WHERE IS THE LINE BETWEEN BENIGN AND INTRUSIVE? AN EXAMINATION OF PSYCHOLOGICAL BARRIERS TO THE ACCEPTANCE OF AWARENESS MONITORING TECHNOLOGIES

by

David Zweig

A thesis

presented to the University of Waterloo

in fulfilment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Psychology

Waterloo, Ontario, Canada, 2001

©David Zweig 2001

National Library of Canada
Bibliothèque nationale du Canada

Acquisitions and Bibliographic Services
Acquisitions et services bibliographiques

395 Wellington Street
Ottawa ON K1A 0N4
Canada

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

L'auteur conserve la propriété du droit d'auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-60580-9

Canada

I hereby declare that I am the sole author of this thesis.

I authorize the University of Waterloo to lend this thesis to other institutions or individuals for the purpose of scholarly research.

I further authorize the University of Waterloo to reproduce this thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

The University of Waterloo requires the signatures of all persons using or photocopying this thesis. Please sign below, and give address and date.

ABSTRACT

Where is the Line Between Benign and Intrusive? An Examination of Psychological Barriers to the Acceptance of Awareness Monitoring Technologies

The rapid proliferation of communications technologies, designed to aid in information sharing and communications across distance, is changing the way people work. As employees find themselves in geographically separated teams, the loss of face-to-face interaction has led to the development of new monitoring technologies aimed at providing availability information to enhance collaboration. However, little attention has been paid to the psychological impact of these new types of monitoring technologies. This thesis presents three studies involving over 1200 participants examining the psychological effects of being monitored for availability. Drawing on diverse literatures in computer supported cooperative work, electronic performance monitoring, privacy and fairness, a comprehensive theoretical model of acceptance was developed to examine the effects of being monitored for availability. Studies 1 and 2 utilized a scenario design to assess participant reactions to a video-based monitoring system that provided availability information on geographically separated colleagues. Furthermore, Study 2 refined the model of acceptance to examine justifications provided to the employees for the use of awareness monitoring systems. The results of both studies suggested that technical solutions, such as manipulating the characteristics of the awareness system to enhance perceptions of fairness and privacy, are not sufficient to overcome psychological barriers to being monitored. Furthermore, perceptions of usefulness, considered to be a mediator in the relationship between fairness and privacy perceptions and acceptance, may indeed

serve as a moderator of this relationship. A third study, using a focus group methodology, adds to the explanation for these findings. Specifically, the qualitative evidence suggests that maintaining psychological boundaries is a more important consideration than manipulating the technology to enhance perceptions of privacy and fairness. Furthermore, the premise behind the use of awareness monitoring might be faulty as awareness monitoring only provides information on a colleague's presence and not his or her availability to interact. Theoretical and practical implications for future research on technology acceptance and the design of new communications technologies are discussed.

ACKNOWLEDGEMENTS

Although only one name appears on the title page of this dissertation, it has been a truly collaborative effort. I have been extremely fortunate to be surrounded by an exceptional group of friends and colleagues who have enriched my life. Derek Chapman, Camilla Holmvall, Alice Tjiu, Leanne Son Hing and Marie-Helene Daigle have all shared in my ups and downs and incredibly, are still willing to share in more. My good fortune extends to the people who served on my dissertation committee. I have benefitted greatly from the knowledge, wisdom and insight offered by Ramona Bobocel, Mark Zanna and Greg Irving. I would also like to thank the Social Sciences and Humanities Research Council for funding this research and over 1200 students and employees who generously shared their thoughts and feelings with me. Finally, I would like to acknowledge my family's unwavering support throughout the years. They've been waiting a long time for this and happily, I can now tell them that "yes, I'm finally done".

DEDICATION

Almost three years ago, I made a decision that changed my life. I walked into Jane Webster's office and asked her to be my advisor. I'm not exactly sure why, but she agreed. Since then, Jane has been my harshest critic and my strongest supporter. At times, I questioned my own ability to meet the goals that she set but slowly came to realize that these doubts were mine alone. Jane has never wavered in her expectations or in her support. She has selflessly created opportunities for me to learn and grow as a researcher and as a person.

Jane, I will always consider you to be my mentor and will continue to try and apply all of the knowledge and wisdom you have shared with me. Two people made a decision on that day three years ago. I will benefit from yours for the rest of my life. Thank you.

TABLE OF CONTENTS

ABSTRACT iv

ACKNOWLEDGEMENTS vi

DEDICATION vii

CHAPTER 1 INTRODUCTION 1
The Genesis of Awareness Systems 3
Purpose of the Dissertation Research 6
Extensions to Past Research 7

CHAPTER 2
DEVELOPMENT OF A MODEL OF AWARENESS SYSTEM ACCEPTANCE 10
System Characteristics 12
System Characteristics and Privacy 15
System Characteristics and Fairness 16
Privacy and Fairness – What Comes First? 19
From Privacy and Fairness to Acceptance 20
Usefulness as a Mediator of Privacy and Fairness 21
If You Build It, Will They Come? 23

CHAPTER 3
A STUDY EXAMINING THE INFLUENCE OF SYSTEM CHARACTERISTICS ON PERCEPTIONS OF PRIVACY, FAIRNESS, USEFULNESS AND AWARENESS SYSTEM ACCEPTANCE 24
Method 24
Participants 26
Procedure 26
Measures 26
Independent Variables and Manipulation Check Items 27
Invasion of Privacy Perceptions 27
Fairness Perceptions 27
Acceptance 28
Usefulness 29
Intentions to Work for the Organization 29
Analytical Strategy 29
Results 31
Manipulation Checks 31
Model Testing 31
Discussion of Results 37
Contributions and Limitations 40

CHAPTER 4
A RE-EXAMINATION OF THE MODEL OF AWARNESS SYSTEM ACCEPTANCE....42
Generalizability of the Model....42
Including Justifications in the Model....43
Re-examining Usefulness as a Mediator....44
Fine Tuning the Manipulations....48
Method....48
Participants....49
Procedure....49
Measures....51
Independent Variables....51
Manipulation Checks....52
Means Justifications....52
Ends Justification....52
Mediating and Dependent Variables....52
Results....55
Analyses....55
Manipulation Checks and Confirmatory Factor Analysis....56
Model Testing....57
Usefulness as a Moderator....62
Discussion....66
Contribution and Limitations....68

CHAPTER 5
A QUALITATIVE STUDY EXAMINING EMPLOYEE REACTIONS TO AWARENESS MONITORING TECHNOLOGIES....71
Method....72
Participants....72
Procedure....73
Discussion Framework....74
Coding the Transcripts....75
Results....79
Are System Characteristics and Justifications Important?....79
Linking System Characteristics and Justifications with Privacy and Fairness....80
Privacy – A Key Variable....80
Why is Fairness Important?....81
Linking Privacy and Fairness....82
Psychological Boundary Violations....83
Violation of Social Norms and Perception Distortion....89
Boundary Restoration....90
Usefulness of the Awareness System....91
Presence Versus Availability....92
Negative Performance Consequences....93
Ideal System Characteristics....94

Acceptance and Willingness to Use the Awareness System 94
Discussion 96
Contributions and Limitations 99

CHAPTER 6 GENERAL DISCUSSION 101
Where is the Line Between Benign and Intrusive? 104
Theoretical Contributions 106
Limitations 108
Implications for Research and Practice 109

APPENDIX
A. Example System Characteristics – Study 1 112
B. Awareness System Survey – Study 1 113
C. Example System Characteristics and Justifications – Study 2 118
D. Awareness System Survey – Study 2 120
E. Sample Focus Group Materials 125
F. Focus Group Coding Scheme, Frequencies and Sample Comments 127
G. Managers Versus Non-Managers – Study 2 138

REFERENCES 139

LIST OF TABLES

Table		Page(s)
1.	Descriptive Statistics and Zero-Order Correlations among Study 1 Variables	32
2.	Demographic Variable Frequencies – Study 2	50
3.	Descriptive Statistics and Zero-Order Correlations among Study 2 Variables	53
4.	Comparison of Mediated and Moderated Models for Study 2	64
5.	Focus Group Coding Scheme	77-78

LIST OF FIGURES

Figure		Page
1.	Theoretical model of awareness system acceptance	13
2.	Results from the analysis of the theoretical model – Study 1	34
3.	Theoretical model of awareness system acceptance with usefulness as a mediator – Study 2	45
4.	Theoretical model of awareness system acceptance with usefulness as a moderator – Study 2	47
5.	Results from the analysis of the theoretical model – Study 2	58
6.	Results from the analysis of the moderated model – Study 2	63
7.	A comparison of comment frequency linking privacy to system characteristics and boundary violations	88
8.	A comparison of comment frequency linking fairness to system characteristics and boundary violations	88
9.	Frequency of comments questioning the usefulness of awareness systems across groups	92

CHAPTER 1

INTRODUCTION

Technology is often used as a benchmark of societal development. Whereas for most of human history, technology did not seem powerful enough to have a pervasive influence on society (Howard, 1995), there is no question that as we move through an industrialized to a post-industrialized society, technology is producing an ever-greater impact on the way we organize our activities.

As social entities, organizations must respond to the changes offered by technology and must adapt their activities accordingly. Recently, technology has offered organizations the tools to remove physical constraints such as time and space (Barrett & Walsham, 1999). Videoconferencing, virtual reality, and more simply, e-mail and telephones permit a distributed workforce in countries across the globe. With the rapid proliferation of information technologies, traditional organizational boundaries are crumbling. This globalization of industries, aided by information sharing and communications tools, is changing the way people work.

The implication of these changes to the work environment is profound. Information technologies, designed to enhance connectivity among employees and allow for the physical separation of colleagues, can in essence, act as a distancing agent for these employees. For example, the traditional organizational model finds co-workers in the next office or a few doors down. However, with new communications technologies, co-workers might be located in different buildings, different cities or even different countries. As a result, employees can no longer rely on face-to-face communications with their colleagues and instant collaboration to complete job tasks. In fact, even when employees

are located in the same building, proximity has an effect on communication. Kraut, Egido and Gallagher (1990) reported that communication episodes per month dropped from over 60 for people in adjacent offices to 30 for people on the same floor, and to less than 20 for people located on different floors of the same building. This loss of ability to initiate "opportunistic connections" (Whittaker, 1995), is believed to inhibit the creation of close working relationships and enhanced collaboration that is possible for co-located employees. As stated by Johnson and Greenberg (1999):

> Casual real time interaction is an essential ingredient of group cohesiveness. Yet the bottleneck to rich, spontaneous interaction is distance and distant-separated team members will be at a disadvantage unless a prosthesis that overcomes distance barriers is available.

Communications technologies that remove traditional geographic boundaries create a new reality that organizations must address. Colleagues who work at a distance do not communicate as frequently as do those who are co-located. Therefore, organizations must create connections where they did not previously exist. In other words, new ties must be established, ones that link distributed employees together in a space no longer bounded by bricks and mortar. Often, these efforts to enhance connections among distributed employees take the form of monitoring (e.g., Erickson & Kellogg, 2000; Lee, Girgensohn & Schlueter, 1997). Whether this monitoring involves physical location tracking, application sharing, or even as described below, availability awareness monitoring, these new technologies can exact a high price for organizational employees. Yet, as the options for monitoring increase, so will attempts by organizations to scrutinize their employees.

The rationale offered for monitoring expresses the need to address the challenge of distance and proponents of monitoring technologies have not developed them to be used for anything other than enhancing communication among distributed employees. As indicated below, researchers and developers of monitoring technologies are simply attempting to address a communication problem in organizations. Their efforts are not malevolent. Breakdowns in communications among distributed employees are a real concern. Nonetheless, invasion of privacy, fairness concerns and even willingness to work for an organization that uses monitoring technologies are some of the potential psychological costs of monitoring that can thwart efforts to enhance connections, no matter how well intentioned. This thesis explores some of these psychological costs of monitoring in the context of awareness monitoring technologies.

The lessons learned here hold implications for not only the continued use of awareness monitoring systems but for any type of monitoring technology designed to enhance communication among employees. As will be shown, new technologies that are developed to address a loss of physical boundaries might result in the creation of new psychological barriers aimed at resisting the expressed need to be continuously seen and available.

The Genesis of Awareness Systems

In reaction to the challenges presented by distance-separated team members, and to address the lack of face-to-face interaction among co-workers in remote working environments, new technologies are being developed to increase awareness. These technologies are designed to support "a general sense of who is around and what others are up to as they work" (Greenberg & Kuzuoka, 2000), "the likelihood of actions by one

user being noticed by another" (Rodden, 1996, p. 90), and the "knowledge about the attention of others" (Vertegaal, 1999, p. 245). These awareness monitoring or, as they are sometimes called, benign surveillance systems are designed to act as substitutes for physical connections by providing information on a distant colleagues' availability and actions so that remotely-located colleagues can know when and where their co-workers are available to interact (Whittaker, 1995). It is important to note that the awareness portion of these systems is not designed for communication. Their purpose is to establish availability to communicate. Once established, communication can be exchanged through the same (e.g., video) or another (e.g., telephone) medium.

Two broad types of awareness systems - peripheral and activity - have emerged to provide information on distributed colleagues. Peripheral awareness systems, also termed general, informal, or background awareness, have been developed to gather presence information about co-worker availability through such means as audio and video signals (Zhao & Statsko, 1998). In this case, a video camera mounted on a computer monitor might capture images of the co-worker in her workspace and transmit these images to remotely-located colleagues. For example, Webster (1998) reported on an organization with over 1000 video-based awareness systems (implemented as part of the organization's desktop videoconference system) that provided video snapshots of coworkers. In addition to this more macro type of awareness, researchers are also focusing on micro-level awareness, for instance by representing eye movements during real-time distributed meetings (e.g., Vertegaal, 1999).

In contrast, activity systems gather information on co-worker actions by allowing employees to view the computer desktop environment of a colleague (Whittaker, 1995).

For example, an activity awareness system might be used when computer programmers are merging independently-developed software components (Simone & Bandini, 1997).

Awareness monitoring systems have been implemented in organizations such as NYNEX and Xerox (Harper, 1995; Lee, Girgensohn, & Schlueter, 1997) and have been designed as stand-alone systems (e.g., Portholes^{TNG}: Lee & Girgensohn, 1999) or as features of integrated communication systems (e.g., CorelVideo: ZD Inc., 2000). Indeed, research and development efforts into awareness systems represent a very active area for the human-computer interaction community (e.g., see Abowd & Mynatt, 2000; Erickson & Kellogg, 2000). This community views awareness as one of the most important design features for collaborative applications, arguing that awareness is necessary for collaborative work because of an "expansive body of literature stressing the importance of awareness and availability of action" (Palfreyman & Rodden, 1996, p. 131).

Increasingly, however, researchers are recognizing the difficulty in getting people to accept and use awareness monitoring systems (Girgensohn, Lee, & Turner, 1999; Lee et al., 1997). There is a growing recognition that employees' privacy concerns about being monitored will have an impact on system acceptance (e.g., Bellotti & Sellen, 1993; Greenberg & Kuzuoka, 2000; Hudson & Smith, 1996). For instance, Webster (1998) pointed out that awareness features that are designed into systems to improve working relationships might actually have the unintended consequence of making privacy more salient to employees and thus result in lower system acceptance.

Current efforts aimed at protecting privacy and enhancing user acceptance of awareness systems focus mainly on adaptations of the technology (e.g., Hudson & Smith, 1996; Lee et al., 1997; Morikawa & Maesko, 1998). To offer an example of a technical

response to the problem of user acceptance, Greenberg and Kuzuoka (2000) have developed surrogates for presenting awareness information about others. Instead of video snapshots and images of employees in their workspaces, these researchers have created motorized models to embody the presence of others. For example, to inform a colleague that a co-worker is engaging in activity, a dragonfly on the colleague's desk will begin to flap its wings to correspond with the amount of activity in which the co-worker is engaging. Other efforts to enhance the perception of privacy include presenting symbolic images of the amount of employee activity through changes in colours of abstract paintings (Pedersen, 1998) and providing presence-regulators; that is, dials or sliders to choose the amount of detail transmitted to others (Ijsselsteijn, Ridder, Freeman, & Avons, 2000). In examining this body of research, the overriding assumption appears to be: "if we can get the technology right, people will accept it." This stance overlooks some of the fundamental psychological issues that can have an impact on acceptance of invasive technologies such as an awareness system.

The Purpose of the Dissertation Research

Technical efforts aimed at reconstructing social networks and communication by simulating or restoring face-to-face interaction, largely ignore the psychosocial consequences of being monitored. This thesis aims to move beyond an examination of the technical characteristics of the technology to develop a more inclusive model of technology acceptance that explores the psychological implications of availability monitoring. Thus, one purpose of the thesis is to examine the psychological effects of being monitored for the purpose of collaboration. A second goal is to examine the prevailing assumption that technological manipulations designed to enhance user

perceptions of privacy will result in greater acceptance of awareness monitoring systems. In other words, this thesis aims to test the assumption that if the technology is right, people will accept it. A third goal is to inform and expand on current theory, research and practice surrounding distributed work and acceptance of technologies designed to facilitate collaboration at a distance.

There is little doubt that there will be an increased need for organizational employees to collaborate at a distance. However, the question is, are there ways to collaborate effectively without the need to sacrifice control over how much personal information is presented to others and to do so in a manner that is perceived as fair to everyone using a particular technology? Thus, along with an examination of current assumptions regarding distributed work, this thesis also represents an attempt to understand the nature of monitoring itself, the consequences of being monitored and to explore alternatives to monitoring. Perhaps, as assumed in the literature and research examining awareness monitoring, we can get the technology right. But, we will not succeed until we have an understanding of the psychological implications of monitoring and use this knowledge to inform the design of future awareness monitoring systems. Before outlining the rationale for examining these questions, I will review past research on both awareness and electronic performance monitoring (EPM) of organizational employees to go beyond technical characteristics and develop a more comprehensive model of awareness system acceptance.

Extensions to Past Research

This research responds to calls for increased examination of privacy as a determinant of awareness system acceptance (Adams & Sasse, 1999; Webster, 1998).

Furthermore, this thesis extends past research concerning the fairness of EPM systems (e.g., Ambrose & Alder, 2000; Stanton, 2000a) to examine monitoring systems in general. With EPM, supervisors track and record employee performance through such means as telephone, keystroke monitoring, or video-based surveillance of work areas (Stanton & Weiss, 2000). In contrast, with awareness monitoring systems, peers monitor peers for the purpose of determining their availability. Although the rationale behind awareness monitoring can be distinguished from EPM, many of the same issues apply. Further, research on technology acceptance (e.g., Davis, Bagozzi, & Warshaw, 1989) is incorporated to enhance understanding of the usefulness of the tools in informing attitudes toward the technology. A theoretical model is tested in three studies examining over 1200 participants' reactions to a video-based peripheral awareness monitoring system.

This dissertation is the first to systematically examine fairness, privacy, usefulness, and acceptance within the context of awareness monitoring systems. In contrast, previous awareness studies generally have focused on technical employees who are the developers of these systems, have incorporated small sample sizes, and have relied on anecdotal evidence (e.g., Girgensohn, Lee, & Turner, 1999; Greenberg & Kuzuoka, 2000). By developing a more comprehensive model, this dissertation responds to calls by investigators (e.g., Ambrose & Alder, 2000; Stanton, 2000a) to extend electronic performance monitoring research in several ways -- to other types of monitoring techniques (here, awareness of employees rather than monitoring of their specific work tasks), to other targets of monitoring (availability rather than performance), and to other kinds of monitoring agents (peers rather than supervisors). Furthermore, this dissertation presents evidence to support and extend previous research (e.g., Alge, 1999; Bies, 1993;

Eddy, Stone & Stone-Romero, 1999) examining the link between privacy and fairness within the monitoring context.

Beyond the theoretical and practical contributions of this dissertation, a final goal is to answer two key questions about the development and use of awareness system technology. First, do employees need or want awareness monitoring systems to collaborate at a distance? Second, as Adams and Sasse (1999) stated: Where is the dividing line between benign and intrusive when monitoring technologies are used in the workplace? These questions are of interest to researchers, developers and employees who might be exposed to this type of awareness technology, yet little research has been conducted to answer them.

CHAPTER 2

DEVELOPMENT OF A MODEL OF AWARENESS SYSTEM ACCEPTANCE

Past research has investigated the privacy implications of awareness monitoring. In addition to examining awareness system characteristics and privacy, the theoretical model presented below addresses other influences on acceptance; specifically, perceptions of fairness and usefulness. Next, the constructs making up the theoretical model are described.

When examining people's reactions to the use of new technologies, acceptance has often been conceptualized as three related variables: attitudes, intentions, and use (Saga & Zmud, 1994). First, attitudes represent a tendency that is expressed by evaluating an entity with a degree of favour or disfavour (Eagly & Chaiken, 1993). Second, attitudes inform intentions to engage in some behavior, which are defined as the subjective probability that one will perform the behavior (Fishbein & Azjen, 1975). Finally, use of a system emerges from attitudes and intentions to use the system.

Awareness system characteristics (such as the control over when one's video image is displayed) should represent key influences on acceptance. Although manipulating system characteristics will influence acceptance, the literature suggests a number of mediating variables that can potentially affect this relationship. Specifically, there is some evidence to suggest that perceptions of privacy (Eddy et al., 1999; Webster, 1998), fairness (Alge 1999; Ambrose & Alder, 2000), and usefulness (Davis et al., 1989) will influence acceptance of awareness systems.

When examining issues of privacy, a common theme is the idea of control. For instance, Stone and Stone (1990, p. 358) defined privacy as:

> a state or condition in which the individual has the capacity to (a) control the release and possible subsequent dissemination of information about him or herself, (b) regulate both the amount and nature of social interaction, (c) exclude or isolate him or herself from unwanted (auditory, visual, etc.) stimuli in an environment, and as a consequence, can (d) behave autonomously.

Perceptions of privacy, then, follow from an ability to control and regulate personal information. Indeed, privacy concerns represent one of the most consistent reactions to awareness systems (e.g., Lee et al., 1997).

Fairness, on the other hand, can be conceptualized as a subjective judgement of what is right and wrong with respect to outcomes, procedures and interactions (Tyler, Boeckman, Smith & Huo, 1997). Bies (1993) defines fairness as the extent to which individuals perceive the procedures that led to the decision as being just. Although both of these definitions of fairness imply that procedures used to make decisions influence perceptions of fairness, the former definition also includes both the fairness of the outcome itself and the quality of interpersonal treatment received from the decision maker as important determinants of fairness perceptions. A review of the fairness literature failed to uncover a general definition of fairness that did not include all or some of these determinants as central to the construct. Nonetheless, it has been well established that fairness plays a key role in determining reactions to organizational events (Ambrose & Alder, 2000). What is less well understood is the link between privacy and fairness in determining outcomes such as acceptance (Eddy, Stone, & Stone-Romero, 1999).

Research in technology acceptance also informs the model of awareness system acceptance. For instance, Davis et al. (1989) presented a model of user acceptance of

computer technology based on Fishbein and Azjen's (1975) theory of reasoned action (TRA), which specifies that behaviors often result from a combination of attitudes and intentions. Perceived usefulness of the computer technology is considered a main component of Davis et al.'s (1989) technology acceptance model (TAM) and is defined as the prospective user's subjective probability that using a specific technology will increase his or her job performance. According to these researchers, people form attitudes and intentions toward using computer technology based on a cognitive appraisal of how these systems will improve performance. Thus, it is proposed that the relationships between privacy, fairness, and acceptance might be mediated by the perceived usefulness of the awareness system. As shown in Figure 1, the model addresses the theoretical relationships among the characteristics of awareness systems and their effects on perceptions of privacy, fairness, usefulness, and acceptance of the awareness system. The numbers located on the paths in the model represent specific hypotheses linking the constructs in the model. Based upon a review of the literature, the justification for the theoretical model linking system characteristics, privacy, fairness, usefulness and acceptance of awareness systems is presented below.

System Characteristics

Researchers in the human-computer interaction (HCI) community have generally focused on modifying system characteristics in order to respect employees' privacy (e.g., Greenberg & Kuzuoka, 2000), whereas EPM researchers have typically emphasized modifying system characteristics in order to increase perceptions of fairness (e.g., Ambrose & Alder, 2000). Although the goals are different, the characteristics of both awareness and performance monitoring systems are quite similar. For example, Grant and

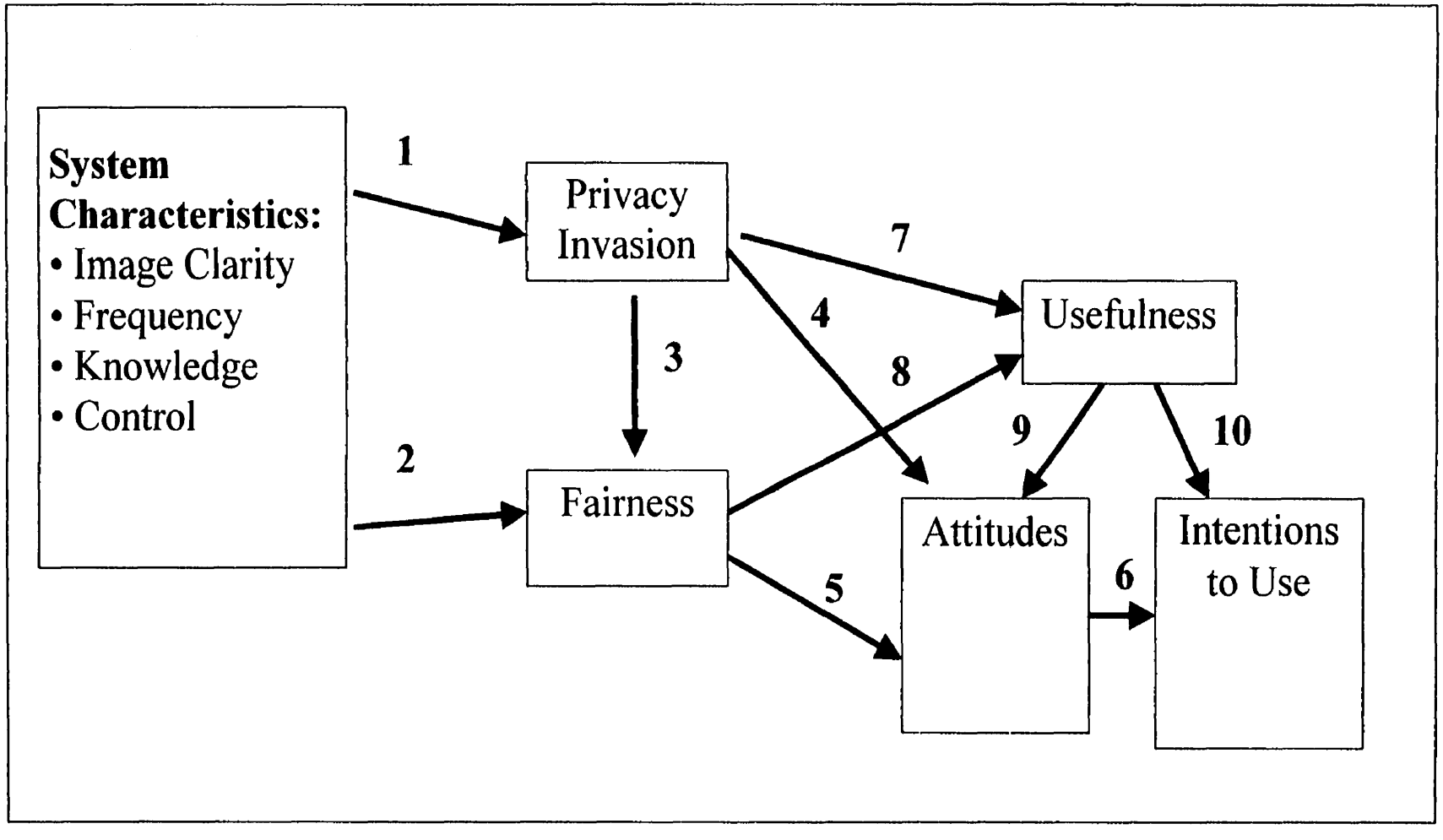


Figure 1: Theoretical Model of Awareness System Acceptance

Higgins (1989) proposed four key characteristics of EPM systems. They are: object (who is monitored), task (what activities are monitored), frequency (how often does monitoring occur) and recipient (who receives data from the monitoring). Carayon (1993) also proposed twelve important characteristics of EPM systems. Although many are relevant only to EPM, five dimensions build upon and extend those presented by Grant and Higgins (1991). The relevant dimensions of Carayon's model are: intensiveness (what is the amount of detail monitored), frequency (how often does the monitoring take place), continuousness (how constant is the monitoring), regularity (how predictable are the intervals between monitoring), and visibility (does the system give feedback to the employee or supervisor).

In integrating the relevant elements of both Grant and Higgins (1991) and Carayon's (1993) models, I chose to focus on four system characteristics that are commonly implemented in awareness systems (e.g., Lee et al., 1997) and relate closely to characteristics studied in EPM research (e.g., Grant & Higgins, 1991). More specifically, I propose that (a) image clarity, or the amount of awareness information presented to others (e.g., a blurred image to denote availability versus a clear image conveying both availability and details on activities), (b) frequency of image updating (such as the projection of continuous versus intermittent images), (c) knowledge of others' access to awareness information (i.e., the employees' ability to determine who is monitoring them), and (d) control (over when awareness information is made available to others), will affect perceptions of privacy and fairness.

System Characteristics and Privacy

Drawing on relevant research in the HCI literature, predictions related to the four manipulated system characteristics are presented below. First, image clarity (a blurred versus a clear image) will affect privacy because clear images are more invasive. In the case of a clear image, coworkers can not only determine others' availability but they can determine their actions or facial expressions. However, many HCI researchers have found that viewing actions or facial expressions can result in feelings of invasion of privacy (e.g., Lee et al., 1997). This has led HCI researchers to develop a variety of technical solutions such as filtering out inappropriate images that are captured on video (Coutaz, Berard, Carraux & Astier, 1999), blurring images (Lee et al., 1997), placing shadows over employees' images (Hudson & Smith, 1996), and masking images with pixels (Boyle, Edwards, & Greenberg, 2000).

Second, frequency of image updating (such as the projection of continuous versus intermittent images) also will relate to privacy. Similar to the rationale for blurred versus clear images, continuous video images provide more detailed information about employees' actions and thus present a higher potential for privacy invasion (Greenberg & Kuzuoka, 2000; Hudson & Smith, 1996). For this reason, systems such as Portholes only provide snapshots, rather than continuous images, of coworkers (Lee et al., 1997).

Third, when employees can determine who has monitored them, lower perceptions of privacy invasion will result. This is because the targets of information disclosure represent an important determinant of privacy (Stone & Stone, 1990). HCI researchers view employees' knowledge of who is receiving information about them as an important

principle of design (Bellotti & Sellen, 1993). For this reason, Portholes contains a "Lookback" option that allows employees to see who has been accessing their images.

Fourth, individual control over the collection and dissemination of personal information represents a critical construct in defining perceptions of privacy (Stone & Stone, 1990). For instance, Eddy et al. (1999) found that decision control over the disclosure of information from a human resources information system (HRIS) had a direct effect on perceptions of privacy. Similarly, HCI researchers view employees' control over the information they project to others as another important principle of design (Bellotti & Sellen, 1993). Therefore, to increase perceptions of privacy, researchers have designed user controls into awareness systems to allow employees to determine when their images are displayed to others, such as providing users with the option of turning off their awareness cameras (Hudson & Smith, 1996).

Summarizing these predictions relating system characteristics to privacy invasions, it is proposed that:

> Hypothesis 1: Perceptions of privacy invasion will be lower when system characteristics respect the individual more. More specifically, perceptions of privacy invasion will be lower when (a) the image is blurred, (b) the image is updated less frequently, (c) employees can determine who has monitored them, and (d) employees have more control over when their images are displayed.

System Characteristics and Fairness

In addition to affecting privacy perceptions, system characteristics may also influence perceptions of fairness. Some theorists have proposed that procedural and interactional justice might help to explain these effects (Ambrose & Alder, 2000; Bies,

1993; Kidwell & Bennett, 1994). Specifically, procedural justice, or the process by which outcomes are determined (Leventhal, 1980), and interactional justice, or interpersonal sensitivity (Cropanzano & Greenberg, 1997), will relate to perceptions of fairness. Research in a variety of settings has supported the effects of procedural and interactional justice rules on fairness (Ambrose & Alder, 2000). As proposed next, when awareness systems are designed such that both procedural and interactional justice are respected, employees will perceive these systems as being more fair.

First, image clarity (a blurred versus a clear image) relates to what is monitored, and thus the relevancy of the information collected. In the case of a clear image, coworkers can not only determine others' availability but they can determine their actions or facial expressions. However, knowing coworkers' facial expressions or actions may not be relevant to the determination of availability. Drawing on Leventhal's (1980) justice rules of accuracy (that is, relevance) and ethicality, Ambrose and Alder (2000), Bies (1993), and Kidwell and Bennett (1994) proposed that information that appears unrelated or indirectly related to the purpose at hand (low relevance) will decrease perceptions of fairness. Indeed, Alge (1999) found that participants who were exposed to EPM that gathered irrelevant performance data reported lower levels of perceived fairness.

Second, frequency of image updating (such as the projection of continuous versus intermittent images) relates to the intrusiveness or pervasiveness of the data gathering procedure (Aiello & Kolb, 1995). The intrusiveness of the data gathering procedure provides information to the employee regarding the dignity and respect accorded by the procedure, and thus its ethicality (Bies, 1993). As suggested by Ambrose and Alder (2000), too much monitoring can erode trust, implying low interpersonal sensitivity.

Interestingly, Niehoff and Moorman (1993) found that monitoring frequency enhanced employees' perceptions of fairness related to supervision and evaluation. However, no research has examined monitoring regularity (Stanton, 2000a) and in the context of awareness monitoring, when supervision and evaluation are not the main outcomes, it is expected that increased frequency of image updating will result in lower perceptions of fairness due to the pervasiveness of the data gathering procedure.

Third, knowledge of others' access to awareness information (i.e., the employees' ability to determine who is monitoring them) relates to the justice rule of ethicality (Leventhal, 1980). The ethicality rule dictates that procedures must be compatible with moral and ethical values. However, silent EPM, or being unaware of who is monitoring employees, is viewed as tantamount to spying (Picard, 1994). Therefore, if employees can find out who is monitoring them, they will perceive the awareness system as adhering to the ethicality rule. Additionally, this monitoring knowledge will relate to perceptions of interpersonal sensitivity (Cropanzano & Greenberg, 1997), because it provides information on the quality of treatment (courtesy, dignity, and respect) provided to the employee. This disclosure, or informing employees how frequently they are being monitored, has been critical to the success of EPM systems (Picard, 1994). For instance, Carayon (1993) found that when participants were aware of when they were being monitored, they reported feeling less stress. Further, Stanton and Barnes-Farrell (1996) found that participants who knew exactly when they were being monitored expressed higher feelings of personal control, and Stanton (2000b) found that monitoring consistency and monitoring control predicted fairness perceptions.

Fourth, control (over when awareness information is made available to others) should be consistent with the procedural justice criterion of decision control or voice (Thibaut & Walker, 1975). That is, when employees have the ability to control when their images are available to others, perceptions of voice, and thus fairness will result (Bies, 1993; Kidwell & Bennett, 1994). In support of this, Stanton and Barnes-Farrell (1996) found that participants who were able to delay or prevent EPM indicated higher feelings of personal control over those who could not control EPM, and Eddy et al. (1999) found that decision control over disclosure of information from an HRIS had a direct effect on perceptions of fairness.

Summarizing these predictions relating system characteristics to fairness, it is proposed that:

> Hypothesis 2: Perceptions of fairness will be higher when awareness system characteristics respect the individual. More specifically, perceptions of fairness will be higher when (a) the image is blurred, (b) the image is updated less frequently, (c) employees can determine who has monitored them, and (d) employees have more control over when their images are displayed.

Privacy and Fairness – What Comes First?

The explanations presented above for privacy and fairness imply that these constructs are distinct. However, although their literatures were initially developed separately, they turn out to be quite similar (Bies, 1993; Eddy et al., 1999). In fact, Bies (1993) has argued that "privacy becomes a procedural justice issue when people's moral expectations about control over their personal information are violated" (p. 72). For instance, when more personal information is released, employees will experience higher

privacy invasions (Kidwell & Bennett, 1994), and higher privacy invasions will be perceived as less fair (Ambrose & Alder, 2000). Further, correlations between privacy and fairness have been moderate to high (Eddy et al., 1999). This has led Bies (1993) and Eddy et al. (1999) to call for increased examination of these concepts as related constructs.

Responding to this call, researchers are now beginning to recognize that privacy and fairness together play a role in determining reactions to organizational policies and outcomes. For example, Alge (1999) examined organizational privacy in the context of EPM and found that perceptions of privacy invasion were related to procedural fairness judgements. Furthermore, Eddy et al. (1999) found that the ability to authorize disclosure of HRIS information and knowledge of the target of disclosure affected both privacy and fairness perceptions. These researchers concluded that privacy could be conceptualized as an antecedent to fairness. In doing so, they acknowledged that the two constructs are highly related. However, they pointed to theoretical and factor analytical evidence to show that privacy and fairness are conceptually and empirically distinct. Thus, this research suggests that privacy partially mediates the relationship between system characteristics and perceptions of fairness, and it is proposed that:

> Hypothesis 3: Employees who perceive the awareness system as respecting their privacy will be more likely to perceive the awareness system as fair.

From Privacy and Fairness to Acceptance

Ambrose and Alder (2000) argued that when organizations utilize monitoring systems that lead to perceptions of fairness, employees will respond more positively to these systems. Similarly, Kidwell and Bennett (1994) proposed that when monitoring

systems respect procedural justice, employees will be more satisfied, and Eddy et al. (1999) suggested that when systems are less invasive, greater acceptance will result. As stated earlier, results from a number of studies examining reactions to information systems that collect personal data suggest that perceptions of privacy and fairness do have an impact on attitudes (e.g., Stanton & Barnes-Farrell, 1996; Webster, 1998). Accordingly, individuals who perceive that the awareness system upholds privacy and fairness will hold more positive attitudes toward the awareness system. As such, the following hypotheses are presented:

Hypothesis 4: Employees who experience lower perceptions of privacy invasion will be more likely to exhibit more positive attitudes toward the system.

Hypothesis 5: Employees who experience greater perceptions of fairness will be more likely to exhibit more positive attitudes toward the system.

Fishbein and Azjen's (1975) well-supported Theory of Reasoned Action (e.g., Fisher, Fisher & Rye, 1995) suggests that behaviour stems from a behavioural intention, which is in itself the consequence of considering one's attitude toward the behaviour (Fazio & Towles-Schwen, 1999). In other words, attitudes are viewed as a major determinant of a person's intention to perform a behavior. Thus, based on TRA, it is hypothesized that:

Hypothesis 6: Employees who exhibit more positive attitudes will endorse stronger intentions to use the awareness system.

Usefulness as a Mediator of Privacy and Fairness

As stated earlier, Davis et al.'s (1989) TAM model suggests that people form intentions toward using computer systems based on a cognitive appraisal of how these

systems will improve their performance. For instance, Davis et al. (1989) examined people's perceptions of a software program using the TAM model and found that perceived usefulness of the software was a major determinant of intentions to use the program. Subsequent research has continued to support the TAM model (e.g., Adams, Nelson & Todd, 1992).

The TAM model positions perceived usefulness of the software as a mediator in the relationship between external variables such as beliefs, and both attitudes and intentions. Beliefs represent the information one has about some object (Fishbein & Azjen, 1975). In the context of this research, fairness and privacy perceptions can be construed as beliefs about the awareness system. That is, perceptions of usefulness might be influenced by beliefs about the fairness and privacy of the awareness system. For example, if I do not believe that the awareness system respects my privacy, I might be less inclined to acknowledge its usefulness in accomplishing my job tasks. Thus, consistent with TAM, it is proposed that the perceived usefulness of an awareness system will act as a mediator between both fairness and privacy and acceptance. No empirical research has examined the effects of privacy and fairness on usefulness, but based on TAM, it seems reasonable to propose that:

Hypothesis 7: Those who experience lower perceptions of privacy invasion will perceive the awareness system to be more useful for awareness.

Hypothesis 8: Those who experience greater perceptions of fairness will perceive the awareness system to be more useful for awareness.

Additionally, as described above, higher perceptions of usefulness will result in more positive attitudes and intentions to use the awareness system. The following two hypotheses reflect these relationships:

Hypothesis 9: Employees who perceive the awareness system as more useful will hold more positive attitudes toward the awareness system.

Hypothesis 10: Employees who perceive the awareness system as more useful will endorse greater intentions to use the awareness system.

If You Build It, Will They Come?

This investigation has been focused on the effects of system characteristics, privacy, fairness, and usefulness on acceptance of awareness systems. Another important question to address is – will people actually want to work for an organization that uses awareness monitoring systems? In other words, if fairness and privacy are respected, will people be more willing to express their desire to work for that organization? This is explored as a research question:

Research Question 1: Will intentions to work for an organization be positively related to perceptions of fairness and privacy?

CHAPTER 3

A STUDY EXAMINING THE INFLUENCE OF SYSTEM CHARACTERISTICS ON PERCEPTIONS OF PRIVACY, FAIRNESS, USEFULNESS AND AWARENESS SYSTEM ACCEPTANCE

The primary goal of this first study was to examine the model of awareness system acceptance presented in Figure 1. Prior to conducting this first study, two pretest studies were carried out to provide a preliminary analysis of the constructs under investigation and to refine the measures of privacy, fairness, usefulness and acceptance. In the first pretest study, twenty-six employees from a large federal government department each received a description of one version of an awareness system and were asked to complete items measuring the variables of interest. The second pretest study employed a policy capturing methodology in which multiple scenarios were presented, each manipulating the attributes of interest. Six participants (distributed employees working for a small software technology firm) responded to sixteen different scenarios, each reflecting one version of an awareness monitoring system. Participants were asked to complete single-item indicators for all of the variables of interest for each version. Based on the analysis of the pretest data, minor modifications were made to the description of the awareness system and to the wording of the measures to enhance clarity and understanding.

Method

In order to examine the hypotheses and research question in Study 1, a scenario design was utilized. Scenario designs allow for the collection of data from a large number of participants while still manipulating independent variables. In other words, scenario designs combine experimental control with surveys. Specifically, each participant was

presented with a survey "packet" that contained the description for one experimental condition. The experimental conditions were created by controlling the description of the four system characteristics (which were high or low on each characteristic). Each characteristic was designed to respect or violate perceptions of fairness and privacy, respectively. Thus, sixteen different versions of the survey were created to reflect all the combinations of the four independent variables (see Appendix A for an example of two of these conditions).

Before presenting the system characteristics, the survey packet provided participants with a (roughly two-page) description of a hypothetical position (as a customer service agent working from home) and the technology available to support that position. Included in the description were illustrations of awareness systems that included several images displaying possible features of awareness systems. This description emphasized the features of the system and explained how the technology could be used to aid in collaborative work. For instance, it stated that:

> *This awareness system allows your colleagues to access their networked computers to see your image during the workday. This will allow them to determine your presence or absence at your workstation and whether you appear to be busy (e.g., talking on the phone, meeting with someone else). Similarly, you can view your colleagues' images to see their availability. The awareness system will run in the "background" all the time. That is, you or your colleagues may not be accessing it at any point in time, but it will always be there.*
>
> *The idea behind video awareness systems is that if your colleagues can view your image, they will have a better idea of whether you are present to answer*

a question or to collaborate on a task. Similarly, you will be able to view your colleagues' images to determine their availability. This system will not be used by management to monitor your performance; rather, it can be used by you and your coworkers to aid in collaboration.

A two-page questionnaire was included at the end of the survey packet to measure the variables of interest (see Appendix B).

Participants

Six hundred and sixty-four university students enrolled in two introductory Psychology courses volunteered to participate. Participants received credit for completing the questionnaire as part of a larger survey distributed in the middle of the term that included scales from a number of different researchers. Average age for the participants was 19.42 years (SD = 2.11). Females comprised 65.8% of the sample. A majority of the sample was in their first year of university (85.8%, SD = .63) and 42.3% of the sample was enrolled in the co-operative education program.

Procedure

Each participant was handed a validation booklet, which contained one of the 16 versions of the awareness system survey described below. Completed surveys were collected in class one week after distribution.

Measures

Items were included to assess fairness, privacy, usefulness of the system, attitudes, intentions to use the system, and intentions to work for the organization. Manipulation check items were included to assess the manipulation of the system characteristics. Participants responded on 7-point Likert-type scales for all items, except for those

measuring intentions to use the awareness system assessed on a dichotomous (use/not use) scale. As described below, the scale items, presented in random order, included both positively and negatively-keyed response anchors.

Independent Variables and Manipulation Check Items

The manipulation of the study's independent variables occurred through the description of the characteristics of the awareness system. Each independent variable was coded as 1 or 0 to represent whether the variable was expected to respect or violate perceptions of privacy and fairness (e.g., in Appendix A, all system variables were coded as 1 in the first example and 0 in the second example).

Participants responded to items designed to ensure that the manipulations were successful. For example, the item "To what extent do you feel that you would have an opportunity to control the awareness system?", ranging from "No Opportunity" (1) to "Full Opportunity" (7), captured the system characteristic of "Control."

Invasion of Privacy Perceptions

Three items adapted from Alge (1999) were used to assess perceptions of privacy invasion such as, "To what extent do you feel that this awareness system would result in an invasion of your privacy?", ranging from "Definitely Not an Invasion" (1) to "Definitely an Invasion" (7). For this measure, the higher the score, the greater the perceived invasion of privacy. Coefficient alpha for these items was .82 and the items were collapsed to create an average measure of privacy invasion perceptions.

Fairness Perceptions

Four items to assess fairness were adapted from Alge (1999), such as "Do you feel that this awareness system would be fair?", ranging from "Not at all Fair" (1) to

"Extremely Fair" (7). Internal consistency for these four items was .89 and the items were collapsed to create an average measure of fairness.

Acceptance

Acceptance was measured using items assessing attitudes toward the awareness system and intentions to use the awareness system. Three attitude items such as: "What would be your attitude toward the use of this awareness system?", ranging from "Extremely Negative" (1) to "Extremely Positive" (7), were adapted from Davis et al. (1989) following guidelines for generating scale items outlined in Arnold and Feldman (1981). The items displayed a coefficient alpha of .92 and were averaged into a composite measure of attitude.

Two items were created to assess intentions to use the awareness system[1]. The first item asked participants to rate whether they would be willing to check a colleague's image to determine availability or preferred to use the phone or e-mail to determine availability. The second item asked if they would rather a colleague checked their image using the awareness system to determine availability or if they would rather the colleague contacted them via the phone or e-mail. Participants responded by choosing between two options which were coded as 0 = not use and 1 = use. Internal consistency for these items was .76 and the items were collapsed to create an average measure of intentions to use the awareness system.

[1] Three items rated on a 7-point Likert-type scale measuring intentions to use the awareness system were also included in the survey. However, due to their high correlation with items measuring attitudes ($\beta = .87$), these items were dropped from the analysis in favour of the two items measuring intentions on a dichotomous scale.

Usefulness

Perceived usefulness of the awareness system was assessed with three items, two of which were adapted from Davis et al. (1989). The new item stated: "Do you feel that this awareness system would be more useful than phone, e-mail or fax in determining availability?", ranging from "Definitely Less Useful" (1) to "Definitely More Useful" (7). Coefficient alpha for these items was .78 and the items were collapsed into a composite measure of usefulness.

Intentions to Work for the Organization

A single item assessed participants' intentions to work for the organization. The item was worded as follows: "How likely is it that you would want to work for this organization?", ranging from "Not at all Likely" (1) to "Extremely Likely" (7).

Analytical Strategy

Given that there are multiple relationships between the dependent, mediating and independent variables presented in Figure 1, structural equation modeling (SEM) appeared to be the most appropriate method of testing the model of awareness system acceptance. SEM allows for an evaluation of mediating models, and examines the overall fit of the data to the hypothesized model. Furthermore, SEM provides advantages over traditional regression techniques because it takes measurement unreliability into account when estimating the relationships among variables (Maruyama & McGarvey, 1980).

Hypotheses 1 through 10 were tested with SEM using AMOS (Arbuckle & Wothke, 1999). Before conducting the analysis, I created composites for multi-item indicators (that is, single item latent variables: SILV's) that compensate for difficulties in fitting models with a large number of variables but still account for unreliability of

measurement (Landis, Beal & Tesluk, 2000). Specifically, the beta matrix was a full matrix estimating paths between SILV's. Any imperfect measurement of the latent constructs was accounted for by fixing the error terms of the measures to VarT (1-alpha), where Var T = the variance of the measure, and by fixing the weighting of the indicators to 1 (Frone, 1998). This tells the SEM program the proportion of systematic variance in the measure, thereby permitting a disattenuated estimate of the relationships among the latent variables. Although this method might appear to be similar to path analysis, it is not. Unlike path analysis, this method takes unreliability of measurement into account and offers the benefits of SEM using composite measures (e.g., Landis et al. 2000).

To evaluate the fit of the model, chi-square, goodness of fit indices, and RMSEA (root mean square error of approximation), a measure of model adequacy based on the population discrepancy (Arbuckle & Wothke, 1999), were included. According to Hair, Anderson, Tatham, and Black (1995), goodness of fit indices of greater than .90 and RMSEA indices of less than .08 indicate a good model fit.

When using SEM, sample sizes larger than 400 are considered to be too sensitive in detecting differences (Hair et al., 1995). As such, I also employed a bootstrapping technique (Yung & Bentler, 1996) to test this dataset. Bootstrapping creates a new estimate of the sampling distribution by recalculating estimates based on selected iterations of the sample population. In other words, bootstrapping continuously samples with replacement for the entire sample and thus serves to approximate a cross-validation in a single sample. Finally, multiple regression was used to assess the relationship between intentions to work for the organization and fairness and privacy perceptions (Research Question 1).

Results

Descriptive statistics and correlations among the variables in Study 1 are presented in Table 1.

Manipulation Checks

ANOVA's were performed to assess the effectiveness of the system characteristic manipulations. The results indicated that the image clarity manipulation was not successful. However, participants were able to distinguish differences in the accuracy of the frequency characteristic in determining presence, F (1, 662) = 12.36, $p < .001$[2]. A marginally significant relationship was found between the system characteristic of knowledge and control over image dissemination, F (1, 662) = 3.22, $p = .07$. Furthermore, there were between-condition differences in the system characteristic of control and its manipulation check item, F (1, 660) = 7.66, $p = .006$ indicating that participants distinguished when they had control over the dissemination of images through the awareness system.[3]

Model Testing

Hypotheses 1 and 2 suggested that system characteristics designed to respect privacy and fairness would be negatively related to perceptions of privacy invasion and positively related to perceptions of fairness. Before examining these specific hypotheses,

---

[2] It was proposed that frequency of image capture would be related to perceptions of ethicality. Although this was not found, the relationship with accuracy makes sense. An intermittent image capture is less accurate in presenting availability information.

[3] Interestingly, the system characteristic of control was also related to an item assessing the amount of dignity and respect offered by the awareness system, F (1, 657) = 6.93, $p = .009$. In retrospect, this too makes sense. Having control over when and if one's image is captured could be considered as reflecting the amount of respect offered by the system. Overall, while there was not a one-to-one correspondence between some of the manipulation check items thought to be related to the system characteristics, results did indicate significant differences across conditions.

Table 1: Descriptive Statistics and Zero-Order Correlations Among Study 1 Variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Image Clarity	.50	.50	---								
2. Frequency of Image Updating	.43	.50	-.01	---							
3. Knowledge of Monitoring	.56	.50	.02	.01	---						
4. Control over Monitoring	.57	.50	.04	.02	-.03	---					
5. Fairness	3.63	1.31	.01	.02	.12**	.15***	(.89)				
6. Privacy Invasion	4.83	1.26	-.02	-.08*	-.08*	-.11**	-.62***	(.84)			
7. Attitude	3.10	1.38	.05	.08*	.08*	.05	.75***	-.60***	(.91)		
8. Intent to Use	.33	.42	.02	.02	.02	.09*	.53***	-.41***	.55***	(.76)	
9. Usefulness	3.97	1.34	.03	-.15**	.02	-.02	.58***	-.31***	.63***	.51***	(.77)

Note: Numbers in parentheses are Cronbach's alpha estimates of internal consistency reliability. Means for independent variables (variables 1-4) represent the mean level for each independent variable (e.g., 1 for high, 0 for low).

*p <.05, **p <.01, ***p <.001 (two-tailed)

it is important to note that the SEM analysis of the model presented in Figure 1 revealed strong support for the theoretical model of awareness system acceptance. The model exhibited a very high degree of fit with the data, χ^2 (19, $\underline{N}$ = 664) = 40.69, $\underline{p}$ = .003; GFI = .987, AGFI = .968, RMSEA = .041[4]. Figure 2 presents the path coefficients for the model. The hypotheses were tested by examining the significance of the standardized path coefficients as shown in Figure 2.

Hypothesis 1 predicted that perceptions of privacy would be lower when system characteristics respect the individual more. This hypothesis is partially supported by a significant relationship between frequency and perceptions of privacy invasion (β = -.09, $\underline{p}$ < .05) such that intermittent image updating is seen as less invasive to privacy than continuous image capture by the awareness system. Furthermore, having knowledge of who is using the awareness system to determine availability is perceived as less of an invasion of privacy than not having this knowledge (β = -.09, $\underline{p}$ < .05). Finally, having control over when and if an image is captured and transmitted is perceived as less of an invasion of privacy than not having control over image capture and dissemination (β = -.13, $\underline{p}$ < .05).

Hypothesis 2 examined the relationship between the system characteristics and perceptions of fairness. Here, only one path, from frequency of image capture to fairness, reached significance (β = .10, $\underline{p}$ < .05). In other words, participants perceived intermittent

[4] The model in Figure 1 was also compared to a saturated model, which included both direct and indirect paths to every variable in the model and a second model which tested the hypothesis that privacy fully mediated the relationships between system characteristics and fairness (full-mediation model). The model in Figure 1 was found to fit significantly better than either the saturated or full-mediation model.

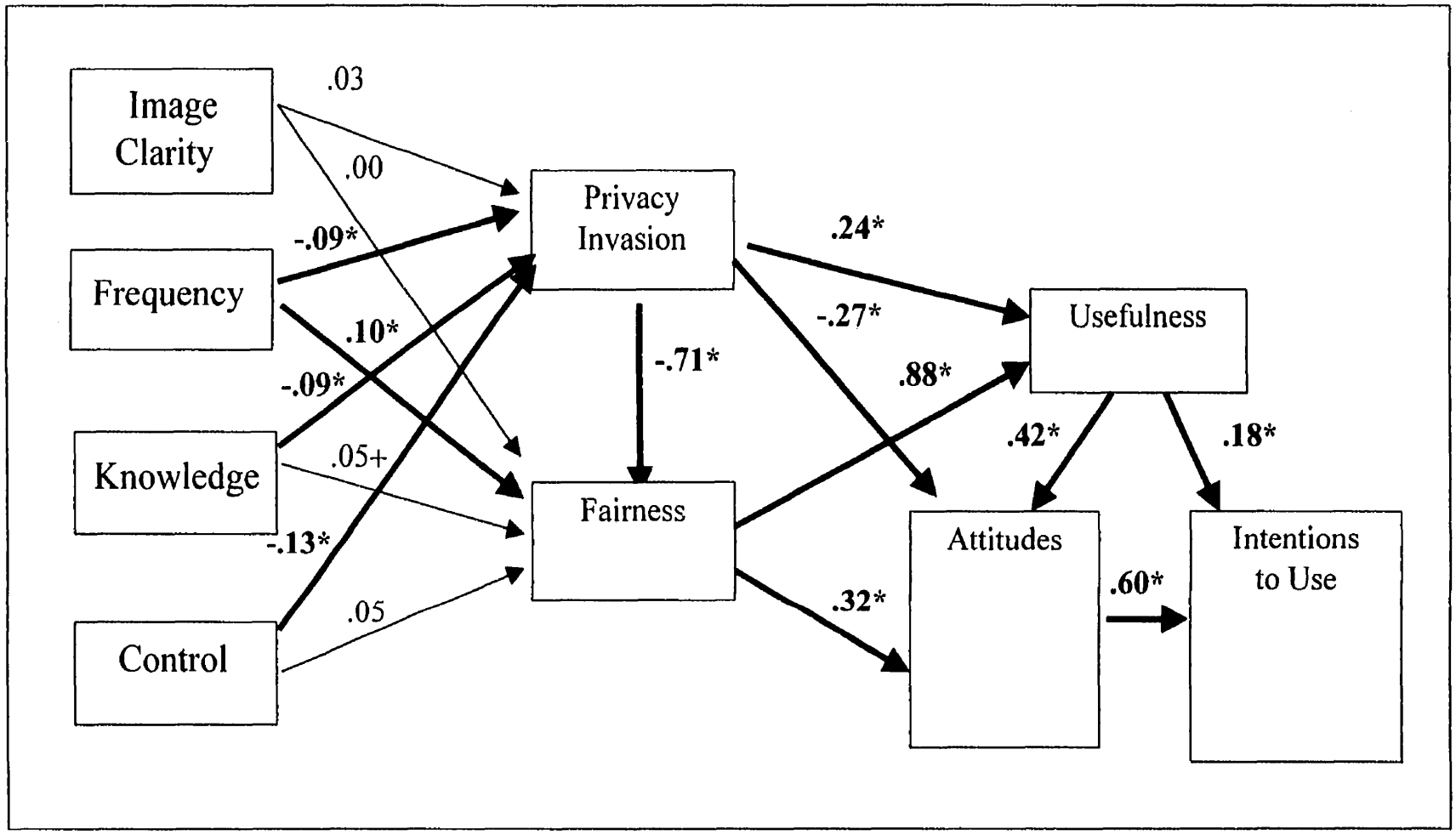


Figure 2: Results from the analysis of the theoretical model – Study 1

Note: + $p < .10$, * $p < .05$

image capture to be more fair than continuous image capture. Knowledge of who is using the awareness system did influence perceptions of fairness but the relationship was significant at the one-tailed level only ($\beta = .05$, $p < .10$). Thus, hypothesis 2 received partial support.

As expected, there was a strong relationship between perceptions of privacy invasion and perceptions of fairness. Hypothesis 3, which predicted that individuals who perceive the awareness system as more likely to invade their privacy would be less likely to perceive the awareness system as fair, was supported ($\beta = -.71$, $p < .05$).

Turning to acceptance of awareness systems, hypothesis 4, which suggested that higher perceptions of privacy invasion would be related to less positive attitudes toward the awareness system, was supported ($\beta = -.27$, $p < .05$). Greater perceptions of fairness were found to be related to more positive attitudes toward the awareness system ($\beta = .32$, $p < .05$), thus supporting hypothesis 5.

Hypothesis 6 addressed the first element of the Theory of Reasoned Action model. It was hypothesized that more positive attitudes toward the awareness system would be related to stronger intentions to use the awareness system. Indeed, hypothesis 6 was supported. Participants who expressed more positive attitudes endorsed greater intentions to use the awareness system ($\beta = .60$, $p < .05$).

Contrary to hypothesis 7, which predicted that lower perceptions of privacy invasion would be related to greater perceptions of the usefulness of the awareness system, greater perceptions of privacy invasion were related to higher perceptions of system usefulness ($\beta = .24$, $p < .05$). Interestingly, this positive relationship from perception of privacy invasion to usefulness suggests that participants perceive the more

invasive characteristics of the awareness system as more useful in determining availability. However, as predicted in hypothesis 8, greater perceptions of fairness were related to higher perceptions of system usefulness ($\beta = .88$, $p < .05$).

Hypotheses 9 and 10 examined the relationship between perceptions of usefulness, attitudes and intentions to use the awareness system. Both of these hypotheses received support. Participants who perceived the awareness system to be useful endorsed more positive attitudes ($\beta = .42$, $p < .05$) and greater intentions to use the awareness system ($\beta = .18$, $p < .05$).

Finally, it was hypothesized that intentions to work for an organization that uses such an awareness system would be influenced by perceptions of fairness and privacy. Results indicated that both fairness and privacy predicted a significant amount of variance in intentions to work for the organization, $R^2 = .437$, $\beta = .648$, $p < .001$, $\beta = -.167$, $p < .001$ for fairness and privacy, respectively. These findings support research question 1.

Discussion of Results

The primary goal of Study 1 was to examine a model of awareness system acceptance to determine if manipulating awareness system characteristics would enhance perceptions of privacy, fairness and ultimately acceptance. Overall, the results suggest that the hypothesized model fits the data well and offers a better fit to the data than alternate models of awareness system acceptance. Some system characteristics influence perceptions of privacy and fairness and privacy and fairness perceptions are related to acceptance of awareness monitoring systems. Furthermore, the perceived usefulness of the technology is related to attitudes and intentions to use an awareness monitoring system.

At first glance, this study appears to offer some answers on how to increase acceptance. By manipulating the characteristics of an awareness system, the results suggest that respecting privacy and fairness is related to attitudes toward the awareness system and intentions to use the awareness system. However, these findings do not tell the whole story.

Examining the individual relationships among the study variables reveals that manipulations to the system characteristics exerted small overall effects on perceptions of privacy and fairness. Although people acknowledge and respond differentially to some system characteristics that respect or violate perceptions of privacy and fairness, it appears that modifying system characteristics to enhance perceptions of privacy and fairness are not sufficient to ensure acceptance. However, it could be the case that a combination of system characteristics (across the four independent variables) might have greater effects on privacy and fairness that the characteristics examined independently.

To examine this possibility further, I conducted a post-hoc analysis on privacy and fairness perceptions, comparing the condition representing the least amount of respect for individuals (coded as "0"; the second example in Appendix A) to the condition representing the greatest amount of respect for individuals (coded as "1"; the first example in Appendix A). Results demonstrated much stronger beta coefficients for overall system characteristics than for individual characteristics ($\beta = -.308$, $p = .004$; $\beta = .244$, $p = .023$ for privacy and fairness, respectively). Furthermore, significant mean differences in perceptions of privacy invasion for the most respectful ($M = 4.84$) compared to the least respectful characteristics ($M = 5.42$, $t = 2.06$, $p = .04$) and fairness perceptions ($M = 4.05$) for the most respectful characteristics compared to the least respectful characteristics ($M = 3.10$, $t = 2.97$, $p = .004$) suggest that manipulating the characteristics can result in higher perceptions of privacy and fairness. However, an examination of the means, though significantly different, demonstrates small changes in perceptions. Indeed, the mean differences represent only a slight decline in perceptions of privacy invasion and a slight increase in fairness perceptions for the most respectful system characteristics.

Furthermore, this same pattern is revealed when examining attitudes toward the awareness system. Participants expressed a very negative attitude toward an awareness system when the system characteristics were least respectful ($M = 2.77$). This attitude was only slightly less negative for participants who were exposed to system characteristics that were most respectful ($M = 3.48$). What this suggests is that manipulating the characteristics of the technology to respect privacy and fairness is necessary, but not sufficient to ensure acceptance.

The results also demonstrate that perceptions of privacy invasion are related to perceptions of fairness. In this case, there was a strong relationship between these two variables. Recalling that both Alge (1999) and Eddy et al. (1999) found similarly strong relationships between privacy and fairness, I conducted a confirmatory factor analysis to assess the distinctiveness of the two constructs. I combined the constructs of fairness and privacy invasion into single factor and compared this to correlated and uncorrelated two-factor models. As expected, the relationship between privacy and fairness was quite high ($\beta = -.71$) in the correlated model. However, the results of this analysis suggested that, as in previous research, this two-factor correlated model exhibited a much higher degree of fit with the data (χ^2 (13, $\underline{N}$ = 664) = 60.591, $\underline{p}$ <.001; GFI = .975, AGFI = .946, RMSEA = .07) than a one-factor model (χ^2 (14, $\underline{N}$ = 664) = 420.148, $\underline{p}$ <.001; GFI = .829, AGFI = .657, RMSEA = .209) or a two-factor uncorrelated model (χ^2 (14, $\underline{N}$ = 664) = 386.449, $\underline{p}$ <.001; GFI = .829, AGFI = .763, RMSEA = .20). Thus, privacy and fairness were kept as separate constructs in the model.

Support for Davis et al.'s (1989) Technology Acceptance Model is more equivocal. Although perceptions of usefulness are related to attitudes and intentions to use the technology, an unexpected but nonetheless interesting pattern emerged from the data. The relationship between privacy and usefulness was contrary to what was hypothesized. Rather than higher perceptions of privacy invasion being related to lower perceptions of usefulness, participants indicated that the more invasive features of the system make the technology appear more useful in determining availability. Yet, even though participants viewed the more invasive features of the technology as more useful, greater perceptions of privacy invasion were negatively related to attitudes toward the technology. In other

words, people recognize that the technology is useful but do not endorse positive attitudes toward the technology. As well, the relationship between perceptions of fairness and usefulness was quite high, prompting a concern about the distinctiveness of the two constructs[5].

Finally, organizations contemplating the use of such awareness technologies must be aware of the implications if privacy and fairness are not respected. Perceptions of both privacy and fairness influence people's willingness to work for an organization that uses awareness system technology. This is of serious concern in a tight labour market.

Contributions and Limitations

The goal of this first study was to begin to extend the analysis of awareness system acceptance beyond privacy alone in an effort to understand the relationships between system characteristics, privacy, fairness and usefulness. Related to this goal was an attempt to examine how privacy and fairness work together in determining acceptance. In broadening our understanding of these psychological constructs, the results of the first study lend support to the belief that enhancing perceptions of privacy and fairness is related to increased acceptance. However, this study was subject to several limitations, which suggested areas for future research. First, this study used university students and generalizing the findings beyond this sample is critical in establishing the merits of the findings. Second, I speculated that the one-page description of the awareness system

[5] To address this concern, I conducted a confirmatory factor analysis to test for the distinctiveness of fairness and usefulness and found that the two-factor correlated model, though revealing a significant relationship between fairness and usefulness, ($\beta = .69$; χ^2 (13, $N = 664$) = 51.676, $p < .001$; GFI = .978, AGFI = .952, RMSEA = .06) displayed a greater degree of fit with the data that either a one factor (χ^2 (14, $N = 664$) = 299.33, $p < .001$; GFI = .875, AGFI = .751, RMSEA = .17) or a two-factor uncorrelated model (χ^2 (14, $N = 664$) = 338.201, $p < .001$; GFI = .892, AGFI = .785, RMSEA = .18). As a result, fairness and usefulness were kept as two separate constructs in the model.

might have acted, in essence, as a justification for the use of the system. This might have occurred because all respondents read a statement explaining that the purpose of the system was to help in the accomplishment of job tasks and not to monitor their work or behaviours. Researchers have suggested that justifications for monitoring systems affect reactions to these systems (Ambrose & Alder, 2000; Stanton, 2000a), and it might be possible that the results were influenced by including this justification. As well, the role of usefulness in mediating the relationship between privacy and acceptance and fairness and acceptance was unclear and warranted further investigation. Finally, the "image clarity" characteristic did not influence privacy or fairness perceptions, and did not relate to its manipulation check variable. It might be that the description was not strong enough and needed to be revised. These limitations provided the motivation for conducting a second study examining reactions to awareness monitoring systems.

CHAPTER 4

A RE-EXAMINATION OF THE MODEL OF AWARENESS SYSTEM ACCEPTANCE

Study 1 highlighted the importance of perceptions of privacy and fairness in enhancing acceptance of awareness monitoring technologies. However, this second study was conducted to address some of the limitations in Study 1 and to expand the examination of attitudes toward and acceptance of awareness monitoring. Specifically, there were four main goals for this second study. First, it was necessary to enhance the generalizability of the results by examining employee reactions to awareness monitoring systems. Second, the model needed to be re-framed to include justifications for how and why the awareness system was being used. Third, it was necessary to re-examine the role of usefulness perceptions in mediating the relationships between privacy, fairness and acceptance. Finally, the description of the "image clarity" system characteristic manipulation needed to be made clearer to participants.

Generalizability of the Model

Study 1 was conducted with a large sample of university students. To enhance the generalizability of the results, a sample of organizational employees was sought to participate in Study 2. Multiple attempts to find an organization that would allow me to conduct this study proved fruitless. All of the organizational members approached for participation in the study expressed concern over exposing their employees to the mere idea that this type of technology might be implemented in their organization. Though telling, these reactions led to a search for an alternate sample. Fortunately, the University of Waterloo Alumni office agreed to solicit the participation of alumni. Indeed, this

alumni sample enhanced the generalizability of the results far more than if the sample was limited to one organization because the sample reflected a diverse cross-section of people working in a variety of different industries and occupations.

Including Justifications in the Model

In addition to exploring system characteristics, organizational contextual variables may also affect perceptions of monitoring systems (Stanton, 2000a). More specifically, I examined the effects of justifications, that is, explanations for the awareness system, on perceptions of fairness. The literatures on means and ends justifications (e.g., Bobocel, McCline & Folger, 1997; Cropanzano & Greenberg, 1997) and on EPM (e.g., Ambrose & Alder, 2000; Stanton, 2000a, 2000b) provide support for examining justifications.

Although most previous research does not distinguish between means and ends justifications, Bobocel et al. (1997) suggested that the adequacy of explanations of organizational policies might be influenced by these different justifications. Specifically, these researchers suggest that legitimizing the means, or how the goals were decided on and implemented, might have different implications for employee attitudes than would legitimizing the ends or goals of an organizational activity. Turning to fairness beliefs, it is plausible that explanations for how (means) and why (ends) monitoring will occur will have an effect on employee responses (Ambrose & Alder, 2000). For example, Ambrose and Alder (2000), Kidwell and Bennett (1994), and Stanton (2000a) suggested that employee participation in system design, or the means by which the decisions were made to use a monitoring system, would influence attitudes because employees would have input into the process. Furthermore, Ambrose and Alder (2000) and Stanton (2000a) suggested that the explanations offered for the purposes of monitoring techniques, or

justification of the ends, would also influence attitudes. These explanations would serve as evidence that the organization had a legitimate reason for implementing the system (Ambrose & Alder, 2000). Support for justifications is provided by Stanton (2000b), who reported higher perceptions of monitoring fairness when participants were offered justifications for the monitoring activities. Thus, it is proposed that perceptions of fairness will be higher when employees receive a justification for the means in which the decisions were made to implement the awareness system, and when employees receive a justification for the ends, or how the awareness system will be used (see Figure 3). Accordingly, it is hypothesized that:

Hypothesis 11: Perceptions of fairness will be higher when employees are offered (a) means and (b) ends justifications for the use of awareness system.

Re-examining Usefulness as a Mediator

In Study 1, usefulness was examined as a mediator in the relationship between privacy, fairness and acceptance. The results indicated that usefulness partially mediated the relationship between fairness and acceptance, such that participants who believed that the awareness system was fair were inclined to endorse more positive attitudes because they found the awareness system to be useful. However, the opposite relationship was found with privacy. Participants who perceived the awareness system to be invasive expressed more negative attitudes despite the fact that participants perceived the more invasive features of the system to be more useful. What this suggests is that people might be willing to accept a system even if it is acknowledged that the system invades their privacy if it helps them accomplish their jobs. Or, more simply, when the system is perceived as useful, perceptions of privacy invasion might be less important. In the

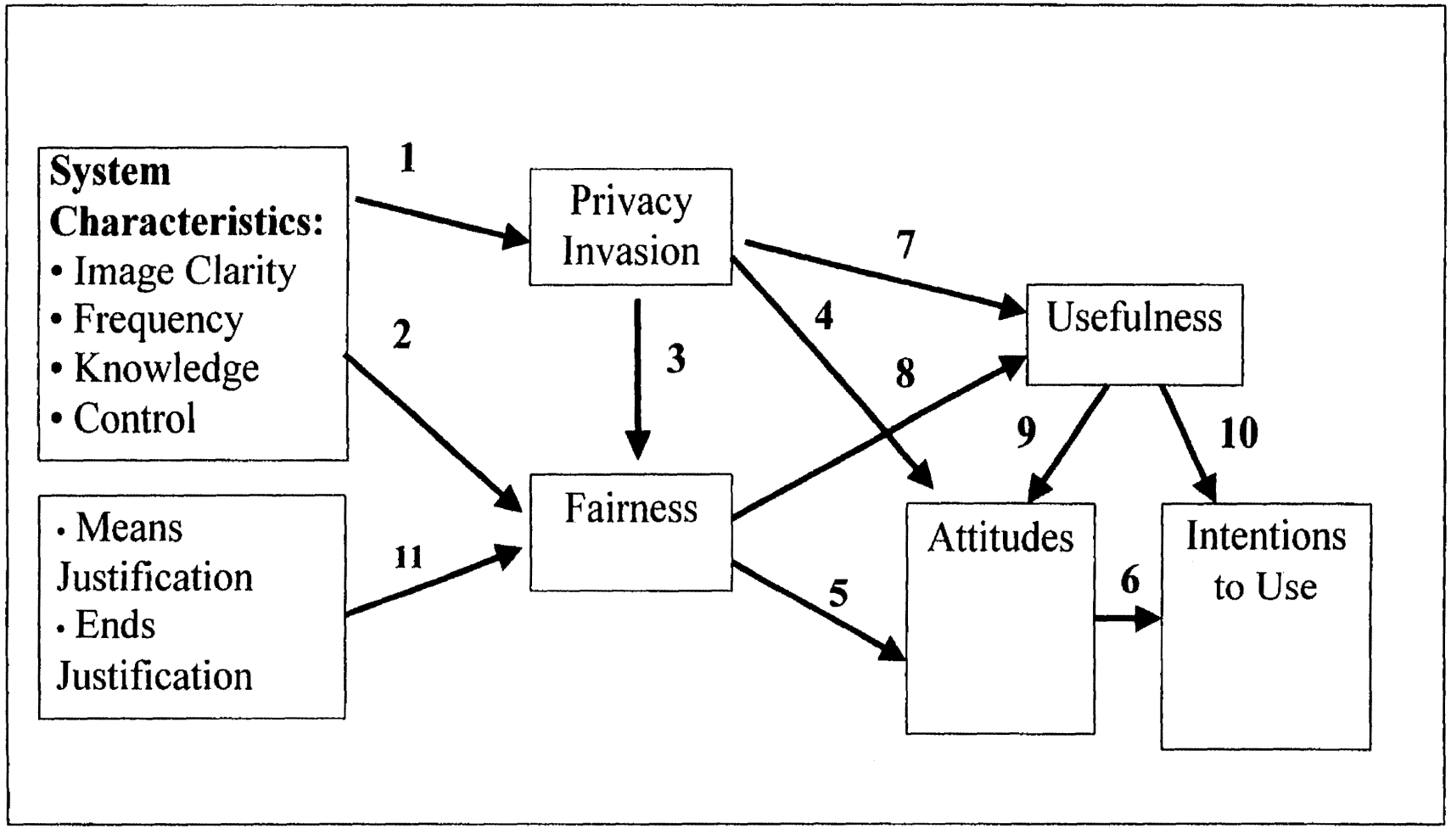


Figure 3: Theoretical Model of Awareness System Acceptance with Usefulness as a Mediator – Study 2

context of awareness systems, the more invasive features of the system are more useful in determining availability of colleagues. This relationship might also hold true for fairness such that higher perceptions of fairness will be more strongly related to positive attitudes when the system is not perceived as useful. Both of these relationships imply a moderating rather than a mediating effect of usefulness. A few studies have revealed anecdotal evidence to support this point. For example, Tollmar, Sandor and Schomer (1996) implemented an awareness system with a small group of volunteers. The researchers found that after a couple of weeks, interest in the awareness system dropped off and people stopped using it. Webster (1998) and Gutwin, Roseman and Greenberg (1996) also found that the main features of the awareness systems they studied went unused. These studies go on to suggest that people did not find the system useful, and if they did, they might still be using it. It is reasonable to suggest then that the relationship between privacy and acceptance and fairness and acceptance might be moderated by perceptions that the awareness system is useful in determining availability.

Following this same logic, usefulness might also moderate the relationship between attitudes and intentions to use the awareness system. In other words, attitudes towards the awareness system might be more strongly related to intentions to use the awareness system when it is perceived to be useful. To test this alternate conception of the role of usefulness, competing models of awareness system acceptance will be examined. The first model re-examines usefulness as a mediator (Figure 3) whereas the second model examines usefulness as a moderator (Figure 4). Accordingly, I propose an exploratory research question:

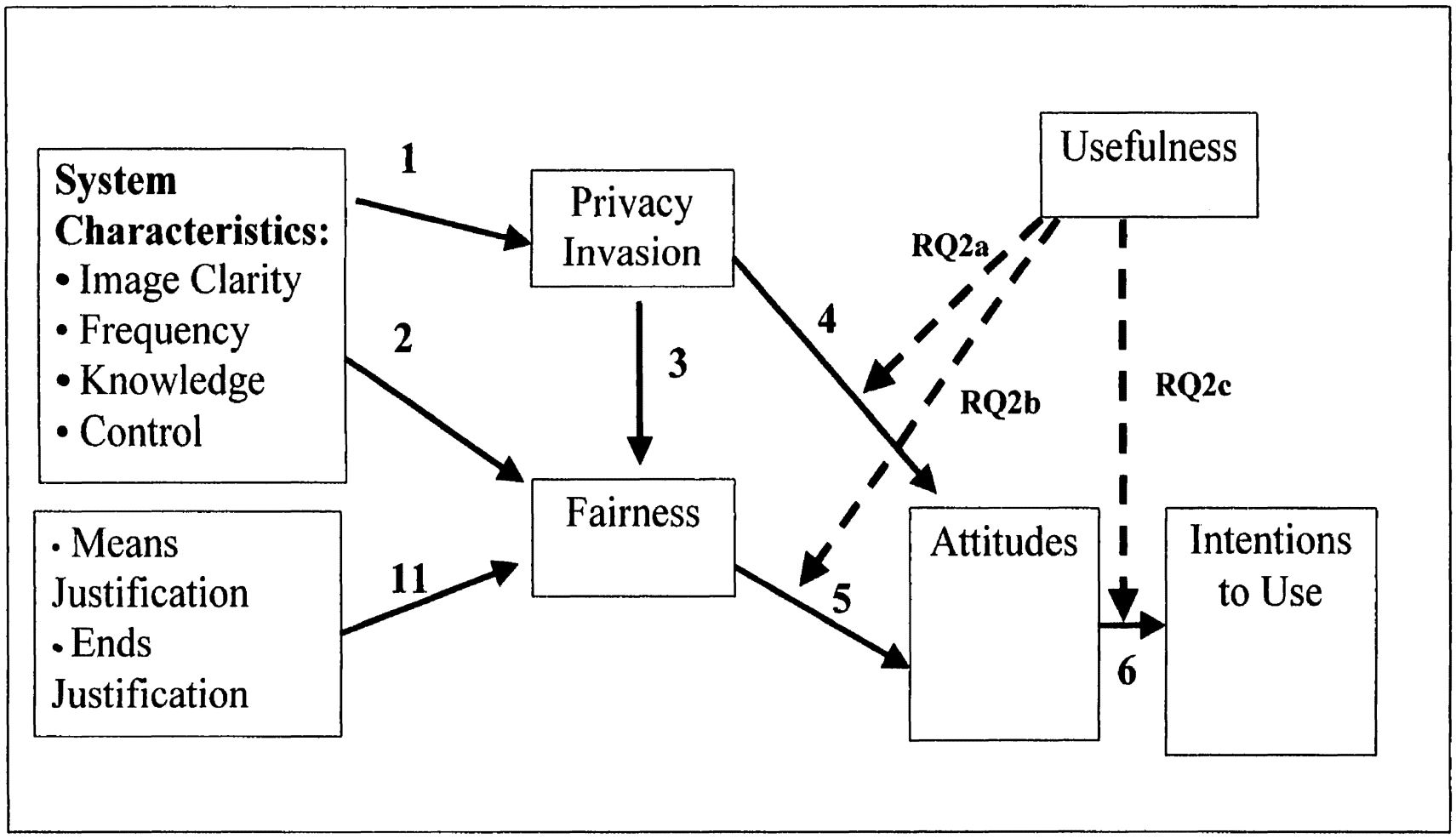


Figure 4: Theoretical Model of Awareness System Acceptance with Usefulness as a Moderator – Study 2

Research Question 2: Is usefulness a moderator in the relationship between (a) privacy and attitudes, (b) fairness and attitudes, and (c) attitudes and intentions such that when the system is perceived as useful, perceptions of privacy invasion and fairness matter less, but attitudes will relate more strongly to intentions.

Fine Tuning the Manipulations

As indicated, the image clarity manipulation was not successful in influencing perceptions of privacy or fairness. Therefore, the description of this variable was revised to further distinguish between the appropriateness of displaying blurry images that transmit availability information alone (respecting the individual more) and displaying clear images that transmit both availability and unnecessary activity information (providing less respect for the individual).

Method

As in Study 1, a scenario design was used to examine the hypotheses. However, for this study, the materials were designed to be presented and completed on-line via the Web. Each participant was presented with a survey packet on the Web that contained the description of one experimental condition. The experimental conditions were created by controlling the descriptions of the same four system characteristics examined in Study 1, as well as the two justifications (which were high or low on each justification). Thus, sixty-four different versions of the survey were created to reflect all the combinations of the six independent variables (see Appendix C for an example of two of these conditions).

As in Study 1, the survey packet provided participants with a (roughly two-page) description of a hypothetical position (as a customer service agent working from home) and the technology available to support that position. Included in the description were

illustrations of awareness systems that included several images displaying possible features of awareness systems. This description emphasized the features of the system and explained how the technology could be used to aid in collaborative work. A two-page questionnaire was included at the end of the survey packet to measure the variables of interest (see Appendix D).

Participants

To ensure a variety of educational backgrounds, participation was solicited from Arts and Engineering alumni from the University of Waterloo. Two thousand Arts and 2000 Engineering alumni were randomly chosen to receive an e-mail requesting their participation in this study. The message, sent directly from the Alumni Office, included a brief description of the study with assurances of confidentiality, and a web-site address for the survey.

Six hundred and twelve participants completed the survey, constituting a 15.3% response rate. Non-response bias was of little concern as an examination of the demographic information collected revealed a diverse cross-section of participants across a variety of demographic variables (see Table 2).

Procedure

On the Web site, participants were presented with an information letter describing the purpose of the study and were provided with assurances of confidentiality. If they chose to continue, the software program automatically randomized which of the conditions they would receive. As such, participants were randomly assigned to one of the 64 different conditions, resulting in approximately 10 participants per condition. Furthermore, the cell frequencies ranged from 34 to 50 for each system characteristic

Table 2: Demographic Variable Frequencies – Study 2

Variable	Frequency	Variable	Frequency
Age		Mgmt. Level	
22-32 years	36.8%	Entry	11.1%
33-44 years	37.4%	Middle	19.3%
45+ years	25.7%	Upper	15.3%
Gender		Work Experience	
Male	61.9%	under 1 yr.	1.1%
Female	34.5%	1-5 years	22.1%
		6-10 years	21.2%
		11+ years	53.6%
Education		Awareness System Experience	
some university	0.3%	Yes	5.9%
university degree	57.0%	No	92.6%
post-graduate	40.5%		
Job		Type of Organization	
GM, CEO	9.6%	Manufacturing	17.3%
Engineer	5.9%	Financial	5.6%
Customer Service	19.1%	Education.	7.7%
Finance/Acctg.	7.5%	Health	1.1%
Consultant	2.1%	Research	13.6%
Programmer/ Systems Analyst	1.8%	Retail	16.0%
		Service	4.2%
Marketing/Sales	5.9%	Other	27.8%
HR	5.9%		
R & D	9.0%	Faculty	
Other	27.9%	Arts	47.6%
		Engineering	42.6%
		Other	9.8%
Current Employment		Work from home	
full time perm.	83.0%	yes, full time	7.8%
full time temp.	4.4%	yes, part time	24.8%
part time perm.	5.6%	no	65.5%
part time temp.	1.6%		
not employed	4.4%	If working from home, how long	
		under 1 yr.	5.9%
Management		1-5 years	17.2%
Yes	48.7%	6-10 years	4.2%
No	49.3%	11+ years	4.2%

manipulation and from 148 to 159 for the means and ends justification manipulations. Completed survey responses were submitted by participants from the Web site, and the responses were received via e-mail. Once respondents completed and submitted their survey responses, they were presented with a feedback letter describing the purpose of the study.

Although unsolicited, participants sent a number of comments regarding the awareness system. Twenty-three respondents sent comments (after submitting their surveys) via separate e-mail messages. These comments are not intended to be considered as representative of the larger population but do give some clues as to what is important to people when evaluating awareness monitoring systems.

Measures

The twenty-three items described in Study 1 remained the same and are described above. Six new items were created and are described below (see Appendix D for new items).

Independent Variables

Three of the study's independent variables (frequency, knowledge and control) remained the same as in Study 1. As explained above, the description of the image clarity variable was revised (see Appendix C) because it did not relate to its manipulation check variable or to privacy or fairness perceptions. Two additional variables – means and ends justifications – were included by modifying the description of the awareness system (see Appendix C).

Manipulation Checks

For the system characteristics, participants responded to the same four items (as in Study 1) to ensure that the manipulations were successful. For the justifications, new items were designed as described next.

Means Justification. Three new items were created to assess the effects of the means justification. For example, one item asked respondents to assess their degree of agreement or disagreement with the following statement: "Employee views are represented in the decisions made for using this awareness system". Participants responded on a 7-point Likert-type scale with anchors ranging from "Strongly Disagree" (1) to "Strongly Agree" (7).

Ends Justification. One new item was added to assess participants' awareness of the ends justification. The item was worded as follows: "To what extent were you told about the purpose for the awareness system?". Another item assessed the legitimacy of the reasons given for using the awareness system. This item asked "To what extent do you believe that the reasons given for using the awareness system are legitimate?". For both items, responses ranged from "Not at all" (1) to A Great Extent (7).

Mediating and Dependent Variables

All of the measures remained the same as in Study 1 and all exhibited a high degree of internal consistency (see Table 3)[6]. One new item was added to assess intentions to work for the organization. The new item stated: "If the job were appropriate, how likely is it that you would want to work for this organization?" and responses ranged

[6] As in Study 1, the three intentions to use items measured on Likert-type scales were retained in the survey. Although the correlation with attitude items was lower in this study, ($\beta = .79$), these items were dropped from the analysis.

Table 3: Descriptive Statistics and Zero-Order Correlations among Study 2 Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Image Clarity	.48	.50	-											
2. Frequency of Image Updating	.52	.50	-.04	-										
3. Knowledge of Monitoring	.50	.50	-.04	-.01	-									
4. Control over Monitoring	.50	.50	-.01	-.06	.03	-								
5. Means Justification	.50	.50	.05	-.03	.00	.01	-							
6. Ends Justification	.50	.50	-.05	.01	-.01	.02	.02	-						
7. Fairness	3.43	1.51	.11**	-.05	.11**	.14**	-.03	.04	(.92)					
8. Privacy Invasion	5.17	1.58	-.10*	-.04	-.05	-.13**	.01	.03	-.78***	(.91)				
9. Attitude	2.67	1.57	.10*	-.04	.05	.12**	-.01	.05	.81***	-.81***	(.95)			
10. Intentions to Use	1.66	.44	-.04	.01	-.04	.04	.01	.11**	.57***	-.54***	.65***	(.86)		
11. Usefulness	3.83	1.55	-.06	-.07	-.01	.07	-.02	.06	.61***	-.54***	.68***	.65***	(.82)	
12. Intentions to Work	3.38	1.77	-.07	-.06	.03	.11**	-.01	.04	.79***	-.76***	.86***	.60***	.62***	(.93)

Note: Numbers in parentheses are Cronbach's alpha estimates of internal consistency reliability. Means for independent variables (variables 1-6) represent the mean level for each independent variable (e.g., 1 for high, 0 for low).
*p <.05. **p <.01. ***p <.001

from "Not at all Likely" (1) to "Extremely Likely" (7). Coefficient alpha for these two intentions to work items was .93 and they were collapsed into a composite measure.

Results

Analyses

As in Study 1, the hypotheses outlined in Figure 3 were tested with structural equation modeling using AMOS. Before testing the overall model presented in Figure 3, I performed confirmatory factor analysis (CFA) on the privacy and fairness constructs to once again determine whether they should be kept as separate constructs in the model.

As in Study 1, I also conducted overall tests of the independent variables. That is, I used regressions to compare conditions in which the independent variables were least respectful of employees with conditions in which the independent variables were most respectful of employees. The analyses followed the same pattern as in Study 1 to assess the overall effect of system characteristics on privacy (hypothesis 1). However, I included justifications in the overall test of hypothesis 2 and 11 because it was hypothesized that justifications would affect perceptions of fairness. Finally, multiple regression was again used to assess the relationship between intentions to work for the organization and fairness and privacy perceptions (Research Question 1).

For Research Question 2 (diagrammed in Figure 4), assessing the moderator effect of usefulness, the significance of the difference in individual parameter estimates was compared for high and low perceptions of usefulness. I followed procedures outlined in Aiken and West (1991) for splitting usefulness variable into high and low scores. Specifically, I conducted a tertile split on the data, retaining all of the data falling one standard deviation above and below the mean (n = 230 for low usefulness; n = 223 for high usefulness). To ensure that usefulness was not being tested as a moderator for all of the variables in the model, I constrained all of the non-relevant paths in the model to be

equal. In other words, the full model was tested, but I only examined the paths hypothesized to be moderated by perceptions of usefulness.

Manipulation Checks and Confirmatory Factor Analysis

Table 3 presents the means, standard deviations, reliabilities and intercorrelations among the study variables. ANOVA's were performed to assess the effectiveness of the system characteristic and justification manipulations. Modifications to the image clarity manipulation were successful. Participants were able to distinguish the accuracy of the blurry versus clear images in determining presence, F (1,610) = 12.71, $p < .001$ and distinguish differences in the degree of ethicality afforded by a blurry versus clear image, F (1,603) = 7.26, $p < .01$. However, the frequency of image updating (continuous versus intermittent) manipulation check was not significant. As in Study 1, participants linked differences in knowledge of others' access to awareness information to control, F (1,610) = 7.11, $p < .01$, and to accuracy, F (1, 609) = 3.67, $p = .05$. Furthermore, control over the dissemination of images was related to its manipulation check item, F (1,610) = 87.95, $p < .001$ and interestingly, to a manipulation check item measuring dignity and respect, F (1,609) = 11.40, $p < .001$. The means justification was successful: participants were able to distinguish the extent of input employees had into the design of the awareness system, F (1, 589) = 24.32, $p < .001$ and whether employee views were represented in the decisions made for using the awareness system, F (1, 594) = 9.28, $p < .01$. Participants did not discern the degree to which they were told about the purpose of the awareness system (the ends justification) but they did relate the ends justification to the manipulation check assessing control of the awareness system, F (1, 610) = 3.58, $p = .05$).

Results of the CFA analysis for fairness and privacy demonstrate that a two-factor correlated model ($\beta = -.85$) exhibits a much higher degree of fit with the data, χ^2 (13, N = 612) = 54.27, p <.001; GFI = .98, AGFI = .95, RMSEA = .07, than a one-factor model, χ^2 (14), N = 612) = 355.72, p <.001; GFI = .82, AGFI = .65, RMSEA = .20 or a two-factor uncorrelated model, χ^2 (14, N = 612) = 644.16, p <.001; GFI = .84, AGFI = .68, RMSEA = .27. Thus, fairness and privacy were kept as separate constructs in the model.

Model Testing

As indicated above, two tests relating to the theoretical model outlined in Figure 3 were conducted. The SEM examined all of the hypotheses, and individually tested each independent variable found in hypotheses 1, 2 and 11. Regressions provided overall tests of the independent variables.

The SEM included those variables presented in Figure 3 (Arts/Engineering education was not included as a control variable, as this variable was uncorrelated (-.06 n.s.) with intentions to use the system). The SEM exhibited a high degree of fit with the data, χ^2 (36, N = 612) = 41.29, p = .25; GFI = .99, AGFI = .98, RMSEA = .02. Bootstrapping results revealed a normal distribution of the data across the sampling iterations (Yung & Bentler, 1996). Figure 5 presents the path coefficients for this model. The hypotheses were tested by examining the significance of the standardized path coefficients shown in the figure.

As in Study 1, Hypotheses 1 and 2 suggested that system characteristics designed to respect privacy and fairness would be negatively related to perceptions of privacy invasion and positively related to perceptions of fairness. As seen in Figure 5, the system characteristics and justifications displayed small effects on perceptions of privacy

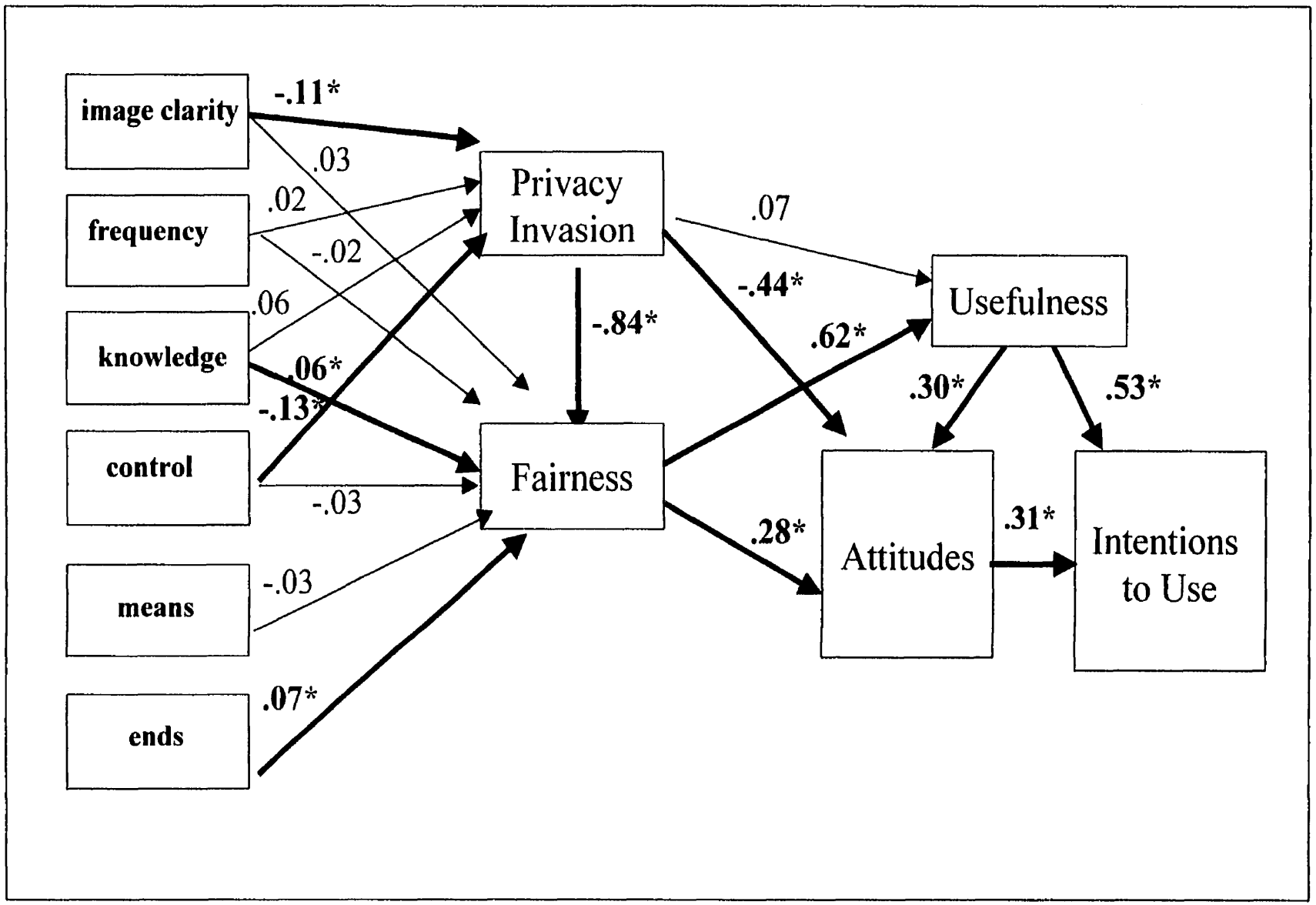


Figure 5: Results from the analysis of the theoretical model – Study 2

*p <.05

invasion and fairness when examined individually (hypotheses 1, 2 and 11). Two paths to privacy, those from image clarity and control, were significant ($\beta = -.11$, $p < .05$; $\beta = -.13$, $p < .05$, for image clarity and control, respectively) such that a clear image and no control resulted in higher perceptions of privacy invasion[7]. In support of the importance of control, 16 of the 22 respondents who sent separate e-mail messages referred to elements of control and privacy as their main concern. In fact, a number of respondents mentioned that they would merely cover the camera to avoid being monitored at all. Two paths to fairness, from knowledge of monitoring ($\beta = .06$, $p < .05$) and the ends justification ($\beta = .07$, $p < .05$) were significant. In other words, although the effects were small, knowing who is using the system to determine availability and receiving justifications for the use of the system resulted in greater perceptions of fairness[8]. In support of this, one e-mail respondent, reacting to the condition in which one does not know who is using the system, stated: "you would never know who is watching you ... I think this would be an especially sensitive issue with women being gawked at by 'virtual stalkers'".

Examining the overall tests of hypotheses 1, 2 and 11 using regression reveals much stronger effect sizes. The sizes of the beta coefficients are comparable to the sizes of the path coefficients in the SEM for the rest of the model. More specifically, results suggest stronger overall effects for hypothesis 1 concerning system characteristics on privacy, $R^2 = .15$; $p = .001$; $\beta = -.39$. Similarly, results suggest stronger overall effects for the six independent variables on fairness, $R^2 = .12$; $p = .03$; $\beta = .35$. Taken together, results from Figure 5 and the regressions provide partial support for hypotheses 1, 2 and 11.

[7] This is in contrast to Study 1, where frequency and knowledge showed significant relationships to privacy.

As in Study 1, an analysis of the mean perceptions of privacy, fairness and attitudes for the most respectful versus least respectful system characteristics and justifications suggests significant, yet small changes. For example, the mean perception of privacy invasion was 5.83 in the least respectful condition as compared to 4.61 in the most respectful condition ($\beta = -.387$, $p < .001$). This same pattern holds true for fairness perceptions ($M = 2.77$, $M = 4.06$; $\beta = .412$, $p < .001$ for the least and most respectful conditions, respectively) and for attitudes ($M = 2.17$, $M = 3.29$; $\beta = .343$, $p = .004$ for the least and most respectful conditions, respectively).

Hypothesis 3, which predicted that privacy invasions would relate negatively to fairness perceptions, was supported ($\beta = -.84$, $p < .05$). Furthermore, both perceptions of privacy invasion and fairness were found to influence attitudes as expected ($\beta = -.44$, $p < .05$ for privacy; $\beta = .28$, $p < .05$ for fairness), thus supporting hypotheses 4 and 5.

Attitudes informed intentions to use the awareness system ($\beta = .31$, $p < .05$); thus, hypothesis 6 was supported. Hypothesis 7 suggested that those who experience lower perceptions of privacy invasion would perceive the awareness system as more useful; however, the relationship was not significant. Hypothesis 8 predicted that those who experience greater perceptions of fairness would perceive the awareness system to be more useful. A significant positive relationship between fairness perceptions and usefulness supports this claim ($\beta = .62$, $p < .05$). Positive and significant path coefficients from usefulness to attitudes ($\beta = .30$, $p < .05$) and from usefulness to intentions ($\beta = .53$, $p < .05$) to use the awareness system also support hypotheses 9 and 10.

---

[8] In study 1, the path from frequency to fairness was significant.

Overall, there were strong relationships between the mediating and outcome variables (hypotheses 3 through 10). Further, an examination of the means (see Table 3) indicates that, just as in Study 1, respondents' perceptions of privacy invasion were high, their perceptions of the fairness of these systems were moderately low, and their attitudes toward these systems were negative. Supporting this, the e-mail messages from the respondents generally related to negative reactions to monitoring for any purpose. For example, one respondent said: "The very idea of being monitored in any way will elicit an immediate backlash, and the idea of video monitoring conjures Orwellian visions to most of us." Another respondent, who had previous experience with an awareness monitoring system at work, stated: "I found that after the novelty wore off I just turned it off for the most part...so then BIG BROTHER couldn't see me!"

Although some people questioned the utility of some of the features of the system, many questioned the motives behind the use of the system. A question that emerged frequently was, "Is it really for availability or is it really another tool for performance monitoring?." Respondents suggested that current technologies to determine availability would be chosen over awareness systems. For example, one respondent remarked: "A phone call and phone-mail work just as, or in fact more effectively ... If this is simply to show my presence in front of my computer, it really is a 'new millenium' time clock in my opinion." Indeed, even those participants who recognized the utility of software in determining availability questioned the necessity for invasive, video-based systems. For example, another respondent said: "I think that the camera is overkill. If all you're looking for is to see if someone is in, something like ICQ would do fine."

Finally, investigating the question of willingness to work for an organization that uses awareness monitoring systems, the regression analysis supports Research Question 1. Results indicate that both fairness and privacy perceptions predicted a significant amount of variance in intentions to work for the organization ($R^2 = .68$, $p < .001$; $\beta = .51$, $p < .001$ for fairness, and $\beta = -.36$, $p < .001$ for privacy).

Usefulness as a Moderator

The second research question suggested that perceptions of usefulness moderates the relationships between privacy, fairness and attitudes toward the awareness system. Examining the path coefficients in Figure 6 reveals that perceptions of usefulness moderate the relationships between privacy, fairness and attitudes. Significant differences among the path coefficients for perceptions of high and low usefulness support this finding. For example, when the system was perceived as being low in usefulness, higher perceptions of privacy invasion were related to less positive attitudes ($\beta = -.27$; $\beta = -.68$, $p < .05$, one-tailed, for high and low usefulness, respectively). As well, more positive attitudes were related to greater intentions to use the awareness system when it was perceived as useful ($\beta = .52$; $\beta = .18$, $p < .05$, for high and low usefulness, respectively). However, contrary to predictions, higher perceptions of fairness were related to more positive attitudes when the awareness system was perceived as useful ($\beta = .62$; $\beta = .26$, $p < .05$, for high and low usefulness, respectively).

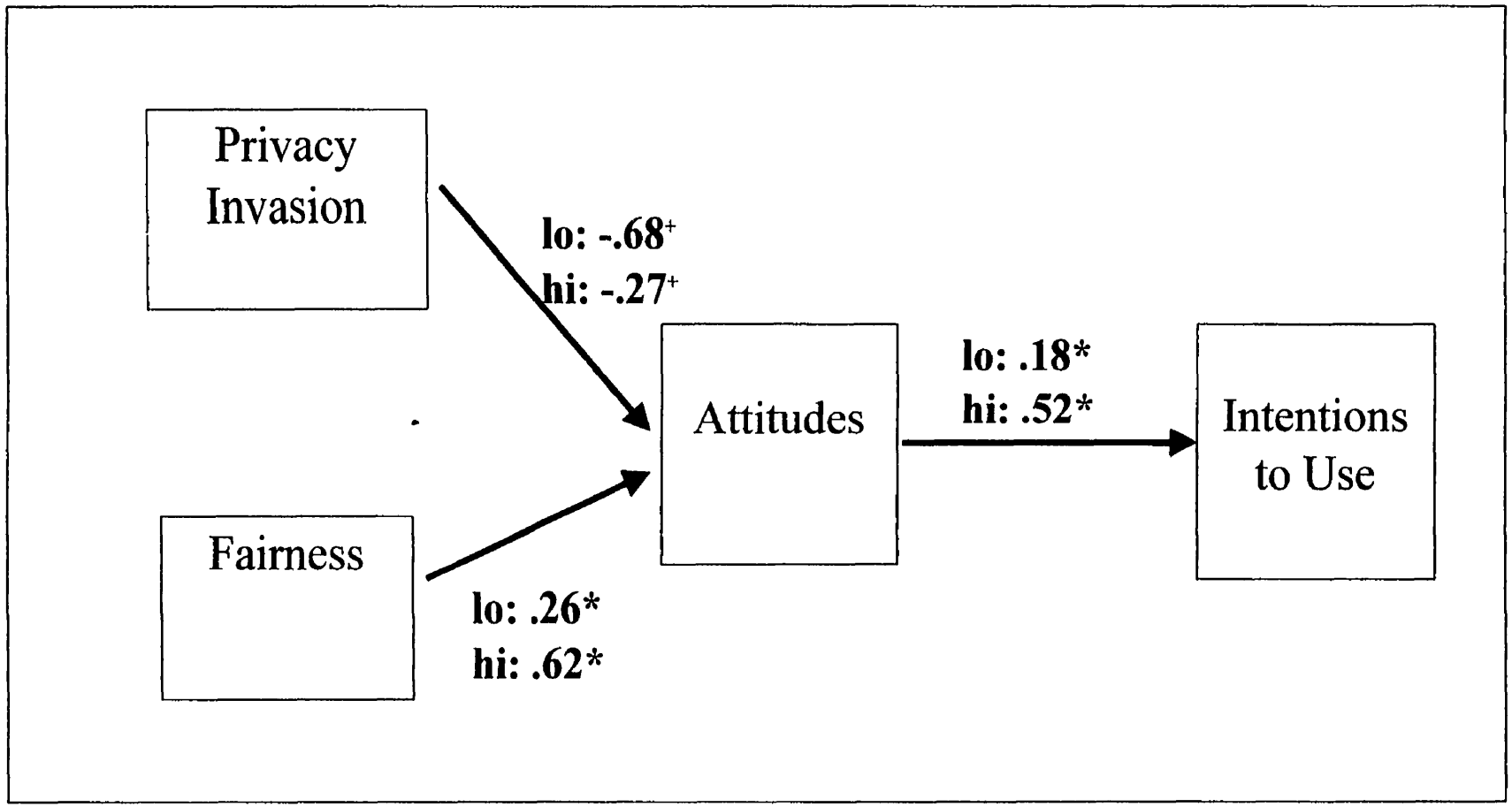


Figure 6: Results of the analysis of the moderated model – Study 2

Note: lo: low usefulness; hi: high usefulness
+$p < .05$ (one-tailed), *$p < .05$ (two-tailed).

The fit statistics for the mediated and moderated model are presented in Table 4, along with the difference in fit between models (delta χ^2) and the significance test for the differences between the two models.

Table 4: Comparison of Mediated and Moderated Models for Study 2

Fit Measure	Mediated Model	Moderated Model
χ^2	41.29	72.99
p	.250	.412
df	36	71
χ^2/df	1.14	1.02
GFI	.99	.97
AGFI	.98	.95
RMSEA	.020	.008
$\Delta\chi^2$		31.7
df/$\Delta\chi^2$		35
p/$\Delta\chi^2$		>.05

Both of the models provided a good fit for the data. Generally, the model with the lowest chi-square and the most favourable goodness of fit indices is viewed as the best fitting model. Accordingly, the mediated model appears to fit the data better than the moderated model. However, a test of the chi-square difference suggests that there is no

significant difference in fit between the two models. Therefore, the most parsimonious model (the one with the fewest paths) is identified as best describing the data. Although both models fit the data very well, in this case, the moderated model is more parsimonious than the mediated model.

Discussion

This second study served as a replication and extension of Study 1 to a sample of organizational employees. Generally, similar relationships were found among the variables in both studies. Individual system characteristics and justifications exerted small effects on perceptions of fairness and privacy invasion. However, a combination of system characteristics and justifications had greater effects on privacy and fairness than these characteristics examined individually. It was also found that, although participants acknowledge differences in system characteristics, perceptions of privacy invasion, fairness, and usefulness proved more important in informing attitudes toward awareness systems. Ensuring that people feel that their privacy is protected and that the awareness system is fair and useful lead to more positive attitudes and stronger intentions to use awareness system. Thus, as indicated in Study 1, modifications to the characteristics of and justifications for such awareness systems appear to be necessary, but not sufficient, to ensure acceptance and use.

The results for individual system characteristics are in contrast to the existing body of EPM research, which has found stronger effects on monitoring outcomes. The question is why? As will be discussed, common method variance might have played a role in inflating the path coefficients among the variables that were not manipulated. However, another possible explanation relates to the design of EPM studies. These studies typically include a control condition of "no monitoring" (e.g., Douthitt & Aiello, 2000) and thus find larger effect sizes; in contrast, the present studies compared fine-tuned differences within the same monitoring system. Yet another explanation for the stronger relationships between the mediating and outcome variables (than for independent variables) may relate

to a strong overall negative evaluation of awareness monitoring. In support of this, Adams and Sasse (1999) explained employees' strong negative reactions to awareness systems implemented in public workplaces (like common rooms and photocopy rooms) as due to the perception of being observed in a situation expected to be private, and thus a violation of social norms. As Douthitt and Aiello (2000) argued, electronic monitoring may be perceived as an invisible presence that represents a source of ambiguity for individuals, resulting in negative attitudes.

In demonstrating the relationship among fairness and privacy to acceptance, the results support the notion that privacy partially mediates the relationship between system characteristics and fairness. However, this study calls into question the assumption implied by Davis et al.'s (1989) Technology Acceptance Model (TAM) that perceived usefulness of the software mediates the relationship between privacy and acceptance. Although the mediating effects of usefulness on perceptions of fairness appear to correspond with the TAM model, the moderating effects of usefulness were found to be a more meaningful predictor of the relationship between privacy and acceptance. In retrospect, this finding makes sense. For example, if the technology is useful, then I might be willing to let go of my privacy concerns, hold less negative attitudes about the technology and actually use it. What this suggests is that acceptance and use of these technologies might rest upon the utility of the tools. Perhaps, then, the assumption in the literature is correct: "If we get the technology right, people will accept it."

Does this mean that as long as the technology is useful it is not necessary to ensure that the technology respects people's perceptions of privacy? I believe that the answer is no. As Adams and Sasse (1999) suggested, there is a dividing line between benign and

intrusive when it comes to monitoring technology. The question is, where is the line? The utility of the technology might push the line back and allay some privacy concerns but it will not fully mitigate these concerns if the technology violates key assumptions about the degree of privacy and respect that we expect from others. Finding this line is the object of the next study.

Contributions and Limitations

This study extended the examination of awareness system acceptance to include an investigation of justifications for the use of awareness monitoring. Furthermore, the results of this study address generalizability concerns by exploring employee reactions to awareness monitoring. Finally, the present study suggests potential modifications to the technology acceptance model. Usefulness might in fact moderate the relationship between beliefs and attitudes rather than mediate them.

Although the present study adds to our understanding of the determinants of awareness system acceptance, it is subject to several limitations. Although the scenario design allowed for control the independent variables (and thus make causal statements concerning the system characteristics and justifications), the survey portion of the study was cross-sectional in nature. Thus, it cannot provide causal evidence regarding the effects of privacy, fairness, and usefulness on acceptance of these systems.

As in any study, when a single instrument is used to collect data, concerns are raised about common method variance. One method of limiting the impact of common method variance is to vary attitude statements with respect to positive and negative-wording and to vary whether the positive or negative end of the response scales appears on the right or left-hand side of the page (Cook & Campbell, 1979). In this study,

perceptions of privacy invasion were negatively coded and the response scale was reflected for these items. These and other negatively-worded items were interspersed across the questionnaire. As well, some of the items were stated as questions and others as statements, the response labels were varied (e.g., "A Great Extent," "Strongly Agree," "Extremely Likely," etc.) across items, and the response formats were varied from Likert-type scales to a dichotomous yes/no format. Further, the analyses showed associations consistent with theory. Thus, common method concerns should be limited.

This study described hypothetical job positions and awareness systems used for collaboration with distant colleagues. In doing so, I conducted a controlled examination of a large number of employees' reactions to awareness monitoring systems. In contrast, most previous studies have included few participants, often with technical employees who participated in the development of these systems (e.g., Lee et al., 1997; Morikawa & Maesko, 1998). Although the participants came from a variety of backgrounds and had considerable work experiences, most had never used an awareness system, and hands-on usage (rather than hypothetical descriptions) might have resulted in even stronger reactions to these systems. Although the use of awareness monitoring technology is growing, it is not widespread yet and efforts to obtain a sample of organizational members using this technology were unsuccessful.

The study participants were highly-educated and results might differ for other types of employees. For instance, for this sample (all university graduates, over half in managerial positions), the idea of being monitored might have been foreign and unfavorable. Even though it was made clear that peer-based monitoring, designed to convey availability information, is different from supervisor-subordinate based monitoring

for performance, people reacted negatively. Manipulating system features and offering justifications did not fully mitigate their concerns.

These limitations suggest areas for future research. Stanton (2000a) called for efforts to employ different methodologies to examine employee reactions to monitoring. The unsolicited qualitative data received from some participants added richness to the quantitative results and pointed to some new directions in the search to understand acceptance of awareness systems. A qualitative investigation that solicits employees' reactions to, and opinions of, awareness systems would certainly complement any conclusions drawn from quantitative data and would allow for an examination of new issues that emerged from the data.

One key question that needs to be addressed is why manipulating system characteristics and justifications did not have a stronger influence on perceptions of fairness and privacy. This could have been because the scenario situation did not provide a high degree of realism or that the manipulations were simply too weak to exert effects. However, participants did respond to the items designed to assess understanding of the manipulations and there were differences in responses across conditions. Perhaps then, there are other variables that were not captured in Studies 1 and 2 that are influencing perceptions of privacy and fairness. As well, questions surrounding the usefulness of the technology emerged from the e-mail responses sent by Study 2 participants. Specifically, do people even see these awareness systems as useful for collaboration? Finally, studying all of these issues more closely might allow for an examination of where the dividing line lies between benign and intrusive monitoring technologies.

CHAPTER 5

A QUALITATIVE STUDY EXAMINING EMPLOYEE REACTIONS TO AWARENESS MONITORING TECHNOLOGIES

As described in the introduction, the purpose of this investigation was to examine reactions to awareness monitoring systems. The two quantitative studies revealed that privacy and fairness concerns are key variables associated with reactions to awareness monitoring technologies. As well, the usefulness of the technology in providing availability information on distributed colleagues is related to acceptance of the technology.

The quantitative investigations provided very valuable information about the relationship among variables in the hypothesized model of awareness system acceptance. However, to uncover other variables that might have gone untested in the quantitative studies, focus groups were conducted with a sample of organizational employees. The goals of this qualitative study were to: (a) further investigate the theoretical model of awareness system acceptance, (b) move beyond an understanding of how the variables in the model are related to discover why the relationships exist, (c) uncover new variables influencing acceptance, and (d) help generate both theoretical and practical suggestions for future research and the design of awareness monitoring systems. In accomplishing all of these goals, the overriding objective was to find out where and when monitoring technologies move from being benign to becoming intrusive.

The quantitative research examined reactions to a large number of system characteristic and justification combinations (16 in Study 1, 64 in Study 2). It was not feasible to have discussions about all of these combinations in the qualitative study. As

such, the decision was made to limit discussions to one set of system characteristics and justifications – the combination that was most respectful of individuals. The reasons for this decision were twofold. First, it was well established that all participants viewed the worst system very unfavourably. It would add nothing to our understanding of awareness system acceptance to further study these characteristics. Second, examining the best system characteristics would address questions about whether "the technology was right" and prompt discussions on how to modify the technology to further enhance perceptions of privacy, fairness and usefulness.

Method

Participants

Data were collected from five separate groups from two different organizations. The first group was comprised of seven administrative staff members employed at the University of Waterloo. The remaining four groups were comprised of twenty-three employees from a large multi-national insurance firm located in Waterloo. All of the focus groups were comprised of five-to-seven members and included participants from a variety of organizational levels and occupations. For example, of the four focus groups conducted at the insurance firm, the sample included administrative staff (30%), senior executives (21%), mid-level managers (21%) and distributed employees (26%). Of the 30 participants, 76% were female.

Members of the university focus group were contacted in person to solicit their participation. The insurance firm sample was solicited with the assistance of an organizational contact who sent a brief e-mail describing the purpose of the study to organizational members. This person then scheduled the focus group meetings with those

who responded. Although the participants were self-selected, efforts to obtain a sample from different levels of the organization were successful.

All of the groups were asked to describe what communications technologies they had available to them. Both the university and insurance firm participants mentioned the availability of traditional communications technologies such as phone, fax, voice-mail and e-mail. Additionally, the insurance firm participants also added the availability of videoconferencing and shared calendaring. Some members also had cell phones and Blackberry text messaging pagers. From the perspective of available communications tools, this insurance organization was well-connected.

Procedure

A focus group methodology was used to assess the variables of interest. This methodology was chosen over other qualitative techniques (e.g., one-to-one interviews) for a number of reasons (Zikmund, 1994). First, focus groups capitalize on synergism. The combined efforts of the group in examining the issues of interest offers a wider range of information than would be obtained from individual responses. As well, the use of focus groups often lead to serendipitous findings. In discussing the issues together, participants build on each other's ideas to offer new and insightful opinions. Finally, the focus group methodology offers participants a sense of security in presenting ideas and making comments because results are focused at the group rather than the individual level. However, there are concerns related to the use of focus groups (Zikmund, 1994). For example, the use of groups might lead to discussions that are dominated by one or two participants. Also, inexperienced facilitators might lose control over the discussion, risking that the discussion will veer off into tangential issues. Ensuring that all group

members in each group session came from similar levels of the organization mitigated these concerns. For example, administrative staff was in one group and senior managers were in another group. As well, I have had experience conducting focus groups in organizations in the past and had no difficulty in controlling the direction of the discussion or in preventing one or two members from dominating the conversation.

All of the meetings were conducted on separate days and the sessions lasted between one and two hours. Each participant received a detailed information sheet outlining the purposes of the study and received written and oral assurances of confidentiality. Once informed consent was obtained, all of the discussions were audiotaped to ensure the accuracy of transcription.

Discussion Framework

To ensure standardization, I read from a prepared script that outlined the features of the awareness system and posed detailed questions to assess the variables of interest. For example, I presented visual images of each system characteristic and justification and then asked the group to share their thoughts and feelings (cognitions and emotions) toward each one (see Appendix E for a sample of the focus group materials). Following the presentation of the system characteristics and the justifications, I asked participants to offer their thoughts and feelings about each construct in the theoretical model of awareness system acceptance. For instance, participants were asked how private they thought the system was and what suggestions they would offer to enhance privacy. Finally, participants were asked to share their thoughts about what jobs this awareness technology might be useful for, how they might modify the technology and what recommendations they would make if their organization was to implement awareness

monitoring technologies. Before the session was complete, I provided both verbal and oral feedback outlining the purpose of the study, relating the findings of the quantitative studies and addressing any remaining questions. Participants were asked to complete a demographic questionnaire, given contact information if they wished to receive a summary report of results, and thanked for their participation.

Coding the Transcripts

Once the audiotapes were transcribed, I employed two methodologies – deductive and inductive - for coding the five transcripts following procedures outlined in Ryan and Bernard (2000). Deductive themes were derived from theory and research. For example, the relationship between privacy and fairness was pulled from the theoretical model investigated here and from research on EPM (e.g., Alge, 1999). Specific instances in the text that described the relationship between privacy and fairness and instances that described the relationships between all of the constructs in the theoretical model supported this approach.

I also employed an inductive coding technique to classify instances in the text that were unrelated to constructs in the theoretical model or past research. For example, a new construct – psychological boundary violations – emerged from specific instances where participants described how their norms for social expectations guiding other people's behaviour were being violated by the use of awareness monitoring. This construct seems to be related to the major theoretical variables (e.g., privacy and fairness) in the model. These and other major themes, were amended by pulling out examples for each code from the text. Thus, coding categories emerged from an examination of the verbatim text and were finalized by identifying exemplars for each code (see Appendix F).

An independent rater was familiarized with all of the variables, their definitions and the related codes as outlined in Appendix F. The rater then coded a trial transcript, and minor modifications to the coding scheme were made to enhance the clarity of the definitions and to address any discrepancies in the coding. Finally, the rater coded another transcript and inter-rater reliability was calculated for this transcript. The inter-rater agreement in coding was 80%, thus limiting concerns about coding idiosyncrasy.

Once the coding was completed, the frequencies for each category were calculated. More specifically, the frequency of statements coded as one category were compared to the frequency of all statements coded. These frequencies were calculated both within and between groups. In doing so, those constructs given more weight in the analysis reflect their degree of importance as expressed by all of the participants. Table 5 presents the final coding categories and rating frequencies for each code across all focus groups.

Table 5: Focus Group Coding Scheme

Construct	Code	Frequency (out of total 941)	
System Characteristics and Justifications	SY	Pos	Neg.
• Image Clarity – Positive & Negative	SY:IMC (+/-)	2	4
• Frequency – Positive & Negative	SY:FREQ (+/-)	5	15
• Knowl. Of Monit. – Positive & Negative	SY:KNOW (+/-)	7	14
• Control – Positive & Negative	SY:CONT (+/-)	10	3
• System Char – Privacy Link	SY:SY:PR	27	
• System Char – Fairness Link	SY:SY:FR	9	
• Justifications – Means	SY: JMEAN	2	
• Justifications – Ends	SY: JENDS	5	
• Justifications – Fairness Link	SY: JUST/FR	3	
• Video Image – Positive & Negative	SY: VI (+/-)	0	26
Violation of Boundaries	VB		
• Boundary Violation – Privacy Link	VB:BV:PR	82	
• Boundary Violation – Fairness Link	VB:BV:FR	29	
• Violation of Social Norms	VB: VSN	52	
• Perception Distortion	VB:PD	30	
• Boundary Restoration/Protection	VB: BR	64	
Privacy Invasion			
• Abuse – Spying	PI/AF	32	
• Performance Monitoring	PI/PM	26	
• Discomfort	PI /DI	29	
• Privacy-Fairness link	PR/FRlink	6	
Fairness	FR		
• Performance Monitoring	FR/PM	26	
• Control over work schedule	FR/SCH.	15	
• Trust	FR/TR	11	
Usefulness	US	Pos	Neg
• Usefulness – Positive & Negative	US (+/-)	21	57
• Usefulness-Sys. Char link	US: US-SY	9	
• Usefulness – Privacy Link	US: US-PR	4	
• Usefulness – Fairness Link	US: US-FR	5	
• Presence vs. Availability	US:PvsA	34	

Performance Consequences	PF		
• Distractors	PF:DIST	21	
• Interpersonal Conflict	PF:ICONF	10	
Fit	FI		
• Culture	FI:CU	7	
• Job	FI:JOB	35	
• Justifications (General)	FI:JUST	14	
Alternatives (Ideal System Characteristics)	ALT		
• Alternatives to Video	ALT:VID	29	
• Alternatives/Modifications to Awareness System	ALT: MOD	49	
• Discounted	ALT:DISC	13	
• Available Technologies	ALT:AT	53	
Acceptance	AC	Pos	Neg
• Attitudes: Positive & Negative	AC: AT+/-	15*	17
• Willingness to Use – Pos. & Neg	AC: WTU (+/-)	6*	8

* indicates acceptance and willingness to use, only with modifications

Results

Evidence to support the theoretical model of acceptance is presented in Appendix F, which defines every variable in the model and presents sample statements for each of the specific constructs and links between the variables in the model. Below is a summary of the key findings of the focus group study, emphasizing the explanations for why the variables in the model of acceptance are related.

Are System Characteristics and Justifications Important?

The answer to this question is yes. All participants expressed both positive and negative comments about each of the system characteristics and justifications (see Appendix F). Summarizing the comments, participants who expressed positive comments about the system characteristics appreciated the value of each in respecting individuals. For instance, one respondent, referring to the frequency of image capture, stated: "It's not live, which would take away some of the issues that people would have. I think a ton of people would not like a live camera on them." However, a number of participants mentioned that the characteristics that respect individuals actually make the system less useful. For example, another participant stated: "The 10 minute delay on the picture doesn't seem timely enough. I mean if you are on a phone, the average phone conversation lasts two or three minutes. It's out of date."

Another key question is why are the system characteristics and justifications important? Supporting the theoretical model, system characteristics and justifications were viewed as important because they are linked to perceptions of privacy and fairness.

Linking System Characteristics and Justifications with Privacy and Fairness

As hypothesized in the theoretical model, there is a link between system characteristics and justifications and perceptions of privacy and fairness. Participants made frequent statements (27 comments out of 132 pertaining to system characteristics) regarding the link between system characteristics and privacy concerns (see Table 4). For example, one participant stated: "The Check History [knowledge of monitoring] feature sure seems crucial as it will eliminate people using it as a performance or check-up feature." Nine comments (out of 132) were made linking system characteristics with perceptions of fairness. One sample comment was: "And it's fair that you know who is checking to see if you are available [referring to knowledge of monitoring]." Referring to justifications, one participant stated: "They have to sell it and they have to build the level of trust that if the say they are not going to use it for performance, then they better mean it."

Privacy – A Key Variable

> *"You have no privacy and you can't have it working and have privacy at the same time because the whole point of it is for you not to have privacy so people know whether you are there or not. It's gone, your privacy has gone."*

This quote from one of the respondents in the study captures the essence of issues surrounding privacy and awareness monitoring. In fact, eighty-seven of the comments concerned the issue of privacy invasion. Related issues surrounding privacy included concern over abuse of the system by colleagues and the accompanying fear that people could use the awareness system to monitor their colleagues covertly. A number of

respondents also expressed discomfort and mentioned the potential for embarrassment that exists when awareness images are captured and transmitted to others.

Respondents were concerned about the potential for management to use the system for performance monitoring. For example, one respondent stated: "Say it was your manager trying to get a hold of you. It could be one of those casual questions 'Well, did you go get a drink or something?' All of a sudden you have to account for everything that you have to do."

Interestingly, there appeared to be differences in the groups relating to the nature of concern over the potential for performance monitoring. Specifically, lower-level administrative staff made 20 references to fears that their supervisors would use the tool to monitor their performance. Moving up the organizational ladder, the frequency of concern over performance monitoring by supervisor decreases and in fact, the nature of the concern appears to shift. Senior managers, while cognizant of the potential for performance monitoring, expressed greater concern for how their subordinates would perceive the privacy issues surrounding the use of this technology. They express little personal concern over the system being used to monitor their own performance.

Why is Fairness Important?

The quantitative studies told us that perceptions of fairness were related to other constructs in the model. The present study offers clues as to why fairness is important. Two important issues surrounding fairness emerged. First, people expressed concern that the use of the system required a level trust in the relationships between colleagues. For example, one respondent stated: "The underlying thing seems to be that it is based on honesty, you have to believe that your colleagues would use this system fairly, that seems

to be important." This issue of trust also extended to the relationship between managers and subordinates. For example, "I don't think it would enhance good will on the part of the employee, because if you are watched constantly, that is not a mark of trust."

Second, many participants expressed concern that the use of the system would restrict their freedom in organizing their own activities and prioritizing their own work. As expressed by one participant: "You might be working on something that's due tomorrow and you have to get it done no matter what, but now you have to stop for half an hour because someone else knows you are there and you have no choice but to deal with whatever it is they bring to you." Another participant stated: "I think it is unfair because it is forcing you to reprioritize everything that you are working on." In summary, fairness seems to be important when people's trustworthiness is questioned and when their freedom to go about their own work is restricted.

Linking Privacy and Fairness

The evidence suggested a link between perceptions of privacy and fairness. However, this relationship did not appear to be as strong as that suggested by the quantitative studies. Only a few comments were made that could accurately be coded as linking the two variables. This might be due to the fact that in an effort to remain neutral in facilitating the focus group discussions, I did not ask a clear question about the link between the two variables. Nonetheless, the comments relating privacy and fairness suggest that there is a relationship between the two variables. For example, one participant stated: "Is it fair for me to know that B. is in his office? If he doesn't want to talk to anybody, he is still not going to talk to anybody. He has to have privacy for whatever he is doing and I think that holds true for everybody." Another participant stated: "But you

know, thinking of the privacy and fairness issue of this...you know, like this is a real invasion of privacy."

Psychological Boundary Violations

One of the main goals of this focus-group study was to uncover other variables that might be influencing the relationships in the theoretical model of awareness system acceptance. Recall that the independent relationships between system characteristic and justification manipulations and perceptions of privacy and fairness were not that strong. Even though combining the system characteristics and justifications revealed much stronger relationships with privacy and fairness, there was the possibility that another variable, not captured in the quantitative studies, was exerting a stronger influence on privacy and fairness perceptions. A great deal of evidence emerging from the focus group study suggests that psychological boundary violations play an important role in triggering privacy and fairness concerns.

Over and over, participants mentioned how uncomfortable and ill at ease this awareness system made them feel. Many expressed emotions surrounding a violation, or loss of personal rights over how the system would distribute personal information to others. Examining this issue further, I uncovered a diverse literature addressing personal rights, expectations, boundaries and violations. Before returning to the results of the focus group study, I will digress into a brief examination of psychological boundary violations.

All of the concerns expressed above centre around the notion of boundary violations. This notion of psychological boundaries has its roots in psychoanalysis, emerging from distinctions between the id, ego and superego (intrapersonal realm) and their interactions with external events or the interpersonal realm. Boundaries refer to

borders between these different realms that separate interactions of events, states and experiences (LaLave & Commons, 1996). Lewin (1951) drew on this psychoanalytic view to develop a field theory of boundaries to define movement and activity within the context of social interaction. This model divided boundaries into personal spaces and movement. Motivations to cross boundaries were conceived as the effects of stimuli on responses.

Similarly, Popp (1996) defined boundaries as a state of differentiation between the self and not self. Defining boundaries is described as a moment to moment process of negotiating the limits between what I will allow inside the boundary of what is me, and what I won't allow and is not me. More simply, defining boundaries involves the negotiations of psychological closeness and distance in all interpersonal interactions and relationships. This takes the form of a decision-making process where limits are drawn and maintained. In negotiating between the self and the outside world, people are believed to differ on their degree of boundary permeability (Popp, 1996). For example, one's boundary between self and other can be quite permeable and thus open to outside influences.

Related to the idea of permeability is Triandis's (1995) treatment of differences between individualistic and collectivist cultures. Triandis suggested that collectivist organizational cultures stress the concept of family whereas individualistic organizational cultures stress the concept of machine. In other words, collectivists view their ingroup (e.g., coworkers) as family, whereas individualists view their colleagues as a part of a larger machine. This family versus machine metaphor did emerge in some of the focus group comments. Some participants mentioned that they would be less opposed to using the awareness system with family members or with those colleagues that they knew well.

Furthermore, this distinction between collectivism and individualism might suggest differences in thresholds for norm violations. For example, on a continuum of individualism/collectivism, an awareness system might trigger norm violations and subsequent privacy and fairness concerns for individualists much sooner than for collectivists who are more likely to view coworkers (ingroup members) as family. This is qualified however by an acknowledgement that who is considered as part of the ingroup is crucial. We cannot assume that a coworker in the same department or function would be considered an ingroup member. Nonetheless, this might point to generalizability issues in making claims about awareness system acceptance.

Environmental social psychology also adds to the analysis of boundaries. Linneweber (1988) described norm violations as a state of incongruence between the person and the situation or place. In other words, a person has knowledge about what is appropriate in a given situation and if the action or behaviour is construed as inappropriate, there is incongruence in fit between person and place. This interaction draws on the notion of triadic reciprocality (Bandura, 1986) suggesting a triangular and multi-directional relationship between the person, the environment and behaviours. If any of the elements are being violated (e.g., a behaviour inappropriate in the given environment), a state of incongruence results.

Argyle (1979) suggested that people gather information concerning regulations, rules and norms to choose their own behaviour and to evaluate and judge the behaviour of others. When these rules, regulations and norms are violated, a state of incongruence occurs. Indeed, Linneweber (1988) found environment – person norm violations such that aspects of the environment were being violated and influencing people's behaviour in

public settings. This seems to correspond to deviations from the norm when awareness systems are implemented and a consequent sense of incongruence that is created as to what is the appropriate behaviour in this environment. Related to this, Ashforth, Kreiner and Fugate (2000) discussed some of the costs and benefits involved in the blurring of boundaries. Specifically, they suggested that the blurring of roles (e.g., between work and non-work) can lead to confusion and interruption. The challenge for people is to create and maintain boundaries between these roles.

Archea (1977) adopted an environmental social psychological perspective to investigate architectural influences on behaviour. One of his key points was that the arrangement of the physical environment regulates the distribution of the information upon which all interpersonal behaviour depends. Consequently, increased exposure results in increased accountability for behaviour and increased pressures to conform with norms. This places the fundamental goal of HCI research into question. HCI researchers have been working under the assumption that facilitating the flow of interpersonal information is beneficial to collaboration at a distance. But, an increase in the flow of interpersonal information, such as when awareness systems are implemented, can result in a loss of one's ability to control self-presentation (by limiting exposure) and to regulate behaviour to attain an optimal degree of exposure.

Sundstrom, Burt and Kamp (1980) presented empirical evidence to support Archea's claims. These researchers found that job satisfaction was related to not being visible to one's supervisor and being located far away from major pathways. These relationships were found across job levels and suggest that people do not want to work in open offices that purport to enhance interpersonal contact. Indeed, people actively

maintain a desirable level of social contact that includes some measure of privacy. This might give us clues as to why people exposed to awareness monitoring are likely to stop using it.

Drawing from these diverse literatures in clinical, social (cross-cultural) and environmental psychology, there appears to be a need to acknowledge the role of boundaries in explaining reactions to awareness systems. Boundary violations and violations of social norms seem to play a role in explaining fairness and privacy reactions to awareness monitoring systems. For instance, in discussing privacy, one participant stated: "I feel like when some prisoners are sort of, they bracelet them so they know where they are...It's the whole idea of a loss of privacy in all of our lives. We have radar on the roads and now we have radar at work." Another participant, describing the relationship between fairness and psychological boundary violations stated: "Everybody needs a little freedom and a little bit of breathing space so is it fair to be watched all the time or watchable all the time?". Indeed as expressed in Figures 7 and 8 below, the frequency of statements linking this notion of boundary violations to both privacy and fairness was much greater than the frequency of statements linking system characteristics to privacy ($\chi^2(1) = 22.25$, $p < .01$) and fairness ($\chi^2(1) = 10.52$, $p < .01$).

Figure 7: A Comparison of Comment Frequency Linking Privacy to System Characteristics and Boundary Violations

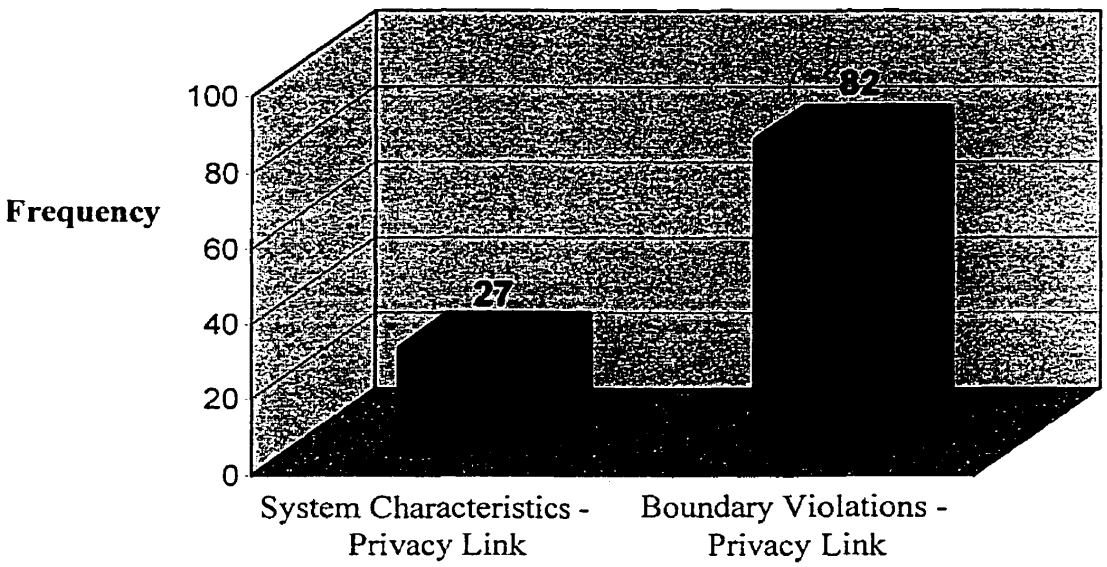
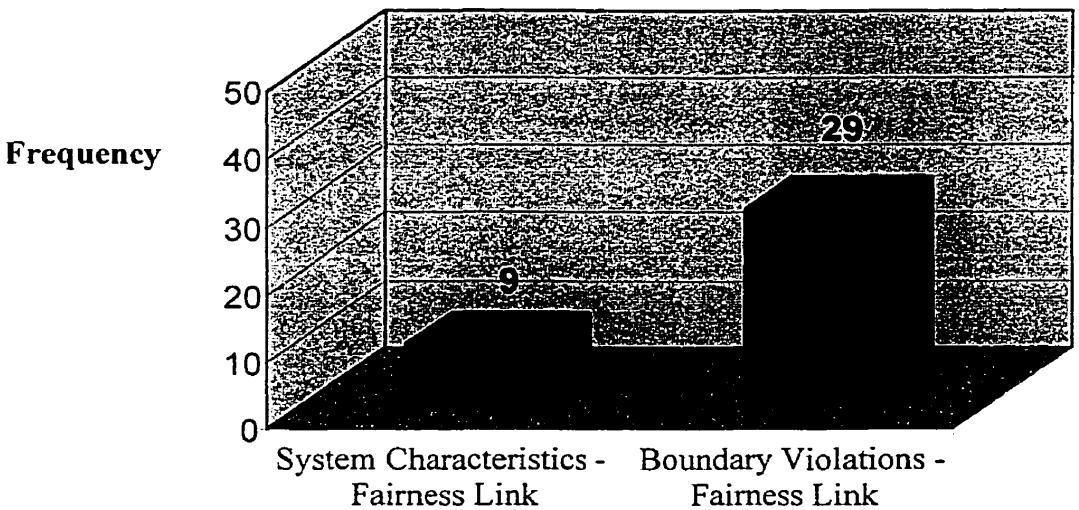


Figure 8: A Comparison of Comment Frequency Linking Fairness to System Characteristics and Boundary Violations



Violations of Social Norms and Perception Distortion

Two related constructs emerge from the notion of psychological boundary violations. The first – violation of social norms – addresses the cause of a boundary violation. When one perceives a state of incongruence over what behaviours are expected from oneself and others in a new environment or situation (Linneweber, 1988; Wilson, Roloff & Carey, 1998), what results is a breach in one's interpersonal space. In other words, one does not know what to expect from others or how to behave in a situation that precludes the use of existing norms and guidelines. The use of an awareness monitoring system appears to trigger this state of incongruence. For example, one participant stated: "I would have less of an issue if someone from Mississauga was trying to find me here [at the office] because I am going to be appropriately dressed here...so in a work environment I have less issue with this than at home in a virtual office. I certainly would not feel comfortable at home having something like this." The sentiments expressed in this statement suggest that in a work environment, one knows what to expect from others. But, when working from home, the expectations guiding social interactions are less clear.

Related to social norm violations and expectations about social interactions is the issue of perception distortion. When we interact with others face-to-face, we use social cues to assess the person we are interacting with and how we think they perceive us (Adams & Sasse, 1999). With an awareness monitoring system, there are no social cues. Interaction is one-way only and there is no opportunity to assess verbal or non-verbal cues to obtain a sense of how others perceive us. This issue was of critical concern to the distributed employees who participated in the focus group study. As expressed by these participants, they are already dealing with the perception that if they work from home,

their colleagues do not feel that they are working very hard. Therefore, if a colleague were to use the awareness system to determine the availability of a fellow employee working from home, and were to find that this person was not in front of the computer, his or her perceptions about that person might be skewed negatively. There is no recourse to adjust this perception because one might not necessarily know that it exists. As one participant stated: "I think that you are dealing with an unknown variable, and that is your colleagues' perceptions of the image that they are seeing. And that perception of not working...I would be concerned about that – my colleagues' perception of what they are seeing in the image."

Boundary Restoration

All participants were asked to describe ways of making the awareness system more private and more fair. Almost unfailingly, people responded to these questions by suggesting ways to restore, enhance or protect personal boundaries in how the system is designed and used. For example, participants suggested a number of technological modifications designed to remove the more invasive elements of the system (e.g., replace the video image with a light indicating availability). However, the majority of comments offered suggestions for putting guidelines in place to restrict the use of the system and to limit who in the organization actually uses it. As stated by one participant: "I think if I knew there were going to be strict guidelines in place and people were going to be of a like mind and use it for the intended purpose." This and other similar comments highlight the desire to establish norms for guiding behaviours as a way of mitigating privacy and fairness concerns. Interestingly, other comments appeared to invoke the idea of equity in who has access to the awareness system. For example, "If we implemented it at every

level of the organization equitably then it's more fair than if we put it on certain people and didn't put it on others." As will be described, this desire to restore boundaries also emerged when participants were asked whether they would be willing to accept and use an awareness system. Those participants indicating willingness to use the system only did so when boundaries were put in place to restrict how the system would be used.

Usefulness of the Awareness System

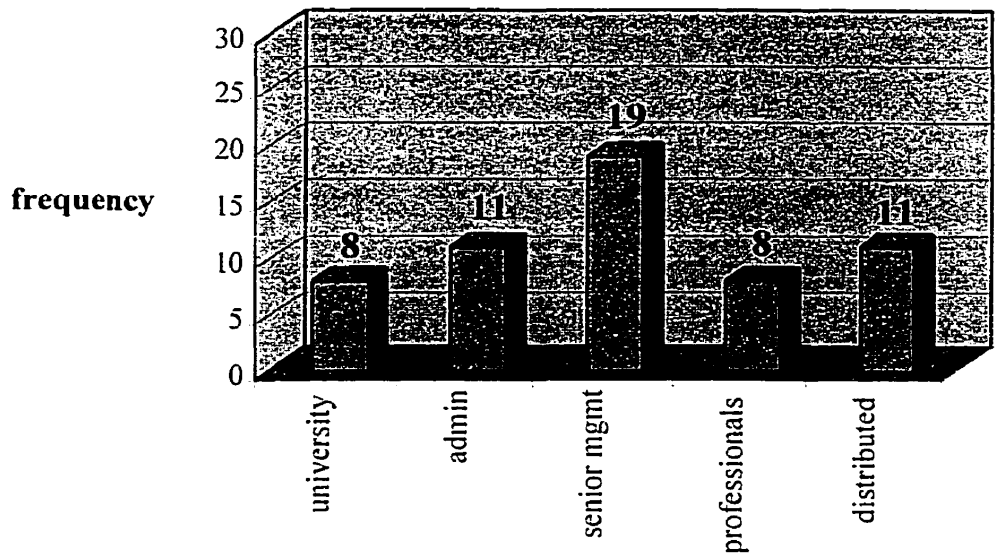
One of the goals of this focus group study was to follow up on suggestions from participants in the second study that this technology is not any more useful than traditional communications technologies in determining availability. This sentiment also emerged in the focus group study. All of the groups questioned the utility of awareness systems over existing technologies such as phones and e-mail. For example: "I'm trying to understand in my mind what the advantage is of this versus dialing a number and seeing if somebody is at their desk." Another participant stated: "I really can't see the value over a cell phone or beeper." Also telling is the fact that senior managers, or those in the organization who are most likely to make the decision to implement an awareness system, questioned the utility of the software to a greater extent than other participants[9]. Figure 9 presents a breakdown by focus group of the frequency of negative comments regarding the usefulness of the awareness system.

Participants were also asked whether there were jobs in the organization for which this type of technology might be useful. Most offered the potential to use this technology with computer programmers. However, participants quickly acknowledged that the computer programmer role requires that one sit in front of the computer all day. So, they

[9] Examining the difference between senior managers and all of the other groups combined, this difference was significant (χ^2 (1) = 6.32, $p < .05$).

questioned what the awareness system offered when the job, by its very nature, requires presence.

Figure 9: Frequency of Comments Questioning the Usefulness of Awareness Systems Across Groups



Presence Versus Availability

What also emerged from the focus group is the reason why awareness systems might not be perceived as useful. According to the focus group participants, awareness monitoring systems do not deliver on their claims: the awareness system does not provide any information on the availability of a colleague to interact, it merely provides information on the physical presence of a colleague. The physical presence of a coworker is irrelevant – "To me, an awareness system is valuable if you know when a person is available to be interrupted, no matter where they are."

Many participants mentioned that they are often away from their desks, but with an awareness system, one cannot assess availability, even when colleagues are at their desks. As one participant stated: "Yeah, there is a big difference between presence and

availability." Indeed, assumptions in the HCI literature about availability, might be wrong (e.g., Hudson & Smith, 1996). Sitting at my desk, staring at my computer screen does not imply that I want to be interrupted. For example, one participant stated: "The time I don't want to be interrupted is when I am doing research or doing something right at my terminal. I'd rather be interrupted if I'm maybe talking to a colleague. The assumption here is that if you are sitting at your terminal it's time to be interrupted and that may not be valid, that may be the time that you are trying to do some deep thinking or some type of other project; you have intentionally turned everything off so you can do that."

Negative Performance Consequences

Another key assumption in the HCI literature is that availability information is useful to enhance collaboration and performance (e.g., Palfreyman & Rodden, 1996). However, this focus group study suggests that there may, in fact, be some negative consequences when these systems are used. A number of comments reflected concern over the increase in distraction that an awareness system would create. Using an awareness system to determine if a colleague is available and then contacting that colleague via phone, e-mail or voice-mail, could have a negative influence on productivity. As stated by one participant: "I think that the increase in interruptions would probably affect productivity...you can't concentrate if people are constantly calling you...I know you're there, I know you're there."

Related to the issue of distraction is the potential for interpersonal conflict. For example, if someone uses the awareness system, identifies that her colleague is present, then contacts that colleague, what happens if the colleague chooses not to respond? The colleague is there, why isn't he responding? This again highlights the issue of presence

versus availability. One participant stated: "Like I could see people getting mad at each other, saying 'I just sent you an e-mail, why didn't you reply?' and then you have to defend yourself...I could see that being a bit of a problem between people."

Ideal System Characteristics

Another goal of the focus group study was to collect suggestions for future awareness system designs. The participants offered a number of suggestions to improve on the utility of the awareness system. As stated, a number of suggestions focused on enhancing the privacy and fairness of the system by restoring boundaries on how it is used or physical changes in the technology itself. For example, participants suggested that an icon could replace the need for a video image, sensors could monitor the room, the chair or the computer to assess activity or the employee could enter availability information. However, these suggestions were all discounted for a variety of reasons, often because of the extra effort involved in entering availability information manually. Furthermore, as one participant stated: "It would be less invasive personally without the picture, but still disturbing, still a distraction."

Interestingly, the senior managers suggested that to be useful, the awareness system needed to be both portable and on all the time. They wanted to see a combination of existing technologies that provided the advantages of cellular phones, voice-mail and e-mail but did not require physical presence at the workspace. Physical location tracking was not required.

Acceptance and Willingness to Use the Awareness System

As stated earlier, those who did indicate a willingness to accept and use the awareness monitoring system always made this acceptance conditional on modifications

to the system. For example, one participant stated: "I would view it in a favourable way, if it was really restricted. I wouldn't want to go into an office where we just knew that people could be checking." As this statement suggests, acceptance was contingent on modifications designed to enhance or restore boundaries around how the system would be used and who would use it.

Discussion

The goal of this third study was to re-examine the model of awareness system acceptance in a new way. Moving beyond the results of the quantitative studies, the focus group methodology employed in this study presented new evidence to support the theoretical model of acceptance, suggest new areas for research, and offer alternatives for the design of future awareness monitoring systems.

The characteristics of an awareness monitoring system and the justifications offered for the use of this system are related to perceptions of privacy and fairness. Interestingly, making the characteristics of the awareness system more salient than in Studies 1 and 2 appeared to result in stronger links between characteristics and privacy and fairness concerns in this focus group study. However, it was further discovered that people's perceptions of privacy and fairness are more strongly related to a sense that their interpersonal space is being violated. These feelings of boundary violations, emerging from a state of incongruence over expectations about how people interact in a monitoring environment, were linked frequently to privacy and fairness concerns.

As stated earlier, investigations in clinical, social and environmental psychology have examined the issues of boundary and social norm violations. Further evidence suggests that maintaining boundaries is critical to ensuring that people feel that their interpersonal space is being protected and that norms exist to guide interactions with others. For example, Adams and Sasse (1999), in the context of evaluating an awareness monitoring system, suggested that the perception of being observed in a private situation is a violation of a social norm. Furthermore, they suggested the need to distinguish between public and private situations and understand social norm expectations in each

situation. The participants told us that they would only use the awareness technology if there was some manner of assuring consensus in how people would behave and use the technology. This corresponds with Wilson, Roloff and Carey's (1998) claim that individuals have boundaries that regulate their disclosure of personal information and that boundary rules serve to protect privacy, integrity and the functioning of relationships. If these boundaries become blurred, individuals will erect and defend new temporal and spatial boundaries (Ashforth et al., 2000). Indeed, some participants mentioned that they would attempt to sabotage the awareness system by for example, covering the camera or even placing a picture of themselves in front of it.

There has been little application of the research surrounding boundary and norm violations in the I/O literature. With the increased use of EPM and even more pervasive monitoring technologies on the way, there is a need to integrate boundary and norm violations into future investigations of employee reactions to monitoring. Future studies need to address these issues by first, creating a valid measure of boundary violations that can be used in the context of monitoring. As well, future research must integrate these concepts into theoretical models of monitoring acceptance. For example, perceptions of boundary violations might mediate the relationship between the characteristics of the monitoring technology and perceptions of privacy and fairness.

The usefulness of the awareness system also emerged as a key determinant of acceptance. In this study, it was discovered that the awareness system does not offer the type of information that would perhaps enhance collaboration and performance. Presence information is distinct from availability information and does not increase the probability of creating opportunistic connections among distributed employees. If the usefulness of

the software falls into question, it appears that people will be more likely to denounce the technology and perhaps even question its purpose. Many of the focus group participants questioned the real motive behind the use of the system, suggesting that it is really for performance monitoring. Indeed, the senior managers in the focus group sample raised the strongest concerns about the utility of the software and in relating these concerns back to privacy and fairness perceptions, exhibited less personal concern over these issues but questioned how their subordinates would perceive the technology.

In examining this difference between managers and non-managers a little further, I returned to the data in Study 2 to look at how managers versus non-managers reacted to the technology. A reanalysis of the data revealed that overall, the model of awareness system acceptance was stronger for non-managers. Every path on the model exhibited stronger relationships among the variables for non-managers: that is, every path except for the one linking perceptions of privacy invasion and usefulness (see Appendix G). Recall that in the overall model in Study 2, this path was non-significant. However, as in the first study, managers saw the more invasive features of the technologies as more useful. There are two possible explanations for this finding. First, just as the participants in Study 1, managers might have recognized the utility of the more invasive features of the technology, but still did not accept the technology. Second, managers might have recognized the utility of the more invasive features in allowing for performance monitoring. The discussion with senior managers in the focus group study offers support to this latter interpretation. They clearly recognized the possibility for monitoring and expressed concern over how their subordinates would perceive the monitoring capabilities of the technology.

Contributions and Limitations

This focus group study uncovered potential determinants of awareness system acceptance that add to the explanation of the findings in the two previous studies. Specifically, boundary and social norm violations appear to be strong triggers of privacy and fairness concerns for participants exposed to an awareness monitoring system. However, there has been little application of the research surrounding boundary and norm violations into the organizational behaviour literature. For example, perceptions of boundary violations might moderate the relationship between the characteristics of the monitoring technology and perceptions of privacy and fairness.

The perceived usefulness of the technology also emerged as a major determinant of acceptance. The results indicated that participants did not see the awareness system as useful in providing availability information on distributed colleagues. Indeed, the awareness system only provided information on presence and presence information alone offers no knowledge about when someone is available to collaborate. We know from Davis, Bagozzi and Warshaw (1989) that perceptions of a technology's utility in helping people accomplish their jobs will influence attitudes toward the technology. If the technology is not useful, people will not endorse positive attitudes toward it. Future development efforts should strive to address the issue of whether the technology meets its goals. If not, one has to question why further development should continue.

The qualitative nature of this study added a degree of richness to complement the data gathered in the two previous quantitative studies. However, as with any focus group study, there are concerns about the representativeness of the sample. As mentioned, attempts were made to select a sample of employees from a cross-section of the

organization (e.g., different departments, different levels of the organization). Nevertheless, the results cannot be considered to be representative of the population as a whole. As well, a majority of the participants in the focus group study were female and other researchers have discovered gender differences in sensitivities to fairness violations. Specifically, Chapman and Ployhart (2001) found that females were more sensitive to procedural and interactional justice violations. However, the results of the focus group study supported the findings from Studies 1 and 2 in which no gender differences were uncovered. Furthermore, participants in this study did not have experience using an awareness monitoring system. Their reactions might have been different had they been exposed to an existing system. As stated earlier, the technology is not widespread yet. But, evidence from previous research examining employee reactions to existing awareness technologies suggests that reactions to the technology are similar in nature (e.g., Webster, 1998).

In summary, the results of this focus group study support and expand upon the data gathered in Studies 1 and 2. The results of this study moved us beyond an understanding of how the variables in the model are related to discover why these relationships exist. As well, new variables influencing acceptance emerged that offer both theoretical and practical suggestions for future research and the design of awareness monitoring systems. Getting the technology right and getting people to accept awareness monitoring appears to hinge on whether or not people's boundaries are respected.

CHAPTER 6

GENERAL DISCUSSION

The use of awareness software is emerging in organizations, and new software designs and experimental awareness systems are being developed and embraced by computer scientists as the key to enhancing collaboration amongst geographically-distributed workers. The main stumbling block appears to be acceptance of these awareness system technologies. Thus, the primary purpose of this dissertation was to examine the psychological effects of being monitored for the purpose of collaboration. In doing so, participant reactions to awareness system characteristics and justifications that were designed to enhance or violate perceptions of fairness and privacy were examined. As well, this dissertation investigated the usefulness of awareness systems, people's willingness to accept them, and uncovered some of the mechanisms pointing to why awareness systems are viewed as invasive.

In Studies 1 and 2, I investigated a theoretical model of awareness system acceptance and the influence of manipulations to the system characteristics on perceptions of privacy, fairness, usefulness and acceptance. The results from over 1200 respondents in these two studies offer some insights into how people respond to these types of awareness technologies. Individual system characteristics and justifications exerted small effects on perceptions of fairness and privacy invasion. However, a combination of system characteristics and justifications had greater effects on privacy and fairness than these characteristics examined individually. It was discovered that, although participants respond to some of the effects of the system characteristics, perceptions of privacy invasion, and fairness proved more important in informing attitudes toward awareness

systems. Ensuring that people feel that their privacy is protected and that the awareness system is fair lead to more positive attitudes and stronger intentions to use awareness system. Thus, modifications to the characteristics of and justifications for such awareness systems appear to be necessary, but not sufficient, to ensure acceptance and use.

The usefulness of the awareness technology emerged as another key determinant of acceptance. Examining usefulness directly questioned the assumption that if the technology is right, people will accept it. Studies 1 and 2 tested this assumption by examining a mediated relationship between perceptions of privacy, fairness and attitudes toward awareness system. Contrary to expectations, participants in the first study viewed the more invasive features of the awareness system as more useful in determining availability. In other words, if the system is perceived as less private, it is more useful. But, in spite of this acknowledgement, these participants did not endorse more positive attitudes toward the awareness system. A test of the moderating effects of usefulness revealed that the negative relationship between perceptions of privacy invasion and attitudes was less negative when the system was perceived as useful. What this implies that if the technology is right, people might be willing to accept it. However, in both studies, even getting the technology right did not result in acceptance. Participants still expressed negative attitudes toward the awareness system. The results from the third, qualitative study offer clues as to why.

The third study revealed that people form expectations about the degree of privacy they are afforded in their daily lives. Often, these are shared expectations that are respected by all and serve to guide social interactions among them. When these expectations are violated, people can experience feelings of discomfort, embarrassment

and even anger. From this study, it was suggested that when awareness systems are put in place, people might be unsure about the expectations guiding their own and others' behaviours. Awareness systems violate boundaries for sharing personal information with others and constrain our ability to control how we present ourselves to others. In other words, awareness systems violate expectations of privacy and this is construed as unfair. Even if attempts are made to respect individuals, these violations of psychological boundaries lead to rejection. There is a delicate balance in the line between benign and intrusive. Awareness systems appear to cross this line and are considered intrusive.

Another fascinating finding emerging from the third study is the fact that awareness systems do not appear to deliver on promises made by their developers. The assumption driving all of the research and development into these systems is that awareness information is useful for distributed work. However, this remains an untested assumption. For instance, Hudson and Smith (1996, p. 253) drew on "anecdotal evidence of the benefit of simply being able to determine when someone is in their work area in order to coordinate more explicit communication such as a phone call" for the development of their awareness systems. However, how does one determine availability from awareness information? If a coworker appears to be busy talking with a colleague, does this activity mean that she is unavailable? Or, does it mean that she is taking a break from her work and thus is actually available to communicate? As Greenberg and Kuzuoka (2000) concluded, "We do not understand how activity estimates availability ... most researchers (including ourselves) use hunches and educated guesses as to what information should be captured and portrayed to remote people." In fact, the third study

suggests that rather than enhancing distributed work, awareness systems might be a source of distraction and have the potential to create conflict among colleagues.

Where is the Line Between Benign and Intrusive?

Across the three studies, I found that ensuring the acceptance and use of a new technology like an awareness monitoring system is not a simple matter of merely designing the system to respect individuals. More fundamentally, if the system invades personal boundaries, it will result in greater perceptions of privacy invasion and lower perceptions of fairness. However, what differentiates one technology from another in predicting these reactions? For example, many do not think that it is an invasion of privacy or even unfair that people can communicate via the telephone or e-mail. It appears that a technology that changes the fundamental nature of interpersonal relationships and drives people to question their own and others' behaviours will trigger strong negative reactions. These negative reactions limit acceptance and use of the technology and even if the technology appears to be useful, people will not use it.

It could be that what I have captured here is people's initial reactions to a new technology. Once people adapt to it, they might be more willing to use it. Indeed, many people had very negative initial impressions of voice mail and e-mail. Today, few would suggest that we abolish their use. However, the difference with awareness technologies is that they are invasive and they remove control over the nature of information we share with others in a manner well beyond that produced by the use of voice mail and e-mail. Coupled with the fact that awareness technologies do not even provide actual availability information, there is little doubt that negative reactions will persist over time. Past research such as Webster (1998) supports this claim. In a longitudinal investigation of

over 1000 employees who had access to an awareness monitoring system, half did not use the system after initially trying it out and of this half, one-third reported being "wary" users who avoided the awareness features of the system. More recent anecdotal evidence emerging from annual conferences investigating awareness systems further supports the claim that people will not adapt and use these awareness technologies.

Despite all of the emerging evidence, awareness monitoring technologies will not go away -- in fact, it is expected that employees will be "benignly" monitored even more in the future. As an example, Gruen, Rohall, Petigara and Lam (2000) have examined the use of large, LED displays to present awareness information about colleagues in common workspace areas and desklamps that light and dim to reflect the presence of a colleague. As well, recent announcements about the convergence of palm computing, cell phones, and location trackers offer other examples of this emergent type of monitoring. Odigo, a commercial instant-messaging system allows users to see who is visiting a particular Web page at any point in time and to initiate conversations with them (ZDNet, 2000). The use of these types of intelligent agent software programs permits the collection of personal data, often without the expressed knowledge of the user. Thus, researchers need to continue to investigate the usefulness and design of such systems and determine whether these benign surveillance systems are in fact, malignant.

Extending these findings to other types of communications technologies and to more traditional employee monitoring applications, the lesson is that if the technology violates boundaries by removing choice in how personal information is shared with others and creates situations where expectations guiding social behaviour are unclear, people will

respond negatively. Even if the technology is useful in helping people to communicate effectively, concerns over privacy and fairness will not lead to acceptance and use.

Theoretical Contributions

A key objective of this research was to respond to calls for more research on electronic media that provide availability information on coworkers (e.g., Sarbaugh-Thompson & Feldman, 1998). To do so, I expanded upon past research in EPM (e.g., Stanton, 2000a), privacy (e.g., Stone & Stone, 1990), fairness (e.g., Ambrose & Alder, 2000), and awareness system technologies (e.g., Greenberg & Kuzuoka, 2000) to develop and test a model of awareness system acceptance.

These studies also responded to calls by researchers such as Bies (1993) to link the disparate literatures and research into privacy and fairness. In extending the research by Alge (1999) and Eddy et al. (1999), this research offers important implications for future work. Results indicate that privacy is not a strict antecedent of fairness. There is no doubt that privacy does have an important role to play in determining employees' attitudes. This was evident in the analysis of both quantitative data and the analysis of participants' qualitative responses. However, privacy plays a dual role with fairness in determining attitudes. In demonstrating this, it can be said that when examining the issue of monitoring respecting both of these variables is extremely important in predicting outcomes. Nonetheless, situational factors might influence the relationship between these variables. For example, privacy and fairness might only be linked in situations where monitoring is implemented for those already working in the organization. For new employees who are informed that they will be monitored as part of the job, the relationship between privacy and fairness might be different or might not exist at all. If I am told that I will be

monitored and am still willing to accept a position, then I might not be as concerned about protecting my privacy (or my public image). In contrast, existing employees who are told that monitoring will be implemented might express stronger concerns about protecting the privacy that might be lost. However, it is likely that in both of these situations, the desire to protect one's private time will result in concerns about the fairness of the monitoring process.

This research also offers a possible extension to the EPM literature. The qualitative study uncovered some reasons why people think that awareness monitoring is unfair. According to the participants, the technology limits one's ability to control how and when work gets done. In other words, if people use the awareness system to see if you are available, find that you are there and then try to contact you, you can no longer prioritize your own work tasks. You are forced to respond and react to their priorities and have lost the freedom to schedule your own work tasks. Working under EPM, you also lose the freedom to control your own work. You must engage in the behaviours that are being monitored, when they are being monitored. Although control over monitoring has been investigated, I am not aware of any EPM studies that have specifically examined loss of control over scheduling of work tasks as a predictor of reactions to EPM.

Another contribution of this research was to test the assumption in the HCI literature that manipulating the characteristics of awareness monitoring systems would lead to greater acceptance. In these studies, it appears that this assumption is faulty. Manipulating the characteristics of an awareness system to enhance perceptions of privacy and fairness did not fully mitigate people's concerns nor guarantee acceptance and use.

The theory driving the research and development of awareness technologies must include an analysis of psychological barriers to acceptance such as boundary violations.

Limitations

As mentioned earlier, the use of a scenario design in Studies 1 and 2 allowed for control of the independent variables and to thus make causal statements concerning the system characteristics and justifications. However, the survey portion of the study was cross-sectional, thus precluding any claims about the causality of privacy and fairness perceptions in influencing acceptance. Another concern mentioned earlier relates to the use of a single instrument to collect data and the possibility of common method variance. As described, attempts were made to limit this concern but it is acknowledged that the magnitude of some of the relationships found to exist between the variables in the studies (especially Study 1) might have been due in part to common method variance. However, using a different methodology, the third study offered support for the correlational evidence found in both Studies 1 and 2.

Furthermore, the items used to capture some of the variables of interest might not have been clear. Specifically, I am referring to the measures of fairness and attitudes that were adapted from previous research (e.g., Alge, 1999; Davis et al., 1989) that might have captured an overall perception of good versus bad than a more accurate reflection of key fairness constructs or the cognitions and emotions related to attitudes. Although the third study attempted to gather more accurate information on these constructs, further conceptual work is needed to refine these measures.

These studies only examined video-based awareness systems and other types of awareness monitoring might have resulted in more positive reactions. As well, the

inclusion of a "no monitoring" condition would have made the results more comparable to past EPM research. Overall, these limitations suggest areas for future research: for example, longitudinal field research is needed that includes employees at a variety of job levels and that compares the use of awareness systems with more traditional technologies.

Implications for Research and Practice

As indicated earlier, development of awareness systems represents a very active research area. However, if the results of these studies tell us anything, it is that modifying system features might not be the key to ensuring acceptance and use. The results suggest that there are psychological barriers to acceptance that will limit the adoption of awareness system technologies. In fact, any technology that violates psychological boundaries might not be accepted and used. Thus, organizations contemplating the use of awareness technologies, or any technology that is designed to enhance communication among colleagues, must be aware of possible psychological implications of these systems. These implications can influence people's willingness to work for these organizations and, with an ever-tightening labor market, this can be a critical concern.

Manipulating the characteristics of the system and even offering justifications for its use were not sufficient to overcome concerns over fairness and privacy. Nevertheless, if efforts at developing these video-based awareness systems continue, attention should be paid to the technical characteristics of the system. It is recommended that features should be designed to convey necessary availability information in the least invasive mode possible. However, for other than truly collaborative efforts, where co-workers are engaging in synchronous, mutually-dependent activities, perhaps the transmission of video-based images is unnecessary. If the dividing line between when a technology is

benign and when it is intrusive falls at the point when psychological boundaries are violated, the design of new technologies should reflect efforts to respect this line. More research is needed to clarify these issues and identify whether barriers to acceptance can or should be overcome. As well, future research efforts should begin with the development of means to meaningfully assess boundary violations using a standardized instrument. Modifications to the model of acceptance should follow from this consideration of boundary violations to extend the findings beyond awareness systems to assess any new technology used for employee monitoring.

A new technology that purports to enhance communication must also prove that it does so effectively. The utility of the awareness system in providing awareness information will influence acceptance. Future design efforts must ensure that the technology provides information on availability, not just presence. But first, research must address the untested assumption that awareness information is useful for distributed work. Anecdotal evidence and educated guesses are no longer acceptable substitutes for empirical investigations. Future research should also search for other influences on monitoring reactions. For instance, Stanton (2000a) called for an examination of individual difference variables such as extroversion as moderators of the links between monitoring characteristics and reactions to monitoring. Douthitt and Aiello (2000) found that monitored individuals who were higher in negative affectivity reported lower levels of task satisfaction. McKnight and Webster (in press) suggested that disposition to trust might influence reactions to awareness systems.

These studies attempted to broaden our understanding of the psychological barriers to awareness system acceptance and to expand our theoretical knowledge into a number of

diverse but related domains. The results of this dissertation present evidence to suggest that technological solutions alone will not lead to greater acceptance of awareness monitoring systems. Respecting fairness and privacy by maintaining personal boundaries might lead to increased acceptance. However, as options for availability monitoring continue to increase, it is important to balance the perceived benefits of monitoring against the psychological implications for those employees being monitored.

Appendix A

Example System Characteristics – Study 1

System Characteristics: Respecting Individuals More

This awareness system has the following features:

- The video camera is set-up so that a blurred image of your face appears to others. (Image Clarity)*
- Every ten minutes, a new snapshot of you is captured for projection. (Frequency of Image Updating)
- You can tell who is using the awareness system to see if you are available. That is, no one can look at your image without your knowledge of who is looking. (Knowledge of Monitoring)
- You can control when you want your image to be made available or unavailable to others. (Control)

System Characteristics: Respecting Individuals Less

This awareness system has the following features:

- The video camera is set-up so that a clear image of you appears to others. (Image Clarity)
- A continuous, real-time image of you is projected. (Frequency of Image Updating)
- You cannot tell who is using the awareness system to see if you are available. That is, someone can look at an image of you without your knowledge of who is looking. (Knowledge of Monitoring)
- You have no control over when your image is available or unavailable to others. (Control)

* System characteristics labeled in parentheses are for the reader's understanding and were not presented to participants

Appendix B

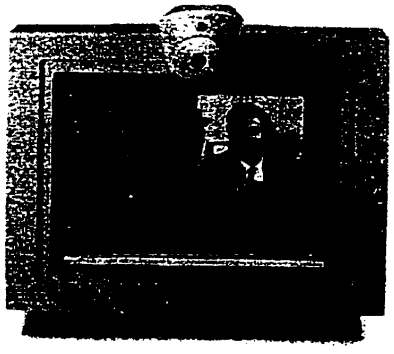
Awareness System Survey – Study 1

Imagine that you are a customer service agent for a large organization. In your job, you take calls from the firm's customers. In addition to working alone, you sometimes need to collaborate with customer service agents at other locations (for instance, to ask them advice on how to answer a customer's question or to seek help from others in addressing a problem). From time to time, you also meet with colleagues or local customers in person.

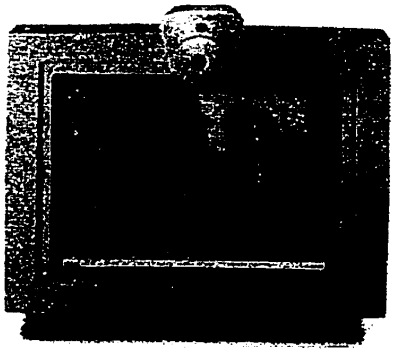
As part of a new telecommuting initiative, the organization is offering all of their customer service agents the option of working from home. If you decide you want to work from home, the organization will install a dedicated phone line in your home and provide you with a high-speed networked computer with e-mail, fax, and database software. Also, the firm is planning on installing a video "awareness" system (which includes a video camera in your workspace).

This awareness system allows your colleagues to access their networked computers to see your image during the workday. This will allow them to determine your presence or absence at your workstation and whether you appear to be busy (e.g., talking on the phone, meeting with someone else). Similarly, you can view your colleagues' images to see their availability. The awareness system will run in the "background" all the time. That is, you or your colleagues may not be accessing it at any point in time, but it will always be there.

With this awareness system, your computer monitor will be set up with a small camera placed on top that captures your image to be transmitted to others. Two examples of video awareness systems are included here. For instance, some awareness systems present images of you and your colleagues quite clearly, while others blur the images. This first screen-shot demonstrates an awareness system in which the image of one of your colleagues appears quite clearly to others:



This second screen-shot demonstrates an awareness system in which your colleague's image has been blurred before transmission through the awareness system:



Similar to the examples above, your image will be captured by the awareness system and transmitted to your colleagues. The idea behind video awareness systems is that if your colleagues can view your image, they will have

a better idea of whether you are present to answer a question or to collaborate on a task. Similarly, you will be able to view your colleagues' images to determine their availability. This system will **not** be used by management to monitor your performance; rather, it can be used by you and your coworkers to aid in collaboration. In addition to the awareness system, you will have access to telephone, fax, and e-mail to aid in collaboration, but you are not required to use any of these tools.

On the next page, you will see a description of the features of this awareness system. Please read through the features carefully and then respond to the questions.

This awareness system has the following features:

- The video camera is set-up so that a clear image of you appears to others.
- Every ten minutes, a new snapshot of you is captured for projection.
- You cannot tell who is using the awareness system to see if you are available. That is, someone can look at an image of you without your knowledge of who is looking.
- You have no control over when you image is available or unavailable to others.

Please answer the following questions:

1. To what extent do you feel that this awareness system would be fair? (Fairness)*	Definitely Not Fair 1	2	3	4	5	6	Definitely Fair 7
2. To what extent would you feel that the manner in which your presence is monitored would be an invasion of your privacy? (Privacy)	Not at all 1	2	3	4	5	6	A Great Deal 7
3. To what extent do you feel that this awareness system would preserve your dignity and respect? (dignity and respect)	Not at all 1	2	3	4	5	6	A Great Deal 7
4. Do you feel that this awareness system would be useful in aiding collaboration? (usefulness)	Definitely Not Useful 1	2	3	4	5	6	Definitely Useful 7
5. What would be your attitude towards the use of this awareness system? (attitudes)	Extremely Negative 1	2	3	4	5	6	Extremely Positive 7
6. How willing would you be to use this awareness system? (intentions to use)	Extremely Unwilling 1	2	3	4	5	6	Extremely Willing 7
7. To what extent do you feel that the methods used to monitor your presence would be invasive? (privacy)	Not at all Invasive 1	2	3	4	5	6	Extremely Invasive 7
8. Do you feel that this awareness system would be more useful than phone, e-mail or fax in determining availability? (usefulness)	Definitely Less Useful 1	2	3	4	5	6	Definitely More Useful 7
9. To what extent do you feel that you would have an opportunity to determine what images are captured and distributed to others? (control)	No Opportunity 1	2	3	4	5	6	Full Opportunity 7

10. To what extent do you feel that you would enjoy this awareness system? (attitudes)	Not at all 1	2	3	4	5	6	A Great Extent 7
11. Do you feel that this awareness system would be fair for everyone who would use it? (fairness)	Not at all Fair 1	2	3	4	5	6	Extremely Fair 7
12. Do you feel that the awareness system would represent your presence accurately? (accuracy)	Not at all Accurate 1	2	3	4	5	6	Extremely Accurate 7
13. How often would you likely use this awareness system? (intentions)	Not at all 1	2	3	4	5	6	Very Often 7
14. To what extent do you feel that this awareness system would result in an invasion of your privacy? (privacy)	Definitely Not an Invasion 1	2	3	4	5	6	Definitely an Invasion 7
15. Do you think that the awareness system would be used in an ethical manner? (ethicality)	Not at all Ethical 1	2	3	4	5	6	Extremely Ethical 7
16. To what extent do you feel that you would like this awareness system? (attitudes)	Not at all 1	2	3	4	5	6	A Great Deal 7
17. Do you feel that this awareness system would be fair to you? (fairness)	Not at all Fair 1	2	3	4	5	6	Extremely Fair 7
18. Do you feel that this awareness system would be useful in accomplishing tasks for this job? (usefulness)	Not at all Useful 1	2	3	4	5	6	Extremely Useful 7
19. To what extent would you look forward to using this awareness system? (intentions)	Not at all 1	2	3	4	5	6	A Great Deal 7
20. Do you feel that the methods used to capture your presence would be fair to you? (fairness)	Not at all Fair 1	2	3	4	5	6	Extremely Fair 7
21. How likely is it that you would want to work for this organization? (intentions to work)	Not at all Likely 1	2	3	4	5	6	Extremely Likely 7

22. If you wanted to collaborate with a distant colleague, would you be most likely to:

_____ a) check the colleague's image through the awareness system, and then contact them through telephone, fax, or e-mail, or
_____ b) not use the awareness system, but contact them only through telephone, fax, or e-mail (intentions to use)

23. If a distant colleague wanted to collaborate with you, would you rather:

_____a) your colleague first checked your image through the awareness system, and then contacted you through telephone, fax, or e-mail, or
_____b) your colleague not use the awareness system, but contact you only through telephone, fax or e-mail (intentions to use)

* Variables assessed by each item are labeled in parentheses for the reader's understanding.

Appendix C

Example System Characteristics and Justifications – Study 2

Respecting Individuals More:

System Characteristics:

This awareness system has the following features:

- The video camera is set-up so that a blurred image of you (transmitting your availability information only) appears to others. (Image Clarity)*
- Every ten minutes, a new snapshot of you is captured for projection. (Frequency of Image Updating)
- You can tell who is using the awareness system to see if you are available. That is, no one can look at your image without your knowledge of who is looking. (Knowledge of Monitoring)
- You can control when you want your image to be made available or unavailable to others. (Control)

Means Justification (present):

The organization used the following procedures to decide how the system should be used. First, a group of employees was surveyed to obtain their views on the awareness system. Second, employee feedback was used to modify some of the characteristics. Now, you have an opportunity to voice your views on the awareness system.

Ends Justification (present):

The purpose of this system is to make the organization more responsive to its customers by giving you and your colleagues the tools to collaborate with each other more quickly and efficiently...The purpose of this system is to make the organization more responsive and competitive...This system is designed to help you in the accomplishment of your job, not to monitor your work or behaviors. ... This system will allow the organization to be more responsive to its clients by giving you and your colleagues the tools to collaborate with each other more quickly and efficiently.

Respecting Individuals Less:

System Characteristics:

This awareness system has the following features:

- The video camera is set-up so that a clear image of you (transmitting information on both your availability and actions) appears to others. (Image Clarity)

- A continuous, real-time image of you is projected. (Frequency of Image Updating)

- You cannot tell who is using the awareness system to see if you are available. That is, someone can look at an image of you without your knowledge of who is looking. (Knowledge of Monitoring)

- You have no control over when your image is available or unavailable to others. (Control)

Means & Ends Justifications (absent)

* System characteristics labeled in parentheses are for the reader's understanding and were not presented to participants

Appendix D

Awareness System Survey – Study 2

Imagine that you are a client service agent for a large organization. In your job, you take calls from the firm's clients. In addition to working alone, you sometimes need to collaborate with client service agents at other locations (for instance, to ask them advice on how to answer a client's question or to seek help from others in addressing a problem). From time to time, you also meet with colleagues or local clients in person.

As part of a new telecommuting initiative, the organization is offering all of their client service agents the option of working from home. If you decide you want to work from home, the organization will install a dedicated phone line in your home and provide you with a high-speed networked computer with e-mail, fax, and database software. Also, the firm is planning on installing a video "awareness" system (which includes a video camera in your workspace).

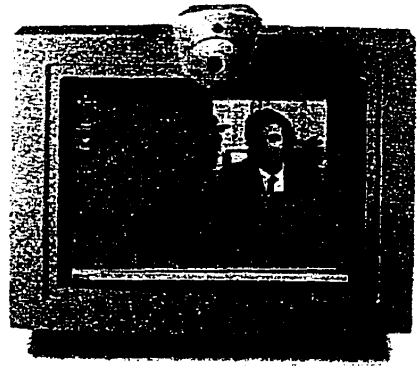
This awareness system allows your colleagues to access their networked computers to see your image during the workday. This will allow them to determine your presence or absence at your workstation and whether you appear to be busy (e.g., talking on the phone, meeting with someone else). Similarly, you can view your colleagues' images to see their availability. The awareness system will run in the "background" all the time. That is, you or your colleagues may not be accessing it at any point in time, but it will always be there.

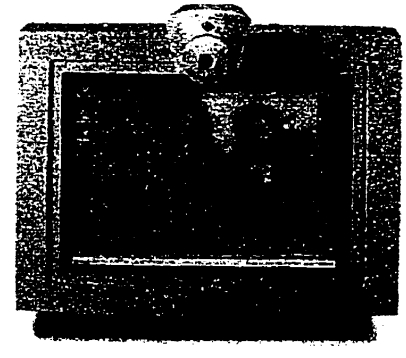
The idea behind video awareness systems is that if your colleagues can view your image, they will have a better idea of whether you are present to answer a question or to collaborate on a task. Similarly, you will be able to view your colleagues' images to determine their availability. This system will not be used by management to monitor your performance; rather, it can be used by you and your coworkers to aid in collaboration. This system will allow the organization to be more responsive to its clients by giving you and your colleagues the tools to collaborate with each other more quickly and efficiently.

The organization used the following procedures to decide how the system should be used. First, a group of employees was surveyed to obtain their views on the awareness system. Second, employee feedback was used to modify some of the characteristics of the system. Now, you have an opportunity to voice your views on the awareness system.

With this awareness system, your computer monitor will be set up with a small camera placed on top that captures your image to be transmitted to others. Two examples of video awareness systems are included here. For instance, some awareness systems present images of you and your colleagues quite clearly, while others blur the images. Both clear and blurred images can transmit your availability equally well, but blurred images protect the details of your actions from others.

The first screen-shot demonstrates an awareness system in which the image of one of your colleagues appears quite clearly to others, while the second screen-shot demonstrates an awareness system in which your colleague's image has been blurred before transmission to protect the details of your actions from others:





Similar to the examples above, your image will be captured by the awareness system and transmitted to your colleagues. In addition to the awareness system, you will have access to telephone, fax, and e-mail to aid in collaboration, but you are not required to use any of these tools. The purpose of this system is to make the organization more responsive and is designed to help you in the accomplishment of your job, not to monitor your work or behaviours.

Before moving to the next screen, please ensure that you have read the description above carefully. On the next screen, you will see a description of the features of an awareness system. Please read through the features carefully and then respond to the questions that follow.

This awareness system has the following features:

- **The video camera is set-up so that a blurred image of you (transmitting your availability information only) appears to others.**
- **Every ten minutes, a new snapshot of you is captured for projection.**
- **You cannot tell who is using the awareness system to see if you are available. That is, someone can look at an image of you without your knowledge of who is looking.**
- **You have no control over when your image is available or unavailable to others.**

Please answer or indicate your degree of agreement/disagreement to the following questions and/or statements:

1. To what extent do you feel that this awareness system would be fair? (fairness)	Definitely Not Fair 1	2	3	4	5	6	Definitely Fair 7
2. To what extent would you feel that the manner in which your presence is monitored would be an invasion of your privacy? (privacy)	Not at all 1	2	3	4	5	6	A Great Deal 7
3. To what extent do you feel that this awareness system would preserve your dignity and respect? (dignity and respect)	Not at all 1	2	3	4	5	6	A Great Deal 7
4. Do you feel that this awareness system would be useful in aiding collaboration? (usefulness)	Definitely Not Useful 1	2	3	4	5	6	Definitely Useful 7
5. What would be your attitude towards the use of this awareness system? (attitudes)	Extremely Negative 1	2	3	4	5	6	Extremely Positive 7
6. How willing would you be to use this awareness system? (intentions)	Extremely Unwilling 1	2	3	4	5	6	Extremely Willing 7
7. To what extent do you feel that the methods used to monitor your presence would be invasive? (privacy)	Not at all Invasive 1	2	3	4	5	6	Extremely Invasive 7
8. To what extent do employees have input into the design of the awareness system? **(means)**	Not at all 1	2	3	4	5	6	A Great Deal 7
9. Do you feel that this awareness system would be more useful than phone, e-mail or fax in determining availability? (usefulness)	Definitely Less Useful 1	2	3	4	5	6	Definitely More Useful 7

10. To what extent do you feel that you would have an opportunity to control the awareness system? (control)	No Opportunity 1	2	3	4	5	6	Full Opportunity 7
11. If the job were appropriate, I would find this company an acceptable place to work. **(intentions to work)**	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
12. To what extent do you feel that you would enjoy this awareness system? (attitudes)	Not at all 1	2	3	4	5	6	A Great Extent 7
13. Employee views are represented in the decisions made for using this awareness system. **(means)**	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
14. Do you feel that this awareness system would be fair for everyone who would use it? (fairness)	Not at all Fair 1	2	3	4	5	6	Extremely Fair 7
15. How often would you likely use this awareness system? (intentions)	Not at all 1	2	3	4	5	6	Very Often 7
16. To what extent do you feel that this awareness system would result in an invasion of your privacy? (privacy)	Definitely Not an Invasion 1	2	3	4	5	6	Definitely an Invasion 7
17. To what extent were you told about the purpose for the awareness system? **(ends)**	Not at all 1	2	3	4	5	6	A Great Deal 7
18. Do you think that the awareness system would be used in an ethical manner? (ethicality)	Not at all Ethical 1	2	3	4	5	6	Extremely Ethical 7
19. To what extent do you feel that you would like this awareness system? (attitudes)	Not at all 1	2	3	4	5	6	A Great Deal 7
20. Do you feel that this awareness system would be fair to you? (fairness)	Not at all Fair 1	2	3	4	5	6	Extremely Fair 7
21. Do you feel that the image transmitted using this awareness system is appropriate for determining your presence? (accuracy)	Extremely Inappropriate 1	2	3	4	5	6	Extremely Appropriate 7

22. How adequate was the organization's explanation of the procedures for deciding how the awareness system would be used? **(means)**	Not at all Adequate 1	2	3	4	5	6	Extremely Adequate 7
23. Do you feel that this awareness system would be useful in accomplishing tasks for this job? (usefulness)	Not at all Useful 1	2	3	4	5	6	Extremely Useful 7
24. To what extent would you look forward to using this awareness system? (intentions)	Not at all 1	2	3	4	5	6	A Great Deal 7
25. Do you feel that the methods used to capture your presence would be fair to you? (fairness)	Not at all Fair 1	2	3	4	5	6	Extremely Fair 7
26. To what extent do you believe that the reasons given for using the awareness system are legitimate? **(ends)**	Not at all Legitimate 1	2	3	4	5	6	Extremely Legitimate 7
27. If the job were appropriate, how likely is it that you would want to work for this organization? (intentions to work)	Not at all Likely 1	2	3	4	5	6	Extremely Likely 7

28. If you wanted to collaborate with a distant colleague, would you be most likely to:

_____ a) check the colleague's image through the awareness system, and then contact them through telephone, fax, or e-mail, or
_____ b) not use the awareness system, but contact them only through telephone, fax or e-mail (intentions to use)

29. If a distant colleague wanted to collaborate with you, would you rather:

_____a) your colleague first checked your image through the awareness system, and then contacted you through telephone, fax, or e-mail, or
_____b) your colleague not use the awareness system, but contact you only through telephone, fax or e-mail. (intentions to use)

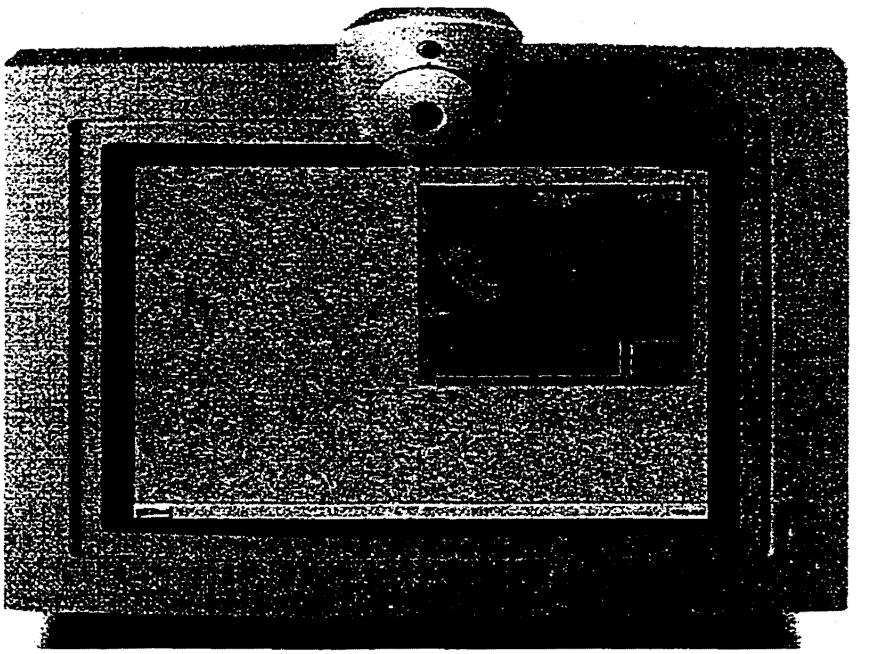
Please go on to the next screen

* Variables assessed by each item are labeled in parentheses for the reader's understanding. New items are denoted in bold.

Appendix E

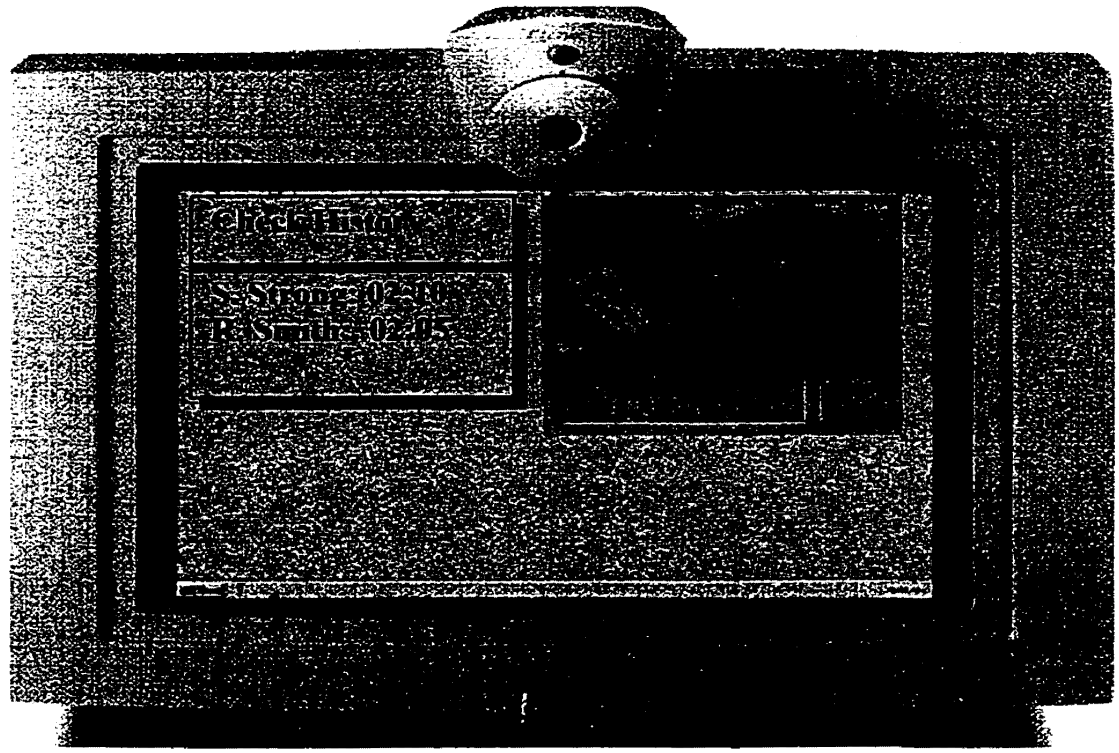
Sample Focus Group Materials

Frequency of Image Capture



Every ten minutes, a new snapshot of you is captured for projection.

Knowledge of Monitoring



You can tell who is using the awareness system to see if you are available. That is, no one can look at your image without your knowledge of who is looking.

Appendix F

Focus Group Coding Scheme, Frequencies and Sample Comments

Construct	Frequency	Sample Comments
System Characteristics		
• Image Clarity [Blurry vs. Clear Image]	2 4	Positive: "So if we are sitting there in my pyjamas, slopping down coffee, dribbling down my chin or something." Negative: "I would think some people would kind of be annoyed thinking 'well this isn't very good technology, it's blurry'."
• Frequency [intermittent image capture vs. continuous (live) image capture]	5 15	Positive: "It's not live, which would take away some of the issues that people would have. I think a ton of people would not like a live camera on them." Negative : "That 10 minute delay on the picture doesn't seem timely enough. I mean if you are on a phone, the average phone conversation lasts two or three minutes, it's out of date."
• Knowledge of Monitoring [Check History Feature – knowledge of who is monitoring vs. no monitoring]	7 14	Positive: "I think that's good [knowledge of monitoring]. It will give people a lot more comfort about being watched." Negative: "But it's not instantaneous that you know who is looking at you right now. You have to do a search kind of thing." "That's what I don't like about it, it's historical data, it's people who have already been watching you."

Construct	Frequency	Sample Comments
• Control [control over when/if image is captured and transmitted vs. no control]	10 3	Positive: "Having the control in terms of when I am not there is good too. Because then you could shut it off." Negative: "So then if you had someone like me that doesn't want to be seen, then the system would be totally defeated, right?"
• System Characteristic – Privacy Link	27	"Lets say you checked it out [Check history], ten times in a row, it is some guy who has been following you home from work and there's problems. But with the non-awareness, I don't like that." "The Check History feature sure seems crucial as it will eliminate people using it as a performance or check-up feature."
• System Characteristic – Fairness Link	9	"And it's fair that you know who is checking to see if you are available." [referring to knowledge of monitoring] "Or even turning it off is, you know, an act of rebellion against the system right? So that brands you right there if your thing is constantly turned off." "I think that as long as you had the upper hand that you could turn it off if you wanted to, that would make a big difference…if you want a coffee in the morning you could turn it off."

Construct	Frequency	Sample Comments
• Justifications – Means Def'n: Legitimizing the means in which the technology is implemented	2	"I guess if it was widely dispersed and that people were using it and understood why and accepted it and management supported the fact that they are going to sit and watch and 'oh, she is not there, but she is okay'."
• Justifications – Ends Def'n: Legitimizing the purpose behind the use of the technology	5	"So how do you avoid point 1 from coming into play?" [referring to monitoring performance when discussing ends justifications]
• Justifications – Fairness Link	3	"Uh huh!" "Yeah, right!" [reactions to ends justification] "They have to sell it and they have to build the level of trust that if the say they are not going to use it for performance, then they better mean it."
• Video Image	0 26	Positive: nothing stated Negative: "Well I wouldn't want somebody to have my picture…I don't think that's a pleasant thought." "I would also say that the always on video portion of it probably is intrusive. Does it have to be video?"

Construct	Frequency	Sample Comments
Boundary Violations - BV [A breach in the limits between the degree of psychological closeness and distance in interpersonal interactions and relationships (Popp, 1996).]		
• Boundary Violation – Privacy Link	82	"And even if it's not monitoring, I mean if your supervisor knows that you are working from home and he is trying to get a hold of you and he checks every twenty minutes and you are still not there, it's not forced monitoring but he is going to find out." "I feel like when some prisoners are sort of, they bracelet them so they know where they are…It's the whole idea of a loss of privacy in all of our lives. We have radar on the roads, and now you have radar at work."
• Boundary Violation – Fairness Link	29	"You might be working on something that's due tomorrow and you have to get it done no matter what but now you have to stop for half an hour because someone else knows you are there and you have no choice but to deal with whatever it is they bring to you." [related to scheduling] "The underlying thing seems to be that it's based on honesty, which you have to believe that your colleagues would use this system fairly, seems to be important."

Construct	Frequency	Sample Comments
• Violation of Social Norms [A state of incongruence between the person and the situation or place (Linneweber, 1988) resulting from a breach of collective social expectations guiding social interactions and behaviours of others (Wislon, Roloff & Carey, 1998).]	52	"It's unfortunate that the world has come to this, but I believe that it's here." [reference to monitoring] "I would have less of an issue if someone from Mississauga was trying to find me here [at office] because I am going to be appropriately dressed here...so in a work environment I have less issue with this than at home in a virtual office. I certainly would not feel comfortable at home having something like this."
• Perception Distortion [The notion that users' perceptions will be distorted because there is no opportunity to gauge what they are thinking and respond accordingly if their perceptions are invalid due to the one-sided nature of the interaction.]	30	"I think you are also dealing with an unknown variable. And that is your colleagues' perceptions of the image that they are seeing. And that perception of not working 'what are they doing? Where are they?' I think creates different situations and scenarios for people and I would be concerned about that – my colleagues perception of what they are seeing in the image." "If I start looking for somebody and I check, they are not there and I check again, they are not there, it can put negative things in your mind, you know. And again when you are doing performance, you would think, 'What is this person doing?'" "It could potentially create unfair assumptions of people's performance, although we know that it's not designed for performance [assessment]."

Construct	Frequency	Sample Comments
• Boundary Restoration/Protection	64	"If we implemented it at every level of the organization equitably then it's more fair than if we put it on certain people and didn't put it on other people." "I think if I knew that there were strict guidelines and people were going to be of a like mind and use it for the intended purpose." "I would love this to be used in a different way, if I am talking to somebody and there is a little camera and I can see them that would be excellent...once you have phoned them, you can turn this camera on."
Privacy Invasion [A state or condition in which the individual has the capacity to (a) control the release and possible subsequent dissemination of information about him or herself, (b) regulate both the amount and nature of social interaction, (c) exclude or isolate him or herself from unwanted (auditory, visual, etc.) stimuli in an environment, and as a consequence, can (d) behave autonomously (Stone & Stone, 1990).]		
• Abuse – Spying	32	"I don't like the spying aspect of it." "I would feel spied on." "If somebody is watching you every 10 minutes in your Check History is it will say "Stalkerman, Stalkerman, Stalkerman."
• Performance Monitoring	26	"Say it was your manager trying to get a hold of you. It could be one of those casual questions 'Well, did you go get a drink or something?' All of a sudden, you have to account for everything that you do."

Construct	Frequency	Sample Comments
• Discomfort/Embarrassment	29	"You're conscious of yourself all of a sudden and I think that's the last thing somebody needs."
• Privacy-Fairness Link	6	"Is it fair for me to know that B. is in his office? If he doesn't want to talk to anybody, he is still not going to talk to anybody. He has to have privacy for whatever he is doing and I think that holds true for everybody." "But you know thinking of the privacy and fairness issue of this...you know, like this is a real invasion of privacy."
Fairness [Subjective judgement of what is right and wrong with respect to outcomes, procedures and interactions (Tyler, Boeckman, Smith & Huo, 1997).]		
• Performance Monitoring	26	"...as soon as someone suspected it being used as performance management, you have defeated the entire purpose."
• Control over work schedule	15	"I think it's unfair because it's forcing you to reprioritize everything that you are working on." "I think that it's really unfair because you no longer have the choice to work the way you want to."
• Trust	11	"Are you monitoring me because you think I might do something wrong?" "I don't think it would enhance good will on the part of the employee, because if you are watched constantly, that is not a mark of trust."

Construct/Code	Frequency	Sample Comments
Usefulness		
• Positive and Negative	21 57	Positive: "Well it's useful when you need to talk to somebody and you keep calling...you wouldn't keep calling every five minutes...so in those circumstances, I think it would be useful." "...that sort of environment where if I needed to get a hold of somebody I could easily get on and see if they are there...without having to have them have a cell phone or go through that expense for an infrequent sort of usage type thing, in a situation where the person is typically at their desk." Negative: "I'm trying to understand in my mind what the advantage of this is versus dialing a number and seeing if somebody is at their desk." "I really can't see the value over a cell phone or beeper."
• Usefulness – System Characterstic Link	9	"So then if you had someone like me that doesn't want to be seen, then the system would be totally defeated right?"
• Usefulness – Privacy Link	4	"You have no privacy and you can't have it working and have privacy at the same time because the whole point of it is for you not to have privacy so people know whether you are there or not."

Construct	Frequency	Sample Comments
• Usefulness – Fairness Link	5	"From a fairness point of view if when I use it, it really helps me, then it's fair but if most of the time when I use it and so and so is there and I call and they don't answer the phone anyway then it's useless."
• Presence vs. Availability	34	"There is a big, big difference between presence and availability" "...to me, an awareness system is valuable if you know when a person is available to be interrupted, no matter where they are." "The assumption here is that if you are sitting at your terminal it's time to be interrupted and that may not be valid."
Performance Consequences		
• Distractors	21	"I think that the increase in interruptions would probably affect productivity...you can't concentrate if people are constantly calling you...I know you're there, I know you're there."
• Interpersonal Conflict	10	"Like I could see people getting mad at each other, saying 'I just sent you an email why didn't you reply?' and then you have to defend yourself...I could see that being a bit of a problem between people."

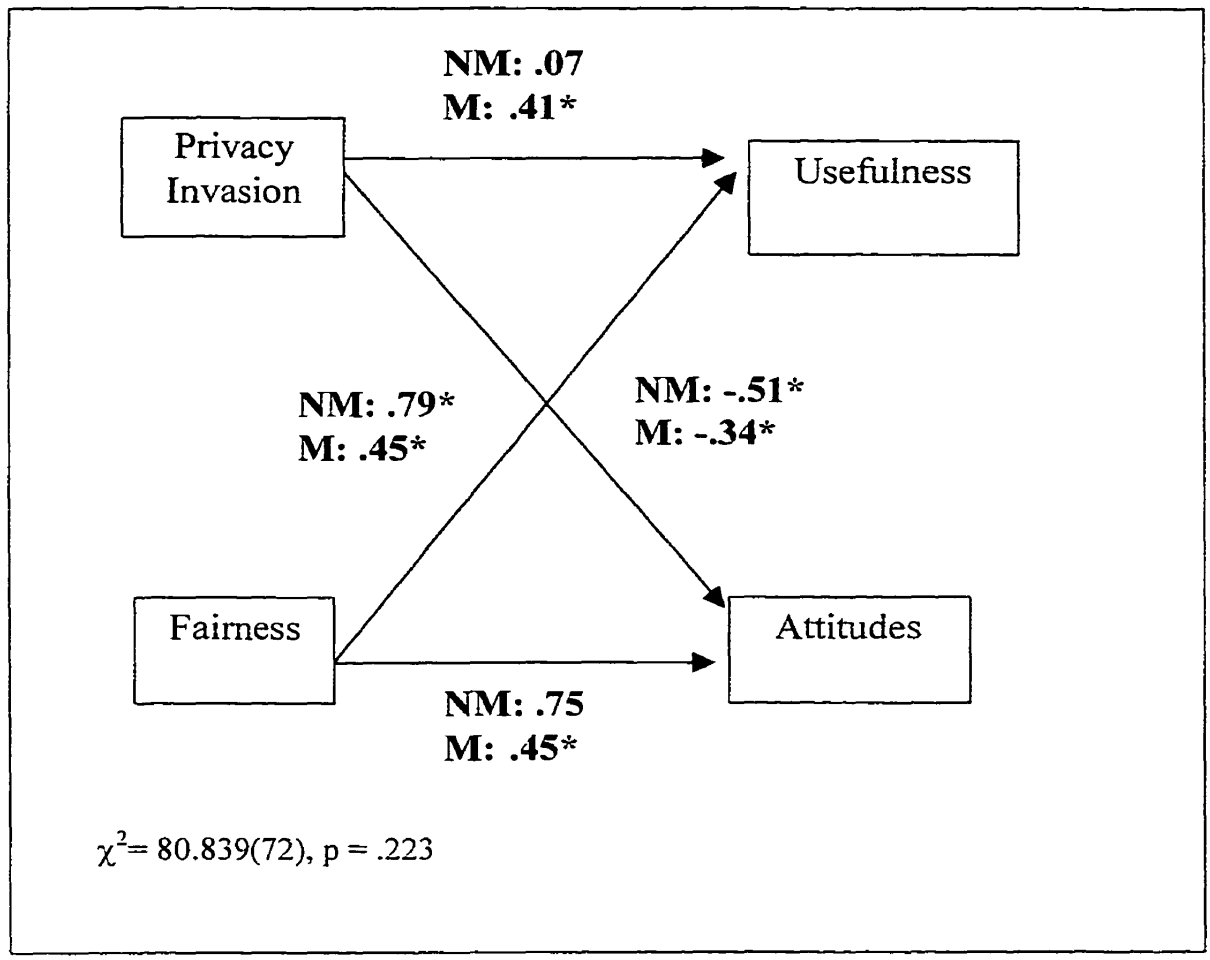
Construct/Code	Frequency	Sample Comments
Fit		
• Culture	7	"That is the organizational structure, everybody lives off their calendar." "And you are also in a company that has a meeting culture."
• Job Fit	35	"I think it would depend on what you are using it for and what level of the organization you implement it for."
• Justifications (General)	14	"So there would have to be a whole communication plan…that would tie into the company's ethics and moral code." "I would have to see the costs versus the benefits."
Alternatives (Ideal System Characteristics)		
• Alternatives to Video	29	"…instead of showing a, actually taking a picture of the person, just putting an indicator on the screen that you know 'John's at his desk'." "It will get rid of the sort of the 'I'm watching you kind of thing."
• Alternatives/Modifications to Awareness System	49	"…a two-step process, availability and them communicating, it would be nice to have that together."
• Discounted	13	"If someone calls your voicemail that says 'I'm out of the office today'…so there is at least some feedback whereas with the picture it tells you nothing, just that they are there or not." "Unless it was linked to the calendaring system where it may have a small description as to where you are. But if you are off ill, how are you going to know that?…You don't update your calendar."

Construct	Frequency	Sample Comments
Acceptance	53	"The first thing you do is check your calendar entries. So I mean I can check someone's calendar and send them an invite for a meeting in half an hour and they are generally there." "I don't really have a problem that email or voice mail doesn't usually solve it or suit the purpose." [participant located in the U.S.]
Acceptance		
• Attitudes	15* 17	Positive: "I would view it in a favourable way, I guess if it was really restricted." Negative: " I just don't see the value of it…versus what technology exists."
• Willingness to Use	6* 8	Positive: "I think I would actually be inclined to use it if I put together a small project team and they were at a great distance. I would be willing to experiment with it." Negative: "I don't see what would be the use. Like you would really have to sell it to me somehow, I don't know how."

*indicates acceptance and willingness to use, only with modifications

Appendix G

Managers versus Non-Managers – Study 2



Note: NM: non-managers; M: managers
*p < .05.

REFERENCES

Abowd, G.D., & Mynatt, E.D. (2000). Charting past, present, and future research in ubiquitous computing, ACM Transactions on Computer-Human Interaction, 7, 29-58.

Adams, A., & Sasse, M.A. (1999). Privacy issues in ubiquitous multimedia environments: Wake sleeping dogs, or let them lie? INTERACT '99, Edinburgh, Scotland, 214-221.

Adams, D.A., Nelson, R.R., & Todd, P.A. (1992). Perceived usefulness, ease of use, and usage of information technology: A replication. MIS Quarterly, 16, (2), 227-247.

Aiello, J.R., & Kolb, K.J. (1995). Electronic performance monitoring and social context: Impact on productivity and stress. Journal of Applied Psychology, 80, (3), 339-353.

Alge, B.J. (1999). The role of fairness and privacy in electronic performance monitoring and control systems: Some preliminary findings. Paper presented at the Annual Academy of Management Meetings, Chicago, IL.

Ambrose, M.L., & Alder, G.S. (2000). Designing, implementing, and utilizing computer performance monitoring: Enhancing organizational justice. In G.R. Ferris (Ed.), Research in Personnel and Human Resource Management (Vol. 18, pp. 187-219), Greenwich, CN: JAI Press.

Arbuckle, J. L., & Wothke, W. (1999). AMOS 4.0 User's Guide. SPSS Inc.: Chicago, IL.

Archea, J. (1977). The place of architectural factors in behavioural theories of privacy. Journal of Social Issues, 33, (3), 116-137.

Argyle, M. (1979). Sequences in social behaviour as a function of the situation. In G.P. Ginsburg (Ed.), Emerging strategies in social psychological research. Chichester, NY: Wiley.

Arnold, H.J., & Feldman, D.C. (1981). Social desirability response bias in self-report and choice situations. Academy of Management Journal, 24, 377-385.

Ashforth, B.E., Kreiner, G.E., & Fugate, M. (2000). All in a day's work: Boundaries and micro role transitions. Academy of Management Review, 25, (3), 472-491.

Bandura, A. (1986). The social foundations of thought and action. Englewood Cliffs, NJ: Prentice Hall.

Barrrett, M., & Walsham, G. (1999). Electronic trading and work transformation in the London insurance market. Information Systems Research, 10, (1), 1-22.

Bellotti, V., & Sellen, A. (1993). Design for privacy in ubiquitous computing environments. In De Michelis, G., Simone, C., & Schmidt (Eds), Proceedings of the Third European Conference on Computer-Supported Cooperative Work (pp. 77-92), Milan, Italy.

Bies, R.J. (1993). Privacy and procedural justice in organizations. Social Justice Research, 6, (1), 69-86.

Bobocel, D.R., McCline, R.L., & Folger, R. (1997). Letting them down gently: Conceptual advances in explaining controversial organizational policies. In C.L. Cooper & D.M. Rousseau (Eds.), Trends in Organizational Behavior (Vol. 4, pp. 73-88). John Wiley & Sons: London.

Boyle, M., Edwards, C. & Greenberg, S. (2000). The effects of filtered video on awareness and privacy. Proceedings of the CSCW'00 Conference on Computer Supported Cooperative Work (Dec. 2-6, Philadelphia, PA), ACM Press.

Carayon, P. (1993). Effect of electronic performance monitoring on job design and worker stress: Review of the literature and conceptual model. Human Factors, 35, (3), 385-395.

Chapman, D.S., & Ployhart, R.E. (2001, April). Gender and perceptions of justice violations in the magnitude of perceived injustice. In R.E. Ployhart & D.M. Truxillo (Chairs), Presenting selection information to applicants: Theoretical and practical implications. Symposium conducted at the Annual Meeting of the Society for Industrial and Organizational Psychology. San Diego, CA.

Cook, T.D., & Campbell, D.T. (1979). Quasi experimentation: Design and analysis for field studies. Rand-McNally.

Coutaz, J., Berard, F., Carraux, E., & Astier, W. (1999). CoMedi: Using computer vision to support awareness and privacy in mediaspaces. In Proceedings of CHI '99 Conference on Human Factors in Computing Systems (pp. 13-14).

Cropanzano, R., & Greenberg, J. (1997). Progress in organizational justice: Tunneling through the maze. In C.L. Cooper & I.T. Robertson (Eds.), International Review of Industrial and Organizational Psychology (Vol 12, pp. 317-372). John Wiley & Sons: London.

Davis, F.D., Bagozzi, R.P., & Warshaw, P. (1989). User acceptance of computer technology. Management Science, 35, 982-1003.

Douthitt, E. A., & Aiello, J. R. (2000). The impact of computer monitoring and negative affectivity on task performance and satisfaction. Paper presented at the annual Academy of Management Meetings, Toronto, Canada.

Eagly, A.H., & Chaiken, S. (1993). The psychology of attitudes. Harcourt Brace:Fort Worth, TX.

Eddy, E.R., Stone, D.L., & Stone-Romero, E.F. (1999). The effects of information management on reactions to human resource information systems: An integration of privacy and procedural justice perspectives. Personnel Psychology, 52, 335-358.

Erickson, T., & Kellogg, W.A. (2000). Social translucence: An approach to designing systems that support social processes. ACM Transactions on Computer-Human Interaction, 7, 59-83.

Fazio, R.H., & Towles-Schwen, T. (1999). The MODE model of attitude-behavior processes. In S. Chaiken & Y. Trope (Eds.), Dual process theories in social psychology (pp. 97-116). New York, NY: Guilford Press.

Fisher, W.A., Fisher, J.D., & Rye, B.J. (1995). Understanding and promoting AIDS-preventive behavior: Insights from the theory of reasoned action. Health Psychology, 14, (3), 255-264.

Fishbein, M., & Azjen, I. (1975). Belief, attitude, intention, and behavior : An introduction to theory and research. Addison-Wesley: Reading, MA.

Frone, M. (1998). Single indicators in AMOS. Academy of Management's RMNET (Research Methods Network) posting Friday, December 18, 1998. Retrieved January 2, 2000 from RMNET Newsgroup: http://www.aom.pace.edu/rmd/rmnet/html.

Girgensohn, A., Lee, A., & Turner, T. (1999). Being in public and reciprocity: Design for Portholes and user preference. In Proceedings of INTERACT '99: IFIP TC.13 International Conference on Human-Computer Interaction (pp. 458-465), IOS Press.

Grant, R.A. & Higgins, C.A. (1991). The impact of computerized performance monitoring on service work: Testing a causal model. Information Systems Research, 2, 116-142.

Greenberg, S., & Kuzuoka, H. (2000). Using digital but physical surrogates to mediate awareness, communication and privacy in media spaces. Personal Technologies, 4 (1), 182-198.

Gruen, D., Rohall, S., Petigara, N., & Lam, D. (December, 2000). "In your space" displays for casual awareness. Technology demonstration at Computer Supported Cooperative Work '00 Conference. Philadelphia, PA.

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (1995). Multivariate Data Analysis, Fourth Edition. Prentice Hall: Englewood Cliffs, NJ.

Harper, R. H. R. (1995). Why people do and don't wear active badges: A case study. Computer-Supported Cooperative Work, 4, 297-318.

Howard, A. (1995). A framework for work change. In A. Howard (Ed.), The Changing Nature of Work. Jossey-Bass Publishers: San Francisco, CA.

Hudson, S.E., & Smith, I. (1996). Techniques for addressing fundamental privacy and disruption tradeoffs in awareness support systems. In Proceedings of Computer Supported Cooperative Work '96 Conference (pp. 248-257).

Ijsselsteijn, W. A., de Ridder, H., Freeman, J., & Avons, S. E. (2000). Presence: Concept, determinants and measurement. Proceedings of the SPIE, Human Vision and Electronic Imaging V, San Joes, CA, January 23-28.

Johnson, B., & Greenberg, S. (1999). Judging people's availability for interaction from video snapshots. In R.H. Sprague, Jr. (Ed.), Proceedings of the Thirty-Second Hawaii International Conference on System Sciences, Jan. 5-8, 1999, Maui, Hawaii (CD-ROM): Institute of Electrical and Electronics Engineers Inc.

Kidwell, R. E., Jr., & Bennett, N. (1994). Electronic surveillance as employee control: A procedural justice interpretation. The Journal of High Technology Management, 5 (1), 39-57.

Kraut, R.J., Egido, C., & Gallegher, J. (1990). Patterns of contact in communication in scientific research collaborations. In J. Gallegher, R.J., Kraut and C. Egido (Eds.), Intellectual Teamwork: Social and Technological Foundations of Cooperative Work. Lawrence Erlbaum: Hillsdale, NJ.

LaLave, J. & Commons, M.L. (1996). Comparing psychodynamic, cognitive-developmental, and behavior-developmental views of psychological boundaries. In M. Commons, J. Demmick, & C. Goldberg (Eds.), Clinical Approaches to Adult Development (pp. 175-209). Norwood, NJ: Ablex Publishing.

Landis, R. S., Beal, D.J., & Tesluk, P. E. (2000). A Comparison of approaches to forming composite measures in structural equation models. Organizational Research Methods, 3, (2), 186-207.

Lee, A., & Girgensohn, A. (1999). Portholes^{TNG} -- A Group Awareness Tool. http://www.welcollab.com/portholes/, accessed Nov. 9, 2000.

Lee, A., Girgensohn, A., & Schlueter, K. (1997). NYNEX Portholes: Initial user reactions and redesign implications. Proceedings of the International ACM SIGGROUP Conference on Supporting Group Work, GROUP '97 (pp. 385-394), Phoenix, AZ, ACM Press: NY, NY.

Lewin, K. (1951). Field theory in social science: Selected theoretical papers. New York, NY: Harpers.

Leventhal, G. S. (1980). What should be done with equity theory? New approaches to the study of fairness in social relationships. In Gergen, K. J., Greenberg, M. S., & Willis, R. H. (Eds.), Social Exchange: Advances in Theory and Research, NY: Plenum Press.

Linneweber, V. (1988). Norm violations in person X place interactions. In D. Canter, J.C. Jesuino, L. Soczka, & G.M. Stephenson (Eds.), Environmental Social Psychology (pp. 116-127). Norwell, MA: Kluwer Academic Publishers.

Maruyama, G., & McGarvey, B. (1980). Evaluating causal models: An application of maximum-likelihood analysis of structural equations. Psychological Bulletin, 87, 505-512.

Morikawa, O., & Maesako, T. (1998). HyperMirror: Toward pleasant-to-use video mediated communication system. In Proceedings of Computer Supported Cooperative Work '98 Conference (pp. 149-158).

McKnight, H., & Webster, J. (in press). Collaborative insight or privacy invasion? Trust climate as a lens for understanding acceptance of awareness systems. In Cooper, C., & Earley, C. (Eds.), Handbook of Organizational Culture and Climate.

Niehoff, B.P., & Moorman, R.H. (1993). Justice as a mediator of the relationship between methods of monitoring and organizational citizenship behaviours. Academy of Management Journal, 36, 527-556.

Palfreyman, K., & Rodden, T. (1996). A protocol for user awareness on the world wide web. In M. S. Ackerman (Ed.), Proceedings of the ACM 1996 Conference on Computer Supported Cooperative Work (pp. 130-139), Association for Computing Machinery: NY, NY.

Picard (1994). Working under an electronic thumb. Training, 31, 47-51.

Popp, M. (1986). Dimensions of psychological boundary development in adults. In M. Commons, J. Demmick, & C. Goldberg (Eds.), Clinical Approaches to Adult Development (pp. 145-174). Norwood, NJ: Ablex Publishing.

Postmes, T., Spears, R., & Lea, M. (1998). Breaching or building social boundaries? SIDE-Effects of computer-mediated communication. Communication Research, 25, (6), 689-697.

Rodden, T. (1996). Populating the application: A model of awareness for cooperative applications. In M. S. Ackerman (Ed.), Proceedings of the ACM 1996 Conference on Computer Supported Cooperative Work (pp. 87-96), Association for Computing Machinery: NY, NY.

Ryan, G.W., & Bernard, H.R. (2000). Data management and analysis methods. In N.K. Denzin & Y.S. Lincoln (Eds.), Handbook of Qualitative Research, 2nd Edition (pp. 769-802), Thousand Oaks, CA: Sage Publications Inc.

Saga, V.L. & Zmud, R.W. (1994). The nature and determinants of IT acceptance, routinization, and infusion. In Levine, L. (Ed.), Diffusion, Transfer and Implementation of Information Technology, Elsevier Science: Amsterdam, Holland.

Sarbaugh-Thompson, M., & Feldman, M. S. (1998). Electronic mail and organizational communication: Does saying "Hi" really matter? Organization Science, 9, 685-698.

Simone, C., & Bandini, S. (1997). Compositional features for promoting awareness within and across cooperative applications. In S.C. Hayne & W. Prinz (Eds.), Proceedings of the International ACM SIGGROUP Conference on Supporting Group Work (pp. 358-367). Association for Computing Machinery: Pheonix, AZ.

Stanton, J.M. (2000a). Reactions to employee performance monitoring: Framework, review and research directions. Human Performance,13, 85-113.

Stanton, J.M. (2000b). Traditional and electronic monitoring from an organizational justice perspective. Journal of Business and Psychology.

Stanton, J.M., & Barnes-Farrell, J.L. (1996). Effects of electronic performance monitoring on personal control. Journal of Applied Psychology, 81, (6), 738-745.

Stanton, J.M. & Weiss, E.M. (2000). Electronic monitoring in their own words: An exploratory study of employees' experiences with new types of surveillance. Computers in Human Behavior.

Stone, E.F., & Stone, D.L. (1990). Privacy in organizations: Theoretical issues, research findings, and protection mechanisms. In, Research in Personnel and Human Resources Management, (8), JAI Press: Greenwich, CN.

Straub, D., & Karahanna, E. (1998). Knowledge worker communications and recipient availability: Toward a task closure explanation of media choice. Organization Science, 9, 160-175.

Sundstrom, E., Burt, R.E., & Kamp, D. (1980). Privacy at work: Architectural correlates of job satisfaction and job performance. Academy of Management Journal, 23, (1), 101-117.

Thibaut, J. W., & Walker, L. (1975). Procedural Justice: A Psychological Analysis. Hillsdale, NJ: Erlbaum.

Triandis, H.C. (1995). Individualism and Collectivism. Westview Press: San Francisco, CA

Tyler, T.R., Boeckmann, R.J., Smith, H.J., & Huo, Y.J. (1997). Social Justice in a Diverse Society. Westview Press: Boulder, CO.

Vertegaal, R. (1999). Designing awareness with attention-based groupware. In Sasse, M. A. & Johnson, C. (Eds.), Human-Computer Interaction -- Interact '99, IOS Press.

Webster, J. (1998). Desktop videoconferencing: Experiences of complete users, wary users and non-users. MIS Quarterly, 22, 257-286.

Whittaker, S. (1995). Rethinking video as a technology for interpersonal communications. International Journal of Human-Computer Studies, 42, 501-529.

Wilson, L.L., Roloff, M.E., & Carey, C.M. (1998). Boundary rules: Factors that inhibit expressing concern about another's romantic relationship. Communications Research, 25, (6), 618-640.

Yung, Y.F., & Bentler, P.M. (1996). Bootstrapping techniques in analysis of mean and covariance structures. In G.A. Marcoulides, R.E. Schumacker (Eds.), Advanced Structural Equation Modeling: Issues and Techniques. Mahwah: Lawrence Erlbaum Associates.

ZD Inc. (2000). CorelVideo. http://home.zdnet.com/anchordesk/products/ products.html, accessed Nov. 9, 2000.

ZDNet (2000). Odigo. http://www.zdnet.co.uk/software/fstore/2/N/00122N.html, accessed Nov. 13, 2000.

Zhao, Q.A., & Stasko, J.T. (1998). Evaluating image filtering based techniques in media space applications. In ACM 1998 Conference on Computer Supported Cooperative Work (pp. 11-18), Nov. 14-18. Seattle, WA: Association for Computing Machinery.

Zikmund, W.G., (1994). Business Research Methods. Fort Worth, TX: Dryden Press.