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Gender Differences in Job Related Attitudes of Software Professionals in India

[1]K.S. Rajeswari, [2]R.N. Anantharaman, [2]K. Jayanty, [2]A. Ajitha

[1]*Tata Consultancy Services. Chennai, India.*
[2]*Faculty of Business, Multimedia University, Melaka, Malaysia.*

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ABSTRACT

The software industry in India is one of the fastest growing sectors. The ratio of men and women in the Indian software industry is 80:20 (Nasscom, 2005). This is despite the fact that computer science is considered a favorable subject for Indian women. Research in the Western countries (Whitley, 1997) and Australia (Trauth, 2000) has brought out gender differences in the attitudes and behavior of IT professionals. The purpose of this paper is to investigate if there are gender differences among software professionals in India with respect to personal attitudes and technology related attitudes. Attitudes such as self-efficacy determine the choice of performing a task, the effort expended in the process, persistence shown in accomplishing it (Bandura and Schunk, 1981) as well as in the actual performance of the task (Bandura, 1986). It therefore becomes important to know if there are gender differences in aspects such as self-beliefs, computer related attitudes and their perception of control at the work place. Thirty female software professionals and one hundred and twenty six male software professionals from Chennai and Bangalore were the respondents of the study. Interview and questionnaire methods were used to collect data. Independent sample t-tests were conducted on individual items that constitute the scale to understand what particular issues significantly contribute to the gender differences. The results suggested that there were significant differences in the intrinsic motivation, computer self-efficacy, self-efficacy and self-efficacy outcome expectancies and perception of control on the job between men and women soft professionals. It can be inferred from the study that self-beliefs of women, their computer self-efficacy and intrinsic motivation need to be enhanced. This can be done through providing continuous training on computer skills. Women should also be given training to act more confidently and be assertive in the workplace. Gaining autonomy and control in the workplace will enable women to gain job satisfaction and equality in the workplace

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INTRODUCTION

India's IT industry is considered as a critical industry since it economic contribution is well acknowledged. According to Software Sector Analysis Report (2013) the Indian IT or ITES (IT Enabled Services) industry's revenue was over US 100 billion during 2013 and around 68% is accounted for export (Anonymous, 2013). Specifically Gartner Inc. (n.d.) pointed out the software revenue in India for the year 2013 was around US 4.765 billion and this is an increase of 10% from the previous year. Furthermore, most of the top IT companies sourced IT professionals from India. Thus, the IT software professionals are greatly in demand in India. Not surprisingly, India is said to have achieved the highest growth among the BRIC countries (Gartner Inc., n.d.).

The NASSCOM's 2013 Strategic Review indicated that the workforce of this industry totalled to around 3 million people. The contribution of this sector in terms of export is also high where it is around 25% (Information Week, 2014). In addition, every year although the search for jobs account to around 12 million people there is yet a shortage of "right talent" for this industry. The supply of software professionals is not enough to meet the growing demand for IT professionals (Information Week, 2014).

The Government of India, the State Governments and private sector are taking active steps by setting up more engineering colleges and by increasing the number of seats in the existing colleges in order to increase the number of IT professionals to cater to the increasing demand of IT professionals in the Indian software industry. Computer Science has now been introduced in the

Corresponding Author: K.S. Rajeswari, Tata Consultancy Services. Chennai, India.

Higher Secondary School (HSS) level (10+2) in educational institutions that follow the syllabi given by States in India, while exposure to computers begins in the High School level. Moreover Indian parents traditionally encourage their children to excel in Maths and Science subjects (Trauth, 2002) irrespective of gender.

The number of women who acquire IT education have increased considerably. Women students constitute one third at graduate and undergraduate level in Science. Since computing is related to Maths, excellence in computer science is also encouraged. In fact, Computer Science is considered an ideal engineering discipline for women as it does not involve heavy work as compared to hard disciplines such as mechanical or civil, electrical and chemical engineering. According to Business Standard (2011), the IT industry has become an importance employment source for young Indian professionals including women. Due to this the enrolment of Indian college graduates has increased where 42% of them are women. This increase is expected in years to come (Hewlett and Rashid, 2010).

Entrance of Indian women to the workforce has steadily increased over the years. It has been reported that in 1983 the Indian women workforce constitutes of 25.8% and it increased to 33.3% in 2000. The increase was around 10% within 17 years. Furthermore, it is expected to reach a ratio of 361 for every 1000 female by the year 2026 (McNay *et al*. 2004). A study by a leading trade journal in India reported that women constitute 19% of the total workforce at lower levels and 6% of the senior workforce in the IT industry (Kalghatgi and Seth, 2003).

The increase of women in workforce is also observed in the IT or ITES sector. According to Wakhlu (2008), the largest number of women employees is in IT sector. The increase has been described as the 'phenomenon of India Women IT Professionals' (The Indian programmer, 2000). In 2007, the percentage of women in the IT workforce is 26.4% compared to 24% in 2005 (Ali, 2006).

It is the intention of the current paper to explore the job related attitudes of these women in the software industry and investigate if there are any gender differences. This paper is organized in the following manner. The first section gives a brief overview of the Indian Software Industry. The statement of objectives follows this. The next section discusses the review of literature and proposed hypotheses on various job related attitudes such as self-efficacy and self-efficacy outcome expectancy, computer self-efficacy, computer playfulness and perception of job control. The subsequent section states the methodology of the study where a brief profile of the sample, and the scales used to measure the variables is presented. The next part of the paper presented the data analyses and discussion of results. The inferences drawn from the current study that is applicable to computing education and software industry respectively are. The paper ends with summary and conclusions.

Indian Software Industry –An Overview:

Indian software industry is a small but growing part of the global software industry. The world has recognized India's competitive advantage in software services and today India is attracting software clients from all over the world owing to the quality of its skilled manpower (Nasscom, 2001a). Based on the NASSCOM report the projected growth in the year 2014 is 12-14%. In addition, the revenue is expected to reach over US 225 billion in the year 2020 while the average growth is predicted to be around 13% (Anonymous, 2013). The IT sector in India has a remarkable influence on India's economy and this has also supported the social standings of its society. Among the area of improvement were found in growth in revenue, livelihood generation, development of infrastructure and social transformation. Due to these, it is pivotal that this industry's workforce upgrade their skill continuously to support the continuous growth.

There has been a healthy growth in the number of India's software professionals over the last decade. The ratio of men and women in the software industry was 79:21, in 2001 but it is expected to improve in the future. From the industry stand-point, one of factors that has contributed to the growth of women in the Indian software industry is the migration of qualified male software engineers to the developed nations such as the United States.

Women workforce in the IT is recognised as critical for the continuous growth of the industry (The Economic Times, 2009). Specifically, the women IT professionals' entry in the fast growing software services sector is the observed significant change in the Indian labour market. In addition, IT sector has been characterised as rapidly growing and demand sector where well educated, highly skilled IT women professional are attracted to in pursuing their career (Valk and Srinivasan, 2011). However, although the percentage of women in IT industry is increasing, yet the ratio of women is still low compared to men.

The IT sector especially related to software services in India provided numerous challenges for the IT professional and this is more adverse in the case of women. Among them are organisation which is project oriented and outsource based (Ethiraj *et al*., 2005).which creates uncertainty and instability in the working environment. In addition, there is constant pressure to work long hours (Scholarios & Marks, 2004) due to the time differences between the Western countries and India. Working in shifts of 24 hours, 7 days a week and throughout the year require team meetings to be handled virtually and it can be outside the normal working hours (Teagarden *et al*.,

2008). Work depends on project which is meeting the deadline or deliver the projects within the required time is essential (Mathew, 2007). In addition, due to the constant advancement in the area of information technology, skills become obsolete more quickly and there is also a necessity to refresh the skills. This would require additional hours to acquire (Armstrong *et al*. 2007). Due to the constant innovation, being good is not adequate in the IT industry, the need to keep up with the technological skills is very important ((Valk and Srinivasan, 2011). According to Ali (2006) there is no industry like IT industry where technology develops or changes significantly.

Objectives of The Study:

This study investigates if there are gender differences among Indian software professionals in terms of self-efficacy, self efficacy outcome expectancy, computer self efficacy, computer playfulness and perception of job control.

Self-Efficacy and Self-Efficacy Outcome Expectancy:

Self-efficacy refers to an individual's belief in his or her capability to organize and execute a course of action needed to meet the demands of a situation. Many researchers have referred to Bandura's work on the issues related to self efficacy. According to Bandura (2006) when there is confidence on the related activities, there will be acceptance on the capacity of attaining it. An earlier study indicated the greater the perception is on one's self efficacy, the more active and longer there will be persistence on one's effort (Bandura, 1986). This shows self-efficacy is an important area of research and research on this topic have continually been conducted in academic achievement related, performance related studies among others. Riggs and Knight (1994) had indicated in an occupational context, self efficacy represents the judgments that employees make concerning their ability to do what is required to successfully perform their jobs. Efficacy beliefs are both situation specific and context specific. Self-efficacy outcome expectancy is defined as a "judgment of the likely consequence …behavior will produce" (Bandura, 1986). Outcome expectancy refers to the beliefs of individuals have regarding the outcomes they expect to attain due to their work behavior. It is a person's estimate that a certain behavior will produce a resulting outcome.

Self-efficacy is associated with beliefs and behavior (Gist, 1989, Gist and Mitchell, 1992, Igbaria and Ivari, 1995). It has a critical influence on decisions involving computer usage and adoption (Hill *et al*., 1987, Davis *et al*., 1989,). Miura (1987) has suggested that self-efficacy is also an important factor in computer skills acquisition. Enhancing self-efficacy reduces the impact of computer anxiety and therefore encourages computer usage. Also, outcome expectancy was found to have significant impact on computer usage (Igbaria and Ivari, 1995). Since self-efficacy plays an important role in the determination of computer usage, the current study examines the gender differences in self-efficacy beliefs.

Studies give conflicting opinions on gender perceptions of self-efficacy. On one hand there are evidences that girls report higher efficacy beliefs (Pajeras and Valiante, 1999) whereas on the other hand there are other studies that give a contrary viewpoint. For instance, Pajeras (2002) has reported that boys have a tendency of self-congratulations and hence have a greater tendency to report better self-efficacy. Women have a lower sense of efficacy particularly with respect to traditionally male domain areas (Bussey and Bandura, 1999). There are some studies that show that there is no statistical difference between men and women in terms of self-efficacy. These studies were focused on self-efficacy scores in terms of writing (Hashemnejad *et al*. 2014). Computing in countries like USA, Australia and UK is typically considered a male domain. Hence it is possible that there are gender differences both in the case of self-efficacy as well as self-efficacy outcome expectancy.

Therefore we hypothesize that,

H 1a – There will be gender differences in the perception of self-efficacy among software professionals

H1b – There will be gender differences in the perception of self-efficacy outcome expectancy among software professionals.

Computer self-efficacy:

Computer self-efficacy (CSE) refers to individual's efficacy in the performance of tasks related to effective computer usage for performance of action towards achievement of goals or desired outcomes. Attitude towards information technology is found to be in related to computer self-efficacy since it can influence on the frequency and success of computers usage (Compeau & Higgins, 1995; Khorrami-Arani, 2001).

Computer self-efficacy affects the cognitive, attitudinal, and behavioral outcomes of interest to researchers, educators, trainers, and employers (Compeau *et al*., 2006; Marakas *et al*., 1998). Among the issues looked at were whether computers seen to be useful (Thompson, Compeau, & Higgins, 2006) and easy to use (Hasan, 2006a). Others researched on users' attitudes toward computers (Compeau, Higgins, & Huff, 1999), intentions to use computers (Klein, 2007), actual computer use (Ball & Levy, 2008), computer skills (Marakas *et al*., 2007), and computer anxiety (Johnson & Marakas, 2000; Thatcher, Zimmer, Gundlach, & McKnight, 2008). Some of the antecedents of computer self-efficacy are encouragement by others (Compeau and Higgins, 1995), computer experience and management support (Igbaria and Ivari, 1995) and self-

conceptions of ability (Martocchio, 1994). The outcomes of computer self-efficacy include affect, anxiety, outcome expectations and actual performance (Compeau and Higgins, 1995). There are also studies that have delved into the concept and nature of computer self-efficacy (Marakas *et al*., 1998; Agarwal *et al*., 2000).

The common thread that links these studies lies in the fact that attitude drives behavior. This interlink is important in the study of issues related to human computer interaction because individuals' beliefs in their attitude towards using computer, i.e., computer self-efficacy (either in using computers as an end-user or as a software developer), would determine the actual performance particularly for software professionals.

The interpretation of CSE may vary according to the situation and context in which it is examined. Perception of ability to perform specific computer related tasks in the domain of general computing is known as task-specific CSE. An individual's judgment of efficacy across multiple computer application domains is known as general computer self-efficacy (Agarwal *et al*., 2000). For example, the end-users who are using a personal computer for individual usage can interpret the general CSE as applicable to all tasks that s/he does on a daily basis using a computer. But for software professionals, with appropriate background, general CSE may mean the efficacy of using computers for purposes of software development across multiple domains/ platforms/ technologies/ application environments. General CSE is more a product of a lifetime of related experiences and tends to more closely confirm to the definition of CSE that is often offered and tested in the IS literature (Martocchio, 1994).

A review of the studies on CSE literature and the meta-analysis of Marakas *et al*. (1998) also reveal that CSE has not been examined among software professionals. This group of professionals needs to be examined as they face greater threat of obsolescence more than any other IT user due to continuous change in technology. Also they are most likely to be the front-runners in the use of latest techniques/ languages/platforms/operating systems due to the demands of the clients or end users. This creates ambiguity and complexity in the task profile of software professionals. Since task characteristics such as ambiguity and complexity affect perceptions of efficacy, the software development professionals are more susceptible to change in computer self-efficacy.

The research on gender and computing even though is not conclusive generally it is reported that males have more experience and use of computers (Brosnan & Lee, 1998; Balka & Smith, 2000). This has been indicated in the studies by Chua *et al*. (1999) and Coffin and Mackintyre (2000) in their meta analyses in the area of computer anxiety, computer attitudes, computer self-efficacy and computer experience. Their meta-analysis resulted in reinforcing the gender effects where when there is higher level of computer experience are associated with positive computer attitudes.

Other than that males have better computer self-efficacy than females (Torkzadeh & Koufteros, 1994). Men rate themselves higher in terms of computer skill level and efficiency than their female peers (Whitley, 1997). Males have higher computer ability and lower computer anxiety than females. Males were found to have higher perceived ability for computer usage than females (Teasdale and Lupart, 2001). Generally, females have more negative attitudes toward computers (Durndell & Thompson, 1997; Whitely, 1997) and greater computer anxiety (McIlroy, Bunting, Tierney, & Gordon, 2001; Igbaria and Chakrabarti, 1990) than males. Also research indicates that higher the anxiety, lower the computer self-efficacy (Hunt and Bohlin, 1993).

Some studies looked into educational background such as female students' choice of courses as well as career and result indicated that self-efficacy has turned out to be a critical predictor. Further evidence was found in terms of subjects such as mathematics and computer science which is male dominated and female students has been found to have significantly lower self-efficacy (Hackett, 1985). Women engage in fewer computer related behaviors than men, thus resulting in gender gap in computer related attitudes.

Nevertheless, the study by Sam *et al*. (2005) have found no differences between male and female in the internet use pattern, computer self-efficacy, computer anxiety, and attitudes toward the Internet. The finding supports earlier study on undergraduates (Fulkerth, 1998; Green 1998; Sax *et al*., 1998) and their mindfulness computer-based technologies's roles across professions and industries (Callan, 1998; Rush, 1998).It is possible that such differences exist even among software professionals as well. Hence in the current context of the study, it is proposed that there will be gender differences in computer self-efficacy.

H2 - There will be gender differences in computer self-efficacy among software professionals.

Computer playfulness:

The adjective 'playful' is considered as a 'state' when it is used to denote a subjective experience, which is based on stimuli and hence is 'dynamic' in nature. On the other hand, 'playful' is considered as a 'trait' when it is used to denote the motivational characteristic of individuals and hence is consistent over a period of time. Playfulness is a manifestation of cognitive spontaneity, which manifests itself as curiosity and inventiveness. In the context of Human Computer Interaction (HCI), this trait enables an individual to interact with the software and explore various patterns of behavior of the software

package/software technology under differing conditions. This enables individuals to get familiar with the software technology. This familiarity gets transformed into mastery, with great ease (in course of time with practice).

Play is fun and satisfying (Agarwal&Karahanna, 2000) and can help one escape from real life into fantasy (Kuss & Griffiths, 2012). Since many computer dependents view computers as a toy, their computing activities are inherently playful (Shotton, 1989). In order to denote this process Webster and Martocchio (1992) have developed the construct called 'micro computer playfulness' and have defined it as "the degree of cognitive spontaneity in microcomputer interactions". Computer playfulness describes an individual's tendency to interact spontaneously, inventively and imaginatively with the computer (Webster and Martocchio, 1992).

The variable of computer playfulness has been studied typically in the context of Technology Acceptance Model (TAM) as a predictor for ease of use and intention to use in the case of MIS professionals as well as of end-users. Computer playfulness has been found to be positively related to computer efficacy beliefs and training outcomes of learning (Webster and Martocchio, 1992). Men designers, developers and vendors were often most exclusively focused on technology itself, due to the thrill of inventiveness (Glastonbury, 1992). This suggests that men could be more 'playful' with respect to the use of computes than women.

H3 - There will be gender differences in the computer playfulness among software professionals.

Perceived Control on The Job:

Efficacy beliefs influence an individual's evaluation of his/ her personal ability to exercise control where as control perceptions capture an individual's appraisal of an objective situation (Ganster and Fusilier, 1989). Perception of control can be (1) related to oneself (e.g. locus of control) or (2) related to extrinsic environment (e.g. work control). Control can be defined as the belief that one has a response available that can influence the aversiveness of an event (Thompson, 1981). It is the belief that one can influence the environment (Perrewe and Ganster, 1989).

Baronas and Louis (1988) have found that perception of control can be increased by facilitating experiences of choice and predictability. Process view of control can be restrained by lack of resources and managerial constraints. Providing information and learning that improves individual's knowledge that is necessary to gain control over situations can enhance predictability dimension of control.

Perceived control over a situation can be estimated in terms of choice, process and predictability. Perceived control is considered as perceived freedom to make decisions concerning the following aspects of work namely contents, methods, pace and priorities (Kushnir and Melamed, 1991). Work control refers to the extent to which employees can exert influence over their tasks and conduct over a normal working day. High level of work control protects the employee from harmful effects of a demanding and stressful job. Also, work control has beneficial effects on job satisfaction (Tetrick and La Rocco, 1987; Dwyer and Ganster, 1991). As mentioned earlier efficacy influences the perception of control in the workplace. Also in the software industry perception of job control is related to use of computers as well. Computer related control beliefs may be conceived as a function of contingency and competence beliefs in relation to computers (Solvberg, 2002). Earlier researches have stated that women have lesser efficacy beliefs as compared to men (Igbaria and Chakrabarti, 1990). Therefore, it is predicted that job control of women would also be lesser than men.

H4 - There will be gender differences in the perception of job control among software professionals.

Method:

The current study adopted a cross-sectional design and survey methodology. Respondents in the study are software development professionals who are employed in the software companies whose core job profile consists of tasks geared towards customized software development for end-users. In the current study, attention is restricted to two cities in South India, namely, Chennai and Bangalore.

The nature of the companies that have participated in the survey ranges from top of the line software companies in India with over 10,000 employees and an annual turnover of over **Rs. 3000** crores, to small software companies which have more than two years of experience in the software development, with a small group of 100 employees and an annual turnover of over three hundred thousand rupees. While some of the well-recognized companies that have participated in the survey have obtained People Capability Maturity Model (PCMM) - Level Five certification, some of the companies have not obtained such quality certifications.

The study is based on 156 responses collected from software professionals. Interviews and email were used to collect data. The respondents have been chosen based on nature of job classification, which is fairly distributive in nature (fifty eight percent of the respondents work in jobs which are purely technical in nature, and forty two percent of the respondents work in jobs which are both technical and managerial in nature).

Sample Profile:

The age of women software professionals ranged from 22 to 32. Nineteen of them were married and the rest were unmarried. Their education level varied from undergraduate science degree to Masters in

Engineering. Twenty one of them which came to 70% were in technical positions while nine or 30% were in technical and managerial position. Men software professionals were in the age group between 22 to 34 years. 38 of them were married while the rest were unmarried. They did possess undergraduate science degree to maintain in engineering and business administration. Seventy or 55% of them were holding technical position and fifty six or 44% were holding technical and managerial position.

Measurement of Variables

Self efficacy and Self efficacy outcome expectancy:

Self-efficacy is measured with Personal Efficacy Beliefs Scale that consists of self-efficacy scale (10 items) and self-efficacy outcome expectancy scale (5 items) that have been developed by Riggs *et al.* (1994). All the efficacy beliefs are measured on a 7-point likert scale with '1'indicating 'Very strongly disagree' and '7' indicating 'Very strongly agree'. Cronbach alpha for self-efficacy is 0.8 and for self-efficacy outcome expectancy it is 0.7.

Computer self-efficacy:

This is measured using the Compueau and Higgins scale of computer self-efficacy (Compeau and Higgins, 1995). Certain aspects including the instructions given to the respondents have been changed to make the scale suitable to be administered for software development professionals in India. The respondents have been asked to indicate their level of confidence in completing the program / design using new software technology/ package/ language under conditions that were enumerated. The items are measured on a 7-point likert scale with '1'indicating 'Not at all confident' and '7' indicating 'Absolutely confident'. Cronbach's alpha for the scale is 0.9.

Computer Playfulness:

An extracted version consisting of seven items is used in the current study. It has been developed by Webster and Martocchio (1992). The reliability of the scale in the current study is found to be 0.7. The items have been measured on a 7-point likert scale with '1'indicating 'Very strongly disagree' and '7' indicating 'Very strongly agree'.

Perceived Control on the Job:

Perceived control is measured using the Perceived Control on the Job Scale developed by Tetrick and La Rocca (1987). It consists of six items and is measured on a 7-point likert scale with '1' indicating 'Very strongly disagree' and '7' indicating 'Very strongly agree'. Cronbach's alpha for this instrument is 0.7.

Data Analysis:

The data was analyzed using the SPSS version 11.0. Bivariate correlation was conducted to analyze the relationship among the variables used in the study. Independent sample t-test was conducted to investigate if there were differences in self-efficacy, self-efficacy outcome expectancy, computer self-efficacy, and perception of control based on gender. First the summated scales were used to measure gender differences. When gender differences were found, the entire sets of items were subject to *Independent sample t test* to find out the items that caused the significant gender differences. Results indicate that all the hypotheses were proved in the current study.

Results:

Bivariate correlation analysis (Table 1) reveals that gender is negatively related to all the variables used in the study. The correlation analysis also reveals that the rest of the variables have significant positive relationship with each other. The results indicate that gender has a negative relationship with self-efficacy, self-efficacy outcome expectancy, computer self-efficacy and perception of control. In other words, the beliefs of individuals with respect to their abilities in general and specifically in the use of computers are determined to a large extent by the gender. Perception of control on the job is also determined by the gender.

Table 1: Bivariate correlation of gender with variables used in the study

Variables	Gender	Intrinsic Motivation	Perception of control	Self Efficacy	Self Efficacy Outcome Expectancy	Computer Self Efficacy
Gender						
Intrinsic motivation	-0.168*					
Perception of control	-0.217**	0.308**				
Self Efficacy	-0.225**	0.482***	0.256***			
Self Efficacy Outcome Expectancy	-0.217**	0.296***	0.324***	0.355***		
Computer Self Efficacy	-0.171*	0.639***	0.169*	0.467***	0.259***	

***p<0.001, **p<0.01, *p<0.05

The summated scale of the variables used in the study was further subject to Independent Sample *t*-test to assess if there are gender differences in the perception of these factors. The results reveal that there were gender differences on all factors. There are significant gender differences in perception of

self-efficacy (H1a), self-efficacy outcome expectancy (H1b), computer self efficacy (H2), computer playfulness (H3), and perception of job control (H4) among software professionals in India (Table 2). Men software professionals have higher self-efficacy, self-efficacy outcome expectancy, computer self-efficacy, intrinsic motivation and perception of control on the job than women software professionals in this study.

Table 2: Independent sample t-test for the summated scale of the variables used in the study

S. No	Factors	Gender	Mean	*t-value*	*Sig*
1.	Self Efficacy	Male Female	5.5548 5.1100	2.86	.005**
2.	Self-Efficacy Outcome Expectancy	Male Female	5.0000 4.5333	2.76	.006**
3.	Computer Self Efficacy	Male Female	5.1429 4.7100	2.15	.033*
4.	Intrinsic Motivation	Male Female	5.1837 4.8333	2.11	.03*
5.	Perception of control on the job	Male Female	4.8920 4.3611	2.75	.007**

***p<0.001, **p<0.01, *p<0.05

Therefore, the individual items of all the variables were subject to Independent Sample t-test to find out the individual items that cause these significant differences. Knowledge of such individual items will enable a better understanding of the ground issues where women's perception differs significantly from that of men.

Items pertaining to the Self-efficacy measure (Table 3) were subject to Independent Sample *t* test. The results reveal that there are significant differences between the perception of women and men software professionals in five out of ten items that comprise the scale.

Table 3: Independent sample t-test for the summated scale of the items of Self efficacy

S. No	Items of Self Efficacy	Gender	Mean	Std. Dev	*t -value*	Sig
1	I have confidence in my ability to do my job	Male Female	6.0952 5.9667	1.0765 0.9279	.60	.548
2	I cannot perform well certain tasks required by my job	Male Female	3.0556 3.2000	1.5764 1.4479	-.45	.648
3	I feel my poor performance is due to my lack of ability	Male Female	2.2540 2.7000	1.3383 1.5347	-1.59	.113
4	I doubt my ability to do my job	Male Female	1.9444 2.2667	1.1819 1.3113	-1.31	.191
5	I have all the skills needed to perform my job very well	Male Female	5.3651 4.8000	1.1839 1.0306	2.40	.017*
6	I am not as good on my job as many people in my line of work	Male Female	2.3889 3.0000	1.3021 1.2318	-2.33	.021*
7	I am an expert at my job	Male Female	4.9286 4.4000	1.1810 1.1326	2.22	.028*
8	I have limited future in this job, due to my lack of skills	Male Female	2.1984 2.5000	1.2134 1.2798	-1.21	.228
9	I am very proud of my job skills and abilities	Male Female	5.4127 4.7333	1.2134 1.2798	2.73	.007**
10	I feel threatened when others watch my work	Male Female	2.4127 3.1333	1.4101 1.1059	-2.61	.010**

***p<0.001, **p<0.01, *p<0.05

The item 'I have all the skills needed to perform my job very well' gives a mean value 5.3 for men and 4.8 for women. This indicates that women feel that they do not possess all the skills that they need in order to be effective on the job. This is again reiterated in the next item, 'I am not as good on my job as many people in my line of work gives a mean value of 2.3 for men and 3.00 for women, which confirms the earlier thought, that women perceive lack of skills not only in general but also in comparison with others in the field. The next item that shows significant difference has to do with expertise at work namely, 'I am an expert at my job' gives a mean value of 4.9 for men and 4.4 for women. It further implies that self-confidence of women is not as high as men in areas of expertise. The other two items that show significant difference between the perceptions of men and women are 'I am very proud of my job skills and abilities' and 'I feel threatened when others watch my work' where the means for men and women are 5.4 and 4.7 in the first case and 2.4 and 3.1 in the second case respectively. The fact that women feel more threatened when they are watched at work also reveals that they are unsure of their approach to work and lack of confidence in their abilities. Even in the other items that measure confidence, women display lower confidence and more apprehension as compared to men. But the fact

that women consider themselves expert with more than a moderate mean shows the positive attitude of women with respect to their work and is a reflection of their knowledge in computing. This also demonstrates their positive disposition towards their profession. One of the female project managers in a leading software organization said that,

"I am not sure if I am doing a great job. Nobody told me I am good or the best. Sometimes, I feel I do not know where I stand. I would be happy, if I am considered an expert in the field".

There is a general opinion that men tend to be more self-congratulatory than women and it is possible that some of the gender difference could be attributed to that. Some of the difference in the gender can also be attributed to the over confidence of men as well. However, in the above-mentioned five items, there is a significant gender difference and cannot be dismissed based on the above-mentioned reasons. The lack of confidence of women in the software industry could be fueled by the overwhelming presence of men in the workplace. Another attribution is the human capital theory. Women tend to have more responsibility at home, as compared to men and hence do not invest time and money in furthering their careers. Also they do not spend time in the office learning new technologies, or even experimenting and innovating uses of existing software. Moreover, many times women are unable to be simply present in the office and socialize as much as men due to their other responsibilities.

Social conditions in India are yet not totally geared toward women spending late nights at office, even though it is now commonplace to see more and more women spending late nights at the office. These issues prevent women from maintaining 'buddy' relationships with colleagues. But men have no such qualms and hence are able to get peer-to-peer learning better than women. It is easier for men to sit together late night and learn new technologies. However, not all women face such problems. Women and men who have entered the software industry through campus placements do not get left out by the peers and find it easy to network and gain knowledge. Similarly, young women who stay alone are able to put in more number of hours at work. They use their presence in the office in the late hours waiting for client conference calls to discuss work details. They also tend to socialize and hence are able to establish better relationships and learning and so have more confidence as compared to others.

Table 4: Independent sample t-test for the summated scale of the items of Self efficacy outcome expectancy

S. No	Items of Self efficacy outcome expectancy	Gender	Mean	Std. Dev	*t -value*	Sig
1	My good work is well rewarded	Male Female	4.7381 4.1667	1.3034 1.1472	2.20	.029*
2	Performing my job well is a sure way to get ahead here	Male Female	5.5238 5.0667	1.1434 1.3629	1.89	.060
3	Most of my good work goes unnoticed	Male Female	3.1190 3.8667	1.4566 1.1666	-2.61	.010**
4	My work evaluations are accurate	Male Female	4.6746 4.5333	1.0720 1.0080	.65	.513
5	Good work gets the same result as poor work in this job	Male Female	2.8175 3.2333	1.3880 1.5466	-1.44	.151

*** $p<0.001$, ** $p<0.01$, * $p<0.05$

Two items pertaining to self-efficacy outcome expectancy show significant differences between men and women (Table 4). The item, 'My good work is well rewarded' shows significant differences between the mean values of men and women which is 4.7 and 4.1. Women do not feel that their work is well rewarded as compared to men. The other item, 'Most of my good work goes unnoticed' (For males the mean is 3.1 and for the females it is 3.8) is a precursor to the earlier statement. Good work is not recognized and hence it is not rewarded. Women work differently as compared to men. Women are more balanced in their approach towards work. Also women talk less about work, their achievements as well as their problems at work because of the fear of others underestimate their potential. Some women have reported gender discrimination in these aspects.

Software development is a team activity. The software development team consists of both men and women, where men often outnumber the women. When good software is delivered, the team gets praised as a whole. If a man has substantially contributed to the success of that project, it is highlighted and applauded. However, if a woman has contributed substantially to the software development project, the contribution is underplayed. Due recognition is not given to women because the ego of men prevent them from acknowledging that women have performed well. Therefore, the managements of the software companies also do not notice the contribution of women and reward them accordingly.

Reflecting on the differences found in both self-efficacy as well as self-efficacy outcome expectancy, it becomes evident that women are not recognized as much for their work, implying their good work is not reinforced, making them wonder whether it was good work at all. There are no incentives or rewards offered to reinforce good performance in the work place because it is not noticed. Also women do not have the habit of talking about their achievements as much as the men. Men are more likely to discuss their work outside, be it other colleagues at work or outside, and seek recognition. Women do not prefer

to talk about their work and hence remain in anonymity.

Table 5: Independent sample t-test for the summated scale of the items of Computer Self efficacy *I could complete the program /design using a new software technology/ package/ language…*

S. No	Items of Computer Self Efficacy	Gender	Mean	Std. Dev	*t-value*	Sig
1	…if there was no one around to tell me what to do as I go.	Male Female	4.2222 3.5667	1.3320 1.1943	2.46	.015*
2	...if I had never used a technology like it before	Male Female	4.1667 3.4000	1.2946 1.3025	2.91	.004**
3	...if I had only technology manuals for reference	Male Female	4.7302 4.3000	1.2863 1.1788	1.67	.097
4	…if I had seen someone else using it, in the past before trying it myself	Male Female	5.0635 4.3333	1.1916 1.3730	2.92	.004**
5	…if I could call someone for help if I got stuck	Male Female	5.3175 5.0667	1.2753 1.1725	.98	.327
6	…if someone else had helped me get started	Male Female	5.4048 5.0667	1.2469 1.1427	1.35	.177
7	…if I had a lot of time to complete the job for which the technology was provided	Male Female	5.6111 5.2667	1.2773 1.0483	1.37	.173
8	…if I had just the built-in help facility for assistance	Male Female	5.3651 4.9667	1.2624 1.2452	1.55	.121
9	…if someone demonstrated how to do it first, before I try it	Male Female	5.6429 5.4000	1.3414 1.1326	.91	.361
10	…if I had used similar technologies before this one to do the same job.	Male Female	5.9048 5.7333	1.2161 .0807	.70	.480

***p<0.001, **p<0.01, *p<0.05

The items that contribute to significant differences in computer self-efficacy measure relate to computing by oneself (Table 5). These items relate to confidence in completing a program/design using new technology …if there was no one around to tell me what to do as I go, ...if I had never used a technology like it before, and …if I had seen someone else using it, in the past before trying it myself wherein the men have higher means (4.2, 4.1 and 5.0) than women (3.5, 3.4 and 4.3) respectively. In the other items that form the computer self-efficacy scale, women have shown considerably less confidence as compared to men even though the difference is not significant.

These facts further indicate that women are hesitant to accept mastery. Further, women do not evaluate their capabilities with respect to others. This is also suggested by Whitley (1996) that women and men have different self-evaluations, both of which fall within a 'normal' range. Whitley's (1997) findings that despite men have higher mean score than women in computer related attitudes both have positive attitudes towards computers and profession is true in the case of the current study as well.

In the case of computer playfulness, women seem to be significantly different from men with respect to Creative and Playful characterizations, where the mean values of men are 5.2 and 4.7 whereas the mean values of women are 4.6 and 4.0 respectively (Table 6). Women concentrate more on the job at work rather than trying to be creative and explore various ways in which software behaves. In the course of interviews, women accepted that they were less creative because, in the software industry they were expected to satisfy the needs of the client organizations. It was more important to give the client what they wanted rather than give them everything that was high technology and state-of-art. The end-users might not come back if they find unfriendliness in the software that was supplied even if it is state-of-art.

Table 6: Independent sample t-test for the summated scale of the items of Computer Playfulness

S. No	Items of Computer Playfulness	Gender	Mean	Std. Dev	*t-value*	Sig
1	Spontaneous	Male Female	5.1508 4.7333	1.2462 1.5742	1.35	.183
2	Unimaginative	Male Female	2.6270 2.9000	1.4573 1.2690	-.94	.347
3	Flexible	Male Female	5.2222 5.0667	1.2191 0.9803	.74	.461
4	Creative	Male Female	5.2857 4.6333	1.0420 1.2994	2.93	.004**
5	Playful	Male Female	4.7143 4.0333	1.4134 1.3767	2.38	.018*
6	Original	Male Female	5.1587 4.9000	1.0689 1.2134	1.16	.248
7	Uninventive	Male Female	2.6190 2.6333	1.3732 1.1290	-.05	.958

***p<0.001, **p<0.01, *p<0.05

Another fact worth considering in the current context is that if they are successful in delivery of software, they are probably creative and playful in the use of computers and only since there is a lot of pressure at work, even though they tend to think that they are not playful. Women have also said in several instances, that they had lost track of the time particularly when they were involved in designing software and problem solving reveals cognitive absorption. Even though the difference in the aspects of computer playfulness indicates the mean values for men are higher than that of women, it is not that women have low values. Women possess more than moderate level of computer playfulness, which is by itself a good indicator of their competency and motivation to stay in the computing profession.

Table 7: Independent sample t-test for the summated scale of the items of Perception of Control

S. No	Items of Perception of Control	Gender	Mean	Std. Dev	*t-value*	Sig
1	I have control over the things that affect me on the job	Male Female	4.8889 4.3000	1.2343 1.3170	2.31	.022**
2	I have input in deciding what tasks I will do	Male Female	5.0079 4.5333	1.0918 1.3322	1.81	.07
3	I have the opportunity to take part in making decisions that affect me	Male Female	5.0079 4.5333	1.9698 1.4559	1.24	.217
4	I set my own work deadlines	Male Female	4.8016 3.9667	1.4200 1.4499	2.88	.005**
5	I have limited opportunity for independent thought and action in my job	Male Female	3.0952 3.1333	1.4990 1.3830	-.12	.899
6	I control the pace and scheduling of my work	Male Female	4.6667 3.9667	1.3624 1.3257	2.54	.012*

***p<0.001, **p<0.01, *p<0.05

With regard to perception of control, the mean values for men are significantly higher for three items (Table 7). Both men and women have reported more than moderate values for the item 'I have control over the things that affect me on the job' even though the gender difference is significant. In the other two items 'I set my own work deadlines' and 'I control the pace and scheduling of my work' women have reported less than moderate values where as men have reported values which are marginally above the moderate value. The fact that women do not set their own deadlines and have little control over the pace and scheduling of their work, may contribute to the fact that they possess less control over the job. In a software project development team, women are typically a minority and typically the majority of men, decide the project scheduling and delivery aspects. If women in the project team raise any objections due to some reason, men at once tell them that they can take on extra workload in a very patronizing way. Because of this, women tend to just let things flow rather than take control. Another reason is if women have to get their way, they have to be pushy. If they voice their opinions assertively, they are often considered as aggressive. Women consider interpersonal relationships at work and with clients as more important (Colwill and Townsend, 1999) and therefore do not mind some degree of lack of control at work.

Discussion and Implications of The Study:

India possesses rich diversity in terms of culture, languages and religious beliefs. In addition Indian society has caste and class divisions as well. Also there is urban and rural divide. Gender should be interpreted in the context of all these diversities. Gender has additional contextual implications depending on the weightage given to other factors. Proportion wise women constitute only about seven percent of engineering and technology enrollment (Chanana, 2000). Problems for women in higher education exist in terms of access, facilities provided, culture, social economic background, awareness and regional imbalances.

The dimension of gender has to be perceived from the perspective of social construction theory as well as that of human capital theory. Societal decrees, background, upbringing determine behavioral patterns and priorities of women. Typically, women are permitted to work outside their homes, only if there is a need in the family. But in general, the family and society expects women to give up their jobs and pursue the interests of the family once they have children. Slowly these perceptions are changing and more and more women are encouraged to have full time jobs in order to improve the quality of life. The income of woman is still considered as secondary income- no matter how much they earn, the main income being the male members' earnings in the family. It is in this context that the findings of the current study should be interpreted.

In addition, the economic activity pursued by women is also determined by the human capital theory. The investment on education of girls by the family is less as compared to boys. The families in India typically prefer to save adequate money for the girls' marriage rather than education. Therefore women accumulate less human capital in terms of education, skills and training because the investment is less. But the trend is changing, because women in the software industry are preferred as brides as they tend to earn more than women in other industries. Hence women are encouraged to take up careers in the software industry.

Implications of the current study are important both to the academicians as well as to the management of software industries. The current study brings out the individual items that contribute to gender differences in the perception of self-efficacy, computer self-efficacy, computer playfulness and perception of control.

The findings are important to educationists in the field of computing, because these differences can be used to plan training programs in computing for girls and women. Training programs should be organized in such a way that it enables girls and women to learn computing, and also instills confidence in their abilities. For e.g. giving achievable projects during training may instill the much needed sense of achievement and confidence in girls and women. Also benchmarks in achievement must be informed well ahead and the learners must be geared towards achieving them so that it gives them additional confidence that they are experts. Competitions in computing can be encouraged so that excellent computing is recognized and reinforced.

Diversity at work encourages creativity and brings out better results and hence diversity in the composition of software project teams lead to better results. In particular men and women bring differing perspectives to the software development activity. Women are end-users of the software as much as men. Women will be able to bring in the gender perspective to software development and make software more easy to use for women, thereby encouraging and attracting more women clients as well.

Therefore, software companies cannot afford to remain male oriented. Moreover women are more adept in the requirement analysis, which is very crucial for software development because of their technical knowledge, patience and communication skills. Standish group study (1995) has indicated that incomplete requirements contribute significantly (13.1%) to project failure and the top five reasons for project failure are related to the requirements stage. Also, women members in the project team bring in a different dimension because of their approach to gathering requirements, and hence are essential to understand requirements and thereby deliver successful projects. Hence software companies must take efforts to improve the computer related attitudes of women in order to obtain better participation of women in the software development process.

Some software companies in India have taken special efforts to organize training camps for schoolgirls in order to enable them to choose IT as a career in the future. Also men and women in leadership positions in software companies must take cognition of contributions of women in the software project team and encourage their ideas and recognize them in public so that more women are motivated to perform well. Also women lack role models and this will be a good way to promote role models of women achievers in the software industry. Moreover, increase in self-beliefs and computer related attitudes of women will contribute to their sense of control at work, which will give women job satisfaction, and commitment and also increase productivity which contributes to better cost performance of organization.

Summary and Conclusions:

This study discusses the gender differences in self-beliefs and computer related attitudes and perception of control at work in the Indian Software Industry. The results indicate the existence of gender differences in all the above-mentioned aspects. The study also brings out particular issues that contribute to the gender differences in these aspects. Implications for the academics in computing education are discussed. In addition, implications for software industry are also indicated. In brief, the study reiterates the importance of additional training for women to instill confidence in computing abilities, encouragement and motivation for equal participation of women in software development.

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