Investigation on XBRL Adoption Based on TOE Model

Malihe Rostami[1*] and Mahmoud Dehghan Nayeri[2]

[1]*Department of Management, University of Grenoble, France.*
[2]*Department of Management, Tarbiat Modares University, Iran.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

ABSTRACT

One current new technology in financial issues is XBRL (eXtensible Business Reporting Language) that is based on XML (eXtensible Markup Language). Actually, XBRL is a language to transfer data and a new way to publish financial reports on the internet. This is important for organizations which want to communicate internationally with other organizations in the world. Meanwhile, all shareholders, stakeholders, competitors and public users want to know more about an organization for any usage, XBRL can make easy the knowledge discovery procedure in this issue which makes it vital for nowadays firms to compete in the world business era.
Aim: The purpose of this paper is to define a model for facilitating XBRL adoption within firms which van be developed through exploring the affecting factors on XBRL adoption.
Methodology: This paper tries to investigate affecting factors on XBRL based on TOE model including environmental, organizational and technological factors. Confirmatory factor analysis will be employed to test the TOE model on XBRL adoption according to experts' opinion.
Results: Through investigating the effect of various factors based on TOE model on XBRL adoption, environmental factors with 0.95, technological factors with 0.90 and organizational factors with 0.85 respectively are the most important factors which affect XBRL successful adoption.
Conclusion: In order to implement a new technology such as XBRL, every organization should

_____

Corresponding author: E-mail: mle_rostami@yahoo.com, Mahmoud_dehghan@yahoo.com;

define and provide its prerequisites and success factors to reach a well adoption and preventing its relevant risks.

1. INTRODUCTION

EXtensible Business Reporting Language (XBRL) is a language for the electronic business and financial communication that can change the way of information distribution. International data format has been designed specifically for business communication and data transmission [1].

XBRL has created a structure for organizations to report their information through internet. Financial information can include all the financial statements and key information in an organization to extract any analysis. Much of the information published in this way can be used repeatedly and can be archived [2]. In addition, organizations can implement XBRL to reduce their emission and compliance costs and thereby take advantage of potential investors [3].

Many researchers consider factors such as environmental, organizational and technological factors to be effective in implementing this type of innovation. Some studies like Cordery et al. [3], Henderson et al. [4], Alshamaila et al. [5], Sohrabi and Khanlari [6], Golkar and Nikbakht [7], Ramdani et al. [8] and Gangwar et al. [9] discussed the effect of environmental, organizational and technological factors on XBRL adoption as a new technology.

Before undertaking any form of innovation and technology, it is essential to investigate the organization's environment, culture, conditions and prior experience and the ability of implementation. Thus, in this study, the effects of these constructs and factors have been studied in the form of TOE model on XBRL implementation.

2. RESEARCH BACKGROUND

In background, research history, internet financial reporting, the necessity of using non-traditional models of reporting and the necessity of using the extensible reporting language are discussed.

2.1 Research History

Today, the speed of the preparation, distribution and comparability of information specifically financial information is very important. Financial statement users look for the fastest way to achieve the desired results in the least time possible, with the highest accuracy and transparency. It is clear that the financial information is prepared and offered in traditional formats such as PDF, Excel, HTML, etc. but the users of this kind of information cannot use and archive information practically. On the other hand, the use of the internet leads to the distribution of data and information without standard and specific format. In other words, this data doesn't have new financial reporting formats and cannot be easily compared and wastes much time. But in the digital format, information can be compiled and put together on a regular basis and can be easily compared and analyzed [10].

According to the researchers, XBRL is associated with accounting standards, encoding, publishing and editable information by users. XBRL is a language derived from XML, but its capabilities are more and its usage is designed more advanced and more extensible [11].

EXtensible Business Reporting Language encrypts related items using specified and common national or international labels to define the concepts of financial reporting. Labels can be used instead of words to relate users with the information of financial reports and in this way, which will be more understandable for browsers [12].

Financial reports' results that are consistent with the labels are called a sample document. Each industry can design its own glossary for optimal use of this language [13].

EXtensible Business Reporting Language, as a tool, can enter the information in the financial reporting system by estimating the highest level of information. In the study conducted by Peng and Chang [14], it was stated that XBRL is one of the two successful technologies in the field of

accounting and auditing and Yoon and Ciganek [15] introduced this language as a factor increasing levels of accuracy, reliability and efficiency of electronic business financial communication.

The use of this language for business reporting is proposed as an essential source in the information value chain. EXtensible Business Reporting Language enhances the capacity of intra-organization electronic commercial transactions by increasing the flow of information and interaction and expands the contribution of organizations in others' information repertoire [16]. In other words, XBRL is a dynamic format that enables electronic changes of organization's information [7].

Also Hannon [17] considers this language as a non-specific standard language based on the Internet that is used to provide and publish financial statements via computer and software platforms based on the accounting standards.

Organizations can use XBRL as a global framework with the aim of increasing efficiency and improving the reporting path and thereby increase the quality of their financial disclosure and dissemination of information and attract more investors by raising the level of trust resulted from transparency of information.

EXtensible Business Reporting Language can increase organizations' ability to compare themselves with other organizations. Using XBRL, flexibility of organizations' information for immediate analysis and compliance with financial models increases and with this view, foreign investors are interested in starting up an activity with the organization [10]. With this innovation, many of the costs and time related to the release of information are reduced. Main XBRL adoption affecting factors studies are showed in Table 1.

2.2 Internet Financial Reporting

Focusing on all human aspects of technology and IT has started in the 21st century which called information era. In this era, internet, as a tool associated with human activities, has changed the flow of information from suppliers to users and vice versa, as well as access to information. Internet users can process and analyze the data [18].

Today, financial reporting via internet has increased in many organizations. Using the Internet as an information distribution channel is a growing phenomenon and organizations provide financial information on their sites voluntarily [19].

Internet financial reporting increases mentally and reduces the cost of distribution. Thereby, linking suppliers and users will be easily accomplished [7]. Information is made available for users quickly and it's usable and able to be processed [20]. On the other hand, the disadvantages of the dissemination of information via the Internet is hacking and destroying information by hackers; also, not all have access to the Internet, causing a loss of some investors and users of financial reports.

2.3 The Necessity of Using Non-Traditional Models of Reporting

Unfortunately, traditional dissemination of financial reporting has some disadvantages. Lack of access to information and opportunities for investment for some people and lack of direct relationship between investors and other users and suppliers of information decrease the efficacy of provided reports [6].

Also, lack of knowledge about measurement indices of financial instruments and the success of organizations for key decisions by all users is of the disadvantages of traditional reporting that will be resolved with the use of the Internet and Internet dissemination and analysis. The uses of Internet platforms and integrated frameworks increase the comparability of reports and analysis of information can be easily accomplished [18].

Today most organizations record their accounting information in physically and disseminate it by releasing the report pages; and in many cases, they are recorded in physical form [3]. To increase the transparency of the information, it is necessary to give the commercial realities to individuals by particular encoding of the related formats and in many cases, the possible accounting rumors may be prevented. Non-traditional models will enable users to uses the information within the disseminated reports and if necessary, depending on the application, change or analyze them [7].

Table 1. Main XBRL adoption affecting factors studies

Authors	Subject	Citation	Interest for article
Steenkamp, L.P., Nel GF. (2012) [10]	The adoption of XBRL in South Africa: an empirical study (South Africa)	The Electronic Library	This study is indicating a low level of awareness and slow adoption of XBRL as a new technology.
Henderson et al. (2012) [4]	The determinants of XBRL adoption	International Journal of Accounting Information Systems	Technological, environmental and organizational factors affects the XBRL adoption
Golkar R and Nikbakht M. (2011) [7]	XBRL implementation in Iranian organizations (in case of petroleum organizations)	Ms. Thesis, University of Tehran	XBRL implementation success factors identified in petroleum industry
Carolyn et al. (2011) [3]	A solution looking for a problem: Factors associated with the non-adoption of XBRL	Pacific Accounting Review	This study shows the effects of environmental, organizational and technological items on XBRL adoption
Troshani I and Lymer A. (2010) [21]	Translation in XBRL standardization	Information Technology & People	For enhancing understanding of role XBRL standardization networks
Troshani I and Doolin B. (2007) [16]	Innovation diffusion: A stakeholder and social network view	European journal of innovation management	This study investigates the adoption of XBRL in qualitative form
Kaya D. (2014) [22]	The influence of firm-specific characteristics on the extent of voluntary disclosure in XBRL, empirical analysis of SEC filings	International Journal of Accounting and Information Management	This study is about voluntary disclosure in XBRL and depicted that firm size and level of innovation are related to adoption of XBRL
Hao L, et al. (2014) [12]	Does voluntary adoption of XBRL reduce cost of equity capital?	International Journal of Accounting and Information Management	Increasing knowledge, this study is about voluntary XBRL adoption and its financial outcomes

2.4 The Necessity of Using the Extensible Reporting Language

Many people need to focus on specific information of organizations that has been set up and expanded based on the accounting and financial reporting rules and standards [18]. Many of the relevant financial reporting and analysis are simply copy and do not have a clear and coherent form; therefore, they are not comparable and confidence in the transparency and accuracy of information decreases. To increase confidence in the disseminated information and optimal use of users, financial reporting needs certain frameworks for the expected information. EXtensible Business Reporting Language offers specific formats by which a lot of the referred problems will be solved. Information published in this way is comparable, and the difficulty and complexity of its realization will be decreased [7].

By applying new technologies and innovations, organizations will be able to use their manpower to analyze, select and process information instead of just recording accounting and time-consuming traditional activities and thus increase the quality of their reports and manpower [11]. By defining specific formats and encoding, XBRL will enable the organization to reduce its possible mistakes and make the maximum benefit of reporting standards [20].

Business data created by transactions are being used in many parts of the organization. All the organizations need to gather business information, review and analyze [23]. So, these activities can make success:

1. Management needs to get into the details of the business information
2. Providing information to users using Rules and Regulations
3. Identify the company's financial results
4. Companies need to engage and negotiate with parent companies and shareholders to support the business activities [23].

By the research, platform for implementing XBRL or the affecting factors have been studied. Because the most important question in accepting XBRL is which factors could affect XBRL adoption?

3. RESEARCH METHODOLOGY

In this part, research model, Research tool, sampling plan and the measurement model are discussed.

3.1 The Research Model

TOE model is a multi-aspect framework developed by DePietro and Wiarda and Fleischer [24] as cited by Alshamaila et al. [5]. This framework is a theory of organizational levels and is often used for research and study issues related to the organization.

Wang and Yang [25] claimed that this model is an appropriate picture for the users to improve XBRL implementation, to face challenges, to effect on the value chain activities, to promote the inter-organization adoption, to make decision based on adaptation with innovation and organization's capabilities and to put a more appropriate way.

According to the TOE model, three categories of factors can facilitate XBRL adoption. Technological factors are the internal and external technologies and can affect the implementation process by comparing and analyzing technology in an organization with peers and competitor organizations. This technology can be comprised of any type of equipment or software. Premkumar [26] claimed that all issues related to the field of technology arise from organizational factors.

Technological factors include competitive advantages in contrast to the costs, complexity and rigidity of the system, the ability to adapt and the visible results [16]. In other words, the ability of adaptation and integration of the system can make its acceptance easier [6]. Perceived costs to income and benefits of an innovation, difficulty and complexity of implementation are also the factors which form the technological aspect [27]. Testability, integrity and ease of technology affect its acceptance as well [3].

Organizational factors are related to the resources and structure and ability of an organization [5]. According to Salwani and Marthandan [28], organizational factors are all the descriptions related to an organization such as the size, ideas, manpower and management. Also Dedrick and West [29] stated that the phenomenon of adaptation to an innovation is affected by formal and informal intra-organization mechanisms for communication and control of resources and initiatives. Structure and attitudes of managers, staff capabilities and resources are among the organizational factors [26].

The size of the organization in terms of the workforce and the managers and the power of organization are effective in accepting innovation and technology [6].

Environmental factors refer to the environment of an organization including industry, competitors and technology suppliers. In 1990, Depietro et al. [24] added that dependent variables in the industry including communications between buyers and sellers, a sense of competition and defining the nature of the industry are among the factors that give meaning to the environment. Relevant set of rules and guidelines, government and monitoring agencies are among effective environmental factors.

In this research, based on TOE model and prior studies, indicators for each factor are determined and after obtaining the opinion of experts, the TOE based adoption model as it is depicted in Fig. 1, has been developed and scrutinized.

In the research model, easy understanding and fluency of system and compliance of innovation with previous systems have been considered as indicators of technological factor, implementing the successful implementation of innovation and available resources such as human and financial forces and manpower skills and experience have been considered as indicators of organizational

factors and finally, the environmental pressure from regulatory agencies and the competitive pressure from peer organizations have been considered as indicators of environmental factors and after finalization of the model, the effect of parameters on the implementation of XBRL has been studied and analyzed.

Each of the selected indicators of each factor can affect the implementation of XBRL. With this model, the effect of individual indicators is assessed and the impact of each is calculated and compared. In other words, by using the findings, an organization will realize which of the indicators is more effective and has a greater significance on the implementation of XBRL. Through statistical analysis, the effect of each factor on the implementation of XBRL is also analyzed. This is important for the firms to understand that which of the model's factors including environmental, organizational and technological factors can affect the process of XBRL implementation as a new technology. It is also vital to be emphasized by the firms in XBRL implementation and adaptation projects.

3.2 Research Tool

In this study, a standard questionnaire has been used as an instrument to measure the relationship between the TOE model's factors on implementing XBRL. The validity and reliability of the questionnaire is scrutinized as well. To prove the reliability of the questionnaire, Cronbach's alpha is used and to prove the validity of the measurement model confirmatory factor analysis (CFA) is employed.

In order to reach the study aims a sample of experts chose through simple random sampling technique and the questionnaire administered through them. Gathered data consist of 20 managers, 12 deputies, 21 senior experts and 65 experts' responses. It is fruitful to declare that 37 percent of the respondents were female and 63 percent were male. Minimum age of the gathered sample was 21 year old and maximum was 70 year old. Minimum work experience of the sample was about 2 years and maximum was about 50 years.

As it is mentioned before for the validity test of the questionnaire the construct validity through confirmatory factor analysis (CFA) employed. And finally the whole TOE model on XBRL adoption as it is depicted in Fig. 1 investigated

through CFA. For ensuring the findings most of the fit indices in CFA are presented in the following. Fit indices such as X^2 (Chi-squared), DF (Degrees of Freedom), RMSEA (Root Mean Square Error of Approximation), NFI (Normed Fit Index), NNFI (Non-Normed Fit Index), CFI (Comparative Fit Index), IFI (Incremental Fit Index), RFI (Relative Fit Index), GFI (Goodness of Fit Index), AGFI (Adjusted Goodness of Fit Index) are provided to prove measurement model and the final research model. The final model T-values and Fit-indices are depicted in Fig. 2.

As it is clear in Fig. 2 all T-values of final model are more or less that ±1.5 which means that all the relation in final modified model are significant in 95 percent of confidence interval. It means these factors have significant effect on XBRL adoption according to experts' opinions. Also the final model fit indices indicates the suitability of the model since that RFI, GFI and NFI are more than 0.9. Before go through the findings it is necessary to declare that for any kind of SEM analysis like CFA here, the adequacy of the gathered data should be investigated. So this has been done and the results are provided in Table 2. The regression coefficients of the final confirmed model are presented at Table 3 in findings which emphasize on the importance of each signified factor on XBRL adoption projects. These results can help scholars and practitioners to investigate on the most effective factor in facilitating the XBRL adoption within firms launching experience.

Table 2. KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy.		0.82
Bartlett's test of Sphericity	Significant	**0.00**[**]

*** signified at 99 percent of confidence*

Table 3. Importance of the model factors on XBRL adoption success

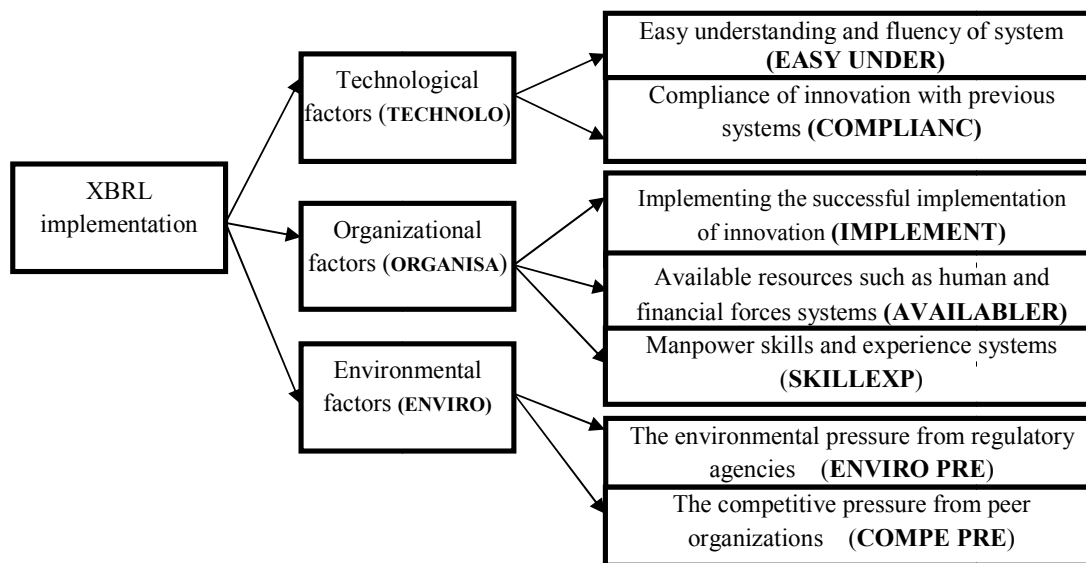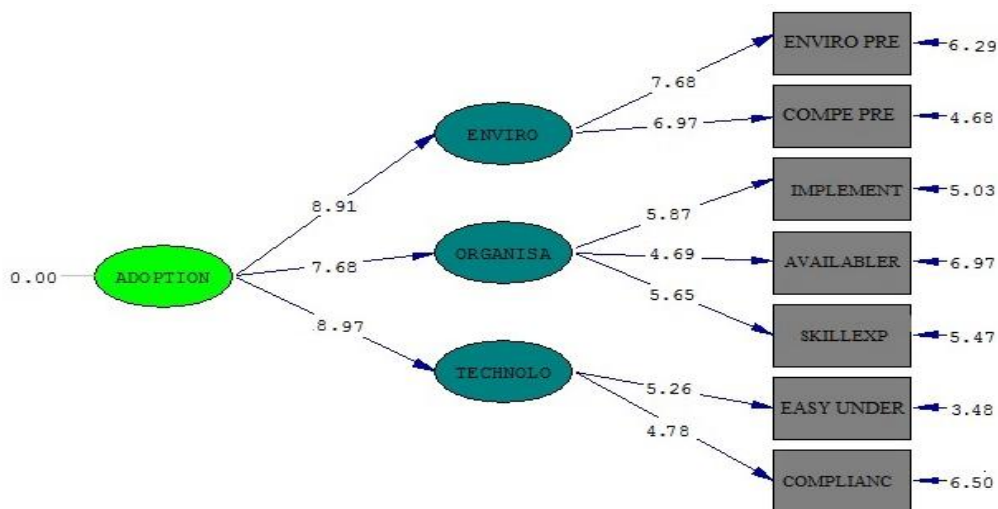| Latent variable	Factor	Importance
Technological (0.90)	Easy under[*]	0.9
	Complianc	0.7
Organizational (0.85)	Implement	0.65
	Availabler	0.5
	Skillexp	0.6
Environmental (0.95)	Enviro pre	0.75
	Compe pre	0.74

Fig. 1. Research model based on the standard organizational TOE model

Chi-Square=32.89, df=21, P-value=0.08132, RMSEA=0.071

Degrees of Freedom = 21
Normal Theory Weighted Least Squares Chi-Square = 32.89 (P = 0.081)
Normed Fit Index (NFI) = 0.95
Non-Normed Fit Index (NNFI) = 0.89
Parsimony Normed Fit Index (PNFI) = 0.61
Comparative Fit Index (CFI) = 0.91
Incremental Fit Index (IFI) = 0.94
Relative Fit Index (RFI) = 0.93
Goodness of Fit Index (GFI) = 0.92
Adjusted Goodness of Fit Index (AGFI) = 0.88

Fig. 2. XBRL adoption model T-values and fit indices

3.2.1 Fit indices

It is mentioned that the sample adequacy test is deployed at first of the data analysis. To this aim KMO and Bartlett's tests are used and results are provided in Table 2. According to KMO test results which is about 0.82 and based on Bartlett's test, significant level which is 0.00 the sample adequacy of the data for factor analysis is confirmed.

4. RESEARCH FINDINGS

Financial reporting is very important from the perspective of investors, shareholders and other stakeholders and affects most of their business decisions. Many people are interested to know the financial and economic situation of organizations before making any decision to invest or participation and compare it with other peer organizations within its industry in order to reach the most beneficial conclusions. Thus, focusing on an organization's financial statements and the reporting system such as XBRL is vital within nowadays business era.

In result this study tries to investigate factors affecting XBRL adoption within firms through TOE model including environmental, organizational and technological factors. Based on the prior literature on this issue, for each group of factors in the model a series of related indicators were founded which led to questionnaire in order to investigate the affecting factors on XBRL well adoption. After reviewing the validity of the model in previous section, the importance of the signified factors on XBRL adoption are discussed here.

Findings depict that in TOE model, environmental factors with 0.95, technological factors with 0.90 and organizational factors with 0.85 are the most important latent factors on XBRL adoption success within Iranian firms, respectively.

In investigating the effect of each index, environmental pressure from regulatory agencies with 0.75 and competition between peer organizations with 0.74 were the affecting factors on XBRL adoption within the environmental factors' group and the results showed that both factors had nearly the same effect on XBRL implementation. In the organizational factors group, implementing the successful implementation of innovation with 0.65 and manpower skills and experience systems with

0.60 and available resources such as human and financial forces systems with 0.50 respectively were factors affecting XBRL implementation. Through the last group, technological factors, easy understanding and fluency of system with 0.90 and compliance of innovation with previous with 0.70 are affecting the XBRL adoption success. Findings depicted that easy understanding of an innovation is one of the most effective factors on XBRL adoption within Iranian firms. This result can help the firm financial managers to invest correctly on the most important factors to facilitate XBRL adoption in their financial reporting launching projects.

5. CONCLUSION

Results showed that the factors of TOE model, as the affecting factors on new technology can be useful for XBRL implementation as a new financial reporting technology as well. Also it can be concluded that focusing on different factors can lead organizations to the correct decisions, it means that there are several factors which can facilitate XBRL adoption within firms although their importance rate are not the same. Considering the organization environment which include competitors and environmental pressure affect XBRL implementation in most serious way (0.95). It can be resulted from directive assignment or obligation for implementation by monitoring organizations such as the Stock Exchange or a sense of superiority in contrast to other organizations can serve as motivation for XBRL implementation project.

Organizational factors such as available resources including financial and human resources and organizational climate of the project implementation will be able to facilitate the implementation XBRL and make adoption of this technological innovation easier. Experience and skill of manpower and accepting the pattern of successful implementation of the project can encourage managers in accepting the implementation of XBRL as well.

Technological factors and especially, ease of understanding the language of financial reporting in accordance with accounting standards can encourage organizations to hope in the successful result of BRL adoption. In general, the effect of the TOE model, or in other words the effect of environmental, organizational and technological factors will be different with respect the atmosphere of any organization in addition to their different coefficient based on the above

mentioned findings. In result the XBRL adoption experience in firms can be affected by many factors which are necessary to be analyzed and investigated before implementation phase of XBRL if well adoption and success are pursued by the firms.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. IAASB. XBRL: The emerging landscape. International auditing and assurance standards board; 2010.
2. Farewell S, Debreceny R. Attesting adios! airways' XBRL filings: A case study on performing agreed-upon procedures. Accounting Education. 2012;21(2):131-160.
3. Cordery CJ, Fowler CJ, Mustafa K. A solution looking for a problem: Factors associated with the non-adoption of XBRL. Pacific Accounting Review. 2011;23(1):69-88.
4. Henderson D, Sheetz SD, Trinkle BS. The determinants of inter-organizational and internal in-house adoption of XBRL: A structural equation model. International Journal of Accounting Information Systems. 2012;13(2):109-140.
5. Alshamaila Y, Papagiannidis S, Li F. Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. Journal of Enterprise Information Management. 2013;26(3):250-275.
6. Sohrabi B, Khanlari A. Prerequisites for XBRL adoption. Study of Accounting and Auditing Journal. 2008;16(56):79-92.
7. Golkar R, Nikbakht M. XBRL implementation: An empirical study in petroleum companies. MS. Thesis, University of Tehran; 2011.
8. Ramdani B, Chevers D, Williams DA. SMEs' adoption of enterprise applications: A technology-organisation-environment model. Journal of Small Business and Enterprise Development. 2013;20(4):735-753.
9. Gangwar H, Date H, Raoot AD. Review on IT adoption: Insights from recent technologies. Journal of Enterprise Information Management. 2014;27(4):488-502.
10. Steenkamp LP, Nel GF. The adoption of XBRL in South Africa: An empirical study. The Electronic Library. 2012;30(3):409-425.
11. Debreceny R, Gray GL. Financial reporting on the Internet and the external audit. European Accounting Review. 1999; 8(2):335-350.
12. Hao L, Zhang JH, Fang JB. Does voluntary adoption of XBRL reduce cost of equity capital? International Journal of Accounting and Information Management. 2014;22(2):86-102.
13. Richards J, Saeedi A, Smith B. An introduction to XBRL. Iranian Accounting & Auditing Review. 2005';45:132- 158.
14. Peng J, Janie Chang C. Applying XBRL in an accounting information system design using the REA approach: An Instructional Case Accounting Perspectives. 2010; 9(1):55-78.
15. Yoon H, Zo H, Ciganek AP. Does XBRL adoption reduce information asymmetry? Journal of Business Research. 2011; 64(2):157-163.
16. Troshani I, Doolin B. Innovation diffusion: A stakeholder and social network view. European Journal of Innovation Management. 2007;10(2):176-200.
17. Hannon N. XBRL for general ledger. The Journal Taxonomy. Strategic Finance. 2003;85(2):63-67.
18. Amini P, Moradi F. Reporting entities on the Internet. Journal of Auditor. 2006;39: 64-71.
19. Craven BM, Marston CL. Financial reporting on the Internet by leading UK companies. European Accounting Review. 1999;8(2):321-333.
20. Pinsker R. XBRL awareness in auditing: A sleeping giant? Managerial Auditing Journal. 2003;18(9):732-736.
21. Troshani I, Lymer A. Translation in XBRL standardization. Information Technology & People. 2010;23(2):136-164.
22. Kaya D. The influence of firm-specific characteristics on the extent of voluntary disclosure in XBRL: Empirical analysis of SEC filings. International Journal of Accounting and Information Management. 2014;22(1):2-17.
23. Bozorg AM, Vali PJ. Familiarity with the concepts and usage of XBRL. chartered Accountant Journal. 2005;83-90.
24. The context for change: Organization, technology and environment. In Tornatzky LG, Fleischer M. (Eds.), Processes of

technological innovation. Lexington, MA: Lexington Books. 273;151-175.

25. Wang YM, Wang YS, Yang YF. Understanding the determinants of RFID adoption in the manufacturing industry. Technological forecasting and social change. 2010;77(5):803-815.

26. Premkumar G. A meta-analysis of research on information technology implementation in small business. Journal of Organizational Computing and Electronic Commerce. 2003;13(2):91-121.

27. Tornatzky LG, Fleischer M, Chakrabarti AK. The process of technology innovation. Lexington: Lexington Books; 1990.

28. Salwani MI, Marthandan G, Norzaidi MD, Chong SC. E-commerce usage and business performance in the Malaysian tourism sector: Empirical analysis. Information Management & Computer Security. 2009;17(2):166-185.

29. Dedrick J, West J. Why firms adopt open source platforms: A grounded theory of innovation and standards adoption. In Proceedings of the workshop on standard making: A critical research frontier for information systems. Seattle, WA. 2003;236-257.