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ORIGINAL ARTICLE

A REVIEW AND META-ANALYSIS OF GENDER DIFFERENCES IN INFORMATION TECHNOLOGY

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Abstract:

Information technology (IT) plays a vital role in every section of society and has its meritorious advantages. It is as simple as our daily routine performances but at some extent there is some biasness of adopting or using IT. In the growing economy era when the concept of equality exists everywhere, still there are some barriers which create hindrance in growing economy. The gender biasness is one of the historical issues because women are looking into the social and cultural aspect. Women are always looking behind men's using of technology and adoption.

This paper help to identify the dimensions between gender disparities through Meta analysis and provide solution with the help of social construct of technology (SCOT) model.

KEY WORDS:

Gender, IT, education, society, and culture.

INTRODUCTION

In today's world, one of the most important elements shaping the humanity is the Information and Communication Technology (ICTs). It affects the way we live, learn, work, spend our leisure time, and also how we communicate. It is not only that, ICTs have become vital engine of growth for the world economy but it has implications on our day to day life as well. It has the potential to enable individuals, firms, communities, in all parts of the world, to address economic and social challenges with greater efficiency and imagination. On one hand, ICTs and the Internet offer vast, new and extraordinary opportunities for human development and empowerment in all areas ranging from education, environment, healthcare and business, they are also one of the key reasons for social and economic disparities in the society. Not only this but, it has a significant role in the gender divide. It is one of the most significant inequalities, which is amplified by the digital revolution, and cuts across all social and income groups. Throughout the world, women face serious challenges that are not only economic but social as well as cultural – obstacles that limit them and prevent their access to, use of, and benefits from ICTs (Primo, 2003). But this potential will only be realized if the factors that contribute to the current gender digital divide are recognized and addressed. Women's access to ICTs is not a simple question of whether there is a computer connected to the Internet that women can use. Improved understanding and awareness of these challenges, but most importantly of the opportunities that ICTs could provide for women, are important steps towards bridging the gender

digital divide and towards transforming it into digital opportunity. Women represent the main economic force in most developing countries. As economies become more and more information-driven, the issues of women's access to and use of ICTs is growing in importance for both developed and developing economies. As a result of profound, gendered applications and implications of ICTs in employment, education, training and other areas of life, women need encouragement and support to take their rightful place in the information revolution. Women are underrepresented in all decision-making structures in the ICT sector, and this undermines the negotiation of gender-sensitive investment decisions and introduction of innovative patterns, policies and standards in the ICT sector. Equitable access to ICTs and the autonomy to receive and produce information relevant to women's needs and concerns are central to women's empowerment, and to the construction of an Information Society for all. The United Nations Millennium Declaration (2005) has resolved to ensure that globalization becomes a positive force for all the world's people and to promote gender equality and empowerment of women as effective ways to combat poverty, hunger and disease and to stimulate development that is truly sustainable, and to ensure that the benefits of new technologies, especially information and communications technologies, are available to all (World Bank, 2005). However, it may be noted that despite international recognition that the benefits of new technologies should be available to all, gender disparities persist with regard to ICTs. One of the major issues in this regard is the understanding of the need of women looking into the social and cultural aspects of their respective societies. Women in general are behind males in understanding, implementing and using ICTs. It is a well established fact that one of the key reasons of this kind of behavior among women is due to cultural and societal factors. The “value”, “perception” and “norm” of a society affect the acceptance and use of ICT including computer and the internet. It seems that men and women are socially constructed for different tasks and this may influence the pattern of ICT usage. Some of social studies have been shown that men and women differ in terms of their attitudes toward technology. For example, In one of the studies, it is reported that gender differences in importance assigned to various factors for the adoption of ICT, and another study reported gender differences in the perception and use of e-mail (Venkatesh and Morri, 2000; Gefen and Straub, 1997). In this study, the effort is to understand the reasons of the gender gap in ICTs. This paper focuses primarily on gender gap and attempts to present ICT usage by gender throughout the world by using the methodology of literature survey. Socially constructed gender roles have some impact on the adoption of ICT by men and women because ICT as a social product is not value-free. It is an attempt to explain gender gap in ICT usage and to justify the differences between men and women. The review and meta-analysis presented in this paper is the first that focuses on analysing gender differences research that has a focus on people issues.

LITERATURE REVIEW:

Extensive literature search is done to find out all the relevant and suitable work done under this theme. The literature review is done in short to give an idea of the work, along with a summary of the papers with their relevance. Finally a discussion section is kept where a comprehensive analysis is done of the works done so far. It is essentially to draw lines between different works on this issue and find out gaps in the literature. To start with let us understand the two key variables – IT and Gender by looking at their definitions. Definition of IT and Gender:

According to Mitter “Information Technology” is a group of technologies that process rather than merely store or transmit information. At the core of IT is computers and software (Mitter and Rowbotham, 1995). Mo¨rtberg (2000) defined the main point of the “information technology” as the integration of computer technology, communication technology and multimedia, so people use ICT as a new concept. Recently, computers are connected to networks that give people opportunities to interact, to co-operate, to talk, to exchange ideas and feelings and to create transnational relationships – cyberspace becomes reality (Mo¨rtberg, 2000). The term “gender” refers to the different roles men and women play in a society or a community. These roles are determined by cultural, social and economic factors and differ within and between cultures and countries. Gender roles are different from sex differences in that sex differences are biological, and for the most part, unchangeable. Gender roles are learned, change over time and vary widely within and between cultures (UNDP, 1999).

Men and women also differ significantly in terms of attitude toward risk and attitude toward technology in general (Brunner and Bennett, 1998). Since so-called “innovators” of a new technology have more favorable attitudes toward risk (Gatignon and Robertson, 1991), women's risk-averse behavior is likely to result in lower rates of technology adoption.

In another US school study, it is observed that boys see the computer and the internet as a source of entertainment whereas girls see it as a tool to help achieve a specific task or goal. However, it has been found that despite the positive opinion and perceptions reported by girls, they were less likely to enroll in

elective computer classes than boys. Girls use the internet to research their favorite celebrities and to obtain the latest beauty and fashion news, whereas boys search for new product information, sports news and the latest technologies. In general, no significant differences were found in terms of access or the amount of time spent using computers and the internet, however, differences were found in the way girls and boys use computers and the internet (Humby-Hoff, 2002). This may be attributed to the socially constructed nature of gender roles.

A long-term study during ten years about general levels of computer literacy among undergraduate students at the University of Edinburgh in Scotland showed that gender was a powerful predictor of the responses that students gave in the early years of the survey. Women reported themselves as less likely to own computing equipment, believed themselves to be less experienced than their male colleagues in IT related skills. All the students used the computers provided by the university and 74 per cent of students had access to computers in the home. However, the female students reported that although they may have computers in their home they had more problems with access such as having to share the computer with other family members or friends. About 49 per cent of the female students reported they did not have priority access to the computer in the home, whereas none of the males reported this (Gunn et al., 2003). One of the reasons for these results may be attributed to the different attitude (being less positive) toward technology among female students.

In a study conducted in Australia it is been reported that the proportion of women using computers is less than males for all regions; however, the greatest difference is in the major metropolitan centers. While more males use computers than females, the difference was never greater than 6 per cent (Armstrong et al., 2003). This is indicative of a greater equality between societal levels, including government, organizations and even within families. This orientation reinforces a cooperative interaction across power levels and creates a more stable cultural environment.

A computer usage study in Korea showed that 75 per cent (16.85 million) of all male and 62.6 per cent (14.08 million) of all female use computers at least once a month, and the difference between the genders is 12.4 per cent (Ministry of Information and Communication of Korea, 2004).

Since the 1990s, computer has become a communications tool that allows people to engage in instantaneous and two-way communication with others. The internet usage by gender in the world shows from reviews and statistics on internet access and use across countries as gender is one of the most important factors influencing the internet usage. In a study conducted by the UCLA World Internet Project in 14 countries showed that there is significant “Digital Gender Gap” in many countries. They found an average 8 per cent gap between men and women using the internet. This figure was not as large as they might have expected, given the gender disparities that persist around the world. However, in several technologically developed countries, the gap was surprisingly large – in some cases almost twice as many men as women use the internet. The gender gap in internet use was as high as 20.2 per cent in Italy (men, 41.7 per cent; women, 21.5 per cent) to as low as 1.6 per cent in Taiwan (where 25.1 per cent of men are internet users, compared to 23.5 per cent of women). According to this study, in the USA, 73.1 per cent of men use the internet compared to 69 per cent of women – about half the average gap of countries in the UCLA World Internet Project (Lebo, 2004).

The gender gap of internet use in the countries surveyed on this question for the UCLA World internet Project is shown in Table I.

In another study reported by the International Labour Office in 2001, the most striking digital gender divide relates to internet use, with women in the minority of users in both developed and developing countries. For example, only 38 per cent of internet users in Latin America are women, while in the European Union the figure is 25 per cent, in Russia 19 per cent, in Japan 18 per cent and in the Middle East 4 per cent. Most internet users are male, college-educated and earn higher than average incomes, the report says. Only where internet access is well developed, for example in Scandinavia and the USA, has the gender gap in use of the internet closed (International Labour Office, 2001).

A study carried out by Riahinia and Azimi on women's use of internet in Tarbiat Moalem University in Iran showed that there is a significant relation between academic females' use of the internet and their social ranking. As social ranking increases the use of internet grows. E-mail was used most, although it is closely followed by other services such as “new discoveries” and “search for resources”, and also “gaining information”. This study was focused on female users and did not provide information about male users (Riahinia and Azimi, 2008).

A study comparing the USA and Japan by using micro-data from several surveys during the 1997-2001 period indicate that there were significant gender differences in computer and internet usage in both countries during the middle of this period and were even reversed in the USA but remained in Japan. People (not currently working) had lower levels of IT use and skills in both countries regardless of gender, but working women in Japan had lower levels of IT use and skills than prior to the 1990s. By 2001, these gender

differences had disappeared. This finding suggests that employment status per se does not play a large role in the gender gap in Japan, but type of employment does. The prevalence of nonstandard employment among female workers in Japan accounts for much of the gender gap in IT use and skills in that country (Ono and Zavodny, 2004).

A study by the Pew Internet Project (reported by BBC) found that roughly the same percentage of men and women in the US are serious internet users. But the research found that men value the Net for the freedom it gives them to try new ways of doing things. By contrast women like the opportunities the Net gives them to make and maintain human connections. One finding suggests that the number of women online already outnumbers that of men. Figures gathered by Pew suggest that 68 per cent of men are Net users, compared to 66 per cent of women. However, the total number of internet-using women is higher because there are more women than men in the general US population. In some sections of the population online, this divide is more pronounced. For instance, 60 per cent of black women are internet users compared to only 50 per cent of black men (Gender Gap Alive, 2005). To substantiate this study, In Facebook Demographics and Statistics Report by Corbett (2010), US males' users are only 42.6%, as compared to US females 54.3%.

In certain studies it was found that women made few strides in high-tech employment though the proportion of women employee comparatively less than male employers. It shows the unbalanced position between the employees. Apart from that the estimated salary of women is about nine percent (9%) lower than male position. Not only in US has the same status of women applied in UK. According to Gender-Schema theory the explanation of behaviour and attitude in work place may adversely affect women in technology. This paper raise questions on the position and trend related to gender research in IT arena and their implications. The research is relevant to as it clearly articulates the women role in the context of emerging IT role in the industries. Women in IT may have higher non-traditional gender schema than men in IT and greater than that of both female and male in general population because men dominate in IT industries, male values create that standard.

This study examine gender difference regarding confidence toward using technology (e.g., AutoCAD, SPSS, Arena, and programming language, such as C, Java, Visual Basic, etc.) for learning in higher educational institutions in Hong Kong. It experienced a trend where more female students than male students have entered Hong Kong universities.

Some study proposed that gender boundaries are modified by interaction at a distance, allowing women to bypass constraints placed on their physical mobility and interaction patterns. Study suggests that men and women, within universities and research institutes, report distinctly different core networks in terms of absolute size, geographic range, gender diversity, and gender homophile. The use of communication technologies, while associated with some measures of network composition, does not exhibit any straightforward or unequivocally positive relationship to ties. Over the three- to five-year period examined here, one marked by dramatic improvements in the technological environment, gender differences are increasing, and women scientists are becoming more isolated.

ICT has been widening the gaps between and within countries, regions, gender while increasing disparities divide between the rural-urban, rich-poor, elite neglected and also within the different categories of women in various spheres of activity. The majority of women in the developing world do not have access to ICTs due to variety of barriers as such the infrastructural, social, cultural and linguistic. It is suggested to encourage and facilitate collaborative action among government bodies with responsibilities for the ICT area and for gender equality through increased financial resources and expertise, to lead advocacy in gender equality and ICT.

With the exponential growth of data on the web, it is time that librarians and computer engineers work together to improve both search mechanisms and data structures for a more effective and efficient information service. Due to the exponential growth of Web pages, users cannot locate Web files by conventional means, such as using directories like those in phone books. Search engines offer document content with full-text indexes and direct links to the documents in the web environment. However, throughout history, most technology breakthroughs have had social and economical impacts on society, and Web portal technology is no exception. As long as the community is aware of the potential impact, the problem can be dealt with accordingly. Thus, the idea is to make it socially constructed, wherein the difference between genders may be kept under consideration.

The new concepts like user viscosity are introduced, which comes from the Social Networking Services (SNS). It is an important idea of internet marketing and web site ranking, which is described in the context of digital library. In this paper, a merit system has been developed and implemented to increase the user viscosity with the digital library of a university.

Summary of the literature review/survey is shown in table-1.

Table-1: Summary of the Literature Survey

S.No	Name of the Paper	Author(s) and Year	Findings	Relevance
1	Gender schemas: A cognitive explanation of discrimination of women's in technology.	Mary A. Lemons and Monica Parzinger (2007).	The results show that theirare ample opportunities for female graduates in technology, which is currently influenced by gender biasness.	The research is relevant to my study as it clearly shows the role of women and gender biasness in IT sector.
2	Students' perceptions of the use of technology: does students' gender make a difference in their perceptions of using technology in teaching?	By Karam Adibifar (2007)	The finding of this research reveals that males and females are different in perceiving the use of technology in teaching, males are more positive in their perceptions on the use of technology than females.	It tells about difference in perception due to cultural and social issues like upbringing than cognitive reasons.
3	Rethinking the Social Construction of Technology through 'Following the Actors': A Reappraisal of Technological Frames.	Christina Prell (2009)	Heterogeneity of technological frames can cloak the more obvious, and potentially more influential, forces at work in technology design.	Sociologists are scrutinizing the SCOT theory, thus validates my idea of research.
4	Socio-psychological determinants of public acceptance of technologies: A review.	Nidhi Gupta, Arnout R.H. Fischer and Lynn J. Frewer (2011)	Certain determinants are seen to have more impact on public acceptance of specific technologies. Pesticides were mainly associated with health and the environment; cloning and genomics with ethics.	It is relevant to understand how Increased societal dependency on technologies necessitates the examination of "society–technology" interactions.
5	Is it really gender? An empirical investigation into gender effects in technology adoption through the examination of individual differences.	Miguel I. Aguirre-Urreta and George M. Marakas,(2010)	Results indicate that gender effects are more complex than previously thought, with potentially multiple influences from different facets operating simultaneously.	It gives empirical evidence of gender differences in technology adoption, which is directly related to my study.
6	Impact of Information and Communication Technologies on Women Empowerment in India.	Lal B. Suresh (2011)	Majority of women in the developing world do not have access to ICT due to different barriers like the infrastructural, social, cultural and linguistics.	Helps in understanding how to create an enabling environment to support women's social and economic empowerment.
7	Gender Difference of Confidence in Using Technology for Learning.	Hon Keung Yau and Alison Lai Fong Cheng (2012)	The finding in this research showed that both male and female students in the university liked to learn to use technology.	Understanding male and female students' perception of confidence in using technology for learning.
8	Digital Divide in India: Problems and prospects to bridge the divide.	Praveen kumar Kumbargoudar (2013)	The study explains different government schemes and program which are aimed to overcome the digital divide and thereby enabling development of digital library possible in India.	This paper is important to my study because it shows direct comparison of library usage and literacy rate in India.

9	Gender Differences in Information Technology Usage: A U.S.-Japan Comparison	Hiroshi Ono and Madeline Zavodny. Working Paper 2004	This study examines whether there are differences in men's and women's use of computers and the Internet in the United States and Japan .	This study important to my study because it define the relationship between gender, work and information technology and shows digital inequality in IT.
10	Gender Issues in the Information Society	N a t asha Primo Published in 2003 by the United Nations Educational, Scientific and Cultural Organization (UNESCO),	This paper forces on shaping the 21st century are the new Information and Communication Technologies. The gender divide is one of the most significant inequalities to be amplified by the digital revolution, and cuts across all social and income groups.	This paper helps to know those issues responsible for Gender Digital Divide which are relating to my research.
11	Measuring the Gender Gap on the Internet	Bruce Bimber, University of California, Santa Barbara [Social Science Quarterly Volume 81, Number 3, September 2000 ©2000 by the University of Texas Press, P.O. Box 7819, Austin, TX 78713-7819]	This paper evaluates differences in men's and women's presence on the Internet, testing for the presence of gender-specific causes for different rates of Internet use. methods. The paper presents new survey data collected by the author in 1996, 1998, and 1999 showing trends in Internet use, and presents regression models.	This analysis has shown that a gap in access to the Internet exists between men and women, but this gap is the product of socio-economic and other factors, not Gender itself.
12	Information technology and gender gap: toward a global view	Golnessa Galyani Moghaddam Department of Library and Information Science, Shahed University, Tehran, Iran Abstract- 2009	Information and communication technology has brought many changes in society in many aspects, has shaped new scenarios and provided new challenges for human beings. Women, comprising over half of society, are not waived of these changes, although, there is a gender gap to access and use of IT among all nations without exception. More recent studies, particularly in developed countries, show gender differences more than gender gap. Originality/value – The paper provides insights into the current computer and especially internet	libraries and their users to see the gender differences perhaps gender gap. ICT as a social product are not gender neutral Access and use of ICT are interwoven with the socio-cultural issues and gender gap is seen among all nations in the world ,however, the gender gap is wider in developing countries.
13	Why Don't Men Ever Stop To Ask For Directions? Gender, Social Influence, And Their Role In Technology Acceptance And Usage Behavior	Viswanath Venkatesh Robert H. Smith School of Business University of Maryland, College Park College Park, MD U.S.A.	This paper implies theoretical Development of Two important constructs that have received very little attention in the context of TAM research are social influence and gender	This paper shows descriptive statistics of gender.. this Research focused on a longitudinal examination of gender differences in the relationships among theoretically grounded determinant of technology acceptance and usage. it is very useful in my research.
14	New Gender Benchmarking Study Finds Numbers of Women in Science and Technology Fields Alarmingly Low in Leading Economies.	Publication info: PR Newswire [New York] 03 Oct 2012.	In this paper researchers have found that numbers of women in the science, technology and innovation fields are alarmingly low in the world. The study maps the opportunities and obstacles faced by women in science and technology.	This study identifies key areas of national strength and weakness, and we hope it will help form the basis of evidence-based policy making and aid going forwar.

15	Girls, computers, and the internet : an end to the gender gap?	Cate Humby-Hoff San Jose State University Follow this and additional works at: http://scholarworks.sjsu.edu/etd_theses 2002	This study update the earlier reserch of the computer gender gap and extend it to include the Internet. The gole of this study is determine if women access and opinion of computer and technology have the changed since the adoption of Internet in to the mainstream.	Its main purpose is to determine how the Internet has changed girls perception opinion, access, and use of computer and technology
16	Adolescent computer use and academic achievement.	Hunley SA1, Evans JH, Delgado-Hachey M, Krise J, Rich T, Schell C. Author information	In this paper, gender differences were found across grade point average and time spent doing homework on and off the computer. Estimates of time spent per week using the computer were correlated with the time recorded in logs.	The main purpose of this study was to investigate the relationship between adolescent computer use and academic achievement.
17	Explaining the IT Gender Gap: Australian Stories for the New Millennium	Eileen M. Trauth Susan H. Nielsen Liisa A. von Hellens	this study was the findings from a previous study of Australian women working in IT. This paper also discusses more recent research on gender and IT, particularly the attempts to address the under theorisation of this research area and the significance of mentoring.	In this studyfour major themes that resulted from a study of IT professionals in Queensland were used as the framework for a deeper exploration of the current position of Australian women in IT. These four findings were explored through open-ended interviews with a broader range of Australian women working in IT
18	Women and the web An evaluation of academic Iranian women's use of the internet in Tarbiat Moalem University	Nosrat Riahinia and Ali Azimi Psychology and Education Faculty, Tarbiat Moalem University, Tehran, Iran 16 April 2007	The study found that there is a significant relation between academic females' use of the internet and their social ranking. As social ranking increases the use of the internet grows. The findings also revealed that as users navigate more through the internet they would find more hidden threats and vague content	The paper provides insight into a group of Iranian academic females' use of the internet. It will help researchers to achieve a closer view to such women's conditions and it is therefore of use to web developers who might design better content related to female interests especially in Iran.
19	Women's values or a gender lens?	Sheila Rowbotham	This study focus on the impediments of a male-dominated capitalism; male prejudice, attitudes and relations within families, schools or work, leek of places in higher education, job segregation and the sexual division of labour.	This paper contributed to new insights into the history of science and technology in western thought and society. Instead of wondering. The view of this paper describe that technological discoveries and their application .s

DISCUSSION:

After the indepth review of the literature on gender differences in information technology, it can be said that there is a gap between males and females in using the information technology and its related services. There are various reasons and solutions being provided to reduce this gap, but somehow one very important concept is being missed from the whole literature, which is the concept of SCOT. SCOT is a theory for technological development, and its basic premise states that technologies emerge from social interactions among social groups and actors. SCOT sees no 'right' or 'wrong' technologies, as all technologies have the potential to be shaped differently based on which actors and groups are involved. This flexible quality of technology design, which is the basis of SCOT theory, communicates the message that a technology could have been different, and as such, that technologies in general are pliant creatures, not autonomous ones, and not ones that result from careful, rational planning. The story of Connected Kids illustrates many of SCOT's concepts and demonstrates the usefulness of this approach. The concepts

provide an analytical vocabulary for making sense of the interactions that surround and give rise to a particular artefact. In fact, although Connected Kids is more a tangent technology than a new innovation, the amount of rich, complex interactions brought to life by a SCOT telling illustrates how different kinds of artefacts – not just new technologies -- can be described and explained through this approach.

Increased societal dependency on technologies necessitates the examination of "society–technology" interactions. In this context, it is important to note that on one hand a new technology may bring about radical changes in society, while on the other hand the fate of that technology rests with the society in which it is being applied. A negative societal response may be caused by the fact that, while many technologies deliver benefits to society, they may also introduce new risks such as accidents, and unpredicted events which bring fears in the minds of the people from using it. For example, introduction of the genetically modified food crops led to polarized genetically modified food debate globally. Occurrence of such events and controversies over the use of technology, emphasize the importance of public acceptance in strategic development, application and commercialization of technologies. Thus, there are various factors that lead to acceptance of technology or rejection of technology.

CONCLUSION:

It can be concluded that despite international recognition that the benefits of new technologies should be available to all, gender disparities persist in using IT. One of the major issues in this regard is the understanding of the need of women looking into the social and cultural aspects of their respective societies. Women in general are behind males in understanding, implementing and using ICTs. It is a well established fact that one of the key reasons of this kind of behavior among women is due to cultural and societal factors. The "value", "perception" and "norm" of a society affect the acceptance and use of ICT including computer and the internet. It seems that men and women are socially constructed for different tasks and this may influence the pattern of ICT usage. Some of social studies have been shown that men and women differ in terms of their attitudes toward technology. By doing this meta analysis, it has been clearly understood that the reasons of the gender gap in IT and related services are many and different, and therefore socially constructed technologies using concepts like SCOT can provide solution to such problem.

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