AN ORDINAL FACTOR ANALYSIS OF REQUIREMENTS AND CHALLENGES OF INFORMATION AND COMMUNICATION TECHNOLOGY SYSTEM TO TRAIN PRIVATE AGRICULTURAL INSURANCE BROKERS IN IRAN

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ABSTRACT

This study was conducted to identify challenges and requirements of an information and communication technology (ICT) system to train brokers. Using the ordinal factor analysis, the challenges and requirements have been classified into six factors (Human, Organisational, Technical, Social, Financial, and Legal) and four factors (instructional, technical, organisational, and cultural) respectively. Finally a conceptual framework is presented for the challenges and requirements of the ICT training system.

Keywords: Information and Communication Technology **(**ICT), Brokers; Training, Agricultural insurance, Challenges, Requirements, Framework.

INTRODUCTION

Variability in climate conditions makes agriculture a risky activity. Agricultural insurance can be a remarkable solution to protect farmers against risks associated with the production of agricultural commodities. The Agricultural Insurance fund (AIF) in Iran was established in 1983 and the insurance scheme began in 1984, with cotton in the northern province of Mazandaran and sugar beets in the north-western province of Khorasan. The insurance activity of these two products, along with other products, was extended throughout the country. However, the number of AIF's clerks was insufficient to implement the insurance scheme, so, in 2002, the AIF decided to hire private sectors named "brokers", to keep pace with the increasing demand for coverage and improve the quality of services. According to the latest reports in 2008, more

than 90% of insurance contracts sales and 70% of loss assessments had been completed by private sector brokers. The reports also indicated that the loss ratio is 2.6, which is considerably higher than the international level, and is most likely a result of unrealistic assessments carried out by brokers (AIF, 2008).

One of the main strategies to improve the quality of services is to train and keep the brokers updated. Many studies had indicated that using appropriate training techniques led to improved quality of assessment and consequently reduced the loss ratio and increased the rate of satisfaction among policyholders (farmers). Training also secured the employment status for brokers (Hyer, 2002). AIF uses the traditional face-to-face methods to train brokers, but this often fails to work for several reasons, namely: (i) the number of brokers is considerably high (5000 and more persons); (ii) the brokers are scattered throughout the country in 32 provinces; (iii) this method of training is very costly, difficult to manage, and implement for the AIF.

So an ICT-based training would be an appropriate solution. Expanding e-learning brings several attractive opportunities for organisations: (1) save time, cost, and effort; (2) satisfy educational needs from remote areas; (3) provide self-learning opportunities; (4) have a positive impact on the learning process; and (5) provide a mechanism for collaborative learning (Karmakar, 2000). To achieve these opportunities, a holistic viewpoint along determination of the requirements and challenges of the system is required. Implementation of such system without consideration of the above aspects will be defeated.

The objectives of this study are as follows:
1. identify requirements of the ICT-based training system,
2. identify challenges of the ICT-based training system, and
3. develop a conceptual framework for the ICT-based training system.

PRIOR STUDIES

ICT includes technologies and methods to store, manage, and process information, such as computers, software, and for communicating information, such as email and the web, (Rusten & Ramirez, 2003).

One can categorise ICT based training into four types, as in the following: (1) Synchronous training methods, which require simultaneous participation of all learners and instructors at distributed locations and include immediate, two-way communication between participants, which may take the form of video

conferencing and virtual classrooms; (2) Asynchronous instruction methods, which do not require simultaneous participation of learners and instructors, thus giving learners more freedom over learning time, process, and content of curriculum (Anaraki, 2004); (3) CD and DVD learning techniques, which include training via compact and digital video discs, (knowledge stored on the web can be updated, but this is not possible with other formats, such as CDs and DVDs); and (4) Mobile instruction methods, which include all mobile devices, such as cell-phones and laptops. This takes advantage of learning opportunities offered by portable technologies (Sribhadung, 2006).

Many studies have identified the requirements and challenges affecting an ICT-based training system. For instance, Barajas and Owen (2006) refered to infrastructure, hardware, software, skills, and cultural organisational requirements while Khan (2001) highlighted evaluation, interface design, technological, pedagogical, institutional, and ethical, resource support, and management requirements. Bersin, Holder, and King (2003) looked at content development, infrastructure, and deployment challenges while Sim and Fersht (2007) pointed out lack of IT infrastructure, lack of governmental and cultural support, and corporate attitude that does not value training challenges.

A good review also can be found in Dirr (2001), Surry (2002), Ouyang (2004), Ebadi (2005), Angela (2005), Mesda (2005), Tai (2005), Sribhadung (2006), Zamani, Movahed, and Emami (2006), Sun, Tsai, Fiyer, Chan, and Yeh (2007), Murphy and Terry (1998), Harris, Logan and Lundy (2001), Lee (2001), Ho (2002), Crase (2004), Cantoni, Cellario, and Porta (2004), and Leary and Berge (2005).

We summarised the results into 13 variables for requirements and 36 variables for challenges.

RESEARCH VARIABLES

Using previous studies and interviews with some experts in the field of e-learning in the agricultural sector, we considered the following variables as requirements (instruct ICT knowledge and skills to learners, instruct self-directed skills to learners, instruct ICT knowledge and skills to instructors, instruct facilitating skills to instructors, instruct general agricultural insurance knowledge to technical experts, instruct LMS skills to technical experts, provide financial resources, employ experts who can produce digital content, appropriate infrastructures, provide appropriate and adaptable hardware, Provide appropriate and adaptable software, and legal approval) and challenges

(low bandwidth, lack of appropriate hardware, lack of appropriate software, technology phobia, lack of appropriate ICT infrastructure, limited access to the internet in the workplace, limited access to the internet at home, requires new knowledge and skills, security affaire, lack of social interaction and face to face contact, intellectual property protection, certification credit, cost of updating contents, prejudiced beliefs of learners towards traditional education, misunderstanding of the advantages and disadvantages of virtual education, negative experiences of users with virtual education, need time and energy to present virtual education, organisational staff not taking virtual education seriously, need interaction with experts, waste time by surfing the internet, high cost for ADSL method, require more self discipline, inadequate experts in virtual education, lack of appropriate support services, negative attitude of organisations towards virtual education, lack of motivational constructs for using virtual education, difficulty in determining job skills, lack of relationship between instructors and students, the limitation of virtual training for practical techniques, incompatibility of online training with values and culture, and lack of non-verbal feedback).

MATERIALS AND METHODS

We conducted a series of in-depth interviews with senior experts in the AIF as well as experts in e-learning to examine the face and content validity of our research model. After that, we developed questionnaire items based on those interviews and previous literature. The questionnaires were revised with the help of experts with significant experience in e-learning (including academic and AIF). A five–point Likert scale ranging from 1 as strongly disagree to 5 as strongly agree, was used for the measurement. A pre-test for the reliability of the instrument was conducted with 13 AIF experts who were chosen randomly from the target population. We summarised requirements and challenges into two single variables R (which stands for requirements) and C (which stands for challenges). Then, we computed the Cronbach's alpha from those variables. The computed Cronbach's alphas for R and C are 96.8% and 94.9% respectively, which indicated a high reliability of our questionnaire.

The research population included all the agricultural insurance experts (with population size N=50). Because of the small size of AIF experts, the total population was surveyed. Data was analysed using the ordinal factor analysis available in the latest version of Lisrel 8.8. The basic idea of factor analysis is the following: the classic factor analysis assumes that both the observed and the latent variables are continuous variables, but in practice, the observed variables are often ordinal. However ordinal measure is most often ignored

and numbers such as "1, 2, 3, 4", representing order categories, are treated as numbers having metric properties (treated the same way as continuous variables); such a procedure is assuredly incorrect in several ways. Joreskog and Moustaki (2001, 2006) used the EM-algorithm technique to provide factor analysis for ordinal observed variables. The last version of their statistical software package, named Lisrel 8.8, can handle such analysis. As far as we know, the software cannot directly evaluate the goodness of model. This means that the goodness of the model must be measured by fitting a structural equation model (SEM) to the data and then using statistics that are available in the SEM. Briefly, we used: Goodness of fitness whose null hypothesis indicates that the model is valid (we prefer to accept the null hypothesis, i.e. p-value>0.05); and 2) RMSEA (Root Mean Square Error of Approximation), which takes into account the error of approximation in the population and asks the question "How well would the model fit the population covariance matrix if it were available?" (p-value less than 0.05 indicates good fit, and higher than 0.08 represents reasonable errors of approximation in the population) (Joreskog & Moustaki, 2001, 2006).

RESULTS

Descriptive Statistics

Table 1 summarises the demographic profile and descriptive statistics.

Table 1. Demographic Profile and Descriptive Statistics of Experts

Sex	Female (6%)	Male (94%)
Age/year	Mean=37.95	S.D=5.3
Work experience/year	Mean=11/88	S.D=6.034
Computer usage (weekly)/hour	Mean=19.09	S.D=12.08
Internet usage (weekly)/hour	Mean=9.35	S.D=7.98
Degree	Undergraduate=40.42	Graduate=59.58

As Table 1 illustrates, AIF experts use the computer about 19 hours per week, surf the web about 9 hours per week, and most of them are graduated and male.

Ordinal Factor Analysis

Implementation of "ordinal factor analysis" along the structural equation model (SEM) summarises all requirements, given by Section 3, into four factors; say

the requirement model given by Table 2. Goodness of the model has been verified by several statistics such as the goodness of fit-test (p-value=0.35) and the RMSEA (p-value=0.031).

Table 2. Ordinal Factor Analysis about Requirements

Factor	Variables included	Explained common variance by factor %
Instructional requirements	Instruct ICT knowledge and skills to learners Instruct self-directed skills to learners Instruct ICT knowledge and skills to instructors Instruct facilitating skills to instructors Instruct general agricultural insurance knowledge to technical experts Instruct LMS skills to technical experts	31/16%
Technical requirements	Provide appropriate and adaptable hardware Provide appropriate and adaptable software	12/72%
Organisational requirements	Provide financial resources Employ experts who can produce digital content, Appropriate infrastructures Legal approval (copyright).	8/32%
Cultural requirements	Culturize to use ICT	0/80%
Total		52/21%

Table 2 represents components of each factor, as well as, portion of each factor from the total common variance. As one may observe, about 52% of total common variance is explained by these four factors, where the majority of it has been explained by the Instructional factor.

Analogous to the Table 2, one may summarise all challenges, given by Section 3, into six factors, say the requirement model given by Table 3. Goodness of the model had been confirmed by several statistical tests such as the goodness of fit-test (p-value=0.23) and the RMSEA (p-value=0.005).

Table 3 represents components of each factor, as well as, portion of each factor from the total common variance. As one may observe, about 45% of total common variance has been explained by these six factors, where the majority of it is explained by the Human factor.

Table 3. Ordinal Factor Analysis about Challenges

Factor	Variables included	Explained common variance by factor %
Human Challenges	Require new knowledge and skills Prejudiced beliefs toward traditional education Lack of understanding of advantages and disadvantages of virtual education Lack of relationship between instructors and students Negative experiences of users Need interaction with experts Waste time by surfing the internet Require more discipline Not adequate experts in virtual education Technological phobia	14.81
Organisational challenges	Needing time and energy; organisational staff not taking virtual education seriously Lack of appropriate supportive services Negative attitude of organisations Not appropriate advertisement about the capabilities of virtual education Difficulty in determining skills of jobs	8.87
Technical challenges	Low bandwidth, Lack of appropriate hardware, technical challenge Lack of appropriate ICT infrastructure Limited access to internet at work and home The limitation of virtual training for operational techniques Lack of appropriate software	7.34
Social challenges	Lack of social interaction and face to, face contact Online training incompatible with values and culture Lack of non-verbal feedback Lack of motivational construct	7.31
Financial Challenges	High cost for ADSL method Cost of updating contents Cost of virtual education	3/55
Legal challenges	Intellectual property rule Certification credit Security affairs	3/15
Total		45/03

DISCUSSION

The following discussion addresses the research findings according to the research objectives.

Identify Requirements of an ICT-based Training System

Table 2 identifies the Instructional requirements as the most important elements in implementation of an ICT-based training system. This finding is supported by Barajas and Owen (2006), Ebadi (2005), Mesda (2002), Tai (2005), Sun et al. (2007), Gugleilmino (2002), and Lynch (2002). The second important element of an ICT-Based training system, which was pointed out by Table 2, is technical requirements. This observation has been pointed out by many authors, such as Barajas and Owen (2006), Khan (2007), Dirr (2001), Surry (2002), Rusten and Ramirez (2003), Zamani et al. (2006), and Sun et al. (2007), among others.

Learners need to have access to e-mail, computers, and an internet connection (Porter, 1997). Yet, despite the incredible growth of the internet since the early 1990s, many people still do not have easy access to the related technology, including hardware, software, or the internet itself. Deciding what technology to use and how to use it effectively probably rank as the two biggest questions faced by organisations as they attempt to design the delivery of on-line learning (Schreiber & Berge, 1998). When choosing technology, it is absolutely important to look at both the advantages and disadvantages of each instrumental technology. For example, before choosing web-based courses, access issues must be addressed including learners' accessibility to emails, computers, internet connections, and web browsers. It reflects that AIF should pay more attention to appropriate hardware and software of the system.

Identify Challenges of an ICT-based Training System

Table 3 identified the human challenge as the most important barrier in implementation of an ICT-based training system. This observation is supported by Samak (2006), Cantoni et al. (2004), and Tyan (2003), among others. Along this result, one has to be aware that: (1) an e-learning training system requires more knowledge, skills, self motivation, and self-discipline than classroom training (Pollard & Hillage, 2001); and (2) active learners' and instructors' involvement is crucial in web-based courses because success is dependent upon motivation and initiative (Dereshiwsky & Moan, 2000).

Develop a Conceptual Framework

According to the literature review and the results, a conceptual framework can be illustrated as follows.

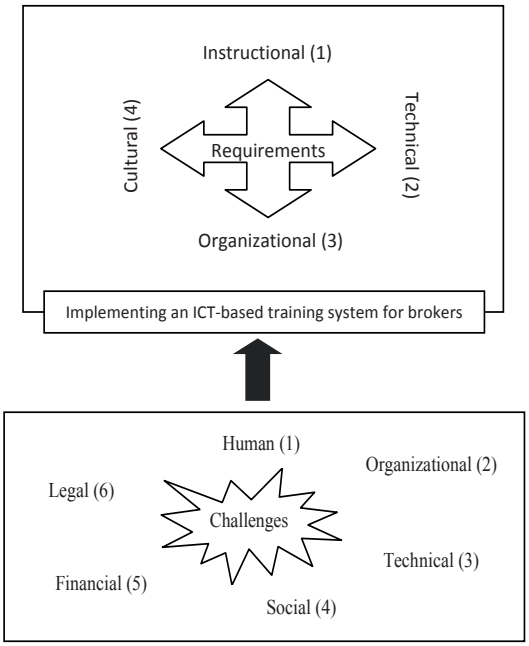

Fig. 1. A conceptual framework of requirements and challenges of an ICT-based training system

CONCLUSION

Even thoungh Table 2 identified organisational and cultural requirements as two less important requirements, to have an efficient system, we should: (1) bring into account these requirements along with the two most important requirements (i.e. instructional and technical requirements); and (2) reinforce the instructional and technical requirements.

The research findings also showed that human and organisational challenges are the most important challenges while the other challenges are less important from experts' viewpoint. These challenges are not necessarily inevitable and with careful design, most can be overcome.

Corporations, in their rush to implement e-learning, often place too much emphasis on the "e" and too little on the learning, so the development of an ICT based system should take into consideration all of the requirements and challenges discussed in this research. Institutions must use a comprehensive review system to get a real picture of what works, what does not and where needs improvement (Khan, 2007).

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