4. Proposed Model

The most important factors are: Perceived Ease of Use (Complexity, Effort expectancy), Perceived Usefulness (Relative Advantages, Performance Expectancy), Observability, and Compatibility. These four factors can be used to make the proposed adoption model. Complexity from DOI, "Perceived Ease of Use" from TAM and Effort expectancy from UTAUT determine a similar concept. Furthermore, Relative Advantages from DOI, "Perceived Usefulness" from TAM and performance expectancy from UTAUT present the same concept too. Therefore, these factors were put in the same category. One dependent variable (Intention to Use) and four independent variables (Perceived Ease of Use, Perceived Usefulness, Observability, and Compatibility). The definitions of these factors are presented in Table 1.

Table 1. . Factor Definitions

	Variable	Definition
1	Perceived Ease of Use	The degree to which a person believes that using a particular system would be free of physical and mental efforts.
2	Perceived Usefulness	The degree to which a person believes that using a particular system would enhance his or her job performance.

3	Observability	The degree to which the results of an innovation are visible to others.
4	Compatibility	The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopter.

These constructs influence one's behavioral intention to use a system, which, in turn, determines actual system usage (Rogers, 2003).

RESEARCH METHODOLOGY

Quantitative research method is used to test the proposed adoption model. Data gathering has been done December 2013 to January 2014. After designing the measurement model, the constructs were tested for item analysis. The researchers were looking for any irrelevant items in the model. Therefore, each variable was tested separately to be prepared for the model fit analysis. There are diagnostic indicators in SEM, which can show the analyzer how to improve the model by improving the model fit indices. To test the model, this study used AMOS 8.0, which is provided as an additional software package for SPSS users.

RESULTS

This study uses a tester model to examine the proposed model. The tester model (Figure 5) is regularly tested by Confirmatory Factor Analysis (CFA) (Teo, 2011). To test the model, this study used CMIN/df, AGFI, RMSEA, CFI, and TLI indices. The Model fit indices values can be seen in Table 2. Two factors needed modifications which were PEU and OBS.
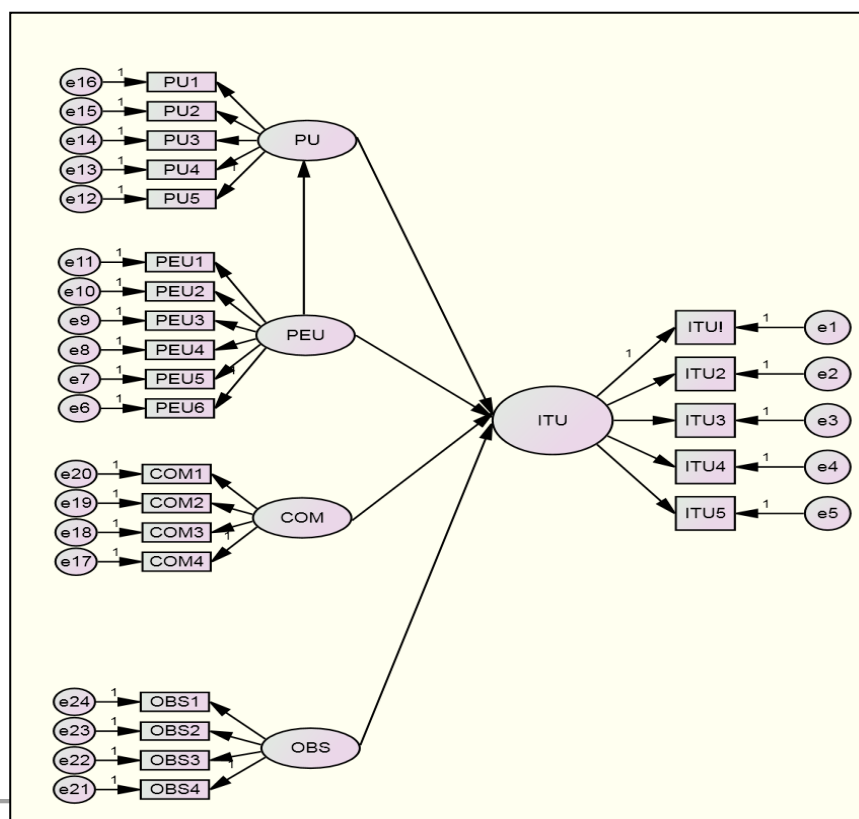
Figure 5. Tester Model

Table 2. . Model fit Indices Values

	CMIN/df	p-Value	AGFI	RMSEA	CFI	TLI
ITU	1.658	0.141	0.965	0.049	0.989	0.978
PU	1.289	0.265	0.973	0.032	0.994	0.988
PEU	4.619	0.0	0.878	0.115	0.856	0.760
PEU (Modified)	0.629	0.678	0.986	0.0	1	1.029
COM	1.88	0.153	0.967	0.057	0.995	0.985
OBS	16.341	0	0.696	0.237	0.813	0.438
OBS (Modified)	0.382	0.537	0.993	0	1	1.023

For a good model fit values, it is recommended that the normal Chi-Square (CMIN/df) to be less than 3, and TLI, AGFI and CFI are all more than 0.9. Also, a good value for RMSEA is a value less than 0.08. The modified model is presented in Figure 6. This model is ready to be tested for the model fit values.
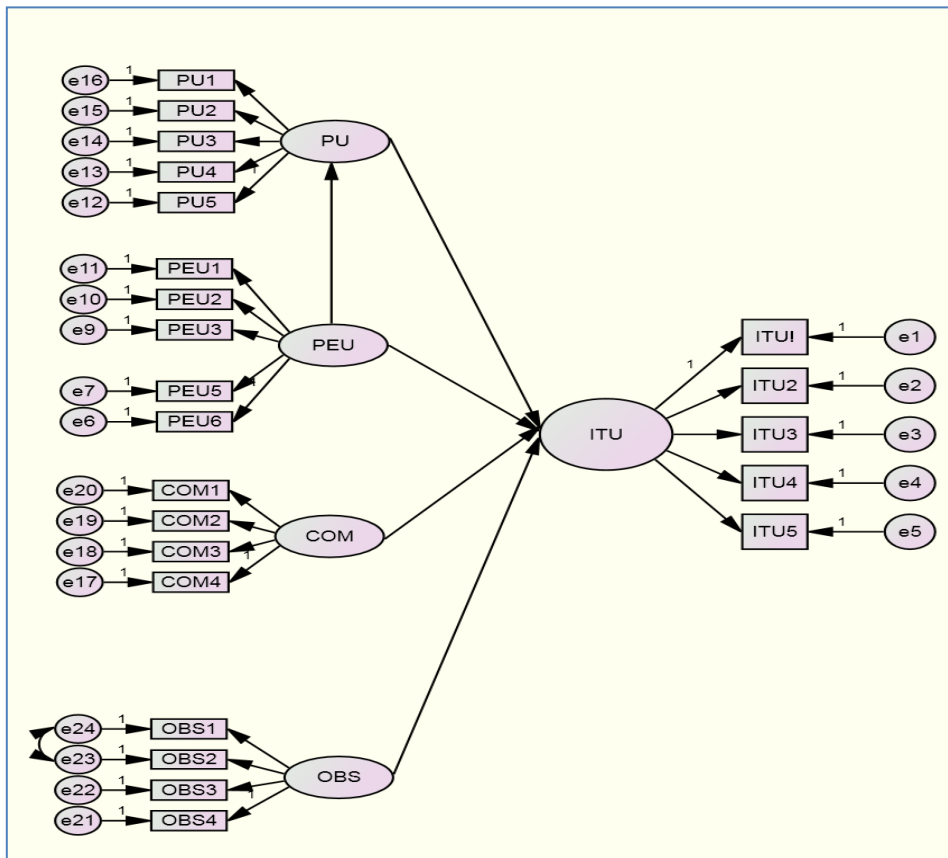

Figure 6. Modified Model

The values for the model fit are illustrated in Table 3.

Table 3. Model Fit Indices after modification

RMSEA	TLI	CFI	P-Value	CMIN/df
0.069	0.819	0.843	0.0	2.323

As it is presented in Table 3, all model fit values are good, therefore the model is appropriate for the further analyses.

SUMMARY AND CONCLUSIONS

Introducing an adoption model for different environments is one of the key issues for the researchers. In this study, an adoption model for an educational environment was presented. This model was based on a qualitative study which was performed in advanced. As the second phase of a larger study, we tested our model and modified it. This model is ready for the final step of the analyses. It is recommended for the other researchers to use and test this model for electronic services in other educational environments.

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ZMANAGING KNOWLEDGE CONSTRUCTION IN DIALOGICAL WORKGROUP PROCESSES

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ABSTRACT

The role of dialogue towards producing complexified knowledge is examined along with its implications for management. Across an ethnographic case study of workgroup members within a large North American aerospace firm, a dialogical model is proposed describing verbal interactions leading towards knowledge complexification. Such an outcome is achieved in part by workgroup managers who nurture an environment conducive towards mutual trust and respect. It is proposed that this, in turn, can be attained across a parental 'safety net' approach.

INTRODUCTION

Organisations can be fertile grounds for the knowledge they possess as well as create. Furthermore, knowledge creation leading towards enriched or complexified knowledge can be viewed as having both a 'defensive' and 'offensive' role within organizations: 'defensive' in that it is primordial in terms of trouble-shooting, problem solving and avoiding deleterious consequences (for example, Weick (2001) speaks of "simplications produce blind spots..." and "...with more differentiation comes a richer and more varied picture of potential consequences"); and 'offensive' in that it is essential for product and service innovation (Nonaka *et al,* 1995, 2004).

This paper, across a past ethnographic case study, first examines and describes the role of dialogue towards producing complexified knowledge; and then proposes the implications for management.

REVIEW OF THE LITERATURE

2. A Few Words on Knowledge

Knowledge is seen as occupying a central place in contemporary modern societies. Yet numerous equivocal concepts have resulted in a range of definitions. Some have come to see it as being divisible into two broad categories: namely, representational and anti-representational knowledge (Von Krogh and Roos, 1996). The representational view sees knowledge as being a representation of a pre-given world with these representations resulting from human cognition (Kakihara and Sørensen, 2002), where cognition in this case consists of purely 'rational'/logical dimensions. Such knowledge is seen as being universal and codifiable.

The anti-representational view sees knowledge as interpretation, as relationship and as process (Kakihara, and Sørensen, 2002):

Furthermore, the knowledge taxonomy of non-representational vs representational can be transposed into an alternative taxonomy of tacit vs explicit knowledge (Nonaka and Takeuchi, 1995). Explicit knowledge covers all of the representational view of knowledge, but also overlaps onto anti-representational dimensions. These latter dimensions cover the very nature of the interpretative/contextual semantic aspect of language such as interpretative ethnographic texts (Geertz, 1998), text as discourse and fiction (Van Mannen, 1988), etc. Tacit knowledge on the other hand is solely non-representational in nature, which Takeuchi (2001, p. 319) divides into 'technical' and 'cognitive' aspects: the former being related to "informal and hard-to-pin-down skills and crafts" as well as "subjective and personal insights, intuitions, hunches and inspirations derived from bodily experience"; and the latter being related to "beliefs, perceptions, ideals, values, emotions and mental models so ingrained in us that we take them for granted...yet shapes the way we perceive the world around us".

Our 'knowledge of knowledge' is a continuously emerging field integrating various contrapositions (e.g. representational vs anti-representational knowledge (Kakihara and Sørensen, 2002); or tacit vs explicit knowledge (Nonaka *et al*, 1995, 2004)), where "knowledge is created in the spiral that goes through pairs of seemingly antithetical concepts such as order and chaos, micro and macro, part and whole…tacit and explicit, self and other, deduction and induction..." (Nonaka *et al*, 2001, p. 14).

2.1   The Individual and the Workgroup as an Ontological 'Starting Point'

Our own ontological starting point as to where ambiguity, contradiction or equivocal points of views are first integrated is at the level of the individual (Nonaka and Takeuchi, 1995; Weick, 1995). Furthermore, we are also interested in examining the individual within the context of a workgroup environment. According to Enriquez (1992, p. 97 and 101), "the group constitutes the privileged location for the comprehension of collective phenomena", in which the "group only establishes itself around an action to accomplish, a project to work on or a task to complete". Group members interact with one another whereby communication is often viewed as the central process of the group. Keeping in mind that communication across dialogue is a prime mechanism for the sharing, conversion and creation of organizational knowledge (Nonaka *et al,* 1995, 2004), it is therefore at the level of workgroup dialogue that we first ask ourselves how and to what degree ambiguity is integrated.

3.   Our Findings on Dialogue

A recent qualitative ethnographic case of specific workgroups within a large North American high-tech firm (pseudonym NorAm Aircraft Engines) allowed us to identify and/or validate certain thematic categories involved in knowledge-complexifying dialogue.

3.1   Perspective-giving

Very often perspectives were transmitted between members in the form of narratives. Here, we define the narrative form as being concerned with the temporal ordering of events, ideas and actions with a focus on "their sequential patterning, their duration and pace, their context and the role of actors" (Holman, 2000, p. 965). Narrations were used as part of overall descriptive explanations given by various members to either assure others that actions had been taken, justify one's own position, report on progress in relation to a specific activity, provide background information to the meeting audience in general or simply to present old knowledge in an entertaining fashion.

The numerous examples of story-telling observed throughout various meetings should not be misconstrued as an argument that all forms of dialogue involved narrations. But it does bring up the notion of a more general category of *perspective-giving*. Boland and Tenkasi (1995, p. 357) speak of narratives as being inherent to the process they refer to as "perspective-making"; but this is in relation to the individual actually generating the narrative. Yet, as Dickey *et al* (2007, p. 50) recently remind us in their own literature review, perspective-making, when articulated towards another individual, involves "the objective...to induce a perspective" towards this very individual known as "perspective giving or perspective setting". Hence, all examples of narration or story-telling can be included within the more general category of perspective-giving. But many more examples of non-narrative forms of perspective-giving were observed; and constituted a major form of exchange in perspectives between the meeting members throughout all of the meetings that were attended.

Here we take a moment to define the non-narrative form as "being concerned with non-temporal patterns such as relationships between propositions, argumentation, descriptions, ideas and evaluations" (Holman, 2000, p. 965).

3.2 Perspective-taking

All of the examples of perspective-giving would have us ask whether or not these perspectives were actually being 'taken in' by the listening members. When we refer to perspective-taking, we are not speaking of agreement on the part of the listening interlocutor but simply that he has taken the other's point of view into account before making up or readjusting his own perspective (Boland and Tenkasi, 1995; Holman, 2000).

Sufficient cues were seen and/or heard to indicate that perspective-taking was predominant across all knowledge-complexifying dialogue.

3.3 Revision of Perspectives

Dialogue between members where perspective-giving and perspective-taking were in constant interaction, led to perspectives being continuously revised; thus echoing Dickey *et al*'s (2007, p. 49) words, that "the ability to change perspective allows individuals to communicate with a multiplicity of partners who hold a wide variety of perspectives". It often appeared in the form of partial discreditations whereby an individual's assumptions, beliefs or practice could be self-perceived to contain both a degree of pertinence, while also needing to be modified in the face of another's input. At other times, we could discern an individual's *tentative* self-discreditation in the face of the other's input, reminding us of Weick's (2001) 'healthy doubt'. On occasion, a 'full' or 'complete' self-discreditation of an individual's retained assumption seemed to occur in parallel to the formation of a new perspective as a result of someone else's input.

Examples of revisions observed throughout group member interactions, were easily discerned across cues such as "Oh ok, now I see what you mean" and "All along I was thinking it was doing…Now I get it.".

4. Knowledge Construction across Dialogue

Based on the four categories observed within the various group interactions, we can now propose a dialogical model on how knowledge seemed to be constructed. Our analysis clearly showed the two strong emergent categories of perspective-giving and perspective-taking to be complementary processes which helped the interlocutors attain what Boland and Tenkasi (1995) and Dickey *et al* (2007) refer to as 'shared understandings'. A relatively clear transmission of a perspective not only clarifies a perspective in the sender's mind (hence perspective-giving = perspective-making: Boland and Tenkasi (1995) and Dickey *et al* (2007)), but is also the first step towards providing the *potential* for the receiver to take in the sender's perspective. That is not to say perspective-taking is an automatic process as a result of the sender's perspective-giving. Taking in the other's point of view, as Mead (1934) explained, involves "taking the attitude of the other" and of being fully human by maintaining "an inner conversation with a generalised other". Furthermore, as Schober (1996, p. 142) states, "communication is unsuccessful when neither party manages to mentally 'step into the other's shoes', to be non-ego-centric".

Clearly seen within group and inter-group interactions was a continuous cycle of immediate reciprocity between the listener-become-speaker and the speaker-become-listener. Perspective-giving was received by perspective taking, or in a more layman's term, 'active listening'. This leads us towards a basic 'perspective coordination' between two interlocutors named '*Self*' and '*Other*' (central 'loop' in figure 1).

Closely associated to the perspective giving/perspective taking process was what appeared to the process of revision of perspectives in line with Krauss and Fussel (1991, p. 2), whereby each member's perspectives within the inter-group meeting were periodically being revised in terms of their retained knowledge (as belief, opinion, practice, etc.). This revision of retained knowledge occurs as a result of the perspective-making process (reciprocal loop seen on both the left and right hand side of figure 1). In turn, a newly revised perspective retained by a member will also have an influence on the subsequent incoming perspective being taken in by this same member
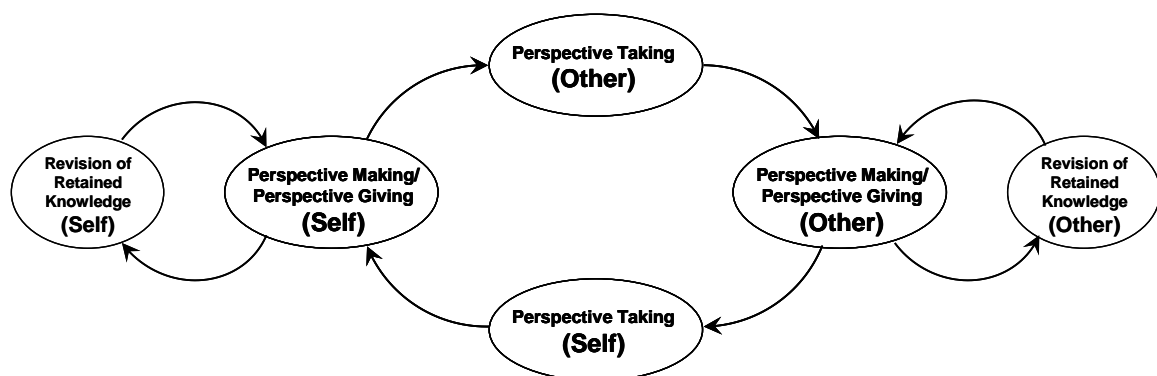

Figure 1: Perspective coordination process between Self and Other.

4.1   Knowledge Complexification as Openness to Antithetical Concepts

As discussed in section 2, dynamic interaction between complementary oppositions, ambiguities or antithetical concepts is an essential 'feedstock' towards knowledge

complexification. In this sense, numerous dynamic contradictions within our study were seen at work leading towards the expression and transmission of enriched individual perspectives.

The first and most obvious antithetical dyad at work was the co-existence, interaction and conversion of tacit and explicit knowledge. Explicit knowledge was articulated verbally (as perspective-giving) often in the form of metaphors, analogies and stories, thereby confirming Nonaka et al's (1995, p. 64) externalisation (tacit to explicit conversion) at work, whereby individuals use their discursive consciousness towards articulating interactive dialogue. Furthermore, perspective-taking involved the taking in of others' perspectives which often implied the beginning of learning-by-listening to others' narratives, whereby members feel the realism and essence of the story that took place so as to convert it into a tacit mental model (Nonaka *et al,* 2004, p. 64).

Other antithetical dyads at work included dialogue vs action as seen across the perspective making complemented by the boundary construction process. In this way, as per Nonaka, Toyama and Konno (2001, p. 14 and 16), it provides the basis (in dialectical fashion) for further ambiguities or complementary oppositions to interact together, which in turn, further reinforces the tacit/explicit dyad and its respective conversions.

One interesting series of interacting antithetical dyads was seen across the complementary strengths between dialoguing members. Certain members for example, seemed more centred towards technical and practical hands-on knowledge, while others were more centred towards the theoretical aspects of engine design – complementarities which interacted, transformed, entrained and complexified one another. Another similar type of antithetical dyad could be seen across the relative knowledge balance between younger and older members. Often, the older members provided ways in which to solve problems (or avoid them altogether) based on their experience and/or the network of contacts they had amassed over the years. The younger members, on the other hand, tended to be stronger within the realms of information technologies as well as having stronger competencies for numerical modelling activities.

5. Management's 'parental' role

What was the role of management in all of this? Certain managers had indicated through their actions and words on the importance of developing a sense of self-confidence amongst the members. Furthermore, as one manager explained, this self-confidence can be gradually developed with time by providing a psychological "safety net", whereby people feel comfortable in learning and trying new ideas. Here we are reminded of Bateson's (1978, p. 498) words:

> "During the period when the acrobat is learning to move his arms in an appropriate way, it is necessary to have a safety net under him, i.e., precisely to give him the freedom to fall off the wire. Freedom and flexibility in regards to the most basic variables may be necessary during the process of learning..."

Within this environment, mistakes or errors are not condemned but rather seen as opportunities to learn, improve oneself and improve the group collectively across the sharing of 'lesson's learned'. The importance of developing self-confidence amongst the group members reminds us of Khan (preface in Winnicott (1971)) with respect to mother-child relationships in regards to child development. It is like the nurturing and supportive action of a mother which gives the child self-confidence to further discover his environment and face

and adapt to conflicts – conflicts which will help him evolve. This parental approach requires a judicious balance between encouraging a gradual transition towards autonomy as members gain confidence and knowledge on the one hand, and always being present in the background so as to provide needed support when members face particularly daunting issues and problems on the other hand. The parental or psychological "safety net" provides a shared belief amongst the members that the group "is safe for interpersonal risk-taking" (Edmonson's, 1999, p. 351); and thereby encourages the willingness to learn, share and create new knowledge (Bogenrieder and Nooteboom, 2004). The lack of such a "safety net" tends to prevent individual risk-taking which is necessary in exploring new venues of knowledge, while on the other hand, discourages the learning and sharing of knowledge amongst various members. Here, members can often fall into an individualistic survival mode, whereby, in an attempt to compensate for the absence of a general shared feeling of psychological safety, have recourse towards various psychological defences leading towards a "relational risk" in which members hold back critical knowledge from one another (Bogenrieder and Nooteboom, 2004, p. 293-294).

CONCLUSION

The role of dialogue in the complexification of knowledge was first reviewed, whereby a dialogical model towards this end was first proposed: based upon emergent categories within a recent ethnographic case study, it brings forth the notions of perspective-making/giving and perspective-taking at the interpersonal level whereby it describes micro-interactions between individuals (as represented across *Self* and *Other*). Antithetical, yet complementary, knowledge was expressed, integrated and synthesized within the dialogical process.

Management plays a key role towards nurturing such a rich dialogical environment across a parental approach – involving complementary yet opposing enabling conditions of encouragement to take initiatives on the one hand, yet also feel the psychological 'safety net' around them that will support them when encountering daunting issues .

This case study prevents us from generalizing outside of the firm's context. As such, similar studies in other institutions within the knowledge economy are to be envisaged.

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A MATHEMATICAL APPROACH FOR SOLVING FUZZY LINEAR FRACTIONAL PROGRAMMING PROBLEM

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ABSTRACT

Abstract- The goal of this article is to lead with a fuzzy linear fractional programming problem where all the objective function, the coefficients and the resources are triangular fuzzy numbers. We first transformed into an equivalent multi objective linear fractional programming (MOLFP) problem. Using fuzzy mathematical approach we transformed into an equivalent multi objective linear programming from the problem has been formulated in the proposed methodology. The proposed solution illustrated to solve numerical examples which gives same expected results with the existing methods.

Keywords- Linear programming; Linear fractional programming; Triangular fuzzy number

INTRODUCTION

There have been significant developments in the theory and applications of fractional programming in the last years. In real world problem, the possible values of coefficients of a linear fractional programming problem are often only imprecisely know to the expert. If the coefficients are not exact due to the errors of measurement with market conditions etc. These conditions can be modeled efficiently through fuzzy linear fractional programming (FLFP) problem. The fields like, financial planning, production planning, marketing planning, industry planning, health care etc.. The above real life problem can be solved by linear fractional programming problems.

Many researchers are interested to work in this field because of real life application. Generally, two types of problems implying fuzzy uncertainty are studied in the literature. Charnes and Cooper [15] proposed several methods for solving linear fractional program by transforming it to an equivalent linear program. Bitran and Novaes [25] considered updated objective functions method to solve linear fractional program by solving a sequence of linear programs whereas Dinkelbach [16] used parametric approach to solve a linear fractional programming problems.

. However, their approach does not necessarily guarantee an efficient solution. Gomes et al. focused on multi objective linear programming problem having weights established some optimality conditions.

Most of the FLFP problems can be modeled and solved by fuzzy goal programming approach [1-3, 7,9,10], but very least researchers considered FLFP problem where fuzzy coefficients are fuzzy numbers. Most of the work listed above deal with fuzziness either in the constraints inequalities or in the aspiration levels of the decision makers. To best of our knowledge, no work has been studied on fuzzy linear fractional programming problem with fuzzy coefficients. In this paper, fuzzy linear fractional programming problem where all the objective function, the coefficients and the resources are triangular fuzzy numbers. We first transformed into an equivalent multi objective linear fractional programming (MOLFP) problem. Using fuzzy mathematical approach we transformed into an equivalent multi objective linear programming from the problem has been formulated in the proposed methodology. The rest of our work is organized as follows: In Section 2, we review some concepts of fuzzy numbers. In section 3, the method of converting LFP problem into LP problem is proposed. The proposed algorithm for transforming MOLFP problem into MOLP problem and used fuzzy programming technique is discussed in Section 4. In Section 5, the method of solving FLFP problem using fuzzy mathematical programming approach. In Section 6, the proposed method illustrated through a numerical example. Finally, we presented our proposed method is very effective method in the conclusion part in Section 7.

Basic Notions:

We have presented some basics concept of fuzzy triangular number, which was very useful in this paper.

Definition 2.1: [4]

Let X denotes a universal set. Then a fuzzy subset $\tilde{A}$ of X is defined by its membership function $\mu_{\tilde{A}} : X \to [0,1];$ which assigned a real number $\mu_{\tilde{A}}(X)$ in the interval [0, 1], to each element $x \in X$, where the values of $\mu_{\tilde{A}}(X)$ at x shows the grade of membership of x in $\tilde{A}$. A fuzzy subset $\tilde{A}$ can be characterized as a set of ordered pairs of element x and grade $\mu_{\tilde{A}}(X)$ and is often written $\tilde{A} = (x, \mu_{\tilde{A}}(x)) : x \in X$ is called a fuzzy set.

Definition 2.2 [4]:

A fuzzy number $\tilde{A} = (b,c,a)$ is said to be a triangular fuzzy number if its membership function is given by

$$\mu_{\tilde{A}}(X) = \begin{cases} \dfrac{(x-b)}{(c-b)}, & b \le x \le c, \\ \dfrac{(x-a)}{(c-a)}, & c \le x \le a, \\ 0, & else. \end{cases}$$

Definition 2.3:

A triangular fuzzy number (b,c,a) is said to be non-negative (non-positive) triangular fuzzy number if and only if $b \ge 0 \, (a \le 0)$.

Definition 2.4 [4]:

Two triangular fuzzy number $\tilde{A} = (b,c,a)$ and $\tilde{B} = (e,f,d)$ are said to be equal if and only if $b = e, c = f, a = d$.

Definition 2.5 [2]:

A ranking is a function $R : F(R) \to R$ where $F(R)$ is a set of fuzzy number defined on set of real numbers, which maps each fuzzy number into the real line, where a natural order exists. Let $\tilde{A} = (b,c,a)$ is a triangular fuzzy number then $\Re(\tilde{A}) = \dfrac{b + 2c + a}{4}$.

Definition 2.6 [2]:

Let $\tilde{A} = (b,c,a)$, $\tilde{B} = (e,f,d)$ be two triangular fuzzy number then the fuzzy arithmetic is defined as follows:

  (i) $\tilde{A} + \tilde{B} = (b,c,a) + (e,f,d) = (b+e, c+f, a+d),$

  (ii) $-\tilde{A} = (-a, -c, -b),$

  (iii) $\tilde{A} - \tilde{B} = (b,c,a) - (e,f,d) = (b-d, c-f, a-e),$

  (iv)   Let $\tilde{A} = (b,c,a)$ be any triangular fuzzy number and $\tilde{B} = (e,f,d)$ be a non-negative triangular fuzzy number then one may have,

$$\tilde{A} \otimes \tilde{B} = \tilde{A}\tilde{B} = \begin{cases} (be, cf, ad) & \text{if } b \geq 0, \\ (bd, cf, ad) & \text{if } b < 0, a \geq 0, \\ (bd, cf, cd) & \text{if } c < 0, \end{cases}$$

3. Linear Fractional programming

The general form of LFP may be written as:

$$\text{Max } \frac{c^t z + q}{d^t z + r} = \frac{F(z)}{G(z)}$$

(1)

s.t.

$$Az \begin{pmatrix} \leq \\ = \\ \geq \end{pmatrix} b,$$

$$z \geq 0.$$

Where $z, c^t, d^t \in R^n$ and $A \in R^{m \times n}, \alpha, \beta \in R$

For some values of z, G(z) may be equal to zero. To avoid such cases, one requires that either

$$\{z \geq 0, Az \begin{pmatrix} \leq \\ = \\ \geq \end{pmatrix} b, \Rightarrow G(z) > 0\} \text{ or } \{z \geq 0, Az \begin{pmatrix} \leq \\ = \\ \geq \end{pmatrix} b, \Rightarrow G(z) < 0\}$$

For satisfaction, we assume that (1) satisfies the condition that:

$$\{z \geq 0, Az \begin{pmatrix} \leq \\ = \\ \geq \end{pmatrix} b, \Rightarrow G(z) > 0\} \qquad (2)$$

Now by a theorem it is shown that the linear fractional programming problem transformed into a linear programming problem can be consider as an exact solution of problem (1)

Theorem 1: Assume that no point (x, 0) with $x \geq 0$ is feasible for the following linear programming (LP) problem:

Max $c^t x + qt$

Subject to

$d^t x + rt = 1,$

Ax-bt=0,   (3)

$t \geq 0, \; x \geq 0$

Now assume that the condition (2) then the LFP (1) is equivalent into linear programming (3).

Proof: For z feasible solution for LFP, define q (z)=(x, t), with $t = (d^t z + r)^{-1}$ and x=tz.

Then $x \geq 0, \; t > 0, \; Ax - bt = t(Az - b) = 0, \; d^t x + rt = t(d^t z + r) = 1$

Thus (x, t) is feasible for LP (3).

Conversely, if (x, t) is feasible for LP (3) and no point (x, 0) as feasible for LP (3), then t>0, and z=x/t satisfies z>=0, Az-b= (Ax-bt)/t=0. The feasible set of LFP problem one-one onto the feasible set for LP (3).

Moreover, the objective functions are related by

$(c^t z + q) / (d^t z + r) = (c^t x + qt) / (d^t x + rt) = (c^t x + qt) / 1$

Thus, the theorem is proved.

4. Multi-Objective linear fractional programming problem

In this section, a procedure for converting MOLFP problem in to MOLP problem is discussed.

The problem may be written as follows:

Max $Z_i(x) = \dfrac{\sum c_j x_j + p}{\sum d_j x_j + q} = \dfrac{N_i(x)}{D_i(x)}$

Subject to

$x \in S = \{x \in R^n : Ax \leq b, x \geq 0\}$

5. Fuzzy linear fractional programming problem

In this section, a procedure for solving Fuzzy linear fractional programming (FLFP) problem where the cost of the objective function, the resources and the technological coefficients are triangular fuzzy numbers is discussed below.

Let us consider the fuzzy linear fractional programming problem

$$\text{Max } \tilde{Z} = \frac{\tilde{c}x + \tilde{p}}{\tilde{d}x + \tilde{q}}$$

Subject to

$$\tilde{A}x \leq \tilde{b},$$

$$x \geq 0.$$

We assume that $\tilde{c}$, $\tilde{d}$, $\tilde{p}$, $\tilde{q}$, $\tilde{A}$ all are represented bt triangular fuzzy numbers. Therefore we can expand the above problem by using triangular fuzzy number definitions.

$$\text{Max } \tilde{Z} = \frac{(c^1, c^2, c^3)x + (p^1, p^2, p^3)}{(d^1, d^2, d^3)x + (q^1, q^2, q^3)}$$

Subject to

$$(a^1, a^2, a^3)x \leq (b^1, b^2, b^3)$$

$$x \geq 0.$$

Now we convert to an equivalent multi objective linear fractional programming problem as follows:

$$\text{Max } Z_1 = \frac{c^1 x + p^1}{d^1 x + q^1}$$

$$\text{Max } Z_2 = \frac{c^2 x + p^2}{d^2 x + q^2}$$

$$\text{Max } Z_3 = \frac{c^3 x + p^3}{d^3 x + q^3}$$

Subject to

$$a^1 x \leq b^1,$$
$$a^2 x \leq b^2,$$
$$a^3 x \leq b^3,$$

$$x \geq 0.$$

The MOLFP problem can be converted into the following MOLP problem as follows:

Max $Z_1 = c^1 y + p^1 t$

Max $Z_2 = c^2 y + p^2 t$

Max $Z_3 = c^3 y + p^3 t$

Subject to

$$d^1 y + q^1 t \leq 1,$$
$$d^2 y + q^2 t \leq 1,$$
$$d^3 y + q^3 t \leq 1,$$
$$a^1 y - b^1 t \leq 0,$$
$$a^2 y - b^2 t \leq 0,$$
$$a^3 y - b^3 t \leq 0,$$

$$y, t \geq 0.$$

Solving the transformed MOLP problem for each objective function we get the result.

6. Numerical Example

Example-1 A company manufactures two kinds of products A and B with profit around 5 and around 3 dollar per unit, respectively. However the cost for each one unit of the above products is around 5 and around 2 dollars respectively. It is assume that a fixed cost of around 1 dollar is added to the cost function due to expected duration through the process of production. Suppose the raw material needed for manufacturing product A and B is about 3 units per pound and about 5 units per pound respectively, the supply for this raw material is restricted to about 15 pounds. Man-hours per unit for the product A is about 5 hour and

product B is about 2 hour per unit for manufacturing but total Man-hour available is about 10 hour daily. Determine how many products A and B should be manufactured in order to maximize the total profit.

Solution: Let x_1 and x_2 to be the amount of units of A and B to be produced. Then the above problem can be formulated as:

$$\text{Max } \tilde{z} = \frac{\tilde{5}x_1 + \tilde{3}x_2}{\tilde{5}x_1 + \tilde{2}x_2 + \tilde{1}}$$

$$\text{Subject to } \tilde{3}x_1 + \tilde{5}x_2 \leq \tilde{15}$$

$$\tilde{5}x_1 + \tilde{2}x_2 \leq \tilde{10}$$

$$x_1, x_2 \geq 0.$$

Now we take the coefficients of variables as follows:

$$\tilde{5} = (3,5,7), \ \tilde{3} = (2,3,4), \ \tilde{5} = (4,5,6), \ \tilde{2} = (1,2,3), \ \tilde{1} = (0,1,2), \tilde{15} = (11,15,19), \ \tilde{5} = (3,5,7),$$
$$\tilde{5} = (4,5,6), \ \tilde{10} = (8,10,12)$$

Now the problem can be written as:

$$\text{Max } (z_1, z_2, z_3) = \frac{(3,5,7) \otimes x_1 + (2,3,4) \otimes x_2}{(4,5,6) \otimes x_1 + (1,2,3) \otimes x_2 + (0,1,2)}$$

$$\text{Subject to } (2,3,4) \otimes x_1 + (3,5,7) \otimes x_2 \leq (11,15,19),$$

$$(4,5,6) \otimes x_1 + (1,2,3) \otimes x_2 \leq (8,10,12),$$

$$x_1, x_2 \geq 0.$$

The above FLFP problem is equivalent to the following MOLFP problem

$$\text{Max } Z_1 = \frac{3x_1 + 2x_2}{6x_1 + 3x_2 + 2}$$

$$\text{Max } Z_2 = \frac{5x_1 + 3x_2}{5x_1 + 2x_2 + 1}$$

Max $Z_3 = \dfrac{7x_1 + 4x_2}{4x_1 + x_2}$

Subject to

$2x_1 + 3x_2 \leq 11,$

$3x_1 + 5x_2 \leq 15,$

$4x_1 + 7x_2 \leq 19,$

$4x_1 + x_2 \leq 8,$

$5x_1 + 2x_2 \leq 10,$

$6x_1 + 3x_2 \leq 12,$

$x_1, x_2 \geq 0.$

The above MOLFP problem is equivalent to the following MOLP problem

Max $Z_1 = 3y_1 + 2y_2$

Max $Z_2 = 5y_1 + 3y_2$

Max $Z_3 = 7y_1 + 4y_2$

Subject to

$6y_1 + 3y_2 + 2t \leq 1,$

$5y_1 + 2y_2 + t \leq 1,$

$4y_1 + y_2 \leq 1,$

$2y_1 + 3y_2 - 11t \leq 0,$

$3y_1 + 5y_2 - 15t \leq 0,$

$4y_1 + 7y_2 - 19t \leq 0,$

$4y_1 + y_2 - 8t \leq 0,$

$$5y_1 + 2y_2 - 10t \le 0,$$

$$6y_1 + 3y_2 - 12t \le 0,$$

$$y_1, y_2 \ge 0.$$

If the MOLP problem solved by LINGO software by using any technique we get the result

$Y_1=0$, $y_2=0.27$ and $t=0.1$. Hence the solution of original problem is $x_1=0$, $x_2=2.7$.

CONCLUSION

In the past few years, a growing interest has been shown in fuzzy linear fractional programming and currently there are several methods for solving FLFP. However, no paper has discussed the solving fully fuzzy linear fractional programming (FLFP) yet. In this paper, a method of solving the FLFP problems, where the cost of the objective function and the resources are triangular fuzzy numbers. In the proposed method, FLFP problem is transformed to a MOLFP problem and then the problem is transformed into an equivalent MOLP problem. We used multi objective linear programming solving technique to get the results of our problem. An illustrative numerical example is given to justify the proposed method.

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FORMULATING THE FILIPINO TYPOLOGY: CATEGORIZING THE DIMENSIONS OF THE FILIPINO TOURIST BEHAVIOR

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ABSTRACT

The researchers intended to formulate a Filipino-based typology that would categorize Filipino tourists according to their travel personalities. Also, they aimed to develop a standardized tool that would aid tourism educators and practitioners in the said categorization. Aside from its significant and unprecedented contribution to the Filipino tourism literature, this research paves the way for various tourism sectors to provide more personalized products and services that would best suit their clients' travel behaviors. Thirteen Filipino tourism experts were interviewed to gather inputs that led the researchers to identify the three (3) main dimensions that were considered in classifying local travelers: Activity Preference, Spending Pattern, and Companionship Propensity. The Empirically Grounded Type Construction Model was used as a guide to formulate the eight (8) Filipino typologies – the matrix formed based on the contrasting extremes of the 3 dimensions. Eight hundred ninety-five (895) random Filipino travelers participated in the preliminary testing of the travel personality test. From a list of ninety (90) items that were subjected to tests of reliability and validity, thirty-three (33) items qualified to make it to the final format of the test called CAPBRYC's Travel Personality Test.

Keywords – tourist behavior, tourist typology, travel personality test

I. INTRODUCTION

Typology is the process of classifying general types of things into different sub-groups. It is a system used for putting things into a category according to how similar or identical they are (Merriam-Webster, 2015). In the tourism industry, there have been many academic typologies of tourists introduced by Western tourism experts. Unfortunately, the Philippines does not have its own classification of tourists. It is in this light that this study was conducted to ascertain the classification of tourists based on Filipino context.

Tourism, being a service-oriented industry, should and must focus on meeting or exceeding expectations of tourists. It is a must, therefore, to determine the classification of local tourists in terms of their interests, personality types, and what they particularly look for when travelling.

This study would greatly help in the development of the tourism industry in the Philippines. The classification of Filipino tourists would allow service providers and practitioners to improve and create services that address each classification. This study will also benefit the Filipino tourism educators as they can now introduce and present a local tourist typology along with the other established academic typologies. Various members of the tourism sector can also better respond to the needs of the tourists. Lastly, this study can be used by future researchers as reference to further understand the Filipino tourist behavior.

This study focused on the Filipino typology of tourists. Specifically, this paper sought to answer the following:

- What are the dimensions to be considered in determining the Filipino tourist typology?
- How would you define each dimension?
- What are the different classifications of Filipino tourists based on Filipino tourist typology?
- How do you classify the tourists based on Filipino typology?

II. LITERATURE AND THEORY

2.1. Academic Typologies of Tourists

Different tourist classifications were introduced to the Tourism Industry by various experts. One of the most influential sociologists, Eric Cohen (1972), has identified four types of tourists. These are the organized mass tourists, individual mass tourists, explorers, and the drifters. Another popular typology is the one introduced by Stanley Plog. In 1974, Plog changed the mindset of people about an individual's underlying psychological characteristics when he published his paper "Why Destination Areas Rise and Fall in Popularity". He introduced the concept of psychocentrism, midcentrism, and allocentrism to classify tourists (Goeldner & Ritchie, 2012).

There are still other typologies that cater to the locals of a certain country or region. The Westvlaams Ekonomisch Studiebureau (1986) identified seven types of tourists: (1) active sea lovers; (2) contact-minded holiday-makers; (3) nature viewers; (4) rest seekers; (5) discoverers; (6) family-oriented tourists; and (7) traditionalists. Another typology was introduced by Dalen (1989) after surveying 3,000 Norwegian individuals and came up with the four-group classification of tourists: (1) the modern materialists; (2) the modern idealists; (3) the traditional idealists; and (4) the traditional materialists. In 1989, American Express commissioned a survey of 6,500 people in the USA, the UK, West Germany, and Japan that led them to the five-type classification of tourists: (1) adventurers; (2) worriers; (3) dreamers; (4) economizers; and (5) indulgers. Smith (1989) identified seven types of tourists: (1) explorers; (2) elite tourists; (3) off-beat tourists; (4) unusual tourists; (5) incipient mass tourists; (6) mass tourists; and (7) charter tourists.

2.2. Theoretical Framework

The researchers used two theories that served as foundations for the study. These theories helped the researchers attain their main objective of introducing a Filipino tourist typology.
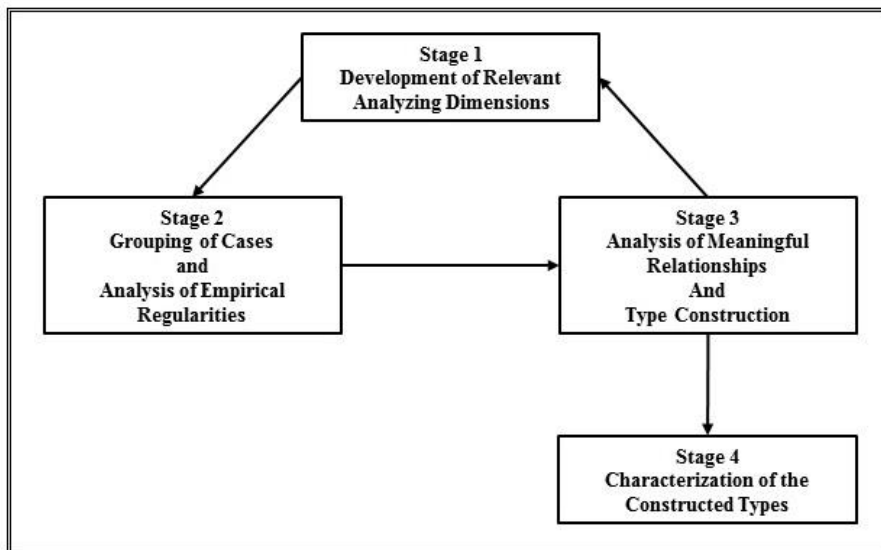
Figure 1
Empirically Grounded Type Construction Model (Adapted from Kluge, 2000)

The first stage in this process is the *development of relevant analyzing dimensions*. The basis for the typology can be formed once a type is characterized as a combination of attributes. However, these attributes need to identify first the properties and its corresponding dimensions. After gathering the properties and dimensions, the commonalities and the differences between the research elements must be understood and the constructed groups and types have to be drawn from these properties.

The next stage is the *grouping of cases and analysis of empirical regularities.* Using the defined properties and their dimensions, the cases can be grouped together. The cases are therefore assigned to a combination of attributes, and, in order to check the similarities of the elements of the constructed group, they must be compared with each other. This is recommended because the cases must resemble each other to such extent to be considered on the "level of type".

The third stage is the *analysis of meaningful relationships and type construction.* The meaningful relationships are the foundation of the empirically founded groups and analysis of the combination of attributes must be done. Different factors may lead to an addition, reduction, or combination of attributes. This leads to the analysis of the revisions (back to Stage 1). The attribute has to be complemented and sufficiently supplemented and the new groups have to be examined again for the commonalities or empirical regularities (Stage 2) and meaningful relationships (Stage 3).

At the last step, *characterization of the constructed types,* typologies are described extensively by means of their combinations of attributes as well as by the meaningful relationships of the constructed types.

In order for the researchers to construct and develop a travel personality test, they used the Test Construction Process Model as guide (Gregory, 2011). The initial action is to define the test (1). Test developers must have a clear idea of what the test intends to measure and how it

will be different from existing instruments. Test developers should select a scaling method (2). This method is a process of using numbers as responses to judge and measure the examinee to determine the tendency from the characteristics of the test. Constructing the items (3) is considered to be the most painful and laborious procedure that requires the creativity of test developers. Then they proceed with the testing of the items (4). They should distribute the preliminary version of the test to a statistically reasonable number of sample respondents to consolidate the initial data about test item characteristics. As construction proceeds, test developers expect that a great number of test items from the original tryout pool will be removed or revised. For this reason, they initially produce excess items. Then item analysis is used to distinguish unproductive items in the preliminary testing so that they can be replaced, revised, or eliminated. From the information gathered from item analysis, the test is then revised (5). If the differences are significant, new items and additional preliminary testing with new respondents may be required. If further changes are unnecessary, test developers may conclude that the test is satisfactory and ready for cross-validation study. Lastly, the test must be published (6). The process does not stop with the collection of cross-validation data. The developers must control the production of the testing materials, publish a technical manual, and produce a user's manual.
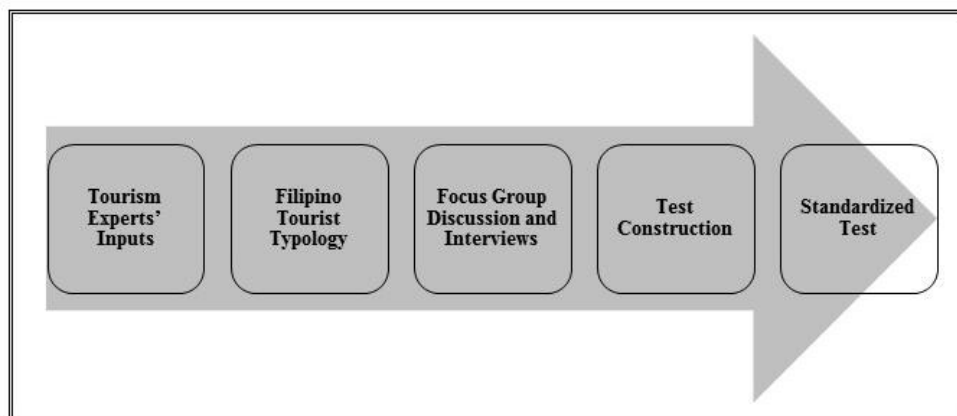
2.3. Research Paradigm

Figure 2
Research Paradigm

The preceding figure shows the flow of the study. Tourism experts were chosen as respondents of the research, via group and one-on-one interviews. Their inputs were consolidated and were used in the formulation of the Filipino tourist classifications. The researchers proceeded to the construction of the tourist personality test using the different dimensions that were formulated. The instrument was subjected to face validity, content validity, and reliability testing in order to achieve the last objective of the study.

III. METHODOLOGY

Both the qualitative and quantitative research methods were used in the study to collect, analyze, interpret, and report data to provide the classification of Filipino tourists.

3.1. Data Gathering Procedures

For the qualitative part, interviews and focus group discussions were conducted to determine the typology of tourists. The respondents of the qualitative part of the study have at least 10 years of technical knowledge or practical experience in the travel industry. The breakdown of respondents are as follows: 5 tourism educators and practitioners; 1 tour operator; 3 travel agents; 1 licensed tour guide, and; 3 frequent travelers. Data gathering took place from February 16 to 25, 2015. The data gathered from the interviews and focus group discussions were consolidated and interpreted using an open coding system to create several major inputs that became bases for the determination of the Filipino tourist typology. Clarifications, comments, and suggestions from the tourism experts were constantly sought to ensure accuracy of the study.

For the qualitative phase, the initial draft of the Filipino travel personality test was taken by 895 random Filipino tourists. Results of which were subjected to tests of validity and reliability, until a final format of the CAPBRYC's Travel Personality Test was developed.

3.2. Data Analysis

For the qualitative phase, the researchers used hermeneutics or interpretive analysis and open coding in analyzing the data gathered. Hermeneutics is the process of interpreting the texts or transcriptions to understand the denotation and prescription of data (Bernard, 2000). Open coding is a method to identify topics and themes by asking for questions that are related to the topic, differentiating events and incidents which are relevant to the study (Strauss & Corbin, 1990). The researchers created codes and eventually classified them into three dimensions.

For the quantitative method, Cronbach Alpha (reliability testing) and Factor Analysis (validity testing) were used and the data were processed using SPSS.

IV. RESULTS

After analyzing the data collected from the respondents of the qualitative part of the study, the researchers were able to construct themes for the categories presented in the research paradigm.

Table 1
Dimensions of Filipino Tourist Behavior and Their Respective Extremes

Activity Preference		Spending Pattern		Companionship Propensity	
Participative	Spectator	Comfort Seeker	Budget Conscious	Independent	Hooked

4.1. Tourist's Activity Preference

The *participating-spectating* dimension refers to a tourists' general attitude towards the destination's activities. Being *participative* shows that a tourist is inclined to show willingness to exert energy and effort in order to take part in the activities offered by the destination. *Participative tourists* are frequently the enthusiastic and vigorous types of tourists. Being a *spectator*, on the other hand, shows that a tourist prefers not to take part in activities, but rather to be appreciative of what the destination has to offer. *Spectators* tend to be attentive and perceptive observers of the activities and/or the destination itself. They are usually the types of tourists who watch and/or admire performances and/or sceneries.

4.2. Tourist's Spending Pattern

The *comfort seeker-budget conscious* dimension deals with how tourists opt to spend their money on the products and services of the different operating travel sectors. *Comfort seekers* usually want what is convenient for them. They are meticulous spenders, making sure that they get the quality of the product and/or service they have paid for. Some comfort seekers do not limit themselves from spending on a trip because they do not want to get worried throughout the course of the trip. They sometimes depend on travel agents/escorts when planning and organizing their trips. Being *budget conscious,* on the other hand, searches for the cheapest possible rates of the products and/or services that they can get in order to maximize the budget that they have allotted for a certain trip. *Budget conscious* tourists usually do a lot of research prior to their visit to the destination in order to plan and organize their trip on their own.

4.3. Tourist's Companionship Propensity

The *independent-hooked* dimension indicates a tourist's inclination for companionship when traveling. Being *independent* means a tourist prefers to travel by himself and is less motivated to travel together with a group. Independent tourists are most likely introverts who do not want to go along with the crowd. They usually travel for the sole purpose of self-fulfillment, self-actualization, or for the sake of anonymity. Being *hooked,* on the other hand, means that a tourists' preference is to travel along with a group. *Hooked tourists* are usually extroverts who are willing to socialize and interact with people. They mostly travel for vacation together with their family, friends, relatives and loved ones.

4.4. Filipino Tourist Typologies

The table below shows the combined acronyms of the 8 possible combinations formed from the 3 major dimensions. The first letter in the typology acronym corresponds to the first dimension of the Filipino tourist typology – "P" for Participative and "S" for Spectator. The second letter corresponds to the Filipino spending pattern – "C" for Comfort Seeker and "B" for Budget Conscious. The third letter corresponds to the independent-hooked pair – "I" for Independent and "H" for Hooked.

Table 2
8 Filipino Tourist Personality Types

FILIPINO TOURIST TYPOLOGIES			
PCI	PCH	PBI	PBH
SCI	SCH	SBI	SBH

4.4.1. Typology Definitions

The **Opulent Tripper (PCI)** – PCI tourists are frequently the enthusiastic and vigorous type of tourists. They are usually willing to pay for any given amount for the activities and services that they would like to partake in. They also tend to be dependent on travel agents/operator when planning and organizing their trips. However, PCI tourist tends to travel alone.

The **Active Socialite (PCH)** – PCH tourists, as the name suggests, are out to spend energy and money during a trip. They often do not want to be worried or be hassled throughout the course of the trip because they travel in a large group usually with family and/or friends. Most often they are willing to hire a tour guide/escort for the convenience of their vacation.

The **Budget Backpacker (PBI)** – They are solo travelers/tourists who usually travel for self-fulfillment or self-discovery. Because of budget limitations, PBI tourists do a lot of research prior to their visit to the destination in order to plan and organize the trip on their own. They tend to search for the most economical rates possible in order to maximize their budget allotted for the expenses of the trip including the activities available in the destination.

The **Outgoing Economizer (PBH)** – PBH tourists enjoy traveling in groups. However, they tend to always seek for the lowest rates available, because of their constrained spending pattern, in order to fully enjoy amenities offered by a destination.

The **Wandering Exclusivist (SCI)** – SCI tourists are solo travelers who prefer to simply appreciate what the destination offers, spending less effort, but agreeable to spend any given amount for the convenience of the trip. They usually travel for the purpose of relaxation and leisure.

The **A-list Observer (SCH)** – These tourists are group travelers who tend to be reliant on the expertise of travel consultants to ensure full satisfaction from the trip. However, SCH tourists are the type who would opt to sit back, relax, and indulge in what the destination presents.

The **Thrifty Onlooker (SBI)** – These are tourists who travel on their own for the purpose of self-fulfillment and self-actualization. They generally do not like to take part in any activity offered by a destination that would require much effort from them. SBI travelers are usually price conscious and will most definitely think twice before spending on supplementary product or service.

The **Sightseeing Excursionist (SBH)** – These are tourists who prefer to travel with a group. They generally do not like to take part in any engaging physical activity. Also, SBH travelers tend to search for the cheapest rates in order to maximize a given budget.

4.5. CAPBRYC's Travel Personality Test: Validity and Reliability

The initial draft of the Filipino Travel Personality Test had a total of 90 questions, with 30 items per dimension. However, after subjecting the items to Cronbach Alpha, only 15 items were considered good for Activity Preference, 12 for Spending Patterns, and 13 for Companionship Propensity. Further, when the remaining 40 items were tested for Factor Analysis, 2 items from Companionship Propensity proved to be bad items. With just 11 good items from the third dimension, the researchers decided to select the other 11 better items from Activity Preference and 11 from Spending Patterns to become part of the 33-item standardized instrument, which the researchers called the CAPBRYC's Travel Personality Test.

V. CONCLUSION

Activity Preference, Spending Pattern, and *Companionship Propensity* are three major dimensions to classify the Filipino tourist typology. Each of the dimensions has its own respective extremes which a traveler would be more inclined to.

Participative and S*pectator* are the extremes for Activity Preference which identify if the tourist prefers to partake in the activities or to just spectate and appreciate the activity offered by a destination. *Comfort Seeker* and B*udget Conscious* are the opposite pairs for Spending Pattern which identify if the tourists would like to spend their money for comfort and convenience or not. The *Independent* and *Hooked* options for Companionship Propensity identify if the tourists would prefer to travel alone or in groups.

The *CAPBRYC's Travel Personality Test* sorts the dominant extreme for each dimension resulting to 8 possible Filipino tourist typology combinations. The combinations identifying the tourist type are: PCI, PCH, PBI, PBH, SCI, SCH, SBI, and SBH.

VI. FUTURE WORK

The researchers have formulated the following recommendations based on the findings and conclusions of the study:

Future researchers may consider increasing the number of dimensions that will eventually increase the number of typology combinations. Also, they may look into defining each typology more concretely for better understanding of service providers. This way, the latter can give more focus on the essential needs of every traveler they serve.

Test developers may redesign the instrument in such a way that it will appear more aptly sophisticated to travelers. This way, the formalities of a standardized test will not meddle with the real intention of the instrument – that is – to get to the core of the tourist's travel personality.

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