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ABSTRACT

Computing has long been considered a male domain in the US. If this perception is true, then this situation can be detrimental to the success of women in the workplace because computing is integral to success in most jobs. Recently however, women in the global workforce are using computers and the Internet at an increasing rate, which brings into question whether computing is globally perceived as "male." In addition, this particular phenomenon gains a more interesting aspect when the computing workforce has been outsourced off shore to countries such India, where the service work force also consists of a significant number of female computing professionals. The cultural differences between the US and India bring to light insightful aspects toward the gender perception in computing, which may benefit the interaction between business personnel when gender stereotyping is a concern. The empirical result showed that gender gaps in usage and attitudes between America and India exist in some degree.

Keywords

Gender Stereotyping, Cross Cultural, India, USA.

INTRODUCTION

For several decades, the cultural difference has been the center of focus in several social science disciplines. Recently, the need to understand the cultural difference became more intense since several firms have adopted the global outsourcing approach as a common business practice to gain a competitive advantage. The valid cross-cultural measurement is critical for expanding the body of knowledge. In a managerial sense, understanding the culture differences is a critical point in achieving a strategic fit, because firms must understand those differences before they are able to manipulate their firm to cope with them. The recent research also shows that the information technology is being adopted in developing countries (Haughey, 2004). Especially, in India, the number of people who have access to computers is significantly increased (Jain, 2006; Krishna, Sahay, and Walsham, 2004).

In the information technology field, India is one of the most outsourced countries among American firms (Budhwar, Saini, and Bhatnagar, 2005; Census Bureau, 2006). Several firms have been outsourced in either products or service to "off shoring" suppliers in India. The objective of this study is to examine possible differences in attitudes toward, and usage of computers by comparing college students in the US and India.

"Gender stereotyping" issues have been the center of focus in several research projects in the past three decades (Rainer Jr., Laosethakul, and Astone, 2003). In the US, in the fields of computing and information technology (IT), "gender stereotyping" issues are important because it has been found that they can directly and indirectly impact participation and success of women in computing fields, high-tech workforce composition, and computing-related degree enrollments to name a few (Astone, 1995). The same trend has been observed and reported in India within the IT work force (Khandelwal, 2002;Kulkarni, 2002). More and more men and women in India and the US; however, are being exposed to and using computers, the Internet, and other types of IT in their jobs and in their personal lives (Bandyopadhyay, 2000; Budhwar, et al., 2005). The female workforce in IT has been increasing in India and still shows a strong increasing trend for the next five

years (Budhwar, et al., 2005;Gupta and Sharma, 2002). If the IT domain is male dominated, what types of problems will this growing number of women face in their career? In order to study this phenomenon effectively, three constructs of computing are used to access the gender perception, which are computer anxiety, computer self-efficacy, and computer/Internet experience (Astone, 1995;Rainer Jr., et al., 2003) .

In light of this increased trend in both countries, it is logical to propose the question of *whether the stereotypical gender perceptions (and the drivers for those perceptions) regarding computing have been different between Americans and Indians*? To answer this question the following research questions were identified.

Primary Question 1 How well do the GTS scales work with Indian respondents when compared to US respondents?

Primary Question 2. Are Americans' perceptions of gender-typing of computing different from Indians?

Secondary Questions : Culture/gender comparison matrix

Gender/Culture	**American**	**Indian**
Male Dominant	*Secondary Question 1:* Do American male perceive male as a dominant gender in computing?	*Secondary Question 2:* Do Indian male perceive male as a dominant gender in computing?
Female Dominant	*Secondary Question 3:* Do American female perceive male as a dominant gender in computing?	*Secondary Question 4:* Do Indian female perceive male as a dominant gender in computing?

LITERATURE REVIEW

Gender Stereotyping of Computing

The gender stereotyping has been studies in several disciplines since early 70s. A gender-typed occupation is one that has activities congruent with sex role stereotypes (e.g., male domain) and/or is dominated by one gender (Albrecht, Bahr, and Chad wick, 1977; Gefen and Straub, 1997). Two techniques have been used to determine if an occupation or activity is gender typed male, female, or considered neutral. The first is to use actual rates of participation of men and women in a career field and compare them to some arbitrary cut off (Betz and Hackett, 1981; Stephan and Holahan, 1982) . The second method is the use of subjective ratings such as a scale of masculinity/femininity (Panek, Rush and Greenawalt, 1977; Shinar, 1975;Wilder, 1985), the perception of the number of males or females employed in a career area (Shinar, 1975), or the personality rates associated with jobholders (Glick, 1991;Shinar, 1975). Several studies have used the judgment of undergraduate and/or graduate students to identify gender-typed occupations (Barnhart, 1983;Young, 2000).

When one gender is predominate in an occupation or activity that gender may be able to dominate and control the occupation or activity by establishing appropriate behaviors (Wilson, 1992). Therefore, the gender that is not predominating may experience negative outcomes in the occupation or activity (e.g., discrimination, pay differentials, and the "glass ceiling" phenomenon). If computing is gender-typed male, then females may experience negative outcomes in the workplace because IT has become essential in the performance of one's job. However, studies attempting to gender type computing have arrived at differing conclusions. Many empirical research studies have stereotyped computing as male (Arch and Cummins, 1989; Gattiker and Hlavka, 1992). Other studies have found that computing is not gender typed as male or female (Clarke, 1989;Wilder, 1985).

Computer Anxiety

Computer anxiety is defined as 'The tendency of an individual to be uneasy, apprehensive, or fearful about the current or future use of computers"(Ibaria and Parasuraman, 1989). Several studies from the 1970s to the 1990s indicated that computer anxiety is related to the belief that computers are part of the male domain (Temple and Lips, 1989; Wilder, 1985). However, a more recent study found that females did not exhibit significantly greater computer anxiety than males (Ray, Sormunen, and Harris, 1999).

Computer Self-Efficacy

Henry and Stone (1999) defined self-efficacy as an individual's belief that he/she possesses the requisite skills and abilities to accomplish an identifiable task. Previous studies have found that males report greater computer self-efficacy than females

(Ogletree and Williams, 1990). However, Smith (1987) and Henry and Stone (1999) found no statistically significant differences in computer self-efficacy between males and females. Based on conflicting evidence regarding gender differences in computer usage, as well as gender stereotyping of computing, computer anxiety, and computer self-efficacy, this study examines male and female perceptions of these constructs and changes in these perceptions over time. The next section discusses the research methodology and the measures used to operationalize each of the constructs.

METHODOLOGY

To investigate difference in gender perceptions of these constructs in the US and India, we examined two samples of university students, one from the US (4 year institutions) and one from India (4 year institutions). Following pilot testing, Astone (1995) distributed a questionnaire to a convenience sample of 300 undergraduate and graduate business students. Students in both countries were offered extra credit as an incentive to complete the questionnaire. The current study distributed the same questionnaire (with modifications as discussed below) to undergraduate and graduate business students. This convenience sample included 150 American students and 150 Indian students. Both survey instruments gathered demographic data on respondents, which included major course of study in college, years of computer use, number of computer courses taken, and usage of various types of software. The American survey was conducted in online format, while the Indian survey was done on pencil and paper due to the lack of infrastructure. Both questionnaires contained the gender-typing scale (GTS) (Astone, 1995), the computer anxiety rating scale (CARS) (Heinssen, Glass and Knight, 1987), and the computer self-efficacy scale (CSE) (Murphy, Coover, and Owen, 1989). The gender-typing construct was operationalized with a scale developed by Astone (1995). These 13-item scale measures perceptions of the gender stereotyping of computing on 5-point Likert scales, ranging from "1" meaning "strongly disagree" to "5", meaning "strongly agree."

Both Indian and American groups employed two versions of the survey to mitigate survey-wording bias in the GTS section. The first version listed all GTS items as "male first." For example, "More men than women design computer systems". The second version reversed the GTS items. For example, "More women than men design computer systems". Each version was apportioned equally between male and female respondents. That is, one-half of male respondents received Version 1 and one-half received Version 2. The same procedure was followed with female' respondents. The second version was reverse scored, so that all scores used and reported in the data analysis are in the "male first" direction.

For each GTS item, t-tests were performed between male responses for Versions 1 and 2 and between female responses for the two versions. No significant differences were noted and data from the two versions were grouped for each gender.

Computer anxiety was operationalized with the Computer Anxiety Rating Scale (CARS)(Heinssen, et al., 1987). This 19-item scale measures perceptions of computer anxiety on 5-point Likert scales. Previous analysis of the CARS demonstrated two underlying latent constructs, high anxiety toward computer use and enthusiasm or anticipation regarding computer use (Harrison and Rainer 1992). Computer self-efficacy was operationalized using the Computer Self-Efficacy Scale (CSE) developed by Murphy et al. (1989). This 32-item scale measures perceptions of computer self-efficacy on 5-point Likert scales. Previous analysis of the CSE demonstrated three underlying latent constructs, beginning computer skills, more conceptual" computer skills, and mainframe computer skills (Harrison and Rainer, 1992). The mainframe computer skills construct was not included in these two studies because the pilot tests indicated that students did not use mainframe computers.

DATA ANALYSIS

Demographics

Table 1 shows the demographic data on respondents as well as the usage of various types of software for the American and Indian samples. Demographic data included the proportions of males and females, age, computer use, and number of computer courses taken. The percentages of males and females differ significantly between the two samples (Table 1). The sample including Americans and Indians contains a significantly higher proportion of males, 60% to 59%, and a correspondingly lower proportion of females, 40% to 41%. The average age of males and females did not differ significantly within the two samples or between the ' two samples. Respondents in both samples represented all majors in the College of Business and there were no significant differences in the proportions of majors represented between both groups.

The average years of computer use differ significantly for men (the US 11.5 and India 4.6) and women (US 12.04 and India 5.90) (Table 1). However, men and women within the samples did not differ significantly. Similarly, the average number of hours on computer per week showed significantly different for the US (21.7-27.22) and India (2.8 to 6.9). Americans, both male and female, spent a greater number of hours on computers, significantly more than their Indian counterparts.

Computer Usage

Computer usage was measured on a 5-point Likert scale ranging from "1" meaning "I do not use at all" to "5"' meaning use many times per day for extended periods of time. Both surveys collected data on usage of seven common end- user applications. These applications include word processing, spreadsheet, database, statistics, personal assistance, multimedia, and communications (e-mail).

In addition, the survey also gathered data on the number of hours per week spent using the Internet. Data on six facets of Internet usage were also gathered. These facets included online shopping, online research, obtaining news or weather, downloading/uploading digital files, copying pictures or text, and entertainment. This usage was measured on 5-point Likert scales as aforementioned.

Table 1 provides computer usage figures. Males in both groups showed the higher usage in almost every application (except online shopping, female American performed the highest). Comparing between countries, Americans (male and female) use word processor, email, and all six-internet applications (except for online game and multimedia software) more than Indian males and females. However, for the applications such as presentation, database, statistics software, personal assistance software (e.g., Quicken, TurboTax), and multimedia software, both samples (and both genders) did not use them widely (average lower than 1.5), therefore, this study could not draw conclusion about the significant difference in this particular case.

American males used software for online games and multimedia more often then did Indian males. However, females of both samples did not participate much in online gaming; therefore, this study could not draw conclusion about the significant difference in this particular case.

Factor Analyses

Computer anxiety: Exploratory factor analyses with varimax rotation were used to examine the interrelationships among the 19 items of the CARS for both studies. In all four analyses, a 2-factor solution resulted in identical items in each factor. The first factor, labeled CARS1, consisted of ten items. Table 2 shows the alpha reliabilities for this factor for males and females in the two samples. The items defining this factor represent high anxiety toward computer use. The second factor, labeled CARS2, consisted of nine items. Table 2 shows the alpha reliabilities for this factor for males and females in the two samples. The items defining this factor represent confidence, enthusiasm, and/or anticipation toward computer use.

The exploratory factor analyses indicate that the CARS exhibits acceptable construct validity. With Cronbach alphas greater than .80, the two constructs of the CARS demonstrate adequate reliability for both genders in the US and India. The items of the CARS were scored on 5-point Likert scales from "1" meaning "strongly disagree" to "5" meaning “strongly agree” Likert responses were averaged to obtain a CARS I and CARS2 score for each respondent (Table 2). Indian (both males and females) demonstrated significantly lower CARS1 scores than do American. There was no significant difference between males and females in either sample.

Computer self-efficacy: .Exploratory factor analyses with varimax rotation were used to examine the interrelationships among 29 items of CSE for men and women in both studies. In all four analyses, a 2-factor solution resulted with identical items in each factor. The first factor, labeled CSE1, consisted of 16 items. Table 2 shows the alpha reliabilities for this factor for males and females in the two samples. The items defining this factor represent the beginning level of computer skills. The second factor, labeled CSE2, consisted of 13 items. Table 2 shows the alpha reliabilities for this factor for males and females in the two samples. The items defining this factor represent high-level, conceptual computer skills.

The exploratory factor analyses indicate that the CSE exhibits acceptable 10 construct validity. With Cronbach alphas greater than .80, the two constructs of the CSE also demonstrate adequate reliability for both genders in the US and India. The items of the CSE were scored on 5-point Likert scales from "1" meaning "strongly disagree" to "5" meaning "strongly agree" Likert responses were averaged to obtain a CSEl and CSE2 score for each respondent

Males and females demonstrated significantly higher CSE1 and CSE2 scores in the India sample than they did in the US sample (Table 2). There were no significant differences between males and females in CSE1 scores in either sample. However, males reported significantly higher CSE2 scores than females in both samples.

		American (Mean)	Indian (Mean)	Significant Difference (across studies)
Male		60%	59%	
Female		40%	41%	
Average age	Male	21.67	20.67	**
	Female	23.67	19.95	**
Average years computer use	Male	11.55	4.60	**
	Female	12.04	5.90	**
Average hr/week	Male	21.70	6.29	**
	Female	27.22	2.80	**
Word processing software	Male	3.10	2.50	**
	Female	3.29	2.50	**
Spreadsheet software	Male	2.29	2.00	No
	Female	2.39	1.82	**
Presentation software	Male	2.16	2.14	No
	Female	2.06	2.09	No
Database software	Male	1.70	1.69	No
	Female	1.58	1.43	No
Statistics software	Male	1.35	1.31	No
	Female	1.17	1.27	No
Personal assistance software	Male	1.43	1.42	No
	Female	1.27	1.39	No
Multimedia software	Male	3.27	2.32	**
	Female	2.10**	1.80**	**
E-mail	Male	4.06	2.96	**
	Female	4.54	2.24	**
Online shopping	Male	2.78	2.00	**
	Female	2.90	1.40	**
Online research	Male	3.23	2.24	**
	Female	3.14	2.05	**
Obtain news or weather	Male	3.39	2.37	**
	Female	2.94	1.98	**
Download/upload digital file	Male	3.43	2.42	**
	Female	2.98	2.13	**
Copy pictures or text	Male	3.06	2.82	No
	Female	3.08	2.14	**
Online Game	Male	2.84	2.11	**
	Female	1.98**	2.02	No
Chat	Male	3.27	2.62	**
	Female	3.17	2.14	**
Online course	Male	2.66	1.84	**
	Female	2.58	1.32	**

Table 1: Demographic and Computer Usage
** = significant different at 95% confident interval

Gender Stereotyping Scale: The GTS consists of one, 13-item factor. The items of the GTS were scored on point Likert scales ranging from "1" meaning "strongly disagree" to "5" meaning "strongly disagree" Table 2 shows the Cronbach alphas of the GTS for males and females in the two studies. The Cronbach alphas are all greater than .80, demonstrating acceptable reliability for this factor. Likert responses for the 13-item GTS were averaged to obtain a GTS score for each respondent. Males reported significantly higher gender stereotyping scores in India than they did in the US. Further, females also reported significantly higher gender stereotyping scores in India than they did in the US. In the US sample, males reported significantly higher gender stereotyping scores than females, but this difference was not present in the India sample. With regard to computer usage, both males and female indicate increasing amounts of computer experience. That is, from the US to India, both genders have increased their years of computer usage and the number of computer courses they take (Table 1).

With regard to common application software, males and females differed on their usage of more applications in the US than they did in India. In the US, men used six of the seven applications more than women did. However, in India, men used only two applications more than women, and women used statistics software more than men.

Both men and women in the India sample use e-mail significantly more often than the men and women in the US sample, with women showing the largest increase. In the US, men used e-mail significantly more than females, but this difference was not present in India (Table 1). The findings show that males and females did not significantly differ in computer anxiety in the US or in India. However, from the US to India, both men and women report significantly less anxiety toward computer use (a score of "1" on CARS1 items. means "less anxiety") and significantly greater enthusiasm toward computer use (a score of "5" on CARS2 items means "more enthusiasm" (Table 2).

Psychological Constructs	American (Cronbach α)	Indian (Cronbach α)	Significant Different (across studies)
Gender stereotyping scale			
Male	4.07(0.927)	3.85(0.947)	***
Female	3.58(0.893)	3.13(0.803) ***	***
CARSl (anxiety*)			
Male	2.93(0.900)	2.60(0.872)	***
Female	3.18(0.840)	2.56(0.807)	***
CARS2 (anticipation)			
Male	4.35(0.857)	4.12(0.931)	No
Female	4.32(0.827)	4.28(0.832)	No
CSEl (beginning skills)			
Male	4.55(0.979)	3.83(0.967)	***
Female	4.64(0.931)	3.62(0.911)	***
CSE2 (conceptual skills)			
Male	3.84 (0.951)	3.38(0.905)	***
Female	3.63(0.895)	3.21(0.867)	***

Table 2: Psychological Constructs

* Reversed scale
*** Significant at 0.001 level

DISCUSSION

Back to the primary research questions, the GTS scale performed quite well in both cultures since each items loaded nicely on the factors with high Cronbach alpha (>0.80). Second, American and Indian respondents shared similarity in terms of both samples agreeing that computing is a male dominated field. The secondary questions are also supported by showing all groups agree that computing is a male dominated field.

With regard to computer skills (CSE), both beginning and conceptual computer skills (CSE1 and CSE 2), the findings demonstrate that men and women did not differ in the US or India. However, comparing the US to India, both American men and women report significantly higher levels of computer skills (a score of "5" on CSE 1 items means "higher levels of skills") (Table 2).

With regard to computer self efficacy-anxiety (CARS1), the findings demonstrate that men and women did not differ in the US or India. However, comparing the US to India, both American men and women report significantly lower levels of anxiety (a score of "5" on CSE I items means "less level of anxiety") (Table 2).

With regard to computer self efficacy-anticipation (CARS2), the findings demonstrate that men and women did not differ in the US or India. In addition, comparing the US to India, both American men and women report indifference in terms of level of anticipation (a score of "5" on CSE I items means "higher levels of beginning skills") (Table 2).

The results suggest that perceptions of gender stereotyping differed between males and females in the US. In this study, both men and women gender typed computing as male (a score of "1" indicates that computing is gender typed "female," a score of "3" means that computing is gender typed neither male nor female, and a score of "5" indicates that computing is gender typed "male"). However, in both countries, women stereotyped computing significantly more female than did men, which showed the existence of gender bias. Unlike the Indian study, the American study showed no significant difference between males and females in gender stereotyping scores. In addition, the male Indian score showed a significantly lower score than did the male American score (3.85 vs. 4.07). This provided a hint of a growing acceptance of Indian women in computing.

LIMITATIONS

There are two primary limitations in this research. First this study assumes that the means of data collection has no impact on the results. Due to infrastructure constraints, a paper-based questionnaire is the sole means for data collection in India, while an online survey was conducted in America to improve respondent's convenience. In reality, there may be a difference resulting from the various data collecting methods. For future research, American respondents could be polled using the paper-based survey, and then compare that result with the existing data of the online American group. Second, the study assumed that both nations should share the same "common computing activities" as listed. In reality, some types of computing activities, such as personal assistance software, online courses, and online shopping, may not be common for the respondents in both groups. Therefore, the low means (<1.5) may represent respondents who are inexperienced with those particular computing activities instead of representing an attitude toward the gender. For future research, a qualitative study defining the current computing activities in India and the US should be conducted in order to indicate the practical "common activities" for both cultural groups. In addition, the questionnaire should contain the "not-applicable" option in every computing activity to validate the "common activities."

CONCLUSIONS

Undoubtedly, males in both countries were viewed as the dominating gender in the computing field. From comparing both genders, the gender stereotyping exists in both samples. Male seems to be the dominant gender in computing, although to a slightly lower degree from female respondents. Among all five psychological constructs, labeled GTS, CSE 1, CSE 2,CARS1, and CARS2, only GTS in Indian sample showed a significant difference between two genders. Indian males seem to view the female workforce with more equality than do American males. Female and male Americans still believe computing is male dominated. This finding in American sample was supported by previous research conducted in the US.

From comparing both cultures, only CAR2 showed no different between two cultures, while other psychological constructs showed significant difference. One possible factor might relate to the difference in experience between the two countries. Besides the anticipation construct, the rest of the constructs deal with the experiences or skill on which the respondents based their answer. Indian respondents has less information to base their answer on; therefore, the answers tend to be less "extreme" than those of the Americans.

From comparisons between the US sample and the Indian sample, if we observe that the average ages did not differ between the two samples, but the years of computer experience are significantly different, then we conclude that American business students have more computer experience than their Indian counterparts do. It can be simply explained by the lack of

infrastructure and computer support in India. The Indian students will not start using computers until they are in college, while Americans may begin as early as primary school

Our findings provide evidence that although males are viewed as the dominant gender in the IT field in both countries, the Indian culture shows more acceptance for women in this profession. This finding implied that India's culture provides strong promise in supplying a high-diversity workforce, which is critical for global outsourcing as a whole.

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