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Title	Towards successful implementation of ICT in Saudi schools (literature review)
Authors	Albugami, SS and Ahmed, V
Type	Book Section
URL	This version is available at: http://usir.salford.ac.uk/37662/
Published Date	2015

Towards Successful Implementation of ICT in Saudi Schools
(Literature Review)

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Abstract

In the last few decades, the massive advances in information and communication technology (ICT) encouraged many countries all over the world to integrate technology tools into classrooms. Computers, the internet, interactive whiteboards, mobile devices, and an assortment of other technological tools have now turned out to be valuable teaching and learning resources. Therefore, several research studies indicated that the use of technological tools creates an environment where students are more actively engaged in the learning process as opposed to the traditional education where they are passive observers and listeners. Saudi Arabia government is not in isolation from this, they have invested heavily in the ICT field. Nonetheless, the progression has often been disappointing; there is still a clear gap between the availability of ICT technology and methods of implementation. Simply, there is no meaning to instructional practices or investing huge amounts of money to equip schools with ICT tools unless they are used effectively with clear strategies, the intended benefits may not be realized. Therefore, this paper focuses on identifying the critical success factors for the implementation of ICT in Saudi Arabian schools, by reviewing the relevant literature, highlighting the barriers that may hinder the utilization of ICT. The literature revealed that a successful implementation of ICT in education requires paying attention to some factors. For example, providing adequate infrastructure, adequate management support, adequate teacher training on ICT and pedagogy, a clear educational policy and evaluation on an ongoing basis.

Keywords: ICT in education, educational technology, Saudi schools, Factors for successful implementation.

1. Introduction & background

The success of any nation is connected to the standard of education it delivers to its people (Ojiambo, 2009; Umezinwa and Chigbata, 2013; Al-harbi, 2014). "Today, real borders do not lie between nations but lie between those who can access ICT and those who cannot" (Shaffer, 2001). Therefore, ICT (Information Communication and Technology) has become a strategic resource in the teaching and learning environment. These resources such as computers, the internet, interactive white boards, and mobile devices are now widely used in the classroom. Evidence reveals that with technology in the classroom, students are more actively involved in learning process as opposed to the conventional classroom where they are passive observers and listeners (Asenso-Okyere and Mekonnen, 2012). Other benefits associated with the use of ICTs in education include encouraging collaborative learning, equipping students with problem solving skills, and offering flexible learning opportunities (Almalki and Williams, 2012). These benefits explain why ICT has turned out to be a crucial element of educational reform in several countries across the world. The US, for instance, spends more than $10 billion annually in educational technology in public schools (Brunk, 2008), while Australia spends approximately AUD$8 billion (Lane, 2012).

The Saudi Arabia has not been left behind, as there has been commitment of considerable investments to the objective of advancing public education. For instance, during 2007 the government of Saudi Arabia spent about £2 billion towards reforming and enhancing education by means of contemporary technologies. Additionally, public learning was enhanced by revising the curriculum and bringing in electronic tools to assist teaching. This scheme additionally commenced training and development schemes for educators to ascertain adequate employment of ICT in learning (Tatweer, 2015). Thus, over a quarter of the entire Saudi 2015 budget is committed towards the educational division (£ 36 billion), which augments the already immense finances put into the educational sector for the integration of technology within the school curriculum and enhancing ICT amenities (Ministry of Finance, 2015).

However, In spite of this huge investment and governmental support, Saudi Arabia still lags behind those countries that lead the world in education, particularly

concerning ICT (Ageel, 2011). There is still a clear gap in Saudi schools between the availability of ICT tools and the methods of implementation. Several contemporary researches associated with ICT within Saudi schools (Oyaid, 2009; Almadhour, 2010; Almalki & Williams, 2012; Al-harbi, 2014), stated that the Saudi government has to develop an effective strategy for ICT in education and to apply it practically.

 Almadhour (2010) in his research reached this conclusion, "Unfortunately although the Saudi Arabian government has lots of funding, there is no clear strategic framework towards equipping ICT in schools". This has largely been attributed to poor implementation. In addition, studies conducted in North America have actually shown that greater availability of technological resources in the classroom does not necessarily translate to improved academic achievement (Wozney et al, 2006; Ungerleider & Burns, 2002; Balanskat et al., 2006). This has largely been attributed to poor implementation. The literature revealed that a successful implementation of ICT in education entails first, identifying educational problems, what students, educators, and learning institutions desire to accomplish, and then utilizing ICT as knowledge construction tools as opposed to instructional tools and viewing ICT integration as a process.

Consequently, this paper aims to explore the success factors for the effective incorporation of ICT into instructional practices by answering the research question, 'what factors affect the successful implementation of ICT in Saudi schools' through reviewing the relevant ICT literature in education, In addition, to identifying the main barriers that hinder ICT in education. The paper concluded that the successful implementation of ICT entails paying attention and investigation of some factors, which will be discussed in the next section.

2.   Success factors for ICT implementation

ICT comprises a "varied set of technological devices and resources utilized to interact, as well as create, distribute, gather and control information" (Blurton, 1999. p46). This includes desktops, portable computers, storage devices, the internet, projectors, and interactive whiteboards. Based on this definition, it is clear that ICTs are now common elements in the teaching and learning environment (Bhattacharya and Sharma, 2007).

In Saudi Arabia, the introduction of ICT as a subject of study dates back to 1985, when the subject was taught only in private schools (Al-Aqeely, 2001). Compulsory learning of ICT subjects in all secondary schools was however introduced later in 1991. For several years, computers in the Saudi education environment were used for administrative purposes (CITC, 2015). The government has nonetheless since 2005 committed to integrating ICT into instructional practices. To achieve this, the government has established some projects such as, Learning Resource Centers, computer labs, and digital technical centers in various regions across the country (Ildeniz, 2012). However, the successful implementation of these technologies remains a real challenge for the decision-makers in education.

Clear justification of ICT integration

According to Vallance et al. (2009), one of the major factors that account for ineffective implementation of ICT in education is the lack of a clear justification for the incorporation of ICT in the classroom. In a similar vein, Al-harbi (2014) argues that in spite of adopting ICT in their instructional practices, educators have limited knowledge of how to effectively integrate ICT into classroom practices. In other words, the adoption of ICT is often conducted without a solid understanding of what the technologies should enhance and in the absence of clear guiding values. This view was supported by Twining (2007), who argued that lack of a common vision about the value of technological tools in education explains why, despite substantial investments in educational technology, the desired benefits are yet to be realized. Twining's (2007) research, which involved respondents from 94 countries, highlights three broad justifications for the adoption of ICT resources in the classroom: enhancing technological literacy, supporting learning, and boosting productivity. Therefore, it is imperative to have a clear rationale before making the decision to invest in educational technology.

Singling out an educational problem and objectives of the curriculum

According to Al-harbi (2014), successful implementation of ICT in teaching and learning starts with singling out an educational problem. In other words, the need to adopt ICT in the classroom should be grounded in dissatisfaction with the status quo and the desire to improve the educational opportunities provided to students. This view is supported by Hakami et al. (2013), who posit that it is important, at first to

identify the objectives of the curriculum and the outcomes desired. Having a clear understanding of the educational problem enables educators to choose the most appropriate ICT tools to address the identified need, paying attention to their merits and demerits. As Al-harbi (2014) puts it, educators cannot effectively utilize ICT in the classroom without a clear understanding of the most appropriate ICT tools.

In the same concept, Singapore, for instance, has recognized ICT as a driver of its educational sector in 1997 with the launch of the ICT Master Plan. Its primary goal was to ensure proper integration of ICT tools into the school curriculum along with the development of a culture of lifelong learning, thinking, and social responsibility (Lim, 2007). To sum up, the goals pursued by the Master plan were to design curriculum and assessment techniques, to provide learning resources, to conduct teacher development, and to build a technological and psychical infrastructure. The implementation plan prescribed three stages to take part in 1997, 1998, and 1999. Schools with previous history of the use of ICT tools were chosen as demonstration units. The process of the ICT integration addressed all subject areas in primary, secondary, and junior college institutions (Lim, 2007).

It is also important for educators to note that greater availability of ICTs in the classroom does not necessarily translate to productive learning. Al-harbi (2014), calls this techno-centric thinking, which should be avoided if educational technology is to produce the desired benefits. Simply stated, productive learning does not occur merely because technological tools are available in the classroom. This is because ICT on its own does not lead to improved academic achievement. Some studies have actually demonstrated that no direct relationship exists between ICT utilization and positive learning outcomes (Wozney et al., 2006; Balanskat et al., 2006). Effective utilization of the technologies is what matters; otherwise, the whole idea may be a waste of resources.

Promote a constructivist learning environment
Another aspect of successful ICT implementation is that it should promote a constructivist learning environment (Pedersen and Liu, 2003). A growing body of literature is urging educators to shift from the conventional teacher-centered classroom to more student-centered learning, which is referred to as constructivist learning (Roblyer and Doering, 2010). Constructivist learning pays attention to the

manner in which students construct knowledge. In such an environment, students become active participants in the learning process as opposed to passive listeners, as they learn via purposeful activities. In this regard, technological tools should be used as tools for constructing knowledge rather than for instructional purposes. This way, as argued by Kirschner and Erkens (2006), students' critical, analytical, and cognitive abilities are aroused.

ICT should be a process, not a product

The implementation of ICT should be viewed as a process, not a product (Yalin et al., 2007). According to Afshari et al. (2009), ICT implementation is a sophisticated process that is dependent upon myriad factors. This sentiment is well amplified by (Bingimlas, 2009), who argued that the integration of ICT into the classroom needs addressing of the barriers that may hinder the success of the various processes involved. Roblyer and Doering (2010), emphasize that the implementation of ICT is most successful when there are supportive processes in place. Therefore, it should be investigated in some of the obstacles that might hinder the use of ICT tools at schools. This could then help to make the implementation of ICT tools more successful.

Some of the obstacles that hinder effective ICT implementation include inadequate organizational support, infrastructure, resources, planning, training, as well as teacher beliefs and attitudes towards educational technology (Bingimal,2009; Ertmer et al., 2007; Hew & Brush, 2007). These obstacles are experienced in both developed and developing countries.

Factors hindering ICT implementation

The previous section showed some factors that could help to make the application of ICT in education more successful. However, the absence of these factors could be considered to comprise barriers, which hinder ICT implementation. Accordingly, the following section discusses main barriers that hinder the effective implementation of ICT in general and in Saudi schools in particular. Overcoming of these obstacles could turn them from barriers to be success factors and vice versa.

Lack of ICT resources

Lack of adequate supportive resources is one of the main factors that hinder ICT implementation in education (Alhawiti, 2013). According to Bingimlas (2009),

inaccessibility of resources remains a major obstacle to the incorporation of technology in education in both developed and developing countries. Bingimlas's analysis shows that computers may not always be accessible to educators. One reason for this is that such resources are mostly shared in most learning institutions. This is further aggravated by inadequate copies of software, lack of simultaneous internet access, slowness of ICT systems, and limited availability of educational software. Essentially, it is difficult to successfully implement ICT in education without sufficient hardware and software (Bingimlas, 2009).

In Saudi Arabia, lack of adequate resources is a major hindering factor in as far as the adoption of educational technology is concerned (Almaghlouth, 2008). In fact, most teachers in the country avoid using audio-visual aids in class, due to lack of supportive equipment and resources such as internet access, laptop computers, and computer labs (Al-harbi, 2014). ICT resource scarcity also affects students. A study carried out by Hakami et al. (2013) in order to investigate critical success factors for ICT integration into the Saudi school curriculum shows that one computer serves about 10 students in each secondary school. This is despite using computers in virtually all lessons. It is therefore important to provide both students and educators with sufficient supportive equipment.

Lack of ICT policy

Another major factor that hinders the effective implementation of educational technology into schools is the lack of educational policy and strategy relating to ICT adoption (Oyaid, 2009). In this concept, Wozney et al. (2006), argue that a clear policy framework helps in the creation of a school culture that supports ICT adoption. Balanskat et al. (2006), stressed that it is important for policy makers in the education sector to focus on policies that encourage educators to incorporate educational technologies in their instructional practices. This, for instance, includes rewarding teachers who use educational technology.

In Saudi Arabia, educators have called for clear policy planning in terms of ICT implementation in schools(Al-Oteawi, 2002). Accordingly, without such a plan, it would be difficult to effectively implement ICT tools into schools. Some scholars emphasize the role played by the perceptions of educational policy makers in the successful implementation of ICT in schools. Tondeur et al. (2008), for instance,

argue that ICT implementation is successful when educators have a common vision, clearly articulated in the school's policy.

Lack of management and technical support

ICT implementation in schools is also hindered by lack of management and technical support (Kozma, 2008). Research done by Ismail (2010) argued that one of the key obligations for the school administration comprises being conscious of areas that necessitate attentions for the fruitful application of ICT within institutions. Wong et al. (2008) established that if the school administration offers support and motivation for the teachers, a suitable working atmosphere would be formed to encourage teachers to test the use of ICT within their lessons. Technical issues such as poor internet connectivity, for instance, discourage teachers from using educational technology. This is particularly true for school teachers (Bingimlas, 2009).

In Saudi Arabia, teachers would be reluctant to use technological resources if they believed that they would experience technical or hardware problems (Almaghlouth, 2008). To avoid this, learning institutions should provide adequate ICT support services (such as making technicians available and securing ICT maintenance contracts) and ongoing technical training for teachers (Mumtaz, 2000). Studies done in 17 different European countries demonstrate the importance of technical support in encouraging teachers to use ICT tools in their teaching methods (Korte and Hüsing, 2007).Therefore, educational managers have an instrumental role to play in achieving this.

Time limitations

Teachers are also hampered by over-loaded curriculums, which leave them little time to integrate technology into their instructional practices (Bingimlas, 2009). Time limitations and difficulties of scheduling adequate time for technology-oriented classes is actually a significant barrier to the use of technological resources in teaching (Jones, 2004; Tearle, 2003). A survey conducted on twenty-six different countries showed that 54% of teachers agreed that they do not have sufficient time to use ICT tools in the classroom (Pelgrum, 2001).

In Saudi Arabia, the average teacher's schedule comprises 18 lessons per week, with each lesson lasting 45 minutes; this could hinder the implementation of ICT tools due

to the lack of adequate time (Al Asmari , 2011; Al-Alwani,2005). This leaves a very limited amount of time to work on integrating technology into their instructional practices. This is worsened by the lack of motivation and encouragement from the administration. It is therefore important for educational managers to provide the necessary support, such as reducing teacher workload and creating flexible teachers' timetables (Hakami et al., 2013).

Lack of teachers training and confidence

It is also important for learning institutions to provide teachers with more training on educational technology (Hennessy, 2005). Lack of training is actually the most commonly cited barrier in the successful implementation of ICT in teaching and learning (Bingimlas, 2009; Balanskat et al., 2006; Hakami, et al., 2013;Buabeng-Andoh, 2012). Teachers have limited knowledge on the use technological resources in the classroom. Therefore, training equips teachers with the skills and knowledge necessary for utilizing ICT in the classroom (Hew & Brush, 2007). This also equips teachers with greater confidence in as far as using educational technology is concerned. Bingimlas (2009), actually argues that lack of teacher confidence, which is occasioned by anxiety, teachers' fear of failure, and limited ICT training, should be viewed as a major hindrance factor to the successful implementation of ICT in teaching and learning.

In Saudi Arabia, lack of training and education on educational technology is a major factor that hinders the successful implementation of ICT (Al Asmari , 2011; Bingimlas, 2009), as most educators have limited computer and/or internet literacy(Al-harbi, 2014). This is particularly true for science subjects in which the integration of ICT has been more challenging as compared to other subjects (Bingimlas, 2009). Inadequate teacher training warrants the establishment of teacher development programs to assist teachers in their efforts to incorporate ICT in the classroom. Adequate ICT training has promising implications for the successful implementation of ICT in Saudi classrooms as it focuses on enhancing technical efficiency, increasing awareness of educational technology, and changing negative attitudes towards educational technology.

Lack of pedagogical training

Though technical competence is necessary, it is important for educators to be competent in other areas such as technology, pedagogy, and content (Koehler and Mishra, 2009). This view is also supported by Bingimlas (2009), who argues; that rather than just ICT training, pedagogical training should as well be provided to teachers. He adds that even after receiving ICT training, educators still face the challenge of incorporating the knowledge acquired. For effective utilization of ICT in the teaching and learning process, teachers must have comprehensive knowledge in technology, pedagogy, and content. According to (Koehler and Mishra, 2009), these elements interact to provide an understanding of delivering content using the most appropriate pedagogy and technology. Knowledge in these aspects places teachers in a better position to use subjects in specific activities to improve student learning. In essence, teachers knowledgeable in these aspects are better placed to use ICT effectively as opposed to those with ICT training only. The implication is that teachers should receive not only ICT training, but also pedagogical training.

Teacher attitudes and beliefs

Teacher attitudes and beliefs about educational technology have also been shown to affect the implementation of ICT tools (Alshumaimeri, 2008; Saleh, 2008). It is generally assumed that as long as there are adequate technological resources, enough technical training, a supportive policy, and a favorable environment, the implementation of ICT will occur automatically (Lim and Khine, 2006). Research studies nonetheless reveal that without the right teacher attitudes towards educational technology, ICT implementation may be a big failure (Hew & Brush, 2007; Tezci, 2009). The ultimate decision to use technological tools in instructional practices largely lies with the teacher. Teachers with negative attitudes towards ICT are less likely to use or support the use of ICT in their schools as opposed to teachers with positive attitudes (Al-harbi, 2014). Negative attitudes may be occasioned by factors such as lack of understanding about how the technology will be beneficial to the teacher and uncertainty about management support and guidance (Bingimlas, 2009). It is therefore important for learning institutions to understand how educators view the use of technology in the context of education.

Resistance to change

Bingimlas (2009) further argues that resistance to change significantly hampers the successful implementation of ICT in classrooms. Integrating technology into teaching and learning certainly implies changes in the educational setting. It is therefore obvious that the change will elicit different reactions from different teachers. As explained by Bingimlas (2009), resistance to change may not be a barrier in itself; it may be a sign that something is not right. Teachers could be worried about inadequate technical support, their limited technical expertise, as well as the time needed for planning. A study conducted by Almaghlouth (2008) to investigate the perceptions of Saudi science teachers towards the use of ICTs in instructional practices found that even though some respondents perceived educational technology to be of immense value, they would be reluctant to use the resources if there was no adequate support. This raises the importance of considering the opinions of teachers towards the change; otherwise, teachers may continue holding on to their conventional instructional practices.

To change negative attitudes towards educational technology, and to reduce resistance to change, professional development programs for teachers can be of great value (Al-harbi, 2014). As shown by Alshumaimeri (2008), who carried out a study to investigate the link between ICT training and attitudes towards technological tools in language teaching, more ICT training increases teacher confidence and the probability of using technological resources in instructional practices.

Regarding teachers' beliefs, Almalki and Williams (2012) identified culture as another factor that hinders the integration of educational technology into Saudi Arabian classrooms. In most cases, developing countries copy and paste educational technology frameworks from developed countries. Most of these initiatives end up failing due to differences in culture. Cultural differences directly or indirectly affect the degree of ICT integration into the learning environment (Almalki and Williams, 2012) As mentioned before, it is important for technological tools to promote constructivist learning, which entails collaborative learning, student-centered learning, and independent learning. However, in most non-Western countries, especially Arab countries, educators express some reservations with the constructivist learning advocated by Western discourse(Almalki and Williams, 2012). This to some
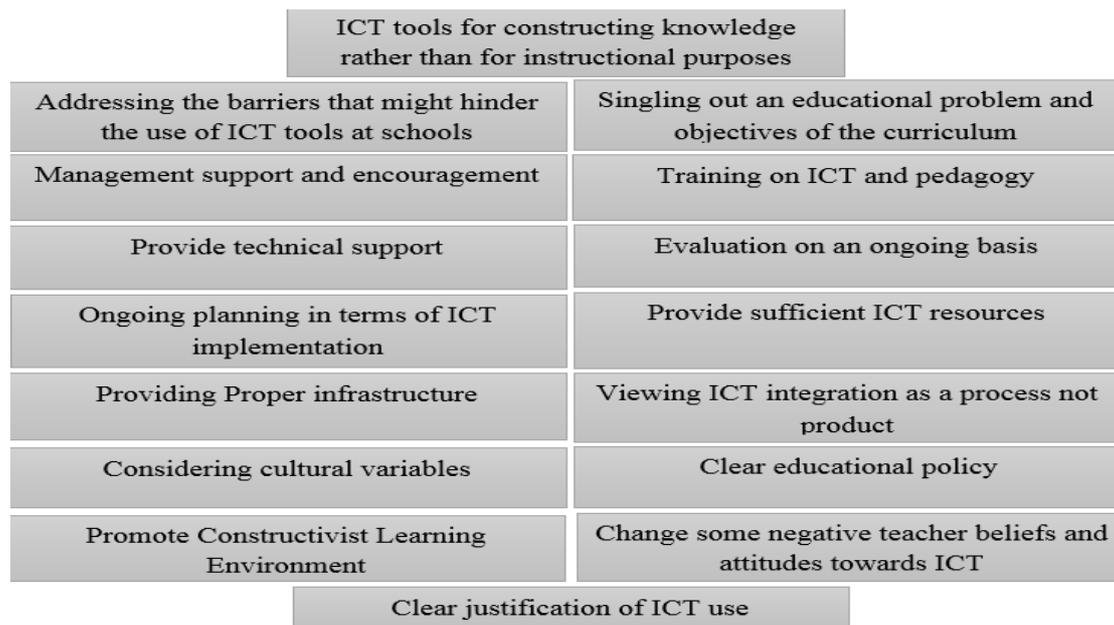
extent explains the unsuccessful implementation of ICT in Saudi classrooms. In fact, as explained by Alenezi (2014), balancing technology with Islamic values has been a challenging endeavor for the country's education sector. Therefore, he sees that there is a necessity to consider the underlying cultural framework when implementing ICT initiatives in the teaching and learning environment in order for Islamic beliefs not to be in conflict with digital technologies.

Lack of progressive evaluation

Finally, the lack of progressive evaluation explains the ineffectiveness of ICT integration into Saudi classrooms (Hakami et al., 2013). Ongoing evaluation is important for establishing the effectiveness of any reform initiative. This enables the identification of faults and correcting them early enough before they escalate. In Saudi Arabia, there is no evidence of the evaluation of the impact of ICT-based instructional practices on learning; eight years after the government introduced the initiative. According to Hakami et al. (2013) this has cost the country a lot in terms of resources.

To sum up, the study concluded with 16 main factors, which should be taken into consideration in order to make ICT application more effective in schools. These factors are illustrated in the subsequent diagram.

Figure1: Success factors for ICT implementation in education

ICT tools for constructing knowledge rather than for instructional purposes	
Addressing the barriers that might hinder the use of ICT tools at schools	Singling out an educational problem and objectives of the curriculum
Management support and encouragement	Training on ICT and pedagogy
Provide technical support	Evaluation on an ongoing basis
Ongoing planning in terms of ICT implementation	Provide sufficient ICT resources
Providing Proper infrastructure	Viewing ICT integration as a process not product
Considering cultural variables	Clear educational policy
Promote Constructivist Learning Environment	Change some negative teacher beliefs and attitudes towards ICT
Clear justification of ICT use	

Conclusion

In conclusion, the use of ICT in the teaching and learning environment has promising implications for Saudi schools in. This implementation, however, is hindered by several factors, including inadequate management and organizational support, inadequate training, negative teachers' attitudes towards educational technology, cultural factors, and insufficient infrastructure. Other hindrances include lack of ICT policy, lack of a justification for the need of ICT in education, and lack of progressive evaluation. Without first addressing these barriers, ICT implementation in Saudi Arabian schools will not be successful in the classroom. No single element is sufficient to guarantee quality teaching, but the presence of all the elements increases the possibility of successful implementation of ICT in schools. Consequently, this paper could help to answer some questions such as; how to support the implementation of ICT in education, what barriers hinder its successful implementation, what are the best methods to make the application of ICT more effective, and establish the kind of support that ICT stakeholders need. Hence, the importance of this research is to suggest some effective solutions, which may help to make ICT implementation in Saudi schools more successful and which could lead to suggesting some solutions for decision-makers.

References:

Afshari, M., Abu Bakar, K., Su Luan, W., Abu Samah, B. & Say Fooi, F. (2009). "Factors affecting teachers' use of information and communication technology". *International Journal of Instruction*, Vol.2, No.1. P.p77-104.

Ageel, M. (2011). "The ICT Proficiencies of University Teachers in Saudi Arabia" A Case Study to Identify Challenges and Encouragements. *Hummingbird, University of Southampton's Doctoral Research Journal*, vol. 8, no.21, pp. 55-60.

Al-Aqeely, A. (2001). "The current situation of computers at public Secondary schools in the Kingdom of Saudi Arabia according to headmaster's attendee of Diploma course at the College of Education" (In Arabic). *Journal of King Saud University, Educational Sciences and Islamic studies*, Vol.14. No. 2, 477-521.

Al-Alwani, A. E. S. 2005, "Barriers to integrating information technology in Saudi Arabia science education". *Doctoral dissertation*, the University of Kansas.

Al-Harbi, H. (2014). "Towards successful implementation of ICT in education". *The 2014 WEI International Academic Conference Proceedings, 2014 Vienna, Austria. The West East Institute*, pp.33-46. Available from:<http://www.westeastinstitute.com/wp-content/uploads/2014/05/Hanaa-Eid-Al-harbi-Full-Paper.pdf >. [8 February 2015].

Al-Oteawi, S. M. (2002). "The perceptions of administrators and teachers in utilizing information technology in instruction, administrative work, technology planning and staff development in Saudi Arabia". Doctoral dissertation, Ohio University.

Al Asmari, A. (2011). "Evaluating the prospects of integrating technology in pre-service EFL teacher training". *Arab world English journal. (AWEJ).* vol. 2, no.2, pp.133-166.

Alenezi, A. (2014). "Influences of the mandated presence of ICT in Saudi Arabia secondary schools. International Journal of Information and Education Technology ". *International Journal of Information and Education Technology (IJIET).* Vol.5, No.8, p.p638-644.

Alhawiti, M. (2013). "Strategies and action plans for integrating ICT into Saudi elementary schools curricula: The case of Tabuk district of education". *International Journal of Information and Education Technology*, IJIET (2013), ISSN: 2010-3689, vol.3, no.2, pp.77-184.

Almadhour, B. (2010). "The Integration of Information and Communication Technology into Secondary Technology Teachers' Pedagogy in New Zealand". *Unpublished Master's Thesis, Auckland University of Technology*, New Zealand.

Almaghlouth, O. (2008). "Saudi secondary school science teachers' perceptions of the use of ICT tools to support teaching and learning". *Master of Science (MSc).The University of Waikato.*

Almalki, G. & Williams, N. (2012). "A strategy to improve the usage of ICT in the kingdom of Saudi Arabia primary school". *International Journal of Advanced Computer Science & Application*, vol. 3, no10, p42.

Alshumaimeri, Y. A. (2008). "Perceptions and Attitudes toward Using CALL in English Classrooms among Saudi Secondary EFL Teachers". *The JALT CALL Journal*, Vol.44, No. 2, p.p29-66.

Asenso-Okyere, K. & Mekonnen, D. (2012). "The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa," Working Papers 2012-015, United Nations Development Programme, *Regional Bureau for Africa* (UNDP/RBA).

Balanskat, A., Blamire, R. & Kefala, S. (2006). "The ICT impact report, a review of studies of ICT impact on schools in Europe". *European School net in the framework of the European Commission's ICT cluster*. Available from: <http://www.aef-europe.be/documents/RAPP_doc254_en.pdf >. [8 Jan 2015].

Bhattacharya, I. & Sharma, K. (2007). India in the knowledge economy – an electronic paradigm. International Journal of Educational Management, 21, 543-568.

Bingimlas, K. A. (2009). "Barriers to the successful integration of *ICT* in teaching and learning environments", a review of the literature. *Eurasia Journal of Mathematics, Science & Technology Educati*on vol.5, no.3, pp.235-245.

Blurton, C. (1999). Chapter 2: "New directions in education". In: *UNESCO's World communication and information 1999-2000. Paris: UNESCO*: 46-61.

Brunk, J. D. (2008). "Factors affecting the level of technology implementation by teachers in elementary schools". 190. *THE UNIVERSITY OF OKLAHOMA*.

Buabeng-Andoh, C. (2012). "Factors influencing teachers' adoption and integration of information and communication technology into teaching" *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, Vol.8,No.1, p.p136-155.

CITC. (2015). "The internet in Saudi Arabia [Online]. *The Communications and Information technology Commission*. Availabile<http://web1.internet.sa/ar/category/statistics_study/> Accessed in [22/02/2015].

Ertmer, A., Ottenbreit-Leftwich, A. & York, S. (2007). "Exemplary technology-using teachers: Perceptions of factors influencing success". *Journal of Computing in Teacher Education*, Vol.23, No.2, p.p55-61.

Hakami, A. A., Hussin, A. R. B. C. & Dahlan, H. M. (2013). "Critical success factors necessary for curriculum integration of computer based testing into Saudi secondary schools". *Journal of Information Systems Research and Innovation (JISRI)*, ISSN: 2289-1358, vol.4, no.3 pp.22-30.

Hennessy, S. Ruthven, K. Brindley, S. (2005) "Teacher perspectives on integrating ICT into subject teaching: commitment, constraints, caution, and change" *Journal of Curriculum Studies*, Vol. 37, No. 2, pp. 155-192.

Hew, F. & Brush, T. (2007). "Integrating technology into k-12 teaching and learning: Current knowledge gaps and recommendations for future research". Educational Technology Research and Development, DOI 10.1007/s11423-006-9022-5. Vol. 55, p.p223-252.

Ildeniz, A. (2012). "Intel Corporation. Boosting ICT key to kingdom's growth". Arab News, Newspaper. Available< http://www.arabnews.com/boosting-ict-key-kingdoms-growth>. Accessed [15/02/2015].

Ismail, A. Z. (2010). "Strategic leadership of information and communication technology (slict) among the head teachers in the rural Malaysian primary schools". Available at< http://research.ncl.ac.uk/ARECLS/volume_4/ISMAIL.pdf> Accessed in [05/03/2014].

Jones, A. (2004). *"*A review of the research literature on barriers to the uptake of ICT by teachers*". British Educational Communications and Technology Agency (BECTA)*, corp creator.

Kirschner, P. & Erkens, G. (2006). *"*Cognitive tools and mind tools for collaborative learning*". Journal of Educational Computing Research*, Vol. 35, No. 2, p.p199-209.

Koehler, M. J., & Mishra, P. (2009). *"*What is technological pedagogical content knowledge?*" Contemporary Issues in Technology and Teacher Education*, Vol. *9, No.* 1, p.p60-70.

Korte, W. & Hüsing, T. (2007). *"*Benchmarking access and use of ICT in European schools*"*. Results from head teacher and a classroom teacher surveys in 27 European countries. *ELearning Papers* Vol 2, No. 1, ISSN 1887-1542

Kozma, R. B. (2008). "Comparative analysis of policies for ICT in education", in. Voogt and G. nezek (eds), *International handbook on information technology in primary and secondary education*. New York: Springer.

Lane, J. M. (2012). "Developing the vision: Preparing teachers to deliver a digital world-class education system". *Australian Journal of Teacher Education*, vol.37**,** no.4, pp.59-74.

Lim, C. P. (2007). "Effective integration of ICT in Singapore schools: Pedagogical and policy implications". *Educational Technology Research and Development*, 55, 83-116.

Lim, C. P. & Khine, M. (2006). "Managing teachers' barriers to *ICT* integration in Singapore schools". *Journal of Technology and Teacher Education*, vol.14, no.1, pp.97-125.

Ministry of Finance. (2015). "Kingdom of Saudi Arabia. Recent economic developments and highlights of fiscal years 1435/1436 (2014) & 1436/1437 (2015) ".The actual outcome of Fiscal Year (FY) 1435/1436 (2014), the 1435/1436 (2014) budget, and recent economic developments in the Kingdom of Saudi Arabia. *The Ministry of Finance in Saudi Arabia*.

Mumtaz, S. (2000). "Factors affecting teachers' use of information and communications technology teacher education technology". *Journal of Information Technology*, Vol.9, No.3, pp.319-342.

Ojiambo, P. (2009). "Quality of education and its role in national development: A case study of Kenya's educational reforms". *Kenya Scholars and Studies Association (KESSA)* Vol.1, No.1, p.p133-149.

Oyaid, A. (2009). "Education policy in Saudi Arabia and its relation to secondary school teachers' ICT use, perceptions, and views of the future of ICT in education". *Doctoral of philosophy PhD Thesis,* University of Exeter.

Pedersen, S. & Liu, M. (2003). "Teachers' beliefs about issues in the implementation of a Student-Centered Learning Environment". *Educational Technology Research and Development* (ETR&D), Vol. 51, No. 2, 2003, pp. 57–76 ISSN 1042–1629.

Pelgrum, W. J. (2001). "Obstacles to the integration of ICT in education": Results from a worldwide educational assessment. *Computer& Education*. Vol. 37, No.2, p.p163 – 178.

Roblyer, M. & Doering, A. (2010). "Integrating educational technology into teaching". *New York, Boston Allyn and Bacon*. Fifth edition, 458 pages. ISBN: 9780135130636.

Saleh, K. (2008). Computer self-efficacy of university faculty in Lebanon. *Educational Technology Research and Development*, Vol. 56, No. 2, pp 229-240.

Shaffer, S. (2001). "Using ICT for quality teaching, learning and effective management Report". Seventh UNESCO-ACEID International Conference on Education. UNESCO Asia and Pacific Regional Bureau for Education.

Tatweer. (2015). "King Abdullah bin Abdul-Aziz public educational development project" *Tatweer project*. Available from< http://www.tatweer.edu.sa/content/aboutus >. [12 Dec 2014].

Tearle, P. (2003). "ICT implementation: What makes the difference?" .*British Journal of Educational Technology*. Vol. 34, No.5, pp.567-583.

Tezci, E. (2009). "Teachers' effect on ICT use in education: The turkey sample". *(Elsevier)Procedia - Social and Behavioural Sciences*, Vol. 1, No. 1, p.p1285-1294.

Tondeur, J., Keer, H., Braak, J. & Valcke, M. (2008). "ICT integration in the classroom: Challenging the potential of a school policy". *Computers & Education*, Vol.51, No. 1, p.p212-223.

Twining, P. (2007). "Discussing ICT, aspirations and targets for education: International perspectives" International *Journal of Knowledge and Learning*, Vol. 3, No. 2-3, p.p154-170.

Umezinwa, R. N. & Chigbata, J. I. (2013). "Education of women for national development". *Part-II: Social Sciences and Humanitie*s, Vol. 4 No.3, p.p2223-9944.

Ungerleider, C., & Burns, T. (2002). *"Information and communication technologies in elementary and secondary education: a state of art review"* Prepared for 2002 Pan-Canadian Education Research Agenda Symposium "Information Technology and Learning", Montreal, QC.

Vallance, M., Vallance, K., & Matsui, M. (2009). *"Criteria for the implementation of learning technologies"*. In M. Thomas (Ed.). Handbook of Research on Web 2.0 and Second Language Learning. *IGI Global: Hershey*, USA. pp. 1-19. ISBN 978-1-60566-190-2.

Wong, E., S.C., S., Li, T.-H., Choi & Lee, T.-N. (2008). Insights into innovative classroom practices with ICT: Identifying the impetus for change. Educational Technology & Society, Vol.11, No. 1, p.p248-265.

Wozney, L., Venkatesh, V., & Abrami, P. C. (2006). "Implementing computer technologies: Teachers' perceptions and practices". *Journal of Technology and Teacher Education, vol.14, no.*1, pp.173-207.

Yalin, H., Karadeniz, O. & H., O. (2007). "Barriers to information and communication technologies integration into elementary schools in turkey". *Journal of Applied Sciences*, Vol.7, No. 24, p.p4036-4039.