Knowledge Transfer Conduits: Women’s Effectiveness in a Central Texas High Technology Company

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Problem Statement and Goal

Information Technology (IT) in the United States has changed the way companies conduct business from automated grocery checkouts to digital imaging at the airport that catalogs and maintains reports on automobiles parked in their feed lots, but there have been drastic changes in the role of women within the IT sector. Knowledge Transfer (KT) conduits are normally those individuals that retain seniority, or a high level of education/expertise in an area, but contrary to the advent of computing, women play a much smaller role in both the scholastic and professional computing fields. Information technologies early roots in the military was viewed as a non-gender biased industry, subject to constant change and relatively open to women (Von Hellens, Pringle, Nielson, & Greenhill, 2000). Vehvilainen (1997) found that a strict gender hierarchy were developed and strengthened by “fraternities of former army acquaintances” (p. 1) and the views of male experts objective truth became entrenched and has yet to be formally challenged in the industry. The National Science Foundation found sufficiently serious discrepancy to declare the lack of women in IT a national problem (Lee, 2000, p. 1). The problem does not begin at Universities where only one third of those selecting a science major in college are women (Samadzadeh, 1992) and only sixteen percent of computer science doctoral recipients were female (Cohoon, 2003), Klawe & Levenson (1995) found that despite females receiving generally higher grades in math and science, they were discouraged from pursuing those avenues of learning even before the undergraduate level. Extrapolating these findings would not only find a greater percentage of males holding positions of leadership in technology, but also IT professionals with greater years of experience.
KT conduits are vital to organizational development and cohesion as the most experienced employees are leveraged for their creativity and useful information. As American programming positions are shipped overseas, the demand for computing professionals with multitasking and project management skills will grow, creating business opportunities for women in technology similar to its infancy decades ago. However, several factors are hindering women’s abilities to determine or develop into KT conduits. These include:

1. Scholastic and Cultural differences create a false perception of computing environments;
2. A female’s negative influence of professional tenure is significantly stronger than males;
3. A lack of scholastic and professional role models inhibits advancement.

Although studies have shown that the computing image is changing, the numbers correlating this changing image to higher numbers of females is limited and the information correlating women as KT conduits, their ability to acquire KTs, or their ability to develop into KTs is vacant from scholarly publication. The process of gathering information about gender specifics is a time consuming process and few organizations have high technology departments that are run by women, or contain a majority of women so organizing this information may be virtually impossible for a company.

A recommendation to further understand these key deficiencies is a case study that will develop two avenues of perspectives to help describe this phenomenon: the first between
different gender departments within an organization, the second between different gender new hires.

This research will attempt to describe the phenomenon to help primary and secondary schools develop curricula that will help increase the number of women in computer science. It will help companies develop more diverse organizations that foster a more gender-neutral sense of corroboration. It will help create a greater number of professional and scholastic mentors for women in computer science. The specific goals of this research include:

1. Identify key gender differences in KT conduit acquisition, or development;
2. Identify current gender perceptions of computer science in professions;
3. Determine the impact of gender role models scholastically and professionally;
4. Determine if gender has bearing on the KT conduit selection process.

Relevance and Significance

Attaining Knowledge

Strassmann (1998) describes knowledge capital is an intangible asset that creates the seventy percent difference between corporate market valuations and the company’s fixed assets. Strassmann later suggests that the most successful companies are those that not only share tacit knowledge throughout the organization, but also continue to cultivate the value of each employee through continued learning. Knowledge experts are individuals that contain special expertise (Dixon, 2000) and only through sharing that knowledge (Stewart, 2003; Grey, 1998) can the potential of the expert information be fully realized; otherwise it is only static data.
It is reasonable to believe that the longer an employee works in an organization the more information they will acquire and in turn, generate more knowledge that becomes a valuable asset to the company. How are women in the industry affected by such knowledge transfers?

Sharing Knowledge

Murphy (2003) found that a large number of knowledge transfer (KT) conduits exist in business including traffic lights, baking recipes, work instructions, or training programs. These KT conduits can be classified into explicit knowledge – information that is codified and archived, or tacit knowledge – “interactions of personnel, memories of suppliers and customers, personal recollections of process problems & solutions and the mindset formed following a project” (p. 17). While Murphy’s research was based on a Virginian civil service organization, external implications can be formed with a reasonably high confidence level that any company requiring cooperative employees will engage in knowledge transfers through a number of conduits including knowledge experts. If the knowledge experts are the longest tenured employees and the industry is predominantly male, than most of the experts in the IT field would be male. Velde, Mandy, Bossink, & Jansen (2003) found that “the negative influence of professional tenure was significantly stronger for women than for men” relative to commitment within organizations. With male IT workers influenced more by professional tenure and organizational structures built on older military hierarchies, do female IT workers abilities to act as knowledge transfer conduits suffer, or is their ability to select proper KT conduits different from males?
Scholastic Gender Difference

Some research suggests that there is no significant difference between the abilities between the genders, but a measurable difference between educational levels can be proven (Palmer, 2003). If females are not reaching higher education levels (Samadzadeh, 1992; Cohoon, 2003; Jepsen, 2001), perhaps higher education is the key for female workers. Jepsen also found a significant confidence gap between genders at the undergraduate level with only one-half of the female freshmen believing they had attained “above average computer skills” (p. 70). Lacking this formal attitude leads to less assertiveness and confidence (Jepsen, 2001) and may have a significant impact on women as KT conduits.

Samadzadeh (1992) found a Johns Hopkins University study concluding that boys have stronger mathematical skills, findings contrary to Klawe & Levenson (1995), but failed to account formal training and development patterns such as aggressiveness and hobbies. Samadzadeh found that boys were encouraged to vocalize correct answers while girls exhibiting the same behavior were found unladylike and Klawe & Levenson found similar situations with women’s offered solutions ignored by professors only to hear the same solution lauded when offered by a male in the same class. If women’s interjections are constantly admonished and solutions ignored from a young age, could this provide a significant difference in the method used to obtain information or to act as a knowledge transfer conduit professionally? The quiet hobbies, such as isolationistic reading, could “affect the females’ decisions for choice of career paths and objectives” (Samadzadeh, p. 557), but this seems contradictory to the Von Hellens, Pringle, Nielson, & Greenhill (2000) and Nielson (1998) research that suggest women’s
interpersonal skills help them excel in human resource divisions. If the subject matter of the reading material is relationship-based, that could explain the discrepancy.

Cultural Gender Difference

“The inherently male culture of geekdom” (Johnston, 2001, p. 40) has proven a steadfast model for computer scientists, as gender differences appear to be growing, not shrinking. Cohoon (2003) also found that among leading institutions, computer science majors maintained the computer sub-culture of “young men who do nothing but live and breath computers” (p. 670). A number of different reasons may contribute to the lack of women in the field and the difference in attitude including: pubescent stereotyping, social concerns, and role models in the field.

Gurer & Camp (2002) found that women make the best mentors for women and that tele-mentoring is an option since the number of women available in computing leaves few directly accessible options. Computing environments, social influences, and self-confidence all play a part in the lack of women, or the lack of female assertiveness in professional environments and could affect the ability of women to act as, or quickly adapt to knowledge transfer conduits.

Natale (2002) found that males drive the $10 billion electronic gaming industry with 75 – 80 percent of all sales. This may be related to Czerwinski, Tan, & Robertson (2002) findings that women benefited from physically wider views of information in 3-dimentional environments and that the gender difference in special orientation is even further exaggerated when presented in a virtual environment. Johnston (2001) referenced an online poll that “showed that 82 percent of 57,094 respondents define themselves as male, while more people (11 percent) define
themselves as sexually ambiguous than the paltry 5 percent (about 3,000) who define themselves as female” (p. 39). If boys grow up playing video games and surfing the Internet more often, does this condition a greater aptitude for the computing environment, or simply show a higher rate of electronic socialization?

**Barriers and Issues**

Case studies require the cooperation of a group of professionals, or multiple groups, and extensive access to them physically and mentally over an extended period of time. This presents several challenges:

1. Ensuring both organizational and personal cooperation;
2. Controlling a large number of internal validity issues including participant attrition, instrumentation, and experimenter effects;
3. A ability to develop a data collection method that will provide meaningful results;
4. The need to meet with a large number of different people;
5. The availability of participants at the same time or when needed; and
6. Developing an externally valid study including subject selection, characteristics of subjects, and description of variables.

Some of the problems associated will be locating an organization that has both male and female department managers, teams with statistical gender diversity, and a willingness to participate. Other barriers include (1) the difficult nature of qualitative research, and (2) my now remote affiliation with Central Texas.
Approach

This case study design and development will utilize a phased approach:

Phase 1 – will include knowledge acquisition from computer science experts to elicit information required to develop valid questions.

Phase 2 – will include the design of the interview questions, focus group discussions, and methods of observation.

Phase 3 – The interviews, focus groups, and observations will take place at the organization’s site.

Phase 4 – The data collected will be codified, analyzed, member checked, and reported with conclusions.

The specific steps will include:

1. Research in the areas of Knowledge Transfer (KT) and KT conduits.

2. Research in the areas of professional and scholastic computer science: female role models, cultural differences, and gender bias.

3. Research in the area of women in technology.

4. Identification and selection of computer science experts.

5. Design of questions for interviews and discussions.

6. Design method and details required during periods of observation.

7. Codification of data from interviews and discussions, an iterative process.

8. Codification of data from observations.
9. Analysis and inductions from collected information and summation of conclusions.

Resources

Three yet to be identified female computer science experts will be used to develop the questions and formulate methods of observation. One expert will be scholarly, the second a professional with at least ten years experience in technology, and the third will include any combination of scholastic and professional achievement.
References


