

THE IMPACT OF ORGANISATIONAL CULTURE ON WIMAX ADOPTION BY SAUDI SMES

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Abstract

Although there is some research that examines Worldwide Inter-operability for Microwave Access (WiMax) adoption, the role of the organisational culture by Small and Medium Enterprises (SMEs) has not been studied in the context of the Kingdom of Saudi Arabia (KSA). This paper presents the outcome of a study carried out to examine the impact of organisational culture on the WiMax adoption by SMEs in the KSA. Based on Cameron and Quinn's Organisational Culture Assessments Instrument (OCAI), 63 questionnaires were distributed to different SMEs in Saudi Arabia. The results showed that there is a relatively low level of WiMax adoption by Saudi SMEs. Findings stated that Saudi SMEs are dominated by the clan culture where people are less innovative than the people in adhocracy culture.

Keywords: SMEs, Wireless Broadband, WiMax, Organisational culture, Saudi Arabia

1 WIMAX TECHNOLOGY

The wireless technologies turn out to be critical in our modern society. As highly accentuated by several researchers – ‘Wireless’ is the future of broadband technology (Ganapati and Schoepp, 2008; Jindal et al., 2005). It certainly offers several advantages over the wired connections for Internet access such as greater mobility and flexibility, so that wireless devices can be used in the field for various purposes (Ganapati and Schoepp, 2008). Technologically, several types of wireless network alternatives have emerged in the recent years such as Wi-Fi. Despite providing several benefits, there are yet still several limitations in terms of costs, management, and technical characteristics (Jindal et al., 2005; Rao and Parikh, 2003). Literature highlights that plethora of proponents are advocating the use of Worldwide Interoperability for Microwave Access (WiMax) to overcome the limitation of Wi-Fi technology – yet another wireless broadband technology based on an evolving standard for point-to-multipoint wireless networking (Ganapati and Schoepp, 2008; Abichar et al., 2005; Vaughan-Nichols, 2004). WiMax is based on the IEEE 802.16 standard that enables wireless broadband access anywhere, anytime and virtually on any device. WiMax has been proposed as a promising wireless communication technology due to the fact that it can provide high data rate communications and business and consumer wireless broadband services on the scale of the Metropolitan Area Network (MAN) (Abichar et al., 2005). WiMax is an ideal broadband technology for backhaul applications because it eliminates expansive leased line or fibre alternative (Ganapati and Schoepp, 2008; Jindal et al., 2005; Vaughan-Nichols, 2004).

Literature indicates that WiMax has numerous advantages that are also the driving force behind opting for WiMax broadband technology such as: improved performance and robustness, end-to-end internet protocol-based networking, secure mobility, and broadband speed for voice, data and video (Ahson and Ilyas, 2007; Vaughan-Nichols, 2004). WiMax is a Wireless Metropolitan Area Network (WMAN) technology that provides interoperable broadband wireless connectivity to fixed, portable and travelling users within 50km of service area (Ahson and Ilyas, 2007). Other benefits include e.g.: allowing the users to get broadband connectivity without the need of direct line-of-sight

communication to the based station and provides total data rates to 75 Mbps with sufficient bandwidth to simultaneously support hundreds of residential and business areas with a single base station (Ahson and Ilyas, 2007). Vaughan-Nichols (2004) also supports that WiMax offers a standardised technology. WiMax's open approach could let manufacturers achieve economies of scale by building large quantities of products and components to one standard.

According to the WiMax Forum (2005), WiMax standard has been developed based on several objectives such as: (a) flexible architecture (e.g. WiMax supports several system architectures as the point-to-point, point-to-multipoint, and ubiquitous coverage), (b) high security (e.g. WiMax supports advanced encryption standard and triple data encryption standards), (c) WiMax QoS (e.g. WiMax can be dynamically optimised for the mix of traffic that is being carried), (d) quick deployment (e.g. as compared to the deployment of wired solutions, WiMax requires little or no external plant construction), (e) multi-level service (e.g. the manner in which QoS is delivered is generally based on the service level agreement between the service provider and the end-user), (f) interoperability (e.g. WiMax is based on international, vendor-neutral standards that make it easier for end-users to transport and use their subscriber station at different locations, or with different service providers), (g) portability (e.g. as with current cellular systems, once the WiMax subscriber station is powered up, it identifies itself, determines the characteristics of the link with the base station, as long as the subscriber station is registered in the system database, and then negotiates its transmission characteristics accordingly), (h) mobility (e.g. WiMax technology provides higher mobile environment), (i) cost-effective (e.g. WiMax is based on an open, international standard and mass adoption of such standard, and the use of low-cost, mass-produced chipsets, will drive costs down dramatically), (j) wider coverage (e.g. WiMax systems are able to cover a large geographic areas), (k) non-line-of-sight operations (e.g. WiMax has the inherent capability of handling non-line-of-sight operation environments, which other wireless product cannot do), and (l) high capacity (e.g. using higher modulation and channel bandwidth, WiMax systems can provide significant bandwidth to end-users).

Lu et al., (2008) argues that despite WiMax's benefits and objectives as aforesaid and salient features from the technical perspective, the success of the WiMax network depends on its capability of providing cost-effective solutions for a variety of existing and potential services. Abichar et al., (2005) also support that the WiMax technology faces several stiff challenges before it can become widely popular. Some critics argue that much of the radio spectrum needed to deploy WiMax has already either been distributed by governments or dedicated for other purposes by carriers. Also, some argue that the cost of deploying wireless technology is considerably more when the service is offered at higher radio frequencies because the line-of-sight requirements necessitate the installation of additional antennas to cover the same service area. The frequencies available for new technologies such as WiMax are frequently the higher ones because many of the more desirable lower spectrum ranges have been licensed for other uses. Abichar et al., (2005) also reports that the mobile version of WiMax may face serious competition from IEEE 802.20 mobile broadband technology, which targets high-speed, wireless, IP-based connectivity to devices such as cellular phones, PDAs, and laptops. The technology will operate in the 500 MHz to 3.5 GHz range. On the contrary, despite these arguments, several researchers convincingly emphasize that WiMax broadband technology has the potential to serve in several ways that may overshadow the challenges to WiMax such as including among others: (a) linking residential areas and businesses to core telecommunications networks worldwide (Shankar and Hegde, 2008), (b) WiMax promises to offer a solution to closing the digital divide (Yarali et al., 2007), (c) WiMax point-to-multipoint network provides last-mile access to a broadband Internet Service Provider (ISP) (Lu et al., 2007), (d) WiMax operators offer significantly higher download limits than any other technologies providing fast Internet access (Aytar, 2008).

Having presented the discussions and analysis on the functionality and benefits of WiMax technology, in the next section the authors take a step forward and explore the adoption perspective of WiMax technology in domain of SMEs and thereafter, specifically in the context of KSA.

2 WIMAX ADOPTION BY SMES IN KSA

As this literature review is concerned about WiMax broadband technology adoption by SMEs in the context of KSA; therefore the authors deem important that there is a need to have some background information about KSA. Literature indicates that the Internet is a relatively new technology in the region of KSA and King Abdul-Aziz City for Science & Technology (KACST) pioneered and commenced the Internet service in 1997 (Dwivedi and Weerakkody, 2007). KACST has placed several policies and formal procedures for using the internet with the cooperation of relevant public and private organisations. KACST has also trained its staff and put in place the layout and design of the new network that became the main catalyst which in turn transferred information all over the Kingdom. Dwivedi and Weerakkody (2007) reported that, there are three main types of Internet access available in the region of KSA such as: (a) dial up; (b) DSL broadband; and (c) satellite, which is comparatively expensive but not as popular. It appears that in KSA the Internet has taken a while to diffuse and is therefore seen as a relatively new technology. The KSA first started with dial up connections and then moved on to adopt broadband, satellite s and recently WiMax connections to provide better data communication services to its citizens. Numair and Masarweh (2010) reported that, WiMax has softly launched in Saudi Arabia in 2007. Subsequently, the WiMax service has strongly provided in the Saudi telecommunications market in 2010. Three operators have commercially offered telecom services over WiMax networks in all major cities in Saudi Arabia. However, even with the wireless broadband technology the number of Internet connections is considered to be relatively low in comparison; firstly to other developed countries such as the UK; secondly to leading broadband users such as South Korea (Oh et al., 2003). This low connectivity is often claimed to be caused by website filtration in the region. Consequently, broadband adoption has been slower than expected in the region of KSA.

In regards to SMEs in KSA, Looney (2004) reported that SMEs in KSA have the potential to play a variety of important roles such as: (a) selling their own products; and (b) acting as either subcontractors or suppliers of raw materials for larger multinational enterprises. There are several great success stories where SMEs have created a large number of jobs at relatively low costs. For example, the ICT job market is booming in Saudi Arabia, and in turn many positions in SMEs have been filled by Saudi people (Waegeniere, 2003). Currently, SMEs make up 90% of all businesses, however their contribution to the country's GDP with only 33% and the total employment with 25% remain low (SUSRIS.com, 2011). In contrast, despite these successes, Sajini (2004) also reported that access to technology – the digital divide is a significant problem for many SMEs in the KSA. Improving access to technological networks of international standard can be very expensive and unaffordable for many SMEs. In the context of WiMax adoption in SMEs, Smura (2005) presented a model for techno-economic analysis of WiMax networks. He applied this model to analyze a 3.5 GHz WiMax-based network deployment, so as to provide fixed broadband services for SMEs. Similarly, according to a report from In-Stat/MDR, the Fixed Wireless Broadband (FWB) market would grow from \$558.7 million in 2003 to more than \$1.2 billion by the end of 2007 (Schoolar and Fischer, 2004). One of the primary reasons for such an increase is the introduction of standardized WiMax technology (Angelov and Rao, 2006). A research conducted by the Yankee Group (research firm), also reported that just 21 percent of homes and 51 percent of businesses in the United States had broadband access in 2003. Among the businesses, almost 90 percent of large enterprises and only 35 percent of SMEs have broadband access. This clearly identifies the SMEs as a future opportunity for WiMax (Angelov and Rao, 2006).

Another difficulty which is presented internally from within the SMEs but which is a symptom of the wider culture, is that many company owners, employers and managers have limited market skills and have had no or very little formal training in marketing and product distribution (Looney, 2004). Because of this lack of expertise, important opportunities are being missed out on. Many SMEs in the Kingdom of Saudi Arabia are limited to trading locally with their neighbouring states or even nationally, as their owners are not trained enough to be able instigate more and potentially lucrative international trade further field. Indeed, in a survey of 60 existing SMEs in one province of the KSA in the year 2000, over 75% reported problems with marketing (Looney, 2004), with a great deal of the problem being more perceived rather than actual. That is, owners are not aware of the possibilities that

are available to them and often think that they are more limited than they are in their potential trade links. This can create a detrimental effect causing a vicious circle whereby if they do not attempt to establish more international trade links, potential international trading partners will not consider them as possible trading partners and links will become even less likely. It is partly for this reason as well as the possibility of huge internal growth and productivity, that it would be beneficial for SMEs in the KSA to adopt broadband technology. Connected to WiMax, managers, owners and employees would have access to a wider source of information which would enlighten them about the possibilities of higher trade. Those who were lacking expertise could educate themselves through the vast resources offered by high speed internet connections (Simpson and Docherty, 2004).

As well as having the ability to advance individual small and medium sized enterprises, the adoption of broadband and specifically WiMax can also benefit the wider economy (Olajubu et al., 2009). The principals behind this notion apply to all areas of business in any country and regarding every industry. That is, the more successful companies are the more money they produce and this in turn boosts their industry on a national level. Businesses which are developing and making more sales and profits are generating more economic flow which has a knock on effect for the economy of the nation to which they belong. Therefore, it is in the interest of a country's economy for that country to produce as many successful businesses as possible. As has been previously noted, SMEs account for around 90 % of the Kingdom of Saudi Arabia's total enterprises, 25 % of its total employment and only 33 % to the country's GDP (SUSRIS.com, 2011). It therefore goes without saying that the success of SMEs is of paramount importance for the wider success of the country's economy.

Recent research in broadband technology adoption mainly focuses on broadband services and government policies for home uses. However, there is little emphasis on the adoption of WiMax by SMEs and specifically in the context of KSA. The broadband research has provided a focus in various areas including broadband content, costing, government policies, educational and entertainment benefits (Oni, 2008). Taking into consideration this literature gap, there was a need to examine the adoption of WiMax broadband by SMEs in the KSA.

Since research in the area of WiMax broadband adoption by SMEs is limited, it can be of a benefit to a number of groups. The possible beneficiaries of this research include policy makers, SMEs and researchers. Examining the WiMax broadband by SMEs can help policy makers who are concerning the government's input to support broadband adoption and IT in general. It can also benefit SMEs in deciding whether or not they need to adopt wireless broadband such as WiMax. Additionally, it can help them to improve the strategy of their businesses. Furthermore, it can attract more researchers in areas of SMEs or wireless broadband adoption. As mentioned earlier, the research has provided a focus on broadband home use, its educational and entertainment benefit with little focus on its adoption by SMEs. Therefore, the aims and objectives of this paper are to investigate WiMax adoption in SMEs in the context of KSA in an organisational culture perspective. The study will critically review the WiMax literature and understand the area with a particular focus on SMEs in the context of KSA. Moreover, it will identify the dominant organisational culture profiles that have significant impact on WiMax adoption by SMEs in KSA.

The remaining sections of this paper are structured as follows; in section 3 the theoretical background of the study is presented. Section 4 presents the research methodology. The findings are discussed in section 5. Then the analysis of data is presented in section 6. Finally, in section 7 we summarize the results of this research with a brief outline of contributions and discuss the potential areas for further research.

3 ORGANISATIONAL CULTURE

While some studies suggested that cultures change, other suggested the opposite (Hatch, 1993). Over the last few decades, several researchers have studied the evolution of cultures. They have documented and theorized the stability and changes of the cultures (e.g. White, 1959). Hofstede (1980) defined organisational culture as "the values, attitudes, beliefs and behaviours that represent an organization's working environment, organisational objective, and vision". Other researchers have defined culture in

terms of ideologies, sets of beliefs, basic assumptions, share sets of core values, and important understandings (Sackmann, 1992). Other definitions of culture include: more explicit; artefacts such as norms and practices (DeLong and Fahey, 2000); symbols (Burchell et al., 1980); and language, rituals, myths, and ceremony (Pettigrew, 1979). Although there are many definitions of culture, Twati and Gammack (2006), highlighted that organisational culture has been seen as “holistic, traditionally decided, and socially built”. Krumbholz and Maiden (2000) also reported that; firstly culture involves beliefs, values, and behaviours, existed at various levels; and secondly culture manifests itself in a wide range of characteristics of organisational life. For instance, organisational culture refers to a set of shared values, beliefs, assumptions and practices that shape and guide members’ attitudes and behaviour in the organization (Hofstede, 1980).

Literature also highlighted that organisations are either people-oriented or task-oriented (Twati, 2006). Organisations that are people-oriented may adopt a wide decision-making structure. This, in turn, would direct them to adopt a flat organisational structure, which is characteristic of a low power distance. Conversely, organisations that are task-oriented are likely to adopt a more centralized decision-making process. As result, that will lead them more closely to a hierarchical organisational structure, or to a high power distance structure. Organisations that are task-oriented would aid the adoption and implementation of new technology such as WiMax. The adoption will be accepted and implemented if it helps them to accomplish tasks faster and more efficiently. In contrast, if the organisations are people-oriented, then it will take them long time to accept the new technology. They may also disagree to adapt with the evolution of technology. Moreover, Alvesson (2002) argued that there is a difference between organisations characterized as a technology-oriented culture and others that are a more traditionalist culture. The technology-oriented culture organisations are more likely to adopt modern technologies such as WiMax. However, the traditionalist culture will be more conservative in adopting WiMax. The literature has pointed to numerous research studies that have explored and measured organisational culture. Researchers measured culture differently according to their disciplines and backgrounds. In the next section, we discuss methods used to measure the organisational culture.

3.1 Measuring Organisational Culture

In order to assist, understanding, measuring, and mapping the organisational culture, several studies were explored. For example, Cameron and Quinn (1999), Trompenaars and Hampden-Turner (1998) and Schein (1990) have conducted studies on organisational culture according to their interest and discipline. Having completed their research, they came out with different dimensions of organisational culture. Also, they have developed different techniques to measure organisational culture. In addition, Hofstede (1991) argued that the difference between societal and organisational culture is brought by the various roles played by each in the manifestations of culture. Conversely, Trompenaars and Hampden-Turner (1998) also reported that organisational culture can be measured on seven dimensions similar to Hofstede’s conclusions. Hofstede (1991) developed six dimensions that assist in understanding different kinds of organisational cultures such as: process versus results, employee versus job-oriented, parochial versus professional, open versus closed system, loose versus tight control, and normative versus pragmatic. However, Trompenaars and Hampden-Turner’s dimensions are similar to those of Hofstede, as they are an amalgamation of measuring societal and organisational cultures. Even though they claimed that they were measuring organisational culture by surveying senior management executives in different organisations, It is revealed that in reality they were measuring a combination of societal and organization culture. The survey instrument they developed did not evidently outline between the two forms of culture. This may be a vital reason as to why their research resulted in seven dimensions of culture. Therefore, there are numerous approaches in regards to the measurement of organisational culture. Thus, we have chosen a valid and reliable instrument that can be adapted to measure the influence of organisational culture on the adoption of WiMax technology by SMEs. This will be discussed in the next part.

3.2 The Organisational Culture Assessment Instrument

The aforementioned studies show that culture is a vital factor in the continuing success of organisations and organisational changes. It is also important to measure and investigate the vital leading organisational culture type. The OCAI developed by Cameron and Quinn (1999), is based on the Competing Values Framework (CVF) by Quinn and Rohrbaugh (1981), is used to describe and categorize types of cultures in organisations. Cameron and Quinn (1999) identified two main dimensions, which were divided into four main quadrants (types of cultures). Figure 1 highlights these four quadrants that illustrate the characteristics of competing values framework. These dimensions relate to: flexibility and discretion versus stability and control; and internal focus and integration versus external focus and differentiation.

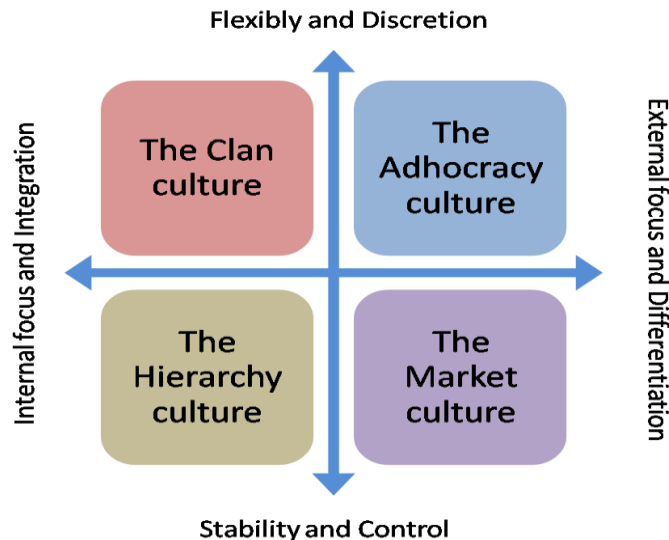


Figure1. The Organisational Cultural Profile (Source: Cameron and Quinn, 1999)

The resulting CVF is set out in Figure 1 and each quadrant representing a different type of organisational culture.

- The clan culture is like an extensive family, with shared values, beliefs, goals, unity and participation. This type of culture focuses on internal issues and values flexibility and carefulness rather than looking for stability and control.
- The hierarchy culture is based on a bureaucratic and official process and values tradition, emphasizing stability, teamwork, and agreement. It focuses more on internal than external issues and values steadiness and control over flexibility.
- The term market in the market culture is not the same as the marketing function, but rather refers to an organization that functions as a market itself. This culture values steadiness and control, but in addition focuses more on external environments rather internal issues. This culture is likely to view the external environment as threatening, and searches to recognize threats and opportunities as it looks for competitive advantage and profit.
- The adhocracy culture focuses on external issues and values flexibility and carefulness rather than looking for stability and control. This culture is characterized by originality, creativity, risk taking and entrepreneurial focus.

These four types of cultures serve as the basis for the OCAI. It is an instrument that is sensitive to creative and innovative aspects of organisational power. For these reasons, OCAI has been chosen in this research to measure types of organisational cultures in SMEs in the region of KSA. The OCAI also generates a mutual language and attitude among all employees at every level of an organization. It includes features that are associated with organisational performance. It also examines the relationship between organisational culture and desirable outcomes such as organisational effectiveness,

organisational strategies, processes, and decision-making styles. The OCAI assists the organisations in determining its dominant orientation based on the four culture types. Having discussed the OCAI, the following section will develop the suitable research methodology.

4 RESEARCH METHODOLOGY

Since information system is multi-disciplinary with many of its aspects related to specialised subjects, the identification of an appropriate research approach is not a simple task. In addition, there is no single framework that includes all the domains of knowledge needed for the study of IS (Galliers, 1992). Walsham (1995) states that selecting an appropriate research approach is a major task of the research design process. The reason is that there is plethora of methodologies that can be selected from, or what Galliers (1994) called, the methodological pluralism. Orlikowski and Baroudi (1991) report that IS are not rooted in a single theoretical perspective, but there is a wide range of philosophical assumptions regarding the underlying nature of phenomena under investigation. Thus, there is a range of research approaches available to IS researchers, not simply the more traditional ones with each research approach having its own strengths and weaknesses (Galliers, 1985). It is essential to comprehend the philosophical assumptions underpinning the appropriate approach selected. This is because it facilitates the development of a strong case to select a research approach (e.g. qualitative and quantitative) for a particular study (e.g. WiMax adoption by SMEs in the KSA). In the context of this research, the authors propose to follow a quantitative research approach.

Literature highlights that quantitative research methods diverge according to research aim and objectives and are one of the most commonly used research method in IS research (Creswell, 2003). However, in the context of this research survey methods and practices will be utilised. Survey based quantitative analysis have rapidly grown in the recent years with the growth of computers and comprise of a potent tool for collecting data from multiple units of analysis and cases (Vitalari and Venkatesh, 1991). Survey based research is a widely accepted and utilised research method among IS researchers in exploring organisational cultural issues (Schein, 1992; Hofstede, 1980). Several researchers have interpreted survey based research according to their own individual research aim, objectives and areas of research. For example, Fink (1995, p. 1) defines 'survey' as a "system of collecting information to describe, compare, or explain knowledge, attitudes, and behaviour". It is a way of collecting information about the characteristics, attitudes, actions, or opinions of a large sample of individuals, and in the context of this research are the employees within SMEs in KSA. Kraemer and Cash (1991) reported three distinct facets of survey based research method such as: (a) assist in generating interpretations of some features of a large of sample of individuals, (b) through structured and predefined questions, collecting information by inquiring from individuals, and (c) information generated is collected in such a way as it represents a generalised form of overall findings. Having stating these conceptions, the objective of the organisational-wide survey in SMEs in KSA in this study is to undertake exploratory research and examining the influence of organisational culture types on the adoption of WiMax in SMEs in KSA.

The quantitative research protocol will draw from Saunders et al., (2000) and Creswell (2003). After the questionnaire is designed, a limited pilot testing will be done using the reference SMEs. This is important to improve the questions and to test respondents' comprehension and clarity before the actual survey was administered (Saunders et al., 2000). Overall, a survey questionnaire approach is selected for this study as it is inexpensive, less time consuming and has the ability to provide both quantitative scale and qualitative data from a large research sample (Cornford and Smithson, 1997). The questionnaire that will be used will incorporate both closed-ended and open-ended questions (Saunders et al., 2000). Open-ended questions do not restrict the respondent's opinions to predetermined categories (Wilson, 1996) whilst closed questions offer a number of optional answers from which a respondent is requested to select and are often quicker and easier to answer (Saunders et al., 2000).

To meet the aim of this study, a survey was conducted and the data collection instrument includes a questionnaire. This instrument will assist this study to collect data on owner and decision makers' use

and no use of WiMax technology. The main parts of the questionnaire include the general demographic, organization profile and organisational culture questions.

To identify the dominant organisational culture type of Saudi SMEs towards WiMax adoption increased, the common instrument OCAI by Cameron and Quinn (1999) has been translated to Arabic. Translations of validated and reliable questionnaire to languages other than English have provided useful tools for researchers in many parts of the world. OCAI consisted of 24 questions, which were organized into six parts with four descriptions in each part. The four descriptions matched the definitions of each of the four culture types (i.e. hierarchy, clan, market and adhocracy). Respondents were asked to distribute 100 points for each of the parts among the four culture types depending on how similar the descriptions were to their organization. Scores for each of the four culture types were then added across the six parts.

The main challenge, and the complex task that can face the researchers, is survey research with a diverse culture where researchers depend on instruments with different languages (Hines, 1993). The translated instrument that has been used in the study was developed and tested in Western countries using the English language. This instrument was translated into the Arabic language for the convenience of participants. Literature identifies steps and guidelines to be considered when translating and adapting instruments for cross-cultural research (Brislin, 1986; Hambleton, 1994; Karahanna, et al., 2002; Mullen, 1995; Orlando & Law, 2000). The questionnaire was firstly translated into the Arabic language by the researchers and reviewed by Arab students and professionals who were fluent in both English and Arabic at the Saudi culture bureau and Brunel University in London. Changes were made accordingly and a revised edition was used for the pilot study. The respondents were asked again to give more comments on the translation and the use of Arabic language.

In order to evaluate the effectiveness of the chosen research method, a pilot study was conducted. The outcome from the pilot study helped to detect any flaws in the questions. Additionally, running a pilot study can contribute in maximizing the response rate and minimizing the error rate on answers (Burgess, 2001). The pilot study took place in the UK two months prior to the study. Therefore, five Saudi business people were involved as they were visiting the UK on business trips. The results of the pilot study were very positive, with the majority of the participants agreed that most questions were very easy and straightforward. All changes were then made before sending the questionnaire to the participating SMEs in Saudi Arabia. In terms of cultural considerations, adopting and using Western developed instruments bears some limitations but there were no indigenous instruments available.

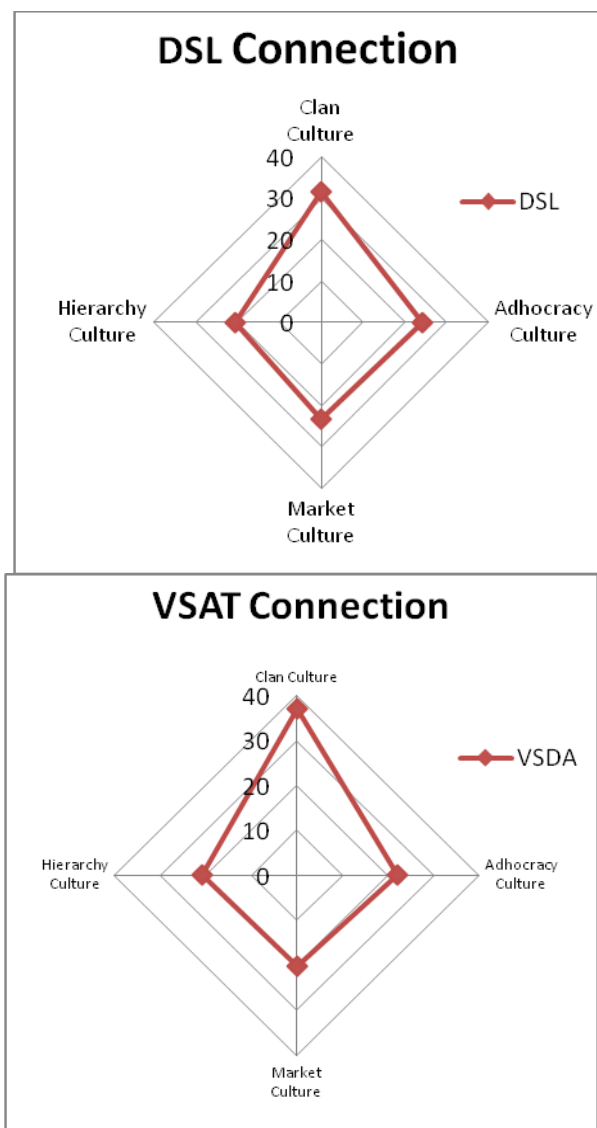
The majority of consumers including SMEs are concerned about the speed of the internet connection and the reliability of it rather than its type. They also interested whether it is a wired or wireless internet connection. They might do not know whether their connection to the internet was WiMax based, fibre-optic or using some other form of technology. Besides, WiMax is enabling technology which sites behind a fast connection rather than being a technology which people buy into directly at a consumer level. For that reason, a presentation about WiMax technology and its benefits to the SMEs has been given to the participants during three planned events between June and July 2010. The differences between the WiMax technology and the other sort of internet connections have been highlighted. The authors wanted to be sure that the SMEs know clearly about the concept of the research before they participate in the survey.

A total of 63 organisations in different sectors of SMEs participated in this study. The Majority of participants were Saudi natives who were in charge in their organization, both males and females from different educational backgrounds. 87 percent of the participants are the decision makers in their organisations. 75 percent of the SMEs have internet access and the majority of them are DSL adopters. Questionnaires were handed to the participants from SMEs in three planned events that mentioned earlier. A covering letters from the researchers and the embassy of Saudi Arabia which support the research were attached to each questionnaire. A total of 100 questionnaires were distributed during the events and a total of 63 completed questionnaires were returned, giving a rate of return of 63 percent. All surveys were suitable for data analysis.

5 FINDINGS

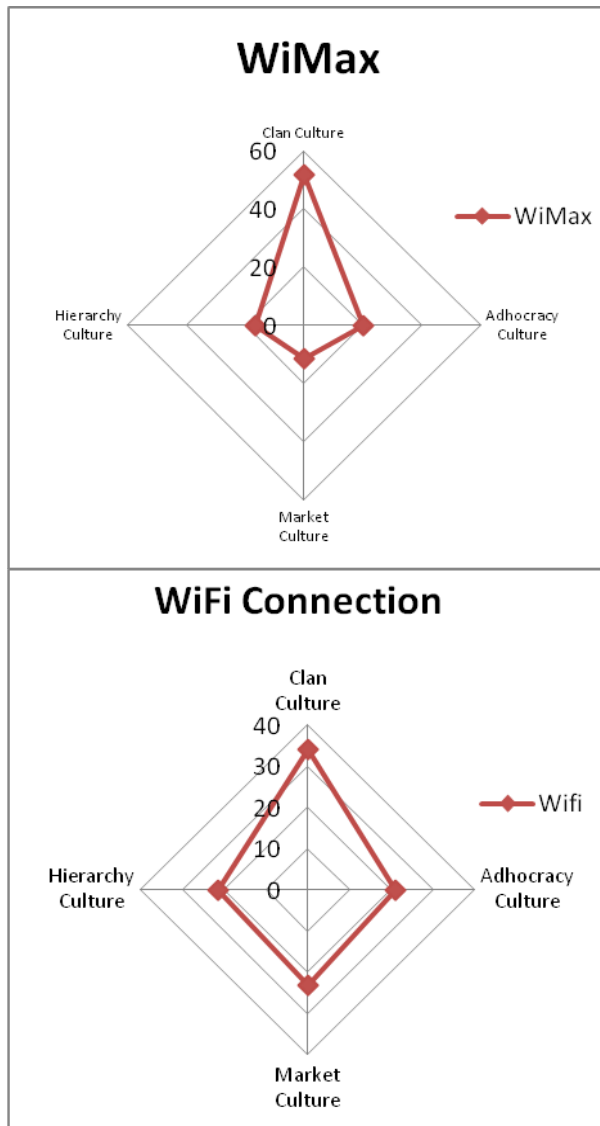
Descriptive statistics which include the frequencies and percentages have been presented by the Statistical Package for the Social Sciences (SPSS). Data of organisational culture were analyzed using the OCAI. Analysis of the questions was done by adding all scores of an alternative of each of the six questions and dividing them by six to get the average score for each alternative. This process was repeated for each of the four alternatives. The average result of each alternative represents the four types of culture: Clan, Adhocracy, Market, and Hierarchy cultures. All of the average scores were then plotted on a two-dimension graph with four quadrants as shown in figure 2. The dominant culture is the quadrant where the graph shifts most away from the centre point. The studies mentioned earlier have confirmed the validity and reliability of the OCAI in WiMax adoption (Cooper & Quinn, 1993; Grieco, 1993; Reagan & Rohrbaugh, 1990)

All of the average scores were then plotted on the two-dimension graph with four quadrants as shown in figure 2. The dominant culture is the quadrant where the graph shifts more away from the centre point.



(a) DSL adaptors profile

(b) VSAT adaptors profile



c) WiFi adopters profile

(d) WiMax adopters profile

Figure 2. The Organisational Cultural Profiles for SMEs in Saudi Arabia

6 ANALYSIS AND DISCUSSION

Figure 2(a, b, c, d) shows that the majority of organisational cultures of Saudi SMEs are clearly dominated by clan culture with the highest average in comparison to the other types of cultures. WiMax adopters are fit in the upper left quadrant, or clan culture with a significant greater average as shown in figure 2d. Unlike the rules and procedures of hierarchies or the competitive profit centres of market culture, typical characteristics of clan culture are cooperative, coordinative, involve teamwork, and fewer management levels. SMEs in clan culture are characterized as a friendly workplace, with shared values, beliefs, goals, unity and participation. This type of culture focuses on internal issues, flexible values and carefulness rather than looking for stability (Cameron and Quinn, 1999). Using WiMax in clan cultures would be helpful because it focuses on people's capability to enhance interpersonal communications and support through networked systems such as electronic mail, group support systems, and group decision support (Cooper & Quinn, 1993; Davison & Jordan, 1996). However, since this could work against the human-touch aspect, any technology would have to be user friendly. Thus, a further investigation will be carried to find out how SMEs perceive WiMax as a technology in term of ease of use, compatibility and so on.

The literature demonstrated the link between an organization's culture, its performance, and its leaders. Schein (1992) argued that leaders of the organisations enforce and create the organisational culture. Even though, the DSL and VSAT adopters show some tendency toward adhocracy, figure 2(a, b, c) shows similarities between the impact of the adhocracy, market and hierarchy in term of DSL, VSAT, and Wi-Fi adoption.

Despite the clan culture, adhocratic organisations are considered to be a creative workplace more than managerial style where people take risks; leaders are known as entrepreneurial and innovative (Cameron and Quinn (1999)). In turn, Saudi SMEs leaders are more likely willing to adopt the latest technologies such as WiMax. However, the result shows that WiMax has not been used widely by SMEs in Saudi Arabia; only 2.1 % of 63 Saudi SMEs are adopting WiMax. Consequently, more investigation should be done on other factors that hold SMEs from adopting WiMax technology, such as lack of awareness.

Although the literature revealed that there is a positive relationship between technology adoption and hierarchy culture (Cooper & Quinn, 1993), the findings from Saudi SMEs showed the opposite. The hierarchy culture is not sufficient to ensure WiMax adoption as it is not the predominate culture of WiMax adopters. Furthermore, the findings of the study are in consonance with the fact that hierarchy scores are generally rated the lowest. Cameron and Quinn (1999) stated that private sectors such as SMEs strongly do not fit in the hierarchy culture quadrant, which confirms our findings. Hierarchy SMEs are not yet convinced and do not yet accept technology. They would resist the adoption of any type of computerized technology, and this negatively affected the adoption of WiMax. In addition, it negatively influences the norms, values, and beliefs shared by the vast majority of employees in the organization.

According to Cameron and Quinn most organisations take turns at different cultures as they progress from the start in clan culture. They then move to adhocracy culture, then to market culture and finally to the hierarchy culture after they have been established for some time (1999). Generally the result shows that the highest average starts with clan then adhocracy culture and end with hierarchy culture with the lowest score. However, the period of time that SMEs have established their business is not mentioned in the questionnaire. Thus, there is need for further investigation to find out if there are any differences between the early established SMEs and the new ones in term of organisational culture type.

Despite the fact that there might be some differences between the organisational cultures types of Saudi SMEs with different types of internet connection, we did not find measurable differences between them. The four types of internet connection in figure 2 are dominated mostly by the same type of organisational culture. Consequently, the findings state that there are no huge dissimilarities between the organisational cultures of Saudi SMEs in term of the internet access type. However, it might be differences in their organisational culture types are due to other factors. The result of Al-Gahtani's study showed that various organisational culture characteristics such as gender, education background and age influenced how people perceived technology (2004). That shed light on the importance of looking into the Saudi SMEs themselves and their organisational culture characteristics, and how that can impact the adoption of WiMax.

7 CONCLUSION AND FUTURE IMPLICATIONS

WiMax adoption by SMEs in Saudi Arabia has not been fully researched. Although ahead of many SMEs around the world, Saudi SMEs are not ready to adopt WiMax. This study examines the impact of organisational culture on WiMax adoption by SMEs in Saudi Arabia. The predominant culture has been measured using the "Organisational Culture Assessment Instrument" proposed by Cameron and Quinn (1999), in which four cultures can be identified: market, hierarchical, clan and adhocracy.

The study has highlighted the important role of organisational culture on the adoption of new technology. Organisational culture might be a crucial factor to lead SMEs to gain a competitive advantage. It also could be an authoritative aspect to assure the survival of SMEs. Thus, recognizing the SMEs culture could help them to improve their performance by adopting latest technology such as

WiMax. However, our results show that Saudi SMEs are dominated by the clan culture where people are less innovative than the people in adhocracy culture. The cause of these results should be associated with the specific characteristics of Saudi SMEs which will be investigated in the future.

The study also engages with the fact that there are other factors influencing the adoption of WiMax by SMEs in Saudi Arabia which are beyond the scope of organisational culture alone. Differences in adoption when organisational culture types are not an influential issue must be explained by other factors; or if adoption has partially occurred in specific cases despite the dominant organisational culture. This suggests another source of data for detailed examination.

The WiMax technology is providing a good opportunity to overcome the lack of ICT infrastructure in Saudi Arabia. However, the result indicated a low level of WiMax adoption by SMEs. Therefore, this investigation also concerns the future of Saudi SMEs in terms of their economic growth. In order to avoid being substantially hindered, and since IT/IS is playing a big role in the marketplace, SMEs should adopt the latest technologies to help them to create a new way of doing business. Adopting WiMax will provide them with the necessary advantages to survive and being competitive in the global marketplace.

We expect our results to be useful for SMEs, in the sense they should be aware of the benefits of recognizing their type of organisational culture. Understanding the importance of their organisational culture characteristics implies the adoption of new ideas and values. This will assure the future of the SMEs, which WiMax could be the best way to do so.

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