Research Article

A CASE STUDY: EFFICIENT AND EFFECTIVE USE OF ICT IN MANAGEMENT AND IT DOCTORAL RESEARCH

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ARTICLE INFO	ABSTRACT

Research is the important parameter to teaching. It also pays in economic development of the country. Information and Communication Technology (ICT) has contributed immensely to higher education and increasing quality of education. ICT refers to telecommunication, computers, software and data system that can be used to support, store and transmit the communication technologies for researcher to access and manipulate information (Murray, 2011). ICT has become the necessary element in academic practices. The researcher from all disciplines use ICT in some form throughout the process of their research, including preparation, field work, analysis and writing phases of their studies. ICT has incorporated tools and methods to handle, distribute and exchange of information. ICT, if used in proper ways, can enhance the positive outcome of education, project and people. This case study provides the impact of using ICT in doctoral research in management and IT courses. The topics and area of research before the implementation of ICT was different than at present. ICT is becoming even more interwoven into academic life than it already has. The emergence of new technologies like big data, hadoop and SAP suppresses the question of limitation in management research. Now management research can be combined with IT like research in MIS, HRIS etc. This case study processes with respect to time zone. The time zone would be divided in two major zones. One is of 90's and second time zone is of after 90's. It gives a comparison on the advantage of choosing topics for doctoral research between before and after the implementation of ICT in doctoral research. This comparison would be done for both the subjects areas like for IT and management.

INTRODUCTION

Research is the intellectual activity of education system that provides dependable solutions to the problem being manifested in various fields of knowledge. Research brings pride to researcher and to the nation also. Research evolves continually and consciously by adding new ideas, inventions and discoveries in different field of knowledge. Research has expanded its area with the help of digital technology. Digital technology have given a new path to research. Pelgrum and Law (2003) stated that the term computer was replaced by IT (Information Technology) signifying a shift of focus from computing technology to capacity to store and retrieve information. The term ICT came into picture around 1992 when email was available to general public. The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005). A great deal of research has proven the benefits to the quality of education (Al-Ansari, 2006).

ICT tools have the potential to innovate, accelerate, enrich and strengthen the skills to motivate and engage the researcher.

In education, Information communication Technology (ICT) provide its support to every level. ICT help the management and technical students throughout their research process such as background research for the thesis, conduction of various research activities and also in writing thesis. Monitoring of registration process, comparison of academic progress among different student throughout the research work and enhancement of time management can be easily maintained using ICT. This case study provides a review of usage of ICT in research in the area of management and IT. It gives a comparative study of research work done by different research scholar in both management and IT in two different time span and also when it was done with and without the use of ICT. It examines the depth of difficulty and changes in process during research period in these two mentioned area.

Research generates new knowledge which ensures the development of subject. Most of the research in management area is empirical research whereas research in IT can be of either fundamental or empirical type. ICT has changed the

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limits of research in both the areas and made them more exploratory research.

Computers and applications of technology became more pervasive in society which led to a concern about the need for computing skills in everyday life. Tinio (2003) defined ICT as a diverse set of technological tools and resources used to communicate, create, disseminate, store and manage information. ICT includes telephone, radio, computer hardware and software, mobile devices as well as the services associated with them. A survey study done by ERSA (2014) showed that maximum number of people do quantitative research by using ICT. Analytical and scientific research occupied the second position and numbers of people who do this kind of study are same. The other types of researches that are more preferred after the use of ICT are applied, qualitative collaborative, experimental and mix methods.

After the ICT came into picture, the mode and the trends in terms of tools and technology used in research have been changed. As discussed earlier, this case is divided into two different eras. This section is sub-divided into three parts. The first part described and analyzed the issues/ barrier that scholar face during their doctoral research in management and IT. This phase of study is based on the questionnaire asked to them. The second part described the change in research in two eras with its advantages and disadvantages. It was supported by the potential and adequate literature review.

Development in Doctoral Research

Jairam & kahl Jr. (2012) poised that the doctoral degree is the pinnacle of educational achievement of a researcher. Doctoral researchers are future faculty or the leaders of industry and commerce (Millett & Nettles, 2006). An understanding of what works, and what does not, in training and developing doctoral students is important, as these students are essential to the continuance of all tertiary educational programs in all countries. Doctoral students are also the potential backbone of all research programs and also are instrumental in the discovery and implementation of new knowledge. A sample of 300 PhD candidates drawn from different universities was used for this study. Half of them are scholar before 2005 and half of the scholars are after 2005. The data generated through questionnaire was analyzed using statistical test and descriptive study. Results show that ICT has significant role during their doctoral research.

Certain issues are common in doctoral research of both areas-IT and Management. ICT helps to resolve these issues and maintain a pace in the development of new research. The following issues are raised and solved by using ICT in management and IT.

Role of Supervisior

Mainhard etal.(2009) stated that role of supervisor is more important to achieve the success of doctoral research. They poised that supervisor must provide their time, expertise and support to foster the research skill and attitude of researcher and to ensure the production of their research thesis to acceptable standard. Ali & Watson (2016) also cited the relationship of supervisor and supervisee as an exploratory study. They have described the relationship and expectation of both on Likert five scale data analysis.

Supervision of doctoral research is the global issue. Carnegie foundation for the advancement of teaching of USA had started Carnegie initiative on doctorate (2001-05) to identify the role of supervisor and his pivotal efforts to improve doctoral research. The thesis is the capstone of doctoral research program. The role of supervisor is the vital component to complete the research process and reach this capstone event. Wang and Li (2011) poised that feedback from the supervisor is important in controlling student's development throughout the academic research journey. The students are getting benefit by intellectual exchange with their supervisor throughout the process and in writing thesis. The ICT has made it easy to provide the feedback on time by using different modes of ICT such as social media app on mobile phone. Skype and Google talk is similar to face to face interaction of earlier era. It has overcome the limitation of inability to read body language and facial expression and these can be also seen in present communication in an abrupt manner. These features are necessary to build rapport, trust and understanding between supervisor and supervisee. The student supervised by using ICT show more significant growth in their perceived development in research related skills.
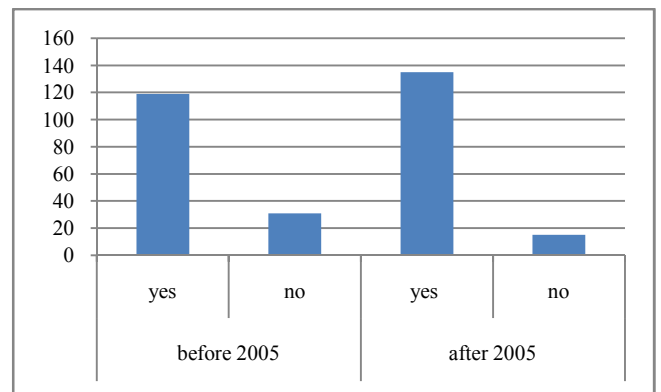

Table 1

The result shows (Table1) that out of 150 candidate 119 i.e. 79% of scholars agreed that ICT is an important tool to have discussion with their supervisors. They admit that after the development in ICT, now it is valuable and time saving to get online feedback from supervisor for further research. It saves the time and effort which are the important component in research. Only 31 candidates deny the good impact of ICT in their doctoral research. The 88.6% of researchers who did their research after 2005 highly agreed that ICT has made a bridge of high communication with their supervisor. Sometimes scholars send the Google document to their supervisor for revision. The changes made by supervisor can be acknowledged in the same document. This overcomes the miscommunication and misunderstanding between supervisor and scholar. Only 10% denied the importance of ICT in making the communication with their supervisor.

Nature of research project

Across the past ten years the use of ICT has fundamentally changed the practices and procedures of nearly all forms of endeavor within education and research.

The thematic issue based research projects require high technical inputs. ICT tools and technologies like GIS (geographical information system) help a lot to solve the issue related to such projects. After the year 2005, ICT tools like GIS, MIS (Management Information System) have given the

new direction of IT research in disaster management, weather and environmental management and data management of atmospheric condition like rain, air and soil. These tools work on social sciences as well as on management science. But the use of these tools requires depth knowledge of IT. Similarly, in management research MIS broaden the research area of governance or economic policy, information sharing and dissemination, research related to assets management, data processing etc. ICT tools have given a new direction to HR and marketing research area like EHRM and marketing tools etc. Though these tools were developed in 90's but by the end of 20th century the systematic and rapid growth of these technologies had given the new consolidated and standardized path to research in management. The new concepts of ICT like cloud computing, big data and internet of things (IoT) have given new trends to research in IT as well as in management. The robust technologies such as analytics, collaboration and mobile have catalyzed the evolution of research in both areas. These concepts change the scheme since 2011. In concern with geographical flexibility, technology-facilitated research programs also remove many of the temporal constraints that face learners with special needs.

ICT tools have great potential to accelerate, enrich and deepen skills to motivate and engage scholars for their research and also strengthen their teaching skills. These tools also help to create economic viability for tomorrow's worker, researcher and consultant.
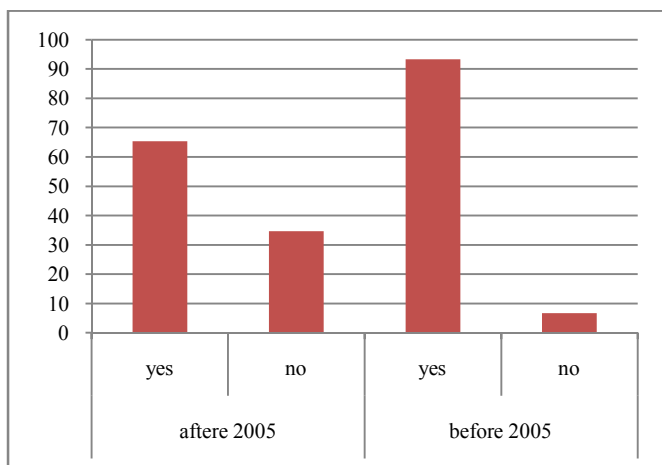

Table 2

Table2 shows the result which depicted that 93.3% respondents of after 2005 agreed to that ICT technologies and tools have an impact on their research work. They admitted that new developed software helped them to work on management operational process as a part of their post doctoral research which they were not able to do during their research. The result concludes that these respondents have used IT technologies to enhance their knowledge either by writing research paper or by being a supervisor. Only 6.6% of respondent said that they have not found any impact of IT tools on their doctoral research. 65.3% of respondent of after 2005 agreed that evolution of IT tools and technologies has expanded their research work in new direction. But 34.6% said that as the growth of technology is not at high speed so there is little or no impact on their doctoral research. They said that new version of software came at high pace which helped them to work on data in easy manner. But, the technological

development is not at the same pace during this time duration; therefore they disagreed to this point.

Connection among Different Government Offices

The widespread availability of computers and internet is the biggest development of ICT. In addition to the same, mobile phones began to popular in 2000. Computer and internet connects scientific and research centers to each others as well as with cultural centers, public libraries and government offices. ICT along with internet has also enhanced the linkage between research institutes at national and international levels. Now many universities operate on elaborative campuses like WAN and have gateways to other similar institutions facilitating collaboration and exchange of research and development information. In developing countries, ICT has become the advance tool to study industries and economic growth.

Research is directly responsible for the social and economic growth of country. Research is a very socially oriented activity. The empirical research has traditionally been strongly associated with government offices to collect the data. Daniels (2002) stated that ICT has become one of the basic building blocks of modern society. Many government departments now regard ICT as the part of education alongside reading and writing. These departments knew that the data from them is required for empirical research. Therefore, many government agencies and department provide the data online or provide the analysis report either on their website or on internet. The agencies like Gartner, Forbs, Brist and Conjoint analytic provide the analysis report after collecting the data from government resources. Scholars can easily get the data from their website and use in their research. Earlier a special meeting and permission is required from head of the government department to get the data. Sometimes this data is in hardcopy which need to be converted into softcopy for further processing. It becomes very tedious task.
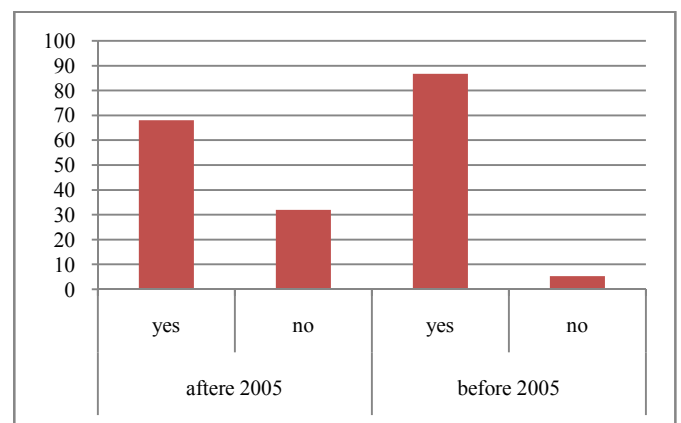

Table 3

This issue was a big hurdle for those who did their doctoral research before 2005. The result of this issue is described in table 3. 68% of respondents agreed that they had faced problems because of lack of communication between different government offices. They had to spend a lot of money and time to collect the data. A very few of them (10 in number) said that they had to move to another country for collection of data. 10 respondents from management stream stated for their doctoral research on work, culture and HR practices among different nation they had to move to corresponding country. Now this data is easily available online. Therefore 86.6%

respondents of after 2005 agreed that because of ICT tools and technologies it is easy to collect the data. Sometimes data is available online also. Only 5.3% of scholars of after 2005 denied to this fact. 8% of respondents have not answered this question. It seems because of easily availability of data; records and reports scholars do not consider this point as important one. It saves their time and money to visit the concerned office or department for collection of data.

ICT tools and technology is involved so deeply in research as a result of which researcher become more focused on the use of the technology to improve their research and learning as a rationale for investment. This case study is also the example of above result. The questionnaire was floated as Google document to different researcher at every corner of India. It was possible to collect the data so fast in short time period only by using ICT technology.

Gender difference in Doctoral Research

ICT has become the supportive domain in research where scholars are doing their research as distance learning mode. Supportive domain generally refers assistive quality aspect that helps the learners to carry out distance learning effectively and efficiently. ICT has also enhanced the pedagogic domain which refers to core quality aspect in distance learning. Good quality of pedagogic domain helps the scholar to develop and adjust their knowledge, skill and attitudes both independently and collaboratively. ICT also works on contextual quality aspect that creates the good quality teaching and learning. The quality of research needs to have a perception on gender difference. It has an impact on developing, delivering and supporting research. Green and Trevor (2002) stated that women faces certain barriers such as family and taking care of children mostly when the course content is not directly relevant to their livelihood, when it does not value their knowledge and experience, when access to content is too costly and when they do not feel able to use the technology competently or confidently. The study revealed that female scholar as compared to male scholar perceived all quality domain and dimensions as being more important in evaluating research. Gender differences were found in perceiving barriers to and support the research work. The finding imply that even though ICT has contributed to widening the access to education and research and reducing the gender disparity in education there still exits a lack of gender considerate support.
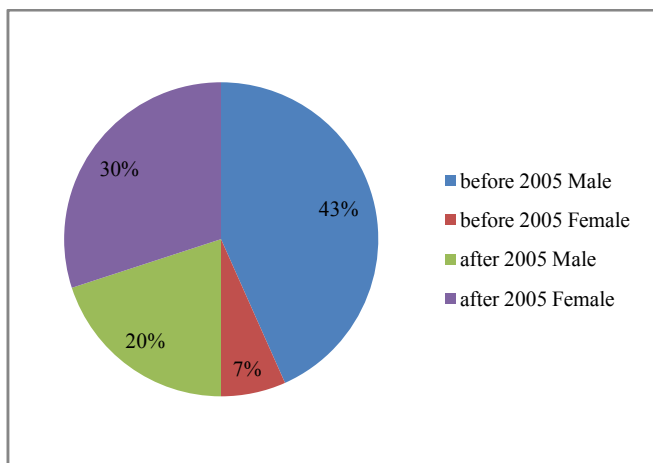

Table 4

During collection of data it has been observed that male scholar are more in number than female scholars before 2005. But the situation is totally different afterwards. It was very easy to find female scholar. Though the gender of scholar was not taken into consideration during data collection, but it has been observed that female scholars have been increased in number after the deep involvement of ICT. There were only 7% of female research scholars before 2005. The number has increased to 30% after 2005 (Table 4). Female scholars have mentioned certain barriers which were faced during their research. A few of the most serious barriers are - conflict with family obligation, caring of young children difficulty in getting material or data in time. The study revealed that ICT has reduced the obligation of these barriers. It was easy for female scholar getting the data online, getting the feedback from supervisor on time and on e-mail or on WhatsApp and discussing the result through skype or through Google talk. They need not to go and personally meet the supervisor. They can also collect the data using Google form and document. It hinders the barriers for working and married female. They can take care of their family and children along with research work by using ICT tools. It makes the research work less tedious and less time consuming. These tools avoid time conflict with other responsibilities.

The data collection for this case study is limited to one country; the result may vary when the data collection would be globally. The barriers discussed in this case study are mentioned by scholars during data collection.   The other factors like number of day care centers, nuclear or joint family and availability of data resources may also affect the research. It is beyond the scope of this case study.

Second phase of study

The aforementioned issues are the result of primary data. The second phase of study is based on the secondary data. These issues are analyzed and proved using proficient literature review.

Research Project in Developed versus Developing nations

The growth and development of nation has direct impact on the usage of ICT tools to enhance the level and growth of research project. It is very tough to establish a stable high level server in developing countries. The IT infrastructure includes the hardware, software, networking and security. The implementation and maintenance cost may vary which is directly affected by geographical, political, transport and economic condition of the nation. Cloud computing is the ICT technique that helps in reduction to cost of incorporation and maintenance of ICT tools. So this technique should be more encouraged in developing countries. Though one time cost to implement this technique is quite high. Any user who is familiar to ICT can use cloud computing easily so it is not required to have special technician to use cloud computing. So this technique can be easily use in developing countries.

With the help of ICT techniques, scholars now can access e-books, tutorial and research papers from different journals. It also helps to access research papers from journals which do not have print copy and only soft copy is available. Scholars can buy only a single paper from any journal; they are not required to buy the complete journal. Chandra and Patkar (2007) poised that ICT can provide speedy dissemination of education to disadvantage group or populations. It has

improved the standard of research work in developing nations. It has improved the perception and understanding of the world of student. The ICT environment in research has been developed by using different software and also extended experience in developing web based and multimedia material. It has played an important role in changing and modernizing research.

ICT not only work at individual level but even at the academic institutional level it also allows them to reach disadvantaged groups and new international educational markets. The academic institutes play large role in shaping the doctoral scholar into the future academician or practitioner (Halse & Malfroy 2010, McAlpine & Amundsen 2012). The ICT tools in research led to democratization of research especially in developing countries like India. The developing nations regard the research and doctoral learning as an important bridge of social, economic and political mobility. The developing nations make the effective use of these ICT tools and their potential to bridge the digital divide.

Bhattacharya and Sharma (2007) cited that in developing countries like India there exist infrastructures, socio-economic, linguistic and physical barrier for people who wish to access education. There is also economic and political pressure of the country to promote doctoral research. UNESCO (2016) in its report cited that there exist drawback in all over the world like lack of learning material, teachers and remoteness of education facilities etc. The effective and innovative use of ICT tools and technologies can potentially solve these issues. ICT has the potential to remove the barriers that are causing problems of low rate of research and development in any country. These tools help to overcome the issues of cost, number of teachers and poor quality of education as well as to overcome time and distance barriers. Capacity building becomes very important when society is to accept, adopt and use ICT. ICT policy should adequately provide for capacity building including lifelong learning.

Micael (2013) in his research paper poised that funding in doctoral research is an important factor. They stated that many scholars complaining about the omnipresent sortie of funds preventing adequate operations. European commission (2005) in its report stated that the uneven distribution of funding and the competition within and between disciplines are required to be addressed and therefore challenges disciplinary boundaries. Academic institutes of developing countries do not provide adequate financial support to the scholars.

Time and space

ICT has given new approach to research and development. ICT can be used to remove communication barriers such as that of space and time (Lim and Chai, 2004). Mobile technologies and seamless communications technologies support 24x7 research and learning. Choosing how much time will be used within the 24x7 envelope and what periods of time are challenges that will face the educators of the future People. Pelgrum and Law (2007) poised that people in developing nations have to access knowledge via ICT to keep pace with the latest developments. Bhattacharya and Sharma (2007) stated that ICT tools allow for the creation of digital resources like digital libraries where scholars and professional both can access research material and course material from any place at any time. These facilities allow the networking of academics and research and hence lead to sharing of research material. These facilities also

control the duplication of work. ICT eliminates time and geographical barrier as learners and scholars can log from any place (Cross and Adam 2007, Mooij2007).

Respondent agreed that they have used laptop, mobile phone and internet connection for their research which saves their time. It is like investment for self infrastructure to access the data and research paper for the complete process of doctoral research. ICT increases the flexibility of delivery of education so that researcher can access knowledge any time and from anywhere.

The emergence of different forms of doctorate makes the situation more complex. Costly & Lester (2010) poised that there are varieties of doctorate such as traditional research doctorate, taut doctorate, work based doctorate and professional doctorate. There is also existence of part time and full time doctoral scholar (Tomson & walker, 2010). To avoid wastage of time and overcome the hurdle of space online supervision is becoming very popular. Each case will naturally imply different approaches to supervision and scholar and supervision's profile.

Data storage and Data Mining

ICT helps to store the large number of data. ICT enabled research allow the researcher to store the data more than 10 tera bytes. It is very much useful in management research as well as for the empirical research where a large number of respondents are required to justify the hypothesis. The other disciplines that require additional large storage capacity for data are medical and health sciences, physical sciences, engineering and technology etc.

Researchers are using high performance computing for their research work. It is very much useful in science and engineering discipline. Management researcher may or may not use High performance Computing (HPC) depending on their topic of research. If the research is related to anticipatory or simulation calculation, then HPC is required for management research.

The most common IT tools are data mining, GIS software, Statistical analysis packages which are used for both IT and management research. But still many parameters like lack of access, knowledge and training are main or primary barriers. The cost and ability to purchase software is the secondary barrier in use of ICT tools in research. In management research when ICT is collaborated for Technical Corporation project it requires use of certain tools. The training of these equipments and their usage is required which sometimes makes the project costly.

The research shows a large growth of the number of researchers who will require large amounts of research data storage. The disciplines that have indicated they will need significant additional storage capacity include the physical sciences, medical and health sciences, agricultural and veterinarian science, bioinformatics, and biological sciences. Respondents indicated that they most commonly store their research data on internal computer hard drives, external hard drives, and USB/flash drives.

If ICT is applied in research effectively, the speed in processing the documents will become easier. Accessibility to ICT facilities ensures accuracy, timeliness and effectiveness of

managing the whole process of research. It allows the easy flow of information.

The use of ICTs builds a strong and effective information system. ICTs offered tremendous possibilities in improving and developing administrators" professional capability.

Other nontechnical issues

ICTs especially computers and Internet technologies enable new ways of research and learning rather than simply allow teachers and scholars to do what they have done before in a better way. Doctoral study includes tacit knowledge which is difficult to explain and to formulate. If doctoral students are able to influence their route towards a doctorate and to construct it meaningfully, their study experiences will be more personally meaningful to them. There are certain non technical issues that doctoral scholars generally face such as isolation, pressure to complete the project on time, financial issues and stress etc. Scholar generally works alone with few other people on their project. This leads to loneliness when scholars feel that no one around to share the problems. Scholars may face high level of mental disorder and stress because of looming deadlines, large scale project with a lot of personal investment. Most scholars depend on the funding from outsource agencies either by academic institute or by government which can be a pain if it is complete personal investment. ICT also resolves these issues. Scholars can contact other through journal clubs, and social networking groups. Being in contact with other PhD students make to them to talk, share and help to assuage this. Scholars do not get the time for outside activities. They can enjoy these activities by playing online games and joining social clubs, news group etc. The social clubs not only help them to get solution of their problems but they can also make good relationships over there.

Online software

For research scholars, the primary process is to science or research, the software is secondary process, it enables them to do science. The secondary process takes over the primary process for analysis of results. Now software are available free of cost online and a few software are available for trail version up to 15 days. It helps the scholar to do their process with ease and on time without spending too much of money.

Even a simple MS project helps the scholars to make to do list and have a regular check on it to complete the project on time. The Gantt and PERT chart help the scholars to make a complete detail of usage and requirement of different resources such as Infrastructure, human resource and IT hardware and software etc. R tool, SPSS are freely available. Mendeley is the software that helps to review the literature and citation in thesis. Evernote is the software that creates the notes for what we have searched and find on the internet. It captures the screen, photos along with PDF file that scholars write themselves (Julio, 2014). There are huge software developed and freely available online which can be useful during research process from planning to thesis writing.

CONCLUSION

Adoption and proper utilization of ICT will lead to increased yields and quality of research in every area. Yusuf (2005) poised that the field of education has been affected by ICT which have been undoubtedly affected teaching, learning and research. Doctoral research is the core of academic practices.

Several complementary factors such as relationship with supervisory, the scholarly community, and supervisor's personal belief are responsible to the overall doctoral experience. The potential use of ICT helps to obtain a deeper understanding of these problems and how these problems relate to well being during the PhD process. The present study focuses on exploring the problems and challenges faced by doctoral scholars and how ICT help them to resolve these issues.

ICT changes the characteristics of research and development work and hence play an important task as mediator of cognitive development enhancing the acquisition of generic cognitive competencies as essential for life in knowledge society. Scholars who use ICT tools for their research are more immersed in learning process. This study has shown that potential use of ICT can catalyze the paradigmatic shift in research and development in both area –in management and IT. The challenges to doctoral research and supervision need to be addressed as an international issue and concern, since quality standards at this level of education, training and research have to be assured. ICT especially computers and internet technologies enable new ways of learning rather than simply allow scholar to do what they have done before in a better way. ICTs have the great potential for increasing access to and improving the relevance and quality of research. The use of ICT in research settings, by itself acts as a catalyst for change in this domain. In addition, ICT will increase flexibility so that scholars can access the research materials regardless of time and geographical barriers. If ICT is used in appropriate manner it can catalyze the paradigmatic shift in both content and pedagogy that is at the heart of education reform in the 21 centaury.

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