International journal of Web applications: Volume(3), N0, 1:

Assessment and Predictive Measures of Information Technology Readiness: Case study

Saleh Al-Zhrani
Department of Information System, Faculty of Computer and Information Sciences,
Al Imam Muhammed bin Saud University, Riyadh, Saudi Arabia

Abstract: Currently, the Information Technology (IT) has a great influence on the lives of the people in all aspect of the life. However, different societies react with IT delivery in various ways. The degree of the deployment of Information Technology, the IT readiness index reveals the availability of IT applications in any country. This research paper target this issue in Saudi Arabia. The study figure out that the IT skills of users do not correlate with the IT readiness in Saudi Arabia. In addition, found that the training the end-users is significant to exploit the Information Technology to an optimum level.

Key words: Information Technology (IT), computer skills, instructional infrastructure, skill acquisition, technological change, categories, systematic analysis, imperfections, variations

INTRODUCTION

Information Technology (IT) deployment has been used a criterion to assess the technology infusion and application in individuals, in institutions and Governments. Since we live in the "information age," information technology has become a part of our everyday lives. Studies consistently indicate that there exist enormous variations in the levels of IT applications across countries. Explaining the wide range of variations in IT application requires a systematic analysis of the factors which appear to influence the deployment. This study discusses general theoretical as well as practical considerations for explaining the levels of IT applications in countries particularly Saudi Arabia. Explanations of the levels of application have been offered with two perspectives. These are whether the differences in the IT applications that are found are attributable to initial differences in the individual background characteristics or to the organizational environment. Both perspectives have supported their positions with collections of empirical evidence. In this study, the primary focus of concern is to identify factors explaining the IT deployment problems of the end-users in Saudi Arabia. Therefore, other aspects of IT applications are not considered.

Two visions of the dynamics of IT enhanced deployment are germane to an understanding of IT penetration movements. The first would emphasize the role of innovative applications whose resource-saving effects impinged upon many branches of the technology concurrently, especially through spillovers of IT knowledge and the diffusion of general purpose technologies into practical use. The second view considers the variegated possible sources of measured IT application increase, each of which might be relevant to one or another particular industry or Government at some period.

It is worth to investigate the additional charge and to develop a set of goals for the user community with regard to the use of information technology, perhaps targeting its various user categories. These roles are identified with that they would present areas or opportunities for IT deployment to exercise leadership in the use of information technology to improve learning process about the wider availability of IT innovations.

Defining information technology: Information Technology (IT) broadly includes the computing infrastructure, the communication infrastructure and by extension of these, the institutional infrastructure (e.g., multi-campus consortia) and the instructional infrastructure (a range of courses from small classes taught by one faculty member to large, team taught or distance learning courses). (NSF, 1998) Thus, any study on the IT includes the computing, communication and the extensions such as web and other applications. The study of the infusion and the degree of the application and practice is the IT readiness. The IT readiness also includes the above components and any research need to focus the IT readiness and these issues.

With the advent of the Internet and a variety of software and hardware applications, institutions have predominantly focused on the acquisition of hardware and computer network infrastructure in the pursuit of

information technology goals (Miller, 2007). Despite the current economic challenges. We believe that the deployment of IT is increasing because of two principal reasons. One is that technology is evolving continuously and, despite economic slowdown in the past two years and also in the possible immediate future years, progress in most areas of IT capabilities continues at a sweltering pace. For example, the price of computers and IT components is falling down which make people to resort to newer technology with less cost and thus the society now get access to affordable computing. Packages, services and software capabilities are available to the large number of users which further leads to a large degree for the growth in popularity of social networks and other relevant components like Web 2.0 including Wikis and blogs. And also, in The Networked Readiness Index, Saudi Arabia has improved their ranking from 48-40 from 2007-2008-2008-2009 (Irend Mia 2009). However, whether these facts ensure that the IT deployment and its exploitation stand in an optimum level? Whether these data manifest in reality in terms of exploitation and application? In fact, inequality surfaces in the IT utility and users' readiness. This factor needs to be investigated.

Studies on IT skills assessment: The growth of digital content and technology and its unlimited use in organizations have created profound issues that raise questions about the knowledge, training, technology. The knowledge focus is stemmed from the levels of skills as Manninen (2004) proposed three levels of skills such as the foundation or basic skills are distinguished from the more specialized-technical skills and are considered as the basis for every person with knowledge of digital technology. The specific knowledge and competences are acquired either formally or non-formally.

Besides, the knowledge and technology, the studied reasons for the varied levels of information technology readiness is the personality composition, particularly motivation, self esteem, learning styles and cognitive thinking-influences a person's academic performance and the decision to pursue IT education and careers. (Wilson 2004)

Training has the common goals of improving skills, knowledge and task based performance of the users in information technology. Within the training context, multiple studies have investigated the factors that lead to improved knowledge, skills and performance including those that focus on training mechanisms (Al-A'ali, M., 2007, Yi and Davis, 2001; 2003; Al-Gahtani *et al*., 2007; Ghobakhloo, 2010) and those that focus on trainee characteristics (Johnson and Marakas, 2000).

Training in the recent period, particularly the Web Training helps the novice users learn how to manage files and data to process and handle. The generation of advice makes use of adaptive computer techniques and is adapted to each individual learner's needs, depending on their knowledge level, age, habits and difficulties. (Kabassi and Virvou, 2004).

Mechanisms employed: The research addressed in this work identified a few significant needs/issues by discussing the various applications and lead to plan as well as predict the possible future directions of information technology:

- The research on IT deployment and the users' readiness to exploit in an optimal way needs to be documented to offer the validity to which leads to produce Information Technology application modes
- The influence of the use of current information technology on the individual and organizations. The study of factors that play role in the formation of IT innovations and fix future path of information technology
- The study of the technological components such as packages, prototypes and services

MATERIALS AND METHODS

A suitable research design is important to elicit the tactical data and information about understanding how the information technology is impacting the learning environment of organizations and institutions. The proposed research design can permit direct observation and thorough exploration of the research context. As a result, the design of the study evolved from within the qualitative research which is described as a multiple observational environment. Eight different organizations and institutions including Government departments of the country were selected based upon their varied IT applications, perceived level of technology infusion and openness in the application. Such purposeful sampling is carried out based on the observation and experience as IT research team. Further, it is noted that the selected users would provide an open and trusting research environment for the study.

The principal methods of data collection employed are the observations, personal interviews, focus group interviews and document review. They were utilized during the research to provide a thorough understanding

of the interactions between the users in the selected organizations. Throughout the data collection period, the data was collected from multiple informal observations in each studied organization, acting in what has been called the participant observer role. Eight formal observations were conducted in each organization as well, with the researcher in a primarily observational role for a longer period of time. Following the observations and nearing the end of the data collection period, personal interviews were held with each of the eight users in addition to several focus group interviews of users. The constant comparative method of data analysis was used to look for similarities and differences between and among units of data collected from multiple sources. The major areas and categories identified throughout the research process and once such labels emerged, each unit of data was coded according to where it fit within these categories.

Computation methodology and data: In line with the methodology described above, the data set is composed of a mixture of hard and survey data capturing both quantitative and qualitative determinants of a country's IT readiness. In this regard, many variables such as are hard, quantitative data, collected from organizations are validated to ensure data comparability across studied organizations. Many components of the data set requirements invited reflections of the dimensions that are more qualitative in nature or for which there are no hard data available for a large number of organizations but that are significant in capturing national information technology readiness. These data are drawn from the Opinion Survey. The solicited data include the reflections about the services, packages, technology together with the users' perception and understanding of the IT penetration and readiness and to what extent these are prioritized in the national agenda. For all these dimensions, since no hard data are available, the users provide an invaluable source of information and insight.

Data were collected from individuals working in various Government as well as private organization who have either undergone introductory computer skills course or training. The data collected were related to two components, viz., assessment of basic computer knowledge and computer history and the second component of the study is the development of technical skills. The skills addressed in this study included Internet/email, word processing, graphics packages, spreadsheets and database skills. Skill acquisition for each computer use and application was assessed through the skills test. Of interest to this study was the spreadsheet skills assessment. The spreadsheet skills test utilized an online testing system where the students used windows platform to complete a series of a few tasks. On the day of the spreadsheet skills test, participants first completed a consent form and a questionnaire assessing the variables of interest in the study. After completing the questionnaire, participants completed the skills test.

RESULTS

Notwithstanding the available information, it is possible to examine the proportion of organizations where users get training in IT in their jobs. On this measure, the level of 'training organizations' in Saudi Arabia is relatively low when comparing too many countries. The relationship between access to IT education and training and the proportion of work centers that are learning organizations could not be explored in our multivariate analysis due to lack of data in Saudi Arabia.

Using the set of both dependent and independent variables, we have measured broadly the relationship interrelationship between the variables to confirm the existence of difficulties in IT readiness of Saudi Arabia. The collective variables data is presented in the Table 1.

Diffusion, Implementation rate and application of information technology: The variables and parameters described in the method section are studied using extensive data collected, but reported in the following tables at a broad level by integrating the data into a few identified major component variables.

While all examined variables in the studied sectors, organizations, IT applications show a positive trend, the contribution of organizations to Research and Development is minimal and show a negative trend. The regression values for the collective data set are presented in Table 2 followed by discussions.

The results obtained show all variables included in the model as significant at better than the 95% level of confidence. The only exception is industry users, which is not significant. The direction of the relationship is the opposite of what we expected for three variables: the extent of participation of top level users in discussions regarding IT, the existence of a national training levy and the existence of a sectoral training levy. This would suggest that training levies only are not an effective way to increase participation in IT orientation. By contrast, the degree of technological change, the strength of collective bargaining over training issues and motivation of users by organizational partners has a positive correlation with access to IT learning. The effect of joint governance of training funds by social partners is quite substantial, as is the effect of the degree of technological change. For assessment of IT infusion or integration the set of criteria weights are proposed by many such as

Dias *et al*. (2002), Mousseau *et al*. (2001) and Mousseau and Slowinski (1998).

Table 1: Expected relationship between access to IT education and framework variables

Dependent variable	Independent variable	Expected relationship
IT Infrastructure	Extent of participation on IT by organizations	+
IT policies	Intensity of collective bargaining on IT	+
Funds for IT	Joint governance of IT funds by social partners	+
Modules	Training levy and earmarked contributions at national level	+
Units	Training levy and earmarked contributions at sectoral level	+
Statistical data	Degree of technological change: The Degree of IT applications in organizations	+
Funding	Percentage of expenditure in research and development performed by the business enterprise sector	-

Table 2: Access to IT training regression result

Variables included in the model	Regression results	Significance
Technological change	0.0351677 ***	(0.01)
Works councils	-5.219445 ***	(1.05)
Collective bargaining	4.28321 **	(2.01)
Joint governance of training funds	8.042649 ***	(1.90)
National levy	-15.66769 ***	(1.34)
Sectoral levy	-12.6936 ***	(1.83)
Industry users	0.079512	(0.13)

N = 145; R-square = 0.7710 ***: Significant at the 99% confidence level; **: Significant at the 95% confidence level; *: Significant at the 90% confidence level

Indeed, the role of the organizational partners in general and the business community and employers in particular, in IT learning strategies has become increasingly prominent across Saudi Arabia. This is in part in recognition of the market failures that exist in the area of adult education and training, such as user environment imperfections, IT market imperfections and training market imperfections, which lead to under-investment. In order to address these problems, structured involvement of employee representatives and the social partners at various levels of negotiation and dialogue on training are needed. It is indeed of interest to note that while much of the industrial relations literature is focused on the trend towards decentralization of bargaining, more flexible use of users and power shifts from organizations, the introduction of IT education and training in many countries reflect a different tendency, i.e., that of increasing dialogue.

The response time of the IT professionals for the implementation of the developments is found to be more. This has far reaching impact on the performance. It takes considerable time for the IT professionals to understand the changes in tools and applications. Deployment of newer and updated tools makes the existing ones obsolete and the study recorded an increasing replacement resulting the updating of available equipments.

Suggestions: In the light of our findings, it is possible to provide a few concrete solutions and suggestions to increase the IT readiness in Saudi Arabia. To sustain the enhanced adaptability, more collaboration is necessary between academic institutions, business and other organizations and industry. It is also essential to take into consideration of the prevailing social, ethical and professional attitudes of all those concerned for making the constituents to change the perceptions so as to consider the use of information technology in different applications [Iskandarani, M., et. al. 2006].

Issues for education-based orientation for IT readiness: We provide further stimulations such as the support for the development of classes and training that engage and interact with target users:

- Trainers or the educators can build their training ability before they embark programs to outreach the user community and the development in the use of information technology and apply in the training/learning centers and educational support systems
- The Authoring/development tools that facilitate transmission of data and information in IT need to be augmented more easily and support for the use of these tools
- The Information Technology access can get guided and organized so that the access is intuitive
- Only optimized educational programs and the training based on them would ensure to offset the inequity of access to information technology-based learning
- The organizations committed to apply IT can be challenged in terms of delimiting the boundaries between courses, curricula and organizations, control and accountability

Issues to be addressed: While we advocate the suggestions, there are many issues that need to be

addressed before embarking institutionalization. These include:

- Small organizations will face workload in ensuring required training to the required users and interrelating the network institutions
- It is also important to ensure the disproportionate demand for the IT services
- The institutions will respond to the opportunity to hire trainers and will this lead to increased trainer employment, an increase in part-time or as-needed assignments, or a concentration of employment of that faculty most in demand
- Institutions will face more rapid and substantive changes than residential campuses.
- The expectations from the trainers and the process of training in the off-campus environment versus on-campus must be addressed

Faculty development in information technology:

- Lack of knowledge in a highly optimized access environment calls for the introduction of training, that includes comprehensive applications in evaluation of available online resources, knowledge of complexity of web environments and packages at a broader level
- The suggested training is aimed at multiple types of locations and targets that include
- departments, institutions, professional societies, industry, government and foundations
- The training for trainers is the requirement in the Saudi environment as the IT focus is unique
- The users who have acquired skills-including self- and external need further motivations and rewards which would lead them to disseminate effective technology to the generations and bring focused culture
- It is a different connotation that the required change in culture and focused access will succeed with the help of establishment of long-lived support groups and communities that span organizational and disciplinary boundaries
- The discussion on use and application of the technology proceeds the hands-on being training
- The environment in Saudi Arabia leads the planners and implementers to understand that infusion at the different levels is required to penetrate the whole user community

CONCLUSION

The World Wide Web has profound influence in the IT corridor which makes people to orient to the IT in an organized way. However, the ultimate benefits of this web medium are contingent upon an accompanying training and support system for end-users. For a continuing and more substantive community-based IT readiness, a greater focus of effort is required. The focus can be both general as well as on a particular discipline, a given area of technology, or in response to an established national need for such development and implementation.

The training and IT readiness have potential when the associations and societies play role as they are required to coordinate evaluation and dissemination, within a specific domain. More attention is required to focus on the planning and budgeting the various information technology readiness scenarios to assist organizations. At the same time the organizations have to assist for IT readiness by offering integrated access of the components such as digital archiving, data warehousing and accounting. Government support at both broader as well as at narrower level is significant to provide coherent and comprehensive credibility to the widespread implementation of these technologies.

The optimum solution for bringing E-readiness in Saudi Arabia is to introduce the collaborative effort between organizations, higher education and government that results in curriculum development, enhanced training of IT workers and research to understand the problem and provide solutions. Now the society realizes that the sustainable technology infusion is determined by the introduction of innovation to keep the quality of life as IT has direct bearing on the society than any other technology. This has been documented in a study on Motivation for Use of Information Technology (Agbonlahor, 2006). The fact remains and perceptions ensure that the firms and markets do not operate in a vacuum. By themselves they do not produce the level of innovation and IT application that a perfectly functioning market would emerge. Relying solely on organizations on their own will increasingly because the Saudi Arabia may lose out in the international competition for high-value added service and technology in the knowledge-intensive society.

REFERENCES

Al-A'ali, M., 2007. Adoption of peer-to-peer assessment in a computing skills course. Am. J. Applied Sci., 4: 828-833. DIO: 10.3844/.2007.828.833

End time

Agbonlahor, R.O., 2006. Motivation for use of information technology by university faculty: A developing country perspective. Inform. Dev., Vol. 22, No. 4, 263-277, DIO: 10.1177/0266666906072955.

Al-Gahtani, S.S., G.S. Hubona and J. Wang, 2007. Information Technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT. Inform. Manage., 44: 681-691.

Dias, L., V. Mousseau, J. Figueira and J. Clımaco, 2002. An aggregation/disaggregation approach to obtain robust conclusions with electre Tri. Eur. J. Operat. Res., 138: 332-348.

Ghobakhloo, M., N.B. Zulkifli and F.A. Aziz, 2010. The interactive model of user information technology acceptance and satisfaction in small and medium-sized enterprises. Eur. J. Econo. Finance Admin. Sci., 19: 8-16.

Iskandarani, M., G. El-Refae and S.F. El-Etter, 2006. A rubber band ethics model for computing and information technology practices. Am. J. Applied Sci., 3: 1910-1915. DIO: 10.3844/.2006.1910.1915.

Johnson, R.D. and G.M. Marakas, 2000. The role of behavioral modeling in computer skills acquisition: Toward refinement of the model. Inform. Syst. Res., 11: 402-417.

Katerina, K. and V. Maria, 2004. Personalized adult e-training on computer use based on multiple attribute decision making0. Int. Comput., 16: 115-132.

Manninen, A., 2004. Supply and demand aspects of e-skills, technology industries of Finland. Proceeding of the for Discussion at the European e-Skills Conference, 20-21 September 2004, Thessaloniki, Greece

Mia, R., S. Dutta and G. Thierry, 2009. Gauging the Networked Readiness of Nations: Findings from the Networked Readiness Index 2008-2009 The Global Information Technology Report 2009. pp: 10.

Miller, R.K., 2007. The impact of educational technology on learner interactions: A multiple case study of elementary classrooms. Proceeding of the 3rd Annual GRASP Symposium, Wichita State University. pp: 57-58.

Mousseau, V. and R. Slowinski, 1998. Inferring an electre tri model from assignment examples. J. Global Optimiz., 12: 157-174.

Mousseau, V., J. Figueira and J.P. Naux, 2001. Using assignment examples to infer weights for Electre Tri method: Some experimental examples. Eur. J. Operat. Res., 130: 263-275.

National Science Foundation, 1998. Information Technology: Its Impact on Undergraduate Education in Science, Mathematics, Engineering and Technology Report on an NSF Workshop pp: 55.

Wilbon. A.D., 2003. Shrinking the digital divide: The moderating role of technology environments. Technol. Soci., 25: 83-97.

Yannis, S., G. Evangelos, K. Evangelia and M. Nikolaos, 2007. A multicriteria accreditation system for information technology skills and qualifications. Eur. J. Operat. Res., 182: 867-885.

Yi, M.Y. and F.D. Davis, 2001. Improving computer training effectiveness for decision technologies: Behavioral modeling and retention enhancement. Decision Sci., 32: 521-544.

Yi, M.Y. and F.D. Davis, 2003. Developing and validating an observational learning model of computer software training and skill acquisition. Inform. Syst. Res., 14: 146-169.