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Toward a Model of Women in the IT Workplace

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Abstract

Women are under-represented in the information technology professions. A sufficient understanding of the underlying causes of gender under-representation in the information technology (IT) profession is needed in order to develop effective educational policies and workplace human resource strategies to attract and retain more women. Unfortunately, the relationship between women and information technology has drawn little attention in previous IS research. What limited research exists is quantitatively grounded in predominant cognitions that technology is masculine, and masculinity is defined in terms of technical competence. In contrast, the theoretical model proposed in this paper, the Women Coping with IT model (WCIT), identifies linkages between two fairly unrelated bodies of research, perceived gender differences in technology adoption and diffusion, and women's engagement within a male dominated majority culture. The integration of these two areas of research substantiates the core of the model, a coping responses framework, which is based upon an analyzation of in-depth interviews conducted with 31 women knowledge workers in the field (Kase and Trauth 2003). By aggregating and realigning coping theories from other disciplines, the coping responses framework establishes the underlying concepts framing commonalities and patterns of women's coping strategies in the information technology professions. This paper offers an alternative perspective on women's under-representation in IT by revealing inadequacies in technology adoption and diffusion theories and by examining the interrelations of women's identity, and social and occupational coping behaviors.

Keywords: Information technology, IT workforce, women and IT, gender, coping, stress

Introduction

Despite significant growth in the information technology (IT) professions in recent years, there remain segments of the population that are under-represented in IT. Among those under-represented are women (Trauth, Nielsen and von Hellens 2000). A sufficient understanding of the underlying causes of gender under-representation in the IT profession is needed in order to develop effective educational policies and workplace human resource strategies to attract and retain more women (Trauth 2002). Unfortunately, the relationship between women and information technology has drawn little attention in previous IS research.

This paper reflects the move toward development of an innovative interpretively-based model, Women Coping with IT (WCIT), representing the relationship between gender and information technology in the workplace (Figure 1). WCIT identifies linkages between two fairly unrelated bodies of research, perceived gender differences in technology adoption and diffusion, and women's engagement within a male dominated majority culture. The integration of these two areas of research substantiates the core of the model, a women and IT coping responses framework previously developed by Kase and Trauth (2003).

Each section of the paper outlines a portion of WCIT, effectively building the model from the ground up. The first section of the paper defines technology as a male domain. The second section identifies previous IS research utilizing quantitative methodologies in the analysis of percieved gender differences in technology adoption and diffusion. The third section discusses key multidisciplinary literature examining a variety of women's coping theories. The fourth section describes an experimental

framework categorizing the commonalities and pervasiveness of women's coping mechanisms uncovered in the IT workplace. In conclusion the paper offers WCIT as a alternative perspective providing deeper insight on the interaction of identity, social and occupational coping behavior, and technology diffusion influences effecting women's under-representation in the IT sector.
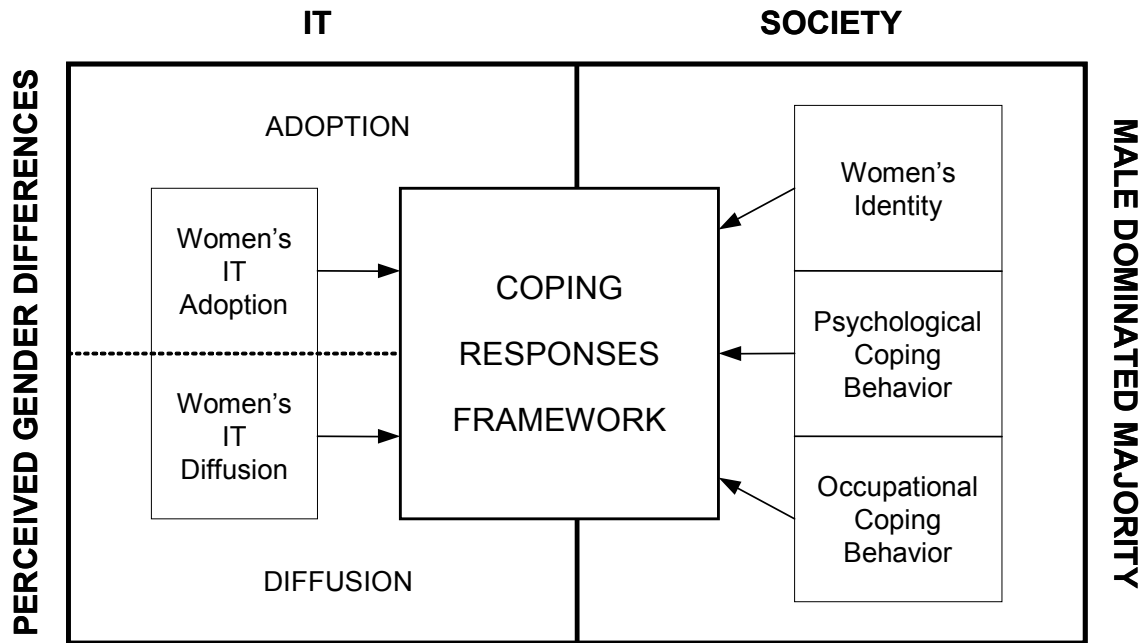
IT   **SOCIETY**

PERCEIVED GENDER DIFFERENCES

ADOPTION

Women's
IT
Adoption

Women's
IT
Diffusion

COPING

RESPONSES

FRAMEWORK

Women's
Identity

Psychological
Coping
Behavior

Occupational
Coping
Behavior

DIFFUSION

MALE DOMINATED MAJORITY

Figure 1. Women Coping with IT Model

Technology as a Male Domain

Information is viewed as quantitatively measured data obtained from surveys contextually set in a variety of professional backgrounds referencing all branches of science and engineering. Technology is viewed as a model that grew out of the traditions of Western scientific thought and the historical frame of computer science with its reliance on formal problem solving. Information technology is seen within this long-standing system of science that sweeps social issues to the side of replicable, quantifiable and provable facts. In *Reflections on Gender and Science* (1985), Evelyn Fox Keller describes science as the culmination of centuries of practices that push women's concerns with social interaction outside of the province of "correct" scientific thinking. Women and men are placed on binary poles where their differences are emphasized in the questions asked by scientists and the methods used to answer those questions. These binary poles, or dichotomies, shape the man's world as supposedly rational, objective, and quantifiable, while the woman's world is painted as emotional, subjective, intuitive, and qualitative. It is within this scientific tradition that the methods and practices of Information Technology were born.

Continuing with this perspective much of previous gender-based information technology research views men and women as two separate groups with different inherent bio-psychological characteristics effecting their relationship to information technology adoption and diffusion (Morrow, Presll and McElroy 1986; Edwards 1990; Gefen and Straub 1997; Venkatesh, Morris and Ackerman 2000; Venkatesh and Morris 2000; Venkatesh and Davis 2000).

Perceived Gender Differences in IT

Explanations why women and men would respond in different ways to IT can be built via the literature that studies IT perception and use. The underlying cognitions for the majority of this literature identify technology as masculine, and define masculinity in terms of technical competence. This section summarizes two studies each predicated on influential theories evaluating IT perception and use: the technology acceptance model and the theory of planned behavior.

The well known technology acceptance model (TAM) (Davis 1986; Davis 1989) and the SPIR addendum (Straub 1994) made influential contributions toward IT implementation and diffusion research. TAM posits that user acceptance is determined by two beliefs, namely, perceived usefulness and perceived ease of use. Perceived usefulness is defined as the extent to which a person believes that using a particular technology will enhance his or her job performance, while perceived ease of use is defined as the degree to which a person believes that using a technology will be free from effort (Davis 1989).

Surprisingly, gender's role within TAM has been investigated only recently (Gefen and Straub 1997). Utilizing TAM, Gefen and Straub examined masculine and feminine perceptions and usage patterns of email systems. A questionnaire sampled 392 female and male knowledge workers using email systems in the airline industry on three continents. Their findings indicated that women and men attribute different social presence and different perceptions of usefulness to the same mode of computer-based communication. Women viewed email as being higher in social presence and human contact than men. Additionally, email was perceived as more useful by women than by men in its better fit with feminine discourse patterns – a proclivity toward a networking approach. Implications addressed in the study included: distinct training techniques for female users; sensitivity toward female user-friendliness of the system; and emphasis on the ability of the medium to convey the "presence" of the communicator, her feelings and thoughts. In conclusion, Gefen and Straub suggested that researchers include gender, as well as, other cultural effects in future IT diffusion models.

Another influential theory, the theory of planned behavior (TPB) (Ajzen 1985; Ajzen 1991), has been widely applied across a range of disciplines in the prediction of intention and behavior. TPB has been applied in information technology adoption and usage contexts to explain an individual's decision-making processes in adopting new technologies. Basically, TPB defines relationships among beliefs influenced by a set of underlying factors: attitude toward a behavior; subjective norm; perceived behavioral control; behavioral intention; and behavior. Venkatesh, Morris and Ackerman (2000) used TPB to investigate gender differences in the context of individual adoption and sustained usage of IT in the workplace. For example, TPB's subjective norm placed in the context of IT measures the normative pressure from superiors and peers in determining an individual's intention to use a system. Utilizing surveys and questionnaires, the authors compared user reactions and technology usage behavior among 355 workers being introduced to a new software technology application. The findings revealed that men and women adopt very different decision processes in evaluating new technologies. Concerning usage behavior, women and men appeared to value or weigh TPB-related factors differently. Venkatesh et al. concluded technology adoption decisions must incorporate both traditional productivity-oriented factors (important to men), and social factors and facilitating conditions (important to women).

Reappearing throughout TAM and TPB-based IT perception and use literature, three key factors seem to influence gender differences in technology adoption and diffusion decisions: perceptions about the usefulness of the technology; social pressure to use the technology; and perceived difficulty in learning the technology. Although the above theories conclude that gender differences generally do exist in IT, viable explanations as to why are shortcoming or nonexistent. The current under-representation of women in all IT professions exemplifies these gender differences as almost common knowledge. TAM and similar survey-based research ignore the underlying causes as to why women do interact differently with technology. Hence, the obstacles delineating our present day IT gender imbalance are not addressed by this technology perception and use literature.

Coping Theories in Literature

The technology research outlined above formalizes the left half of WCIT by presenting information technology adoption and diffusion in a gender perspective – separate sexes with different perceptions. The equally important right half of the model presents women's engagement within a male dominated majority culture. As women struggle with experiences in living in a patriarchal society, repertoires of coping strategies are constructed by common beliefs, values, and behaviors. Once aggregated and realigned, these repertoires of coping strategies establish the underlying concepts framing commonalities and patterns of women's coping strategies in the IT workplace.

In general, most coping studies appear to tap into three sorts of coping variables: direct action on the environment or self; interpretive reappraisal regarding the environment or self; and emotion-management. This section discusses several dominant viewpoints about coping found in the literature from non-IS disciplines. Two feminist identity theories are reviewed. This is followed by two investigations of coping behavior from psychology literature. Finally, several models of coping within occupational life are presented.

Women's Identity Coping Theories

The Downing and Roush (1985) model of feminist identity development is derived from Cross's (1971) theory of Black identity development. The Downing and Roush model is based on the premise that women who live in contemporary society must first acknowledge, then struggle with, and repeatedly work through their feelings about prejudice and discrimination in order to achieve an authentic and positive feminist identity. Downing and Roush delineated a five-stage model. The first stage, *passive acceptance*, involves adherence to traditional sex roles and acceptance of male superiority. These women fail to acknowledge discrimination against women within society. The second stage, *revelation*, is exemplified by a consciousness-raising experience in which the individual develop anger through a questioning process resulting in an understanding of female culture. In the third stage, *embeddedness*, close affiliations with other like-minded women are formed. The relationships create a safe, women-friendly environment in which women process feelings of anger and betrayal. The fourth stage, *synthesis*, is characterized by the formation of a positive feminist identity that integrates the understanding that oppression has an impact on women. In the final stage, *acting commitment*, a culmination of the previous stages occurs in which the individual channels her feminist identity into activities promoting the creation of social change.

The Downing and Roush (1985) identity model is similar in certain aspects to another well-known women's identity model by Belenky, Clinchy, Goldberger and Tarule (1986). In this model five perspectives outline how women view reality, define a male dominated majority culture, and draw conclusions about truth, knowledge, and authority. The authors believe that most women can recall incidents in which either they or female friends were discouraged from pursuing some line of intellectual work on the grounds that it was "unfeminine" or incompatible with female capabilities (Belenky et al. 1986). Belenky et al. access conceptions of knowledge and truth that are accepted and articulated today and shaped throughout history by the male dominated majority culture. Men have constructed the prevailing theories, written the history, and set values that have become the guiding principles for men and women alike.

There are five perspectives in this model from which women know and view the world. The first perspective is *silence*. Women experience themselves as mindless and voiceless, and subject to the whims of external authority. They adhere to sex role stereotypes and have little awareness of their intellectual capabilities. In the second perspective, *received knowledge*, women conceive of themselves as capable of receiving, even reproducing knowledge. They are not capable of creating their own knowledge because all knowledge is obtained from the all-knowing external authorities. *Subjective knowledge* is the third perspective. In this perspective women conceive truth and knowledge as personal, private, and subjectively known or intuited. In the fourth perspective, *procedural knowledge*, women are invested in learning and applying objective procedures for obtaining and communicating knowledge. In the final perspective, *constructed knowledge*, women view all knowledge as contextual. They experience themselves as creators of knowledge, and value both subjective and objective strategies for knowing.

Both of these theories model the journeys of women through phases of psychological development from passive acceptance/ silence to acting commitment/constructed knowledge in their realization of a gendered society. The destination is an individual who recognizes the social oppression of women and actively promotes the creation of social change in a positive way.

Psychological Coping Theories

From a social-psychological perspective, Pearlin and Schooler (1978) investigate coping behavior as a protective function that mediates the impact that society has on its members. A fundamental assumption of their theory is that people are actively responding to the continuous strains built into daily roles. Pearlin and Schooler define coping responses as the behaviors, cognitions, and perceptions in which people engage when actually contending with their life-problems (Pearlin and Schooler 1978).

Pearlin and Schooler (1978) categorize coping responses into three major types distinguished from one another by their functions. The first type of coping response changes the situation out of which the strainful experience arises. This response represents the most direct way to cope with life-strains. It aims at altering or eliminating the very source of the stress. Negotiation, discipline, and direct action are examples of coping responses that modify the conditions leading to the problem.

The second type of response controls the meaning of the strainful experience after it occurs but before the emergence of stress. This response recognizes that the meaning attached to an experience determines to a large extent the threat posed by that experience. Making positive comparisons, and selectively ignoring that which is noxious are examples of coping responses used to neutralize the problematic meaning of the experience.

The third type of response functions more for the control of stress itself after it has emerged. This type of coping neither alters the situation generating the stress nor modifies the perception of the strainful experience. The response functions more for the management of stress by helping people to accommodate without being overwhelmed by it. This type of coping response brings together a number of orientations to life-problems: denial, passive acceptance, withdrawal, a hopefulness bordering on blind faith, and belief that the avoidance of worry and tension is the same as problem solving (Pearlin and Schooler 1978).

Unlike the previous theories, Pearlin and Schooler's (1978) coping responses do not propose a developmental timeline; instead, they are influenced by general psychological resources. Psychological resources are the personality characteristics that people draw upon to help them withstand threats posed by events and objects in their environment. These resources reside in the individual's attitudes toward oneself. The psychological resources represent some of the things people *are*. Coping responses represent some of the things that people *do* in their efforts to deal with the strains they encounter in their different roles (Pearlin and Schooler 1978).

An extensive research program by Lazarus and his colleagues (Lazarus and Folkman 1984) distinguished between problem and emotion-focused coping. Problem-focused coping is defined as efforts aimed at altering the person-environment transaction and emotion-focused coping refers to efforts aimed at regulating the emotions. Problem-focused efforts are often directed at defining the problem, generating alternative solutions, weighing the alternatives in terms of their costs and benefits, choosing among them, and acting. In addition to problem-oriented strategies, problem-focused coping may include strategies that are inwardly directed (Lazarus and Folkman 1984). Emotion-focused processes change the meaning of a stressful transaction without distorting reality, however, self-deception may become a consideration in this type of coping process. Lazarus and Folkman state that emotion-focused coping is used to maintain hope and optimism, to deny both fact and implication, to refuse to acknowledge the worst, to act as if what happened did not matter, and so on. In an earlier study, Folkman and Lazarus (1980) concluded that problem and emotion-focused functions were used by everyone in virtually every stressful encounter both facilitating and impeding each other in the coping process.

Workforce-Oriented Coping Theories

A study by Menaghan and Merves (1984) examined the effectiveness of specific coping efforts for various problems in occupational life. Two different criteria of effectiveness were considered: the extent to which distress was reduced; and the extent to which occupational problems were reduced. The authors identified four major coping efforts: (1) direct action to resolve problems; (2) optimistic comparisons of one's situation relative to the past and relative to one's peers; (3) selective inattention to unpleasant aspects and heightened attention to positive features of the situation; and (4) a conscious restriction of expectations for work satisfaction and a focus on the monetary rewards from employment. Menaghan and Merves's (1984) coping efforts are similar to Pearlin and Schooler's (1978) coping responses in that they are largely interpretive strategies and emotion-management processes rather than direct efforts to change one's situation.

Other workforce-oriented models regarding the immediate reactions or coping strategies employed by women confronted with sexual harassment behavior identify a variety of classification schemes based on these women's reactions. Gutek's (1985) survey of victims of sexual harassment reported the following reactions: 9 percent of the women had quit a job sometime because they refused to grant sexual favors; 5 percent had transferred as a result of sexual harassment; and 23 percent had talked to coworkers after the instance of harassment. Crull (1982) reported that 42 percent of the victims in her survey had resigned from jobs because of sexual harassment. Also, a large number of the women tried to avoid the harasser. Jensen and Gutek (1983) provided more detail on the emotional reactions to sexual harassment. In their study the victims experienced depression 20 percent of the time, disgust 80 percent, and anger 68 percent. The victims labeled their responses as either inward-directed (hurt, sadness and depression) or outward-directed (anger and disgust).

In response to the growing managerial concern about the detrimental effects of job stress, Latack and Havlovic (1992) present a conceptual evaluation framework in the form of a matrix that specifically focuses on coping processes in work organizations. They evaluated published coping theories and coping measures for *comprehensiveness* (defined as focus and method of coping) and *specificity* (defined as coping behaviors versus coping effectiveness; coping style; coping resources; and stress management applications). This coping processes matrix aids researchers in choosing and developing coping measures applicable to job stress.

Coping Responses Framework

The coping theories introduced in the previous section establish the underlying concepts framing commonalities and patterns of women's coping strategies in the IT workplace. A women's coping responses framework resides at the center of WCIT linking together perceived gender differences in IT adoption and diffusion and women's coping behavior within a masculine-biased society. Figure 2 illustrates the premise founding the coping responses framework.
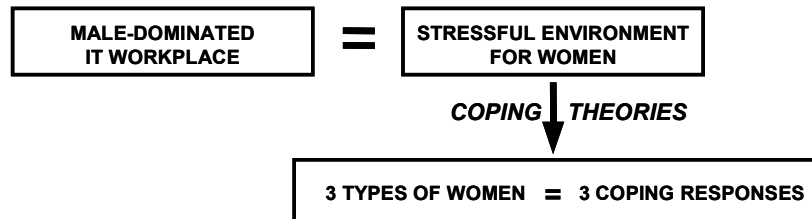

Figure 2. Premise: Coping Responses Framework

Table 1. Summary of Coping Responses Fraework

COPING RESPONSE	DEFINITION	SUPPORTING THEORY
ASSIMILATION	Denies gender discrimination Selectively perceives oppression Adheres to traditional sex roles **Selective inattention** **Selective ignoring** **Denial** **Rationalization**	Downing & Roush Belenky, Clinchy, Goldberger & Tarule Pearlin & Schooler Menaghan & Merves
ACCOMMODATION	Accepts gender discrimination Internalizes oppression **Recognition** **Synthesis**	Downing & Roush Belenky, Clinchy, Goldberger & Tarule Pearlin & Schooler Lazarus & Folkman Menaghan & Merves Gutek Crull Latack & Havlovic
ACTIVISM	Questions male dominated workplace Recognizes institutional barriers Aims to alter or resolve discrimination **Revelation** **Embeddedness**	Downing & Roush Belenky, Clinchy, Goldberger & Tarule Pearlin & Schooler Lazarus & Folkman Menaghan & Merves Gutek Crull Latack & Havlovic

The male-dominated information technology workplace becomes a stressful environment for women IT professionals. These women respond to the stress by utilizing three types of coping strategies dependent on their psychological resources and individual personality characteristics.

The top level categories of the framework are based on the three types of women suggested in Trauth et al. (2000). In that study on the under-representation of women in the IT field, the authors explored the experiences of women who are in technical positions and who work in a range of industries throughout Australia. The framework enables a researcher to take an analytical perspective on the many patterns of women's coping responses in the IT workplace. This particular framework was tested on a set of in-depth interviews conducted with women practitioners and academics in the IT field.

Table 1 presents a summary of the framework. In the first column *Assimilation*, *Accommodation* and *Activism* define the three categories of coping. The second column enumerates specific behavioral responses of each type of woman. The third column connects the coping responses to the supporting coping theories from literature.

A woman coping by *assimilation* denies that discrimination against women exists in the IT workplace. She successfully utilizes differing degrees of selective perception to operate in this male dominated profession. An assimilating woman adheres to traditional sex roles and acknowledges male superiority in all aspects of life. A woman who copes by *accommodation* accepts that gender discrimination is an integral part of the IT workplace, as simply the way things are. She internalizes oppression while skillfully avoiding confrontations within a male dominated environment. Oftentimes, she manages both domestic responsibilities and a full time IT career. Due to impossible time constraints, the accommodating woman often chooses between scaled back professional aspirations and remaining childless. The third type of woman uses *activism* to cope in the male dominated workplace. She questions the inconsistencies and contradictions of the gender imbalance. The activist recognizes institutional barriers and expresses the need to be strong and fight the system. She networks with like-minded women while addressing discriminatory issues in hostile educational and work environments. The activist is proactive, often working as a radical or a champion to promote gender equality throughout society.

This type of framework enables a structured analysis of transcripts produced from open-ended interviews, focus groups, and other participant observatory activities. The flexibility of the framework construction allows a wide range of scope useful from a high-level organizational view to a finely grained individualized analysis of specific coping experiences.

Conclusion

From its scientific origin and computational intensive reputation, information technology is perceived as a male domain. Utilizing quantitative methodologies, TAM and TPB-based research examines gender differences in technology acceptance and diffusion from a preconceived perspective: technology is masculine, and masculinity is defined in terms of technical competence. This type of research provides compelling evidence that gender plays a vital role in shaping initial and sustained technology adoption decisions by IT workers. Unfortunately, this type of research lacks viable explanations as to why women and men interact differently to information technology.

What is missing from TAM and TPB-based research occupies the central position in WCIT – the coping responses framework. The framework, a convergence of interpretive investigations of women knowledge workers in the IT field and existent stress-related coping theories from non-IS disciplines, attributes insightful knowledge to the causes behind the gender differences in information technology.

The Women Coping with IT model addresses the question: "What are the linkages between women coping within a masculine-bias society and women adopting and using technology?" The coping responses framework addresses the question: "What are the actual effects of this relationship on women IT professionals?"

To be in command of the very latest technology signifies being involved in directing the future. Currently, women are disproportionally represented in all information technology based professions. Solving the IT gender imbalance requires three steps: (1) understanding the underlying causes; (2) developing educational policies to attract more women; and (3) modifying human resource strategies to retain more women. The model proposed in this paper addresses the first step by contributing to the development of interpretively grounded theories exposing the underlying causes of the IT gender imbalance. WCIT will improve our understanding as to why women are currently under-represented in the information technology sector and provide the basis for new interventions to promote both attraction and retainment of more women in the profession.

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