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This study assesses the satisfaction of current and potential Semiconductor Research Corporation (SRC) E-meeting users through survey research. Results from 48 survey responses generally confirm the relationships among potential determinants of information technology usage as specified in an augmented version of Davis' (1989) Technology Acceptance Model. By measuring the relationship between the satisfaction factors, intention to use and actual use, we can have a better understanding of the current and potential E-meeting users in the SRC member community. Finally, uncovering negative relationships between perceptions and intention to use E-meeting technology creates an opportunity for the SRC to ameliorate these concerns, including but not limited to changes to the E-meeting technology used, changes in E-meeting conditions, or opportunities to address misperceptions.

Headings:

Groupware (computer software)

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Research Consortia

Diffusion of Innovations

USER ACCEPTANCE OF ELECTRONIC MEETING TECHNOLOGY IN THE SEMICONDUCTOR RESEARCH CORPORATION

by
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Introduction

In 2002, web conferencing technology was sufficiently developed to allow for electronic meetings with participants spread out throughout the country. E-meeting participants do not need to purchase expensive hardware or have special systems installed in their workplace like they have needed to in the past. Instead people are now able to conduct an online meeting with not much more than a computer with a high-speed Internet connection and a web browser – no expensive hardware or software is required. Companies that have previously had large travel budgets and employees who spent a large amount of time traveling to attend face-to-face meetings are now presented with a viable alternative: E-meetings.

In the late 1990s, the Semiconductor Research Corporation (SRC), a research consortium managing semiconductor research, began an electronic meeting initiative designed to reduce travel time and expenditures for face-to-face meetings (without reducing member and researcher satisfaction). E-meetings are offered as an alternative for many types of face-to-face meetings including research reviews (at a member university but including industry members from across the country) and meetings of their advisory boards and coordinating committees who have members distributed throughout the country.

By studying the level of current use and perceptions of E-meetings of the SRC community, we can determine the current level of satisfaction of current and potential

users of E-meetings. In addition, by measuring the relationship between the satisfaction factors, intention to use and actual use, we will have a better understanding of the current and potential E-meeting users in the SRC member community. Finally, uncovering negative relationships between perceptions and intention to use E-meeting technology will create an opportunity for the SRC to ameliorate these concerns, including but not limited to changes to the E-meeting technology used, changes in E-meeting conditions, or opportunities to address misperceptions.

This study assessed the satisfaction of current and potential SRC E-meeting users through survey research. Examining the data from a web-based survey, including both users and non-users of E-meeting technology, I assessed the relationships among potential determinants of information technology usage as specified in an augmented version of Davis' (1989) Technology Acceptance Model (TAM, Taylor & Todd, 1995a).

Background

In this section, I discuss the development of collaboration as a means of advancing scientific research and the role consortia in basic scientific research. The development of computer-mediated communication (CMC) tools and their viability as an alternative to co-location are discussed. Diffusion theory and the Technology Acceptance Model (are discussed as theories to explain the adoption of a new technology and the diffusion of a new technology through an organization.

Scientific Collaboration

With the complexity and exponential growth of scientific knowledge and the high cost of research and instrumentation, "Big Science" has become increasingly collaborative (Price, 1986; Van Alstyne & Brynjolfsson, 1996; Finholt, 2002). Interdisciplinary research carried out across the world has become the norm with large numbers of researchers working together to further scientific knowledge (Hurd, 1996). Until the mid 1990s, this scientific collaboration was characterized by face-to-face interactions, conferences, group meetings, individual actions, and hands-on experimentation and informal communication (Kouzes et al., 1996).

Membership in a research consortium, such as the Semiconductor Research Corporation (SRC), has been positively correlated with a reduction in duplicative research and a decrease in overall research and development (R&D) spending (Irwin & Klenow, 1996). Research consortia have been found to be most effective when focusing on basic research, and R&D spillovers can be found within the consortium and within the industry at large (Brantstetter & Sakakibara, 2002; Irwin & Klenow, 1996).

In an effort to advance joint industry- and university-based semiconductor research efforts in the US, the Semiconductor Research Corporation was established in 1981. According to "SRC: The Early Years", both the US global market and industry funding of semiconductor research were declining. Cooperative research, funded by many corporations and completed by many university researchers, was seen by the SRC founders as the way to regain market share and revitalize domestic semiconductor research.

To accomplish the cooperative research goals of the SRC, scientists sharing research interests and expertise must collaborate regardless of geographic location. However, research has shown that a distance of greater than 30 meters between researchers hinders communication frequency (Allen, 1977). Physical proximity has been shown to increase the amount of communication, communication quality, informal contact, chance meetings, and therefore the likelihood of collaboration and repeat collaborations (Katz, 1994; Kraut et al., 1988; Rolinson et al., 1996).

Remote collaborators face challenges on several dimensions that can impact collaboration: geographic, time, organizational, and cultural (Armstrong & Cole, 2002). Studies have found that communication interactions between remote collaborators tend to be less frequent, less spontaneous, more costly, more effort to coordinate, and more formal in nature (Armstrong & Cole, 2002; Kraut et al., 1988; Walsh & Maloney, 2002). Opportunities to resolve misunderstandings between collaborators or to mentor others are less numerous and it is more difficult to learn from and monitor the performance of remote collaborators (Armstrong & Cole, 2002; Walsh & Maloney, 2002). Thus, scientists who are not physically proximate have been found to be less likely to

collaborate, independent of similar research interests and organizational proximity (Finholt, 2002; Kraut et al, 1988; Kiesler and Cummings, 2002; Olsen et al, 2002).

How then, is it possible for geographically and organizationally distributed researchers (like those of the SRC) to overcome the seemingly critical proximity factor and to collaborate to generate a cooperative research product? Technology can help. Advances in technology have facilitated communication and collaboration among scientific researchers. Computer-mediated communication (CMC) channels have enabled researchers to collaborate with colleagues that are similar in research interests yet not physically proximate. CMC has allowed scientists to overcome the barriers of physical proximity, organizational boundaries, and time.

Computer Mediated Communication

Although first conceptualized in 1945 as "memex" by Vannevar Bush, computer-mediated communication (CMC) was first realized in 1969 as a byproduct of ARPAnet (the United States Defense Advance Research Project Agency's (ARPA) wide-area network) (Finholt, 2002; Hurd, 1996, Webopaedia). Although initially limited to researchers at universities and other academic and governmental research institutions, with the rise of personal computers and the availability of connections to the Internet, CMC channels have become widely available. Recent research on remote collaboration has focused on the use of computer-mediated communication tools in the collaboration process (Hinds & Kiesler, 2002; Munkvold & Anson, 2001; Walsh et al., 2000; Walsh & Maloney, 2002).

CMC tools range from text e-mail messages to web-based discussion forums to audio and video conferencing with shared electronic whiteboards and computer screens. CMC tools are used for a variety of purposes including communication, gaining access to data and instrumentation, sharing and/or analyzing data, and interacting with others. Reviews of the advantages and disadvantages of CMC tools have been written (Kies et all, 1998; Herring, 2002). A brief summary follows.

E- mail has become one of the most popular forms of computer-mediated communication used in scholarly, business and personal applications (Finholt, 2002; Hurd, 1996, Hiltz & Johnson, 1989; Herring, 2002). E-mail is asynchronous, text-based, and requires very little network bandwidth, with distribution lists designed to facilitate e-mail communication among large groups. E-mail allows for communicators to respond at their convenience (Herring, 2002; Kies et al., 1998). A major potential problem with e-mail, as with other textual communication methods, is the difficulty in conveying subtle non-verbal communication (for example, facial cues, gestures and sighs) and the inability to immediately gauge the recipient's reaction to the message (Kies et al., 1998).

Discussion forums are another increasingly popular form of CMC. Discussion forums allow for asynchronous communication and collaboration with a shared virtual space in which to communicate. In addition, discussion forums are similar to newsgroups in that the discussion is threaded and a complete archive of the communication is maintained. Discussion forums differ from newsgroups in that they can have a private membership (Herring, 2002). Among the potential advantages to organizations and users of discussion forums over e-mail include: 1) a threaded, searchable archive of

communication, and 2) a more secure communication environment (with the implementation of security measures and restricting access to the discussion forums).

Audio- and video-conferencing over computer networks are relatively new developments in synchronous computer-mediated communication, requiring a large amount of network bandwidth, speakers, a microphone, and a video camera. Compared to text-based communication, audio communication provides more social cues and more feelings of co-location. Compared to audio communication, video communication provides richer social cues, increased feelings of co-location and an increase in perceptions of productivity (Kies et al., 1998).

Web conferencing is another recent development in computer-mediated communication. Web conferencing typically incorporates a shared view, application and presentation sharing, electronic whiteboards, instant messaging, and integration with scheduling and calendaring applications, sometimes also incorporating audio- and video-conferencing. Web conferencing is marketed to consumers and organizations as a low-cost alternative to travel and videoconferencing. With minimal requirements (computer, internet connection, and a web browser), web conferencing can be used to conduct meetings with others across town or across the country (PlaceWare, 2002).

Kouzes, Myers, and Wulf (1996) reviewed tools commonly included in electronic collaboration: audio/video conferencing, online chatting, shared computer display, electronic whiteboards, file sharing, and shared electronic laboratory notebooks and instrumentation. Immaturity and expense of existing tools, poor audio and video quality, high bandwidth, and interoperability difficulties among components are mentioned as

significant potential barriers to adoption. However, they predict that "increased collaboration in scientific endeavors and new research funding models" will result from the increased complexity of scientific research (p. 45).

CMC Effects

Computer-mediated communication tools have been used in organizational settings to facilitate communication in virtual teams (whose members span geographic and temporal distance) across geographic and organizational lines in part to counter the effects of lack of physical proximity (Armstrong & Cole, 2002; Finholt & Sproull, 1990).

Studies of the effects of CMC on scientific work have uncovered a relationship between CMC use and increased scientific contact, increased access to information, increased scientific collaboration, and increased productivity (Kouzes et al. 1996; Tannen, 1995; Citera, 1998; Kling & McKim, 2000; Valacich et al., 1993; Walsh et al., 2000; Walsh & Maloney, 2002). However, CMC use can also cause problems similar to those historically faced by remote collaborators: misunderstandings are more difficult to overcome, cultural differences can be amplified, some tasks take longer to complete, trust is difficult to establish and maintain, and security must be carefully considered (Hiltz & Johnson, 1989; Sproull & Kiesler, 1991; Armstrong & Cole, 2002; Walsh & Maloney, 2002). Studies have found that collaboration problems exacerbated by CMC use among remote collaborators can be tempered by face-to-face meetings, conference attendance, multiple communication media, and strong group leadership including explicit recognition of cultural differences (Armstrong & Cole, 2002; Hurd, 1996).

Despite these drawbacks, e-mail and other forms of CMC have become essential communication tools in the modern world – for personal and for business use. CMC has even been found to be strongly preferred over synchronous media for completing coordination activities (gathering conference information, scheduling meetings, sharing an agenda), and it is also preferred for interactive research tasks (seeking advice and input from others) (Walsh et al., 2000). However, Kling and McKim (2000) found that synchronous media is preferred when scientists wish to get information or results more quickly.

Modern scientific collaboration uses CMC tools to ameliorate the need for co-location for a variety of reasons including lower costs (by reducing travel expenses), less time spent traveling to remote location, and a lack of change in the effectiveness of communications (given the reduction in travel and travel time). However, all potential system users do not decide to adopt CMC tools immediately. The process of user acceptance and adoption of a new technology over time has been extensively studied.

Adoption of E-Meeting Technology

Innovation Diffusion

Diffusion theory is often used to explain the adoption and use of a new technology like CMC. Rogers (1995) defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p.10). He outlines five stages in the innovation-decision process of an individual or an organization: knowledge, persuasion, decision, implementation and confirmation (see Figure 1). An individual or other decision-making unit first becomes aware of the existence of an innovation (knowledge stage). Persuasion occurs when they

form a "general perception" of the innovation (Rogers, 1995, p. 168). This general perception is the basis for the decision to adopt or reject the technology. In the confirmation stage, the decision makers either (1) confirm their earlier decision to adopt or reject the innovation or (2) change their decision.

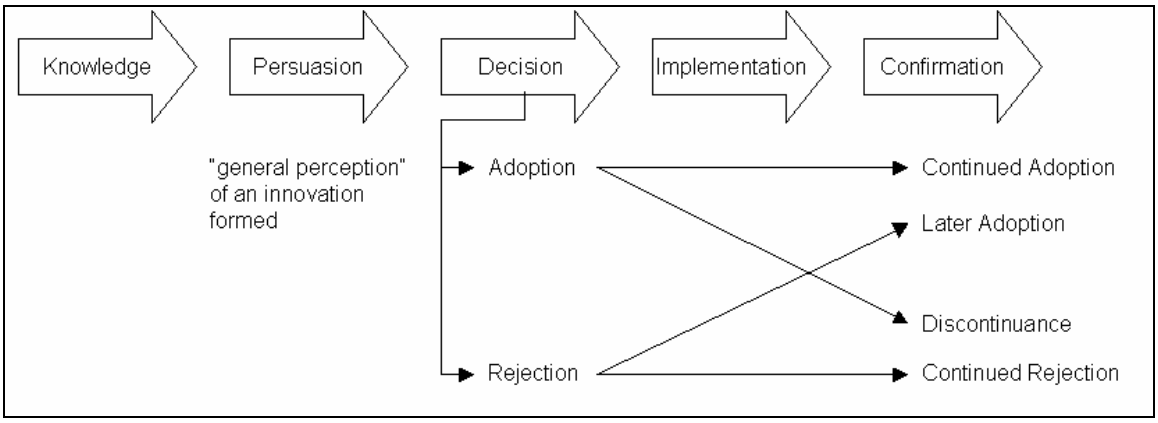

Figure 1: Rogers' innovation -decision process

Rogers (1995) decomposes the "general perception" of the innovation into five perceived characteristics of innovations to explain why innovations are adopted at different rates: relative advantage, compatibility, complexity, trialability, and observability. In other words, the rate of adoption is affected by the degree to which an innovation is (1) perceived as being better than the status quo or another innovation (relative advantage), (2) is compatible with the values, needs and past experiences of potential adopters (compatibility), (3) is perceived as difficult to understand and use (complexity), (4) is available to try out before making a decision (trialability), and (5) has results that are observable by others (observability).

The perceptions of individual potential adopters play a pivotal role in the adoption process; yet, it is impossible and unrealistic to expect that all potential adopters will adopt the innovation within the same time frame. Individual differences in innovativeness

explain the individual variation in the rate of adoption of an innovation. Based upon the time in the process when an individual adopts an innovation, they are placed into an innovativeness category: 1) innovator, a risk-taker who is among the first to adopt an innovation, 2) early adopter, an opinion leader who disseminates advice and information about an innovation and who is respected by other potential adopters, 3) early majority, who adopts an innovation after deliberation, 4) late majority, those somewhat skeptical of an innovation who do not adopt a new technology until most of the uncertainty surrounding the innovation is removed, and 5) laggards, traditionalists who tends to be suspicious of new innovations, often adopting once it has been superseded by another innovation.

In addition to the adoption of individuals, diffusion theory states that a successful innovation has a slow initial period of growth, followed by rapid increase in adoption before its diffusion. Thus, critical mass must be reached before the rate of adoption is self-sustaining (Rogers, 1995).

Diffusion theory has been widely applied to studies of the adoption of new technologies, focusing on the communication patterns supporting diffusion of an innovation through a social network. For the purposes of this study, an alternative theory was used to understand the role of potential adopters' perceptions of an innovation as determinants of adoption or rejection of E-meeting technology.

Technology Acceptance Model

Davis' Technology Acceptance Model (TAM) explains and predicts information system use as a function of users' intention to use which is, in turn, a function of users' perceived

usefulness, perceived ease of use, attitude, and some external variables (see Figure 2). The TAM adapts the widely recognized Theory of Reasoned Action (TRA) and applies it to user acceptance of an information system (Azjen & Fishbein,1980; Davis, 1989; Davis et al., 1989). A discussion of the TAM followed by a comparison with the TRA follows.

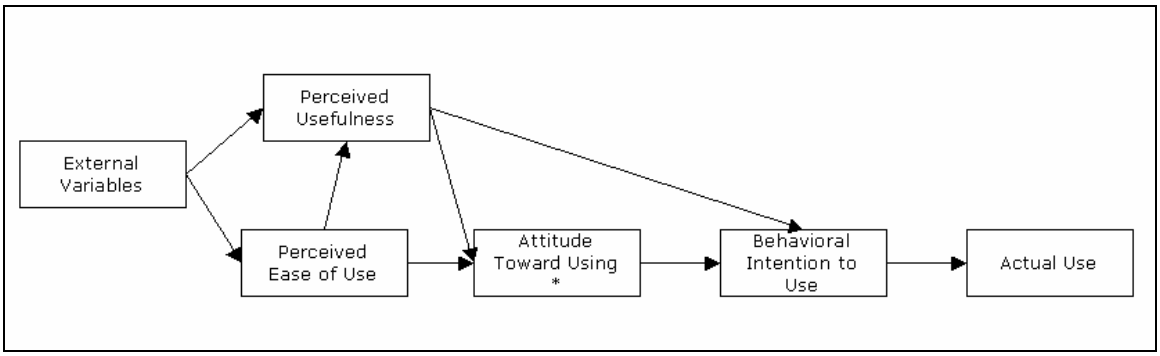

Figure 2: Davis' (1989) Technology Acceptance Model (TAM)

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free from effort" and perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (assuming a positive relationship between job performance and use of the innovation) (Davis, 1989, p. 320).

A user's behavioral intention to use a new technology is a function of an individual's attitude toward use and the perceived usefulness of the technology, while perceived usefulness and perceived ease of use jointly determine attitude. Perceived ease of use is partially determined by external variables (system design, training, documentation, etc.) and, together with external variables, directly affects perceived usefulness.

According to the TAM, the more useful and easier to use a system is perceived to be, the more positive the attitude towards the system, the more positive the intention to use the system, and the higher the actual system use. Behavioral intention to use is also directly

influenced by perceived usefulness (bypassing attitude) as an individual's perceptions of job performance may increase regardless of their attitude toward the system in an organizational setting (Davis et al., 1989). The TAM usually tests usage by usage intention or self-reported usage.

In the original Theory of Reasoned Action (TRA), an individual's behavioral intention to perform a behavior (in this case, adopt a technology) was determined by their attitude towards that behavior and subjective norms to which they believed they needed to comply (see Figure 3) (Fishbein & Azjen, 1975). In the TAM, subjective norm is not included with attitude as predictors of behavioral intention to use. Davis et al. (1989) explained the omission of the subjective norm from the model attributing it to the level of difficulty to "disentangle the direct effects of [subjective norm] on [behavioral intent] from indirect effects via [attitude]. [Subjective norm] may influence [behavioral intent] indirectly via [attitude], due to internalization and identification processes, or influence [behavioral intent] directly through compliance" (Davis et al., 1989, p. 986). They explained that although system use was thought to be discretionary, they believed the effects of mandates from superiors were not successfully captured in standard measures of subjective norms. Given that the purpose of the Davis et al. (1989) study was to explicitly compare the predictive powers of the TRA vs. the TAM, subjective norm data was collected but it was found to have no impact on a users' behavioral intention to use a new technology. However, they admit that this finding should be interpreted narrowly, given that the "specific application studied, word processing, is fairly personal and individual, and may be driven less by social influences compared to more multi-person

applications such as electronic mail, project management or group decision support systems" (Davis et al., 1989, p. 999).

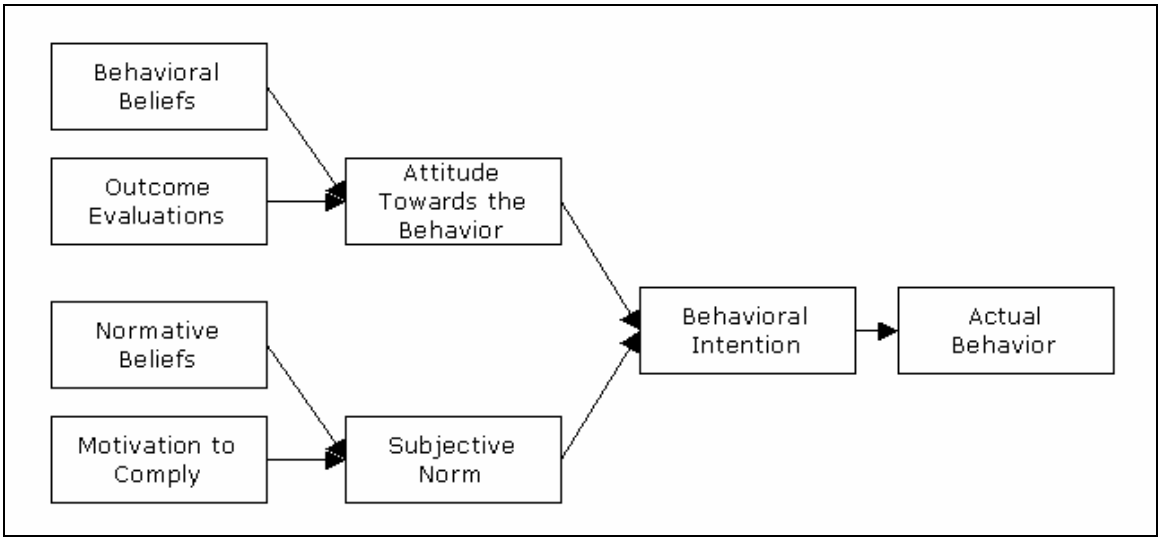

Figure 3: Theory of Reasoned Action (TRA) (Fishbein & Azjen, 1975)

Augmented TAM

Taylor and Todd (1995a) combined the TAM with elements from the Theory of Planned Behavior (TPB, derived from the TRA; Azjen, 1991) into the Augmented TAM. The Augmented TAM model adds subjective norms and perceived behavioral control to attitude as determinants of intention (see Figure 4). The Augmented TAM was designed to provide a richer explanation of the determinants of intention when comparing experienced and inexperienced users of an information system.

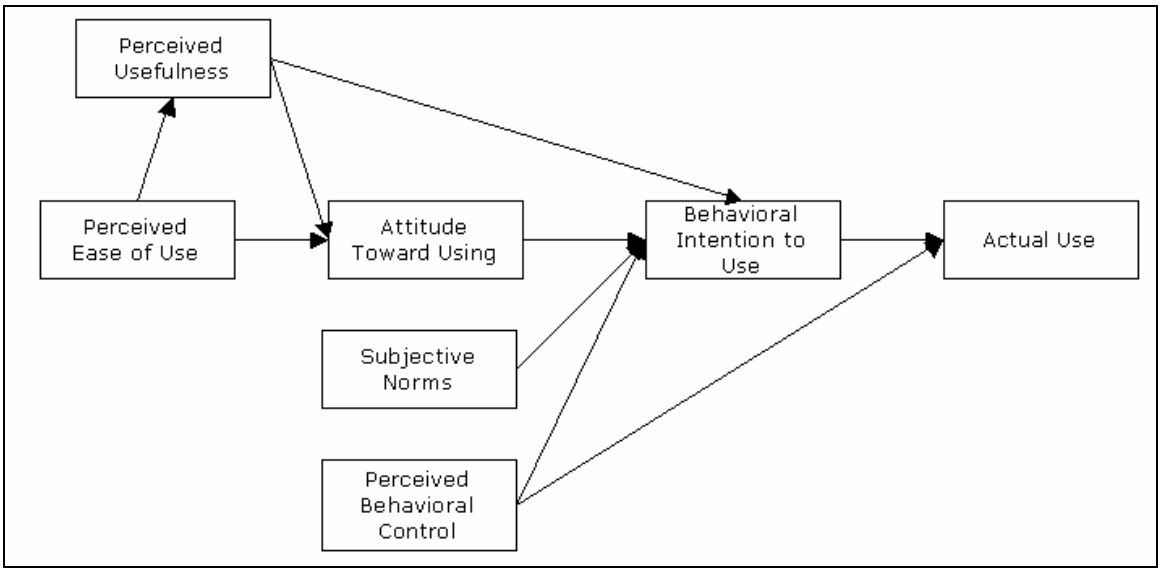

Figure 4: Augmented TAM (Taylor & Todd, 1995a)

Taylor and Todd (1995a) found that all determinants of intention (except attitude) were significant and thus assert that the Augmented TAM can be a valuable tool for assessing intention *prior to actual system exposure*. In addition, the differences in the relative influence of determinants between experienced and inexperienced users lend support to their theory that a stronger link exists between intention and actual use for experienced users than for inexperienced users.

Prior empirical and theoretical work has specified the determinants of use of an innovation, but question still remains: how do these concepts apply in a real-world setting? The next section provides background information on the Semiconductor Research Corporation, the organization that provides the setting for this research on user acceptance of E-meeting technology.

The Setting: The Semiconductor Research Corporation

Founded in 1982 to help the U.S. semiconductor industry regain a competitive edge, the Semiconductor Research Corporation (SRC) is a non-profit research consortium drawing membership from many government agencies and companies in the semiconductor industry (Sumney, 1998). The SRC determines the long-range "precompetitive generic" research needs of its members and manages research at universities and research institutes to meet these needs (Sumney, 1998, p. 350). In addition to the transfer of research results and technology to member groups, the SRC also helps to develop "relevantly educated graduate students" through fellowships and other professional development opportunities (Sumney, 1998, p. 351).

Research Management and "Relevantly Educated Students"

Semiconductor research is categorized within the SRC by Science Areas, each managed by a Director, an experienced researcher and expert in the field. The Science Areas are: Computer Aided Design and Test, Integrated Circuit and System Sciences, Materials and Process Sciences, Nanostructure and Integration Sciences (About Research Programs, 2002). Semiconductor industry representatives on SRC Science Area Coordinating Committees (SACCs) and Thrust Technical Advisory Boards (TABs) assist the SRC Science Area Directors in research management, direction, and oversight (About Research Programs, 2002; SRC Core Program Science Areas and Thrusts, 2003). In a simplification of a complex research management process, the Science Area Directors, in concert with appropriate SACCs and TABs, "develop specific goals to guide, focus, and rank research efforts and to provide a basis for measuring progress and obtaining the

needed results" (About Research Programs, 2002; SRC Core Program Science Areas and Thrusts, 2003).

In addition to managing semiconductor research, the SRC also helps to develop "relevantly educated graduate students" to ensure a strong American semiconductor industry in the future (Sumney, 1998, p. 351). The SRC nurtures graduate student development through several mechanisms. Over 700 students are involved in SRC-sponsored research tasks and have the opportunity to attend research reviews, present research results at technical conferences, publish research results, or receive technical awards from the SRC and other organizations (About Student Programs, 2002). In addition, the SRC funds travel for technical conference attendance and 54 Doctoral Fellowships and Master's Scholarships (About Student Programs, 2002).

The SRC Student Relations department helps to coordinate internships, collects and distributes graduate student resumes and curriculum vitae to interested member companies, and offers mentoring from interested industry professionals to graduate students through the Industrial Liaison program (About Industrial Liaisons, 2003; About Student Programs: SRC Resume Distribution, 2002). In part as a result of these efforts, SRC member companies employ a large percentage of SRC affiliated graduate students upon graduation and rank access to students as a compelling reason to continue SRC membership (About Student Programs: SRC Resume Distribution, 2002).

Electronic Communication at the SRC

In the over 20 years since the founding of the SRC, communication practices and SRC business processes have changed significantly. Personal computers, the World Wide

Web (WWW), e-mail, and teleconferencing and videoconferencing are among the many technological innovations that have affected communication practices at the SRC. Research results are available to individuals in the SRC member community through the Research Engine on the SRC Extranet (a secure, members-only area of the SRC web site) rather than in boxes of photocopies shipped to member companies.

Electronic communication is crucial to the functioning of the SRC. Larry Sumney, President and CEO of the SRC wrote:

> The communication challenges to assess industry's research needs correctly, establish detailed requirements and fund over 243 faculty investigators at the universities, and then to transfer the knowledge back to all the engineers and scientists at member companies are enormous.
>
> These complex communications are accomplished through an extensive backbone of electronic communications conducted through the SRC Web site. A catalog of all research tasks is maintained on the SRC Web server and provides simple and easy access to all member scientists and engineers as well as university researchers. All communications between the universities and the SRC including proposals, reports of progress, and research results are done electronically (Sumney, 1998, p. 354).

SRC employees have many electronic communication tools available to use to communicate with their member communities: e-mail (Microsoft Outlook/Exchange), teleconferencing capabilities in every cubicle and meeting room, and a state of the art videoconferencing system in a specially equipped conference room (with Smart Boards for whiteboard sharing). In addition, the SRC's web site (http://www.src.org), as the point of distribution for research results, is also frequently used to announce calls for papers, upcoming conferencing, and other pieces of news of interest to the SRC member community and to potential members.

In addition to electronic media, the SRC has historically held many face-to-face meetings. For example, Research Task Reviews, to review the progress of research being conducted at a University or research institution, are typically conducted at the sponsoring university with SRC employees (based in RTP and San Jose, CA), industry scientists (employed at member companies located across the US and in Taiwan), and university scientists and graduate students involved in the research. Techical Advisory Boards (TAB) and Coordinating Committee (CC) meetings are also held as needed.

In addition to face-to-face meetings, the SRC sponsors several conferences. TECHCON is the biennial technical conference at which research results are presented to the member community by researchers (university and research institution scientists and graduate students). The JobsFair, held in conjunction with TECHCON, is a student recruitment opportunity for SRC members and students; TechFair is a networking opportunity for industry and university members. The annual Graduate Fellowship Program is an annual conference recognizing the research of Graduate Fellows and Master's Scholars in front of their faculty and industry advisors, and other industry invitees (About Student Programs: Master's Scholarship Program (MSP), 2003).

Cost Savings Initiatives

The SRC derives its research funding from the fees paid by member companies. Member companies are categorized into the following categories: Integrated Circuit (IC) manufacturers, IC users, and large and small suppliers. The exact membership fee is derived from an algorithm which takes into account several factors including company size, expected return on investment and company earnings. Given the recent economic

downturn, especially in the high tech industry, SRC member companies and the SRC are enacting cost-saving initiatives.

In 1998, prior to the economic downturn, Larry Sumney, President and CEO of the SRC, wrote:

> There are, of course still requirements for face-to-face meetings, but many of these are now being redesigned to be done remotely. The biggest remaining meeting is the yearly science area research task reviews conducted at central universities where the…[Principal] Investigators and the graduate students present their results to the SRC Science Director and appropriate Technical Advisory Board members and mentors (Sumney, 1998, p. 355).

The move to conduct fewer face-to-face meetings has been active for several years, with an added incentive in the form of smaller travel budgets across the semiconductor industry and SRC member community. 

The SRC has added electronic discussion forums to their Web site to facilitate electronic communication. Several of the SRC Science Area Directors have been testing E-meeting (electronic meeting) technologies with their Technical Advisory Boards and Coordinating Committees. Initially, E-meetings were championed by a small number of Science Area Directors (considered by all accounts to be "innovators" in Rogers' diffusion theory) who used WebEx and PlaceWare. As interest grew, an E-meeting team, spearheaded by a member of the Information Systems Architecture and Technology department, was created to investigate and select an E-meeting technology for company wide use. In 2002, Placeware was selected as the officially supported E-meeting software.

Research Problem

The Semiconductor Research Corporation as an organization has decided to offer Electronic Meetings (E-meetings) as an alternative to some face-to-face meetings. While offered and recommended by the SRC for certain types of meetings, holding a meeting electronically rather than face-to-face remains a decision for the individual sponsoring the meeting. Therefore, it is important to determine the success of the implementation in terms of the user acceptance by the active members of the SRC member community.

The purpose of this research is to assess the level of intention to use, level of use and perceptions of participating in an E-meeting. This study will 1) measure the user acceptance of (self-reported use) and intention to use E-meetings, 2) evaluate the impact of user perceptions of E-meeting technology on the actual usage of E-meeting technology, and 3) determine which features of E-meetings are the most useful to the member community.

This information can then be used by the SRC to customize and market E-meetings to its member community. Serious user concerns can be addressed as a result of this research; future training and publicity initiatives can be based on the concerns of the member community. Understanding the level of user acceptance will help to implement changes that may impact future use of E-meeting technology. Understanding factors which directly and indirectly impact the usage of the E-meeting technology will help determine ways to enhance the current E-meeting technology or to affirm that it is an appropriate tool. In addition, if perceptions of using E-meeting technology are low, specific

marketing efforts can be made to improve the perceptions of using E-meeting technology or participating in E-meetings.

To assess acceptance of E-meeting technology, a survey instrument, based on existing instruments using the TAM and TPB, was created to capture a more complex view of he factors that influence user acceptance of E-meeting technology. A detailed look at the methodology used in this research follows.

Methodology

A sample of the active member community of the SRC was invited to complete a web-based survey measuring user acceptance and perceptions of E-meeting technology. The study methods are described in detail below.

Population and Sampling

The survey population consisted of all of the actively participating members of the SRC member community. Actively participating members are defined as those members who meet at least one of the following criteria:

- participate in a Technical Advisory Board (TAB) or Coordinating Committee (CC),
- are an industrial liaison (industry employees who mentor graduate students), or
- are a Principal Investigator (PI) or Task Leader (TL) on SRC funded research tasks.

The sampling frame is the list of all people who have active SRC web site accounts filtered by active participation[1]. This list of 1133 active participants was provided by the Director of Information Systems Architecture and Technology of the SRC. A random sample of 400 potential respondents was selected from this list.

[1] To be eligible for a SRC web site account, a person must meet at least one of the SRC member community requirements: 1) be an employee of a SRC member company or participating government agency or 2) work on SRC-sponsored university research program as a PI, TL, Electronic Document Administrator, Administrative Assistant or graduate student (http://www.src.org/member/about/account_faq.asp).

Participant Recruitment

The potential respondents were recruited via e-mail for participation in a web-based survey. Four e-mails to potential respondents were sent:

1. a pre-notice e-mail introducing the purpose of the study (see Appendix B),
2. a request for participation containing a "cover letter" and a link to the URL from which to take the web-based survey (see Appendix C),
3. a follow-up request containing a "cover letter" and the survey URL (see Appendix D), and
4. a thank you including the survey URL (see Appendix E: Thank You).

Instrument Development

An E-meeting was defined as "a meeting in which there are one (1) or more remote participants with *both audio and web conferencing* connections." In 2003, the SRC used telephone conference calls for audio conferencing and PlaceWare for web conferencing technology.[2] E-meeting technology was defined as "audio and web conferencing technology used by participants in an E-meeting (both remote and in person participants)".

Respondents were asked to indicate the degree to which they agreed with each statement regarding using E-meeting technology or participating in an E-meeting. All statements

[2] PlaceWare was acquired by Microsoft in April 2003 (2 months after this survey was administered). The current version of this product is called Microsoft LiveMeeting (http://main.placeware.com/).

were anchored with a 7 point Likert type scale with anchors of "Strongly Agree" and "Strongly Disagree". The order of the questions was determined by randomly selecting one question from each construct to avoid having seemingly redundant questions next to each other.

The survey instrument was derived from the augmented Technology Acceptance Model (TAM) by Taylor and Todd (1995a). The augmented TAM adds subjective norm and perceived behavioral control to attitude as determinants of behavioral intention to use as determinants of IT usage. Perceived ease of use and perceived usefulness are important determinants of attitude. Existing questions from each construct validated in previous research were adapted to measure perceptions of using E-meetings (see Table 1).

Table 1: Instrument Constructs and Questions

Construct and Definition	Questions on Instrument and Source
Perceived Ease of Use "the degree to which a person believes that using a particular system would be free effort" (Davis 1989, p. 320)	1. Learning to operate E-meeting technology would be easy for me. 2. I believe that it is easy to get E-meeting technology to do what I want it to do. 3. Overall, I believe that E-meeting technology is easy to use. (Davis, 1989)
Perceived Usefulness "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989, p. 320).	1. Using E-meeting technology would improve my meeting performance. 2. Using E-meeting technology would enhance my meeting effectiveness. 3. Using E-meeting technology would increase my meeting productivity. 4. I would find E-meeting technology useful. (Davis, 1989)
Attitude "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (Fishbein & Azjen, 1975, p. 216 qtd. in Venkatesh et al., 2003, p. 428)	1. I like the idea of using E-meeting technology. 2. Using E-meeting technology is a good idea. 3. Using E-meeting technology is a wise idea. (Taylor & Todd, 1995b)
Subjective Norm "a person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Azjen, 1975, p. 302 qtd. in Venkatesh et al., 2003, p. 428)	1. Colleagues who are important to me think I should use E-meeting technology. 2. People who influence my behavior (such as management and/or a supervisor) think that I should use E-meeting technology. (Taylor & Todd, 1995b)

Construct and Definition	Questions on Instrument and Source
Perceived Behavioral Control "the perceived ease or difficulty of performing the behavior" (Azjen, 1991, p. 188 qtd. in Venkatesh et al., 2003, p. 429) "perceptions of internal and external constraints on behavior" (Taylor & Todd, 1995a, p. 149 qtd. in Venkatesh et al., 2003, p. 429)	1. I would be able to use E-meeting technology. 2. I have the resources and the knowledge and the ability to make use of E-meeting technology. (Taylor & Todd, 1995b)
Behavioral Intention "indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (Azjen, 1991, p. 181)	1. I intend to participate in a meeting using E-meeting technology this year. 2. I intend to facilitate a meeting using E-meeting technology this year. 3. I intend to use (either participate or facilitate) E-meeting technology frequently this year. (Taylor & Todd, 1995b)
Use	1. I have participated in an E-meeting. 2. In the part 12 months, how many E-meetings have you attended as a remote participant? 3. In the past 12 months, how many E-meetings have you attended in person with others participating remotely? 4. In the past 12 months, how many SRC E-meetings have you attended?

Additional questions designed to capture data important to the SRC management were also added to the survey: perceptions of time and money savings (by holding a meeting electronically instead of traveling to attend a meeting), perceptions of E-meetings being as good as face-to-face meetings, and openness to participation in an E-meeting (see Table 2).

Table 2: Additional Instrument Questions

Category	Questions on Instrument	
Perceived Time Savings	1.	An E-meeting would be a more efficient use of my time than traveling to attend a meeting.
	2.	Saving time (by holding an E-meeting instead of traveling) is a good idea.
Perceived Money Savings	1.	An E-meeting would be cheaper than traveling to attend a meeting.
	2.	Saving money (by holding an E-meeting instead of traveling) is a good idea.
Comparison of E-meeting and Face-to-Face	1.	An E-meeting would be as satisfactory as a face-to-face meeting.
	2.	An E-meeting would be as likely to meet its' objectives as a face-to-face meeting.
Willingness to Participate	1.	I would welcome the opportunity to attend SRC meetings as E-meetings instead of traveling.
	2.	I would be more likely to attend an E-meeting than travel to attend a meeting.
	3.	I would be more likely to actively participate in an E-meeting than in a face-to-face meeting.
Technical Barriers	1.	I am hesitant to use E-meeting technology due to risk of technical problems.
	2.	My high-speed Internet connection would make it easy to attend an E-meeting.

Data Collection

The survey was implemented for web administration, and encompassed five screens of questions. It was written in PHP with the results stored in a MySQL database. The survey was extensively tested using Internet Explorer and Netscape 6 and 7.

Security measures were implemented to ensure that only people in the sample could complete the survey. First, users were required to authenticate on the first page (providing consent) with a researcher-provided passcode to gain access to the survey. If users provided the correct passcode, a random and unique SessionID was created and written to the database along with a flag to indicate that they had completed the first page. Each subsequent survey page would check for the existence of the SessionID. If no SessionID existed (if, for example, the survey respondent wanted to jump forward in the survey or return to the survey at a later date), the potential survey taker was returned to the first page. If they did not return to the first page (or returned more than once to the survey within the same browser session), the record of their responses was written to the database without the SessionID and considered invalid data.

Data collection took place over a two-week time period in March 2003. The initial sample size of 400 was reduced by 39 (nearly 10%) due to bounced e-mails, people no longer affiliated with the SRC, people on vacation, and requests to the researcher to be removed from the survey.

Data Analysis

Data was exported from the MySQL database and imported into SAS for further analysis. Descriptive statistics for measures of use and aggregated constructs (mean, median, standard deviation, minimum and maximum) are listed in Tables 1-3. Constructs were also tested for internal reliability using Cronbach's alpha and for relationships among constructs using Pearson's correlation coefficients.

Results

Fifty-one survey responses were received out of a possible 361 invitations (a 14% response rate). All responses were determined to be valid as a result of the security measures implemented on the online survey. However, three participants discontinued the survey after answering "No" to the first question, "I have participated in an E-meeting."

Respondent demographics roughly matched that of the SRC active membership (see Tables 3 and 4). Most of the respondents were male (*n* = 41, 87% of those who responded), mean respondent age was 44.37 (SD = 11.34), and the mean number of years of computer use at work was 16.25 (SD = 6). Most of the respondents were Industry Professionals (*n* = 36, 77%) with a PhD (*n* = 31, 66%).

Table 3: Demographic Summary

	n	Mean	Median	Std Dev	Min	Max
Age	46	44.37	43	11.34	25	75
Years of Computer Use	47	16.25	16	6.44	5	30

All respondents were active participants in the SRC defined as having at least one of the following affiliations: participating in at least one TAB or CC (n=34, 76% of the 45 responses to this question), Principle Investigators (*n* = 2, 2% of 45), Task Leaders (*n* = 1, 2% of 45), or Industry Liaisons (*n* = 13, 29% of 25). Each of the SRC CCs and all but one TAB were represented by at least one respondent. The number of respondent affiliations with the SRC ranged from 0-5.

Table 4: Sample Demographics, part II (*n* = 47)

	n		Percentage
Gender			
Male	41		87%
Female	6		13%
Education Level			
Bachelor's Degree	3		6%
Some Graduate School	1		2%
Master's Degree	12		26%
Doctorate Degree	31		66%
Occupation			
University Faculty	10		21%
Industry Professional	36		77%
Graduate Student	0		0%
SRC Employee or Consultant	1		2%
SRC Affiliations *			
TAB participation (1-3 TABS)	26		58 %
1 TAB		16	36 %
2 TABs		7	16 %
3 TABs		3	7 %
CC participation (1-2 TABS)	15		33 %
1 CC		13	29 %
2 CCs		2	4 %
Principle Investigator	2		4 %
Task Leader	1		2 %
Industry Liaison	13		29 %

* *n*=45. Percentage of SRC affiliations does not equal 100 due to respondents having multiple affiliations with the SRC.

To assess the reliability of the model constructs, Cronbach's alpha was calculated for each of the model constructs (see Table 5). Reliability of each construct was within the range considered acceptable (greater than .8) with the exception of the Use construct, discussed below. In addition, upon further inspection, combining the constructs of Perceived Ease of Use and Perceived Behavioral Control not only yielded a higher alpha score, but was logical given the similarity of the constructs (see Table 6). The combined Perceived Ease of Use and Perceived Behavioral Control construct measures the degree

to which it would be easy to use a particular system given perceptions of internal and external constraints.

Table 5: Construct reliability (Cronbach's alpha)

Factor	*n*	Alpha (raw)
Perceived Ease of Use (PEU)	45	.842
Perceived Usefulness (PU)	44	.923
Attitude (Att)	44	.948
Subjective Norms (SN)	44	.823
Perceived Behavioral Control (PBC)	45	.804
Behavioral Intent to Use (BI)	45	.888
Use (initial w/4 questions)	45	.614
Use (final w/2 questions)	45	.928
Combined PEU and PBC	45	.894
Perceived Time Savings *	46	.762
Comparison of E-meeting and Face-to-Face *	46	.785
Willingness to Participate *	45	.796

* additional constructs not related to augmented TAM

Table 6: Combined Perceived Ease of Use and Perceived Behavioral control

Construct and Definition	Questions on Instrument and Source
Combined Perceived Ease of Use and Perceived Behavioral Control the degree to which it would be easy to use a particular system given perceptions of internal and external constraints	1. Learning to operate E-meeting technology would be easy for me. 2. I believe that it is easy to get E-meeting technology to do what I want it to do. 3. Overall, I believe that E-meeting technology is easy to use. (Davis, 1989) 4. I would be able to use E-meeting technology. 5. I have the resources and the knowledge and the ability to make use of E-meeting technology. (Taylor & Todd, 1995b)

* original Perceived Ease of Use construct from Davis (1989) and Perceived Behavioral Control from Taylor & Todd (1995a).

The four questions measuring actual use of E-meeting technology did not meet the requirements for a reliable scale, having a raw alpha of .614 (see Table 7). Upon closer examination of the questions, it was obvious that the questions were not measuring the same construct. The first question was answerable only with a yes/no whereas the other items were asking for an estimation of the number of E-meetings attended, so it was removed from the scale. The final question was asking only about SRC E-meeting usage. Given that this survey was completed in early 2003, at the beginning of the SRC implementation of E-meetings, the low correlation with overall E-meeting use is not surprising. Repeating the reliability test with the 2 remaining questions regarding number of E-meetings attended (in person or remotely) yielded a raw alpha value of .928.

Table 7: Initial reliability of Use scale (.564 alpha)

Question	Correlation with Total	Alpha with Item Removed
I have participated in an E-meeting. *	0.293	0.537
In the part 12 months, how many E-meetings have you attended as a remote participant?	0.557	0.307
In the past 12 months, how many E-meetings have you attended in person with others participating remotely?	0.526	0.337
In the past 12 months, how many SRC E-meetings have you attended? *	0.080	0.690

* question removed from final Use scale

The level of actual use of E-meeting technology varied with the definition of use: using the technology, using the technology at the SRC, and using the technology as a remote or co-located participant. More than 80% of respondents had participated in an E-meeting (n = 41, out of 51 total responses) (see Table 8). Thirty-nine of 48 responses (80%) reported having participated in at least one E-meeting "as a remote participant" in the 12 months prior to completing the survey with a mean of 25.75 E-meetings (see Table 9). Almost two-thirds of the respondents (29 of 48) participated in at least one E-meeting "in person with others participating remotely", with a mean of 14.77 E-meetings. Nearly 42% of respondents (20 of 48) had participated in SRC E-meetings with a mean of 1.25 E-meetings.

Table 8: General E-Meeting Use (n=51)

	Yes	No
I have participated in an E-meeting.	41 (80%)	10 (20%)

Table 9: Descriptive Statistics for E-Meeting Use (n=48)

	Mean	Median	Std Dev	Min	Max
How many E-meetings have you attended as a remote participant (in last 12 months)?	25.75	2.00	61.15	0	350
How many E-meetings have you attended in person with others participating remotely (in last 12 months)?	14.77	1.00	39.61	0	250
How many SRC E-meetings have you attended (in past 12 months)?	1.25	0.00	1.73	0	6

As previously noted, respondents were asked multiple questions to evaluate each factor on a 7 point Likert-type scale. The descriptive statistics listed in Table 10 were calculated from the aggregated factor means for each respondent (N=48). The means for Perceived Ease of Use, Perceived Usefulness, Attitude, and Perceived Behavioral Control

were all slightly higher (1-1.51 points) than the middle of the 7 point scale (4), demonstrating that overall survey respondents thought E-meetings would be somewhat useful and easy to use, had favorable attitudes toward E-meeting technology, and thought they would be able to use E-meeting technology. The mean for Subjective Norm was slightly higher than the middle of the scale, yet slightly lower than other perceptions of E-meeting technologies, indicating that generally survey respondents felt little pressure from peers or superiors to adopt E-meeting technology. The mean for Behavioral Intent was slightly higher than the mid-point of the scale, yet did not indicate a high intention overall to use E-meeting technology in the next year.

Table 10: Descriptive Statistics for constructs (*n*=48)

	Mean	Median	Std Dev	Min	Max
Perceived Ease of Use (PEU)	5.11	5.00	1.26	1.67	7.00
Perceived Usefulness (PU)	5.00	5.25	1.29	1.50	7.00
Attitude	5.41	5.67	1.25	1.33	7.00
Subjective Norms	4.57	5.00	1.42	1.00	7.00
Perceived Behavioral Control (PBC)	5.51	5.51	1.09	3.00	7.00
Behavioral Intent to Use	4.99	4.98	1.63	1.00	7.00

These are aggregated measures.

Pearson correlation coefficients were calculated for each of the survey constructs to determine the strength of the relationship between constructs. Results are reported in Table 11 and discussed in the following section. The Use2 variable captures the number of uses of E-meeting technology as a remote participant, while Use 3 captures the number of E-meeting technology uses with others located remotely. The construct Use is an aggregate of these two variables.

Table 11: Correlations among Construct Measures (*n*=42)

	Use2	Use3	Use	PEU	PU	A	SN	PBC	BI
Use2	1								
Use3	.95 ***	1							
Use	.99 ***	.98 ***	1						
Perceived Ease of Use (PEU)	.36 *		.33 *	1					
Perceived Usefulness (PU)	.39 *	.31 *	.36 *	.55 **	1				
Attitude (A)	.32 *		.31 *	.45 **	.88 ***	1			
Subjective Norms (SN)	.41 **		.37 *	.47 **	.65 ***	.58 ***	1		
Perceived Behavioral Control (PBC)	.42 **	.32 *	.39 *	.78 ***	.31 *	.35 *	.50 **	1	
Behavioral Intent to Use (BI)	.48 **	.38 *	.45 **	.56 ***	.71 ***	.57 ***	.84 ***	.47 **	1

* p<.05, ** p<.01, *** p≤.001

Descriptive statistics from the additional E-meeting questions added to the survey can be found in Table 12.

Table 12: E-meeting Questions

Additional Questions	Mean	Std. Dev	Median	Min	Max
An E-meeting would be a more efficient use of my time than traveling to attend a meeting.	5.30	1.49	5	1	7
Saving time (by holding an E-meeting instead of traveling) is a good idea.	5.30	1.17	5.5	1	7
An E-meeting would be cheaper than traveling to attend a meeting.	6.58	.72	7	4	7
Saving money (by holding an E-meeting instead of traveling) is a good idea.	5.52	1.38	6	1	7
An E-meeting would be as satisfactory as a face-to-face meeting.	3.07	1.51	3	1	6
An E-meeting would be as likely to meet its' objectives as a face-to-face meeting	3.70	1.43	4	1	6
I would welcome the opportunity to attend SRC meetings as E-meetings instead of traveling.	4.67	1.60	5	1	7
I would be more likely to attend an E-meeting than travel to attend a meeting.	5.00	1.69	6	1	7
I would be more likely to actively participate in an E-meeting than in a face-to-face meeting.	3.52	1.68	3	1	7
I am hesitant to use E-meeting technology due to risk of technical problems.	3.04	1.62	2	1	7
My high-speed Internet connection would make it easy to attend an E-meeting.	5.93	1.08	6	2	7

Discussion

Nearly 80% of the respondents had used E-meeting technology and 42% had participated in an SRC-sponsored E-meeting. Given the SRC's E-meeting initiative, the high level of use of E-meeting technology is not surprising; however, it there is still a large number of potential E-meeting users within the SRC member community.

The findings of this research study are largely consistent with existing research. There exist strong, statistically significant correlations among the determinants of usage of the Augmented TAM: Perceived Usefulness, Perceived Ease of Use, Attitude, Subjective Norms, and Perceived Behavioral Control (see Table 11). In addition, the correlations between the determinants of use and actual system use are statistically significant (.32-.42), but the correlation between the determinants and Behavioral Intention to Use (.47-.84) are stronger. This is also consistent with the Augmented TAM as Behavioral Intention to use is an intermediary between the determinants and actual use. In addition, the proximity in time between the initiation of the SRC E-meeting initiative and this research study combined with the moderate level of SRC E-meeting use among participants help to explain the difference in correlation strength.

The stronger correlation between Attitude and Perceived Usefulness (.88, $p < .001$) than between Attitude and Perceived Ease of Use (.45, $p < .01$) further reinforces the theory underlying the Augmented TAM. For the SRC, this means that, while Ease of Use cannot be discounted as an important determinant of Attitude, E-meeting technology must demonstrate Usefulness (in terms of increasing job performance) to potential users in order to be considered a good idea.

The very strong correlation between Behavioral Intent to Use and Subjective Norm (.84, $p<.001$) is somewhat surprising given that the mean for Subjective Norm (4.57, SD = 1.42) was slightly above the midpoint, implying that respondents did not have strong perceptions that their colleagues or management think they should use E-meeting technology. Individuals in the SRC member community who intend to use E-meetings this year also indicated a stronger perception that their management and/or colleagues think they should participate in E-meetings.

Within the context of the SRC, this finding seems to indicate that the E-meeting initiative should direct its efforts at management and other change agents within the SRC member community. At the current level of E-meeting use, future adopters of E-meeting technology at the SRC will fall into the diffusion theory adopter categories of early or late majority. The early majority tends to be more receptive to change and more likely to have their behavior influenced by change agents, while the late majority tends to be more skeptical and waits until most of the uncertainty surrounding a new technology has been removed. According to diffusion theory, while the early majority follow the lead of the innovators, for the late majority "the pressure of peers is necessary to motivate adoption" (Rogers, 1995, p. 265). The strong correlation between Subjective Norm and Behavioral Intent to Use and the characteristics of the potential adopters of SRC E-meetings also seem to indicate that additional marketing efforts may be required to increase the level of use of E-meetings in the SRC.

Interestingly, the demographic questions and the questions added to the survey for the SRC stakeholders (not part of the Augmented TAM) yield important insights into the E-meeting perceptions of the respondents. All reported means are on the 7 point Likert-type scale (from 1-7 where 1 is strongly disagree and 7 is strongly agree). Respondents indicated that the fear of potential technical problems did not generally cause them to hesitate to use E-meeting technologies (mean=3.04, SD=1.62). They agreed that E-meetings were cheaper (mean=6.58, SD=0.72) and tended to agree that saving money by holding E-meetings instead of traveling was a good idea (mean=5.52, SD=1.38). In addition, participants felt that conducting E-meetings would save them time (mean=5.30, SD=1.49) and saving time was a good idea (mean=5.30, SD=1.17). These results indicate that saving time and money by using E-meetings were important to respondents, and that a potential barrier to E-meeting use, the fear of technical problems, was not a significant factor.

However, participants generally felt that an E-meeting might not be as likely to meet its' objectives as a face-to-face meeting (mean=3.7, SD=1.43) and disagreed with the statement that an E-meeting would be as satisfactory as a face-to-face meeting (mean=3.07, SD=1.51). Also respondents slightly disagreed with the statement that they would be more likely to actively participate in an E-meeting than a face-to-face meeting (mean=3.52, SD=1.68). These findings are consistent with previous research on remote collaboration which found communications to be less frequent, less satisfactory and to require more coordination efforts (Armstrong & Cole, 2002; Kraut et al., 1988; Walsh & Maloney, 2002).

Interestingly, 19 out of a total of 51 respondents indicated that they would prefer to participate in a Technical Advisory Board (TAB) meeting or a Coordinating Committee (CC) remotely. Twenty-four indicated that they would prefer to participate in a Research Review remotely. However, 13 of the 32 people who were members of a TAB or CC (40.6%) would prefer participating in a TAB or CC remotely. This number is significant because it is evidence that a significant portion of the SRC member community would prefer to attend an E-meeting over traveling to attend a face-to-face meeting.

Limitations of the Study

This study has several characteristics that limit the usefulness of the results. First, this survey is limited to the study of E-meeting adoption at the SRC, hindering the ability to generalize the results to other settings. This research studies the adoption of E-meeting technology in one organization and should not be used as the basis for drawing conclusions about levels of use and perceptions of using E-meeting technology in other organizations. Second, a lack of compatibility of the survey with Netscape 4.75 caused at least 2 potential respondents to e-mail the researcher and ask for the survey in another form. Upon discovery of the incompatibility, the survey was immediately replaced with a version compatible with Netscape 4.7x. There were no substantive changes to the survey, rather the HTML was modified to not rely upon Cascading Style Sheets which rendered incorrectly in Netscape 4.7x.

Finally, and perhaps most critically, nearly all research participants had participated in an E-meeting. This could mean that the active member community of the SRC is composed of early adopters of E-meeting technology. However, given the low response rate of the survey, it is much more likely that the survey results are biased as a result of the low level

of participation of non-users. Two potential participants replied to a recruitment e-mail to the researcher indicating that they would like to help with the research, but given that they had never participated in an E-meeting, they would not be able to help.

Conclusion

The strong correlations found in this research between behavioral intent to use (BI) and actual use, and very strong correlations between BI and Perceived Usefulness and between BI and Subjective Norms suggest that the most important determinants of usage of E-meetings in the SRC community are the perceptions of usefulness of E-meetings and subjective norms (pressure from peers and superiors). These findings reinforce previous research using an augmented version of Davis' (1989) Technology Acceptance Model (TAM, Taylor & Todd, 1995a).

In order to continue efforts to utilize E-meetings as an effective replacement for face-to-face meetings, the SRC should continue to use formal and informal communication channels to not only directly attempt to convince its member community to use E-meeting technology but also to show the benefits of using E-meeting technology. This study suggests that the SRC's marketing efforts should not only show potential users how E-meeting technology will be useful as a means to accomplish their work but also how little uncertainty is involved with holding and participating in E-meetings. This can be accomplished through a variety of ways, including but not limited to: 1) holding formal training sessions or demo E-meetings in which participants could try out the new technology in a "safe" environment where they can make mistakes without feeling foolish, 2) offering clear and simple instructions on the mechanics of using E-meeting technology, and 3) holding informal "best practices" sessions in which those who have already adopted E-meeting technology can share their experiences with those still deliberating its use.

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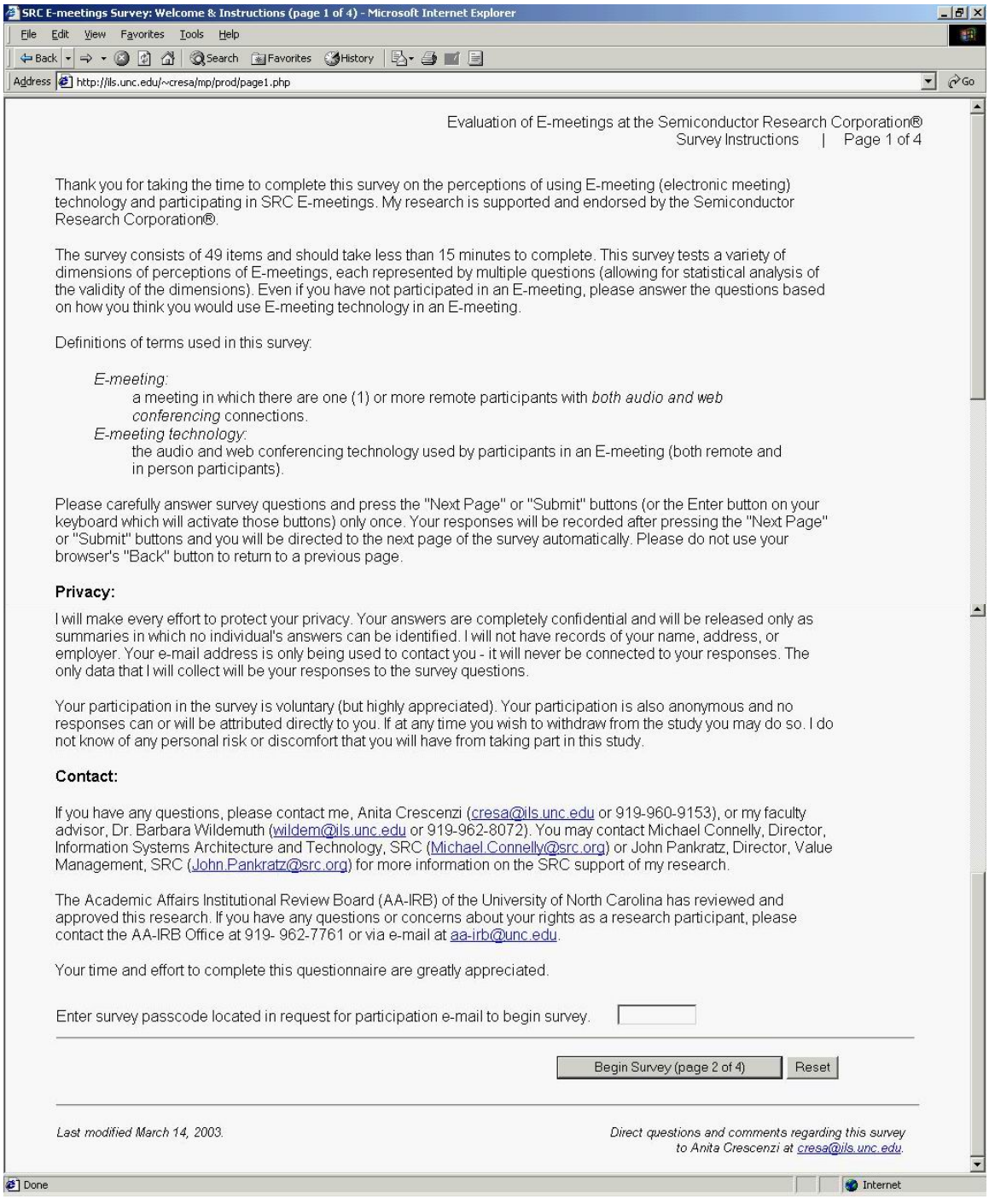
Appendices

Appendix A: Survey Instrument

Page 1



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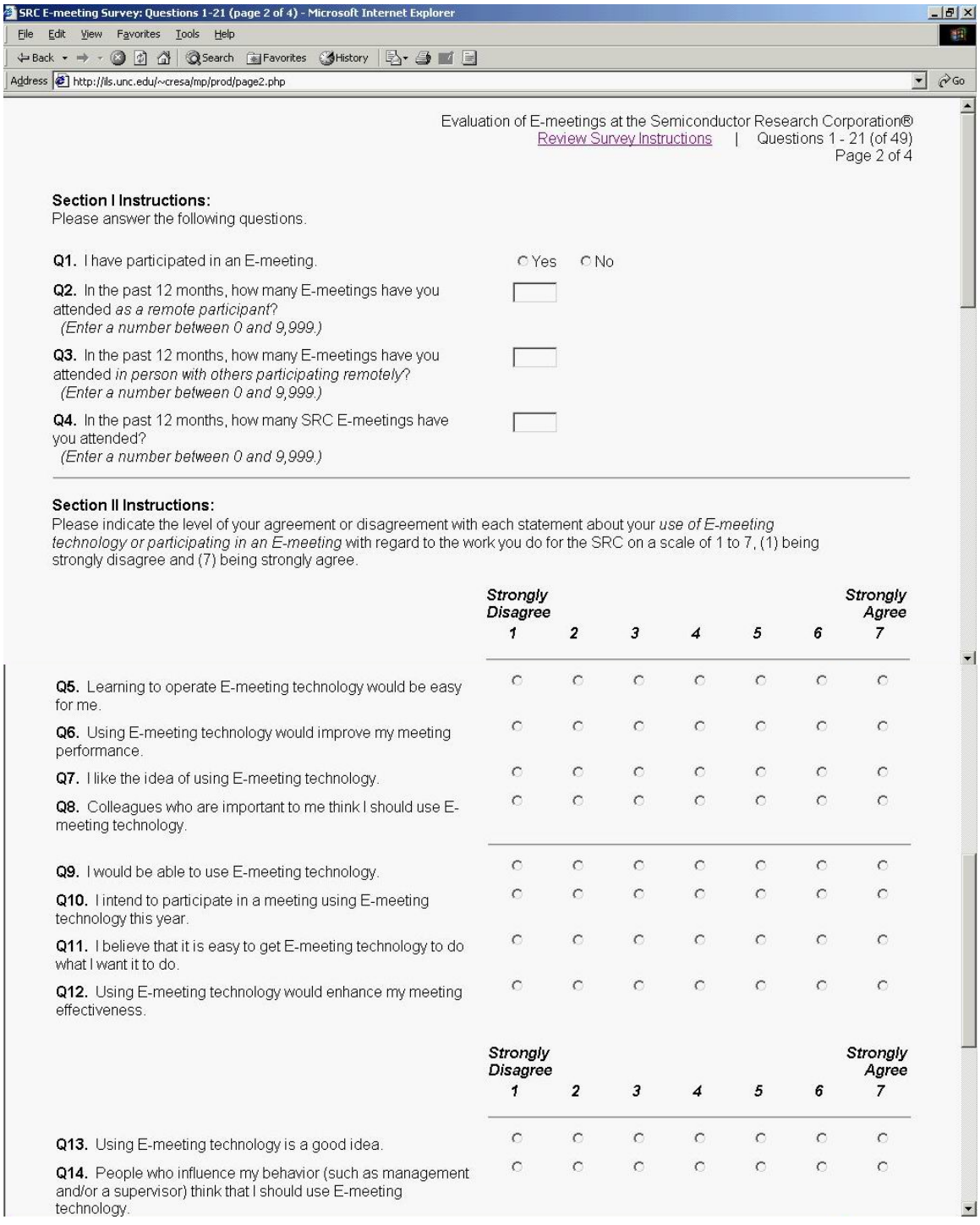

SRC E-meeting Survey: Questions 1-21 (page 2 of 4) - Microsoft Internet Explorer

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Address http://ils.unc.edu/~cresa/mp/prod/page2.php

Evaluation of E-meetings at the Semiconductor Research Corporation®
Review Survey Instructions | Questions 1 - 21 (of 49)
Page 2 of 4

Section I Instructions:
Please answer the following questions.

Q1. I have participated in an E-meeting. ○ Yes ○ No

Q2. In the past 12 months, how many E-meetings have you attended *as a remote participant*?
(Enter a number between 0 and 9,999.)

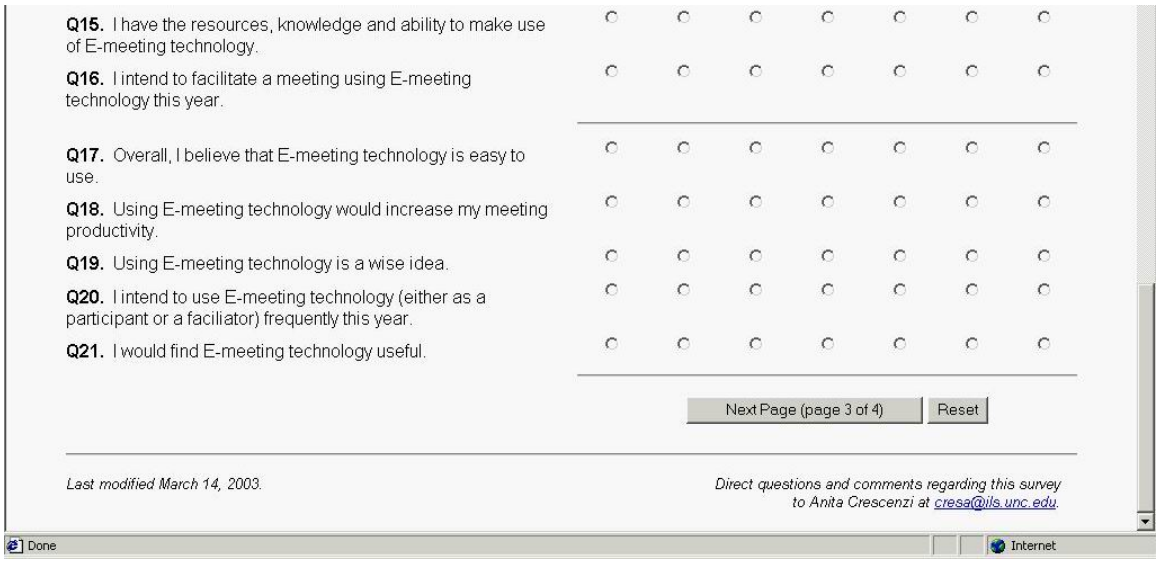
Q3. In the past 12 months, how many E-meetings have you attended *in person with others participating remotely*?
(Enter a number between 0 and 9,999.)

Q4. In the past 12 months, how many SRC E-meetings have you attended?
(Enter a number between 0 and 9,999.)

Section II Instructions:
Please indicate the level of your agreement or disagreement with each statement about your *use of E-meeting technology or participating in an E-meeting* with regard to the work you do for the SRC on a scale of 1 to 7, (1) being strongly disagree and (7) being strongly agree.

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
Q5. Learning to operate E-meeting technology would be easy for me.	○	○	○	○	○	○	○
Q6. Using E-meeting technology would improve my meeting performance.	○	○	○	○	○	○	○
Q7. I like the idea of using E-meeting technology.	○	○	○	○	○	○	○
Q8. Colleagues who are important to me think I should use E-meeting technology.	○	○	○	○	○	○	○
Q9. I would be able to use E-meeting technology.	○	○	○	○	○	○	○
Q10. I intend to participate in a meeting using E-meeting technology this year.	○	○	○	○	○	○	○
Q11. I believe that it is easy to get E-meeting technology to do what I want it to do.	○	○	○	○	○	○	○
Q12. Using E-meeting technology would enhance my meeting effectiveness.	○	○	○	○	○	○	○

	Strongly Disagree 1	2	3	4	5	6	*Strongly Agree* 7
Q13. Using E-meeting technology is a good idea.	○	○	○	○	○	○	○
Q14. People who influence my behavior (such as management and/or a supervisor) think that I should use E-meeting technology.	○	○	○	○	○	○	○



Q15. I have the resources, knowledge and ability to make use of E-meeting technology.

Q16. I intend to facilitate a meeting using E-meeting technology this year.

Q17. Overall, I believe that E-meeting technology is easy to use.

Q18. Using E-meeting technology would increase my meeting productivity.

Q19. Using E-meeting technology is a wise idea.

Q20. I intend to use E-meeting technology (either as a participant or a faciliator) frequently this year.

Q21. I would find E-meeting technology useful.

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Direct questions and comments regarding this survey to Anita Crescenzi at cresa@ils.unc.edu.

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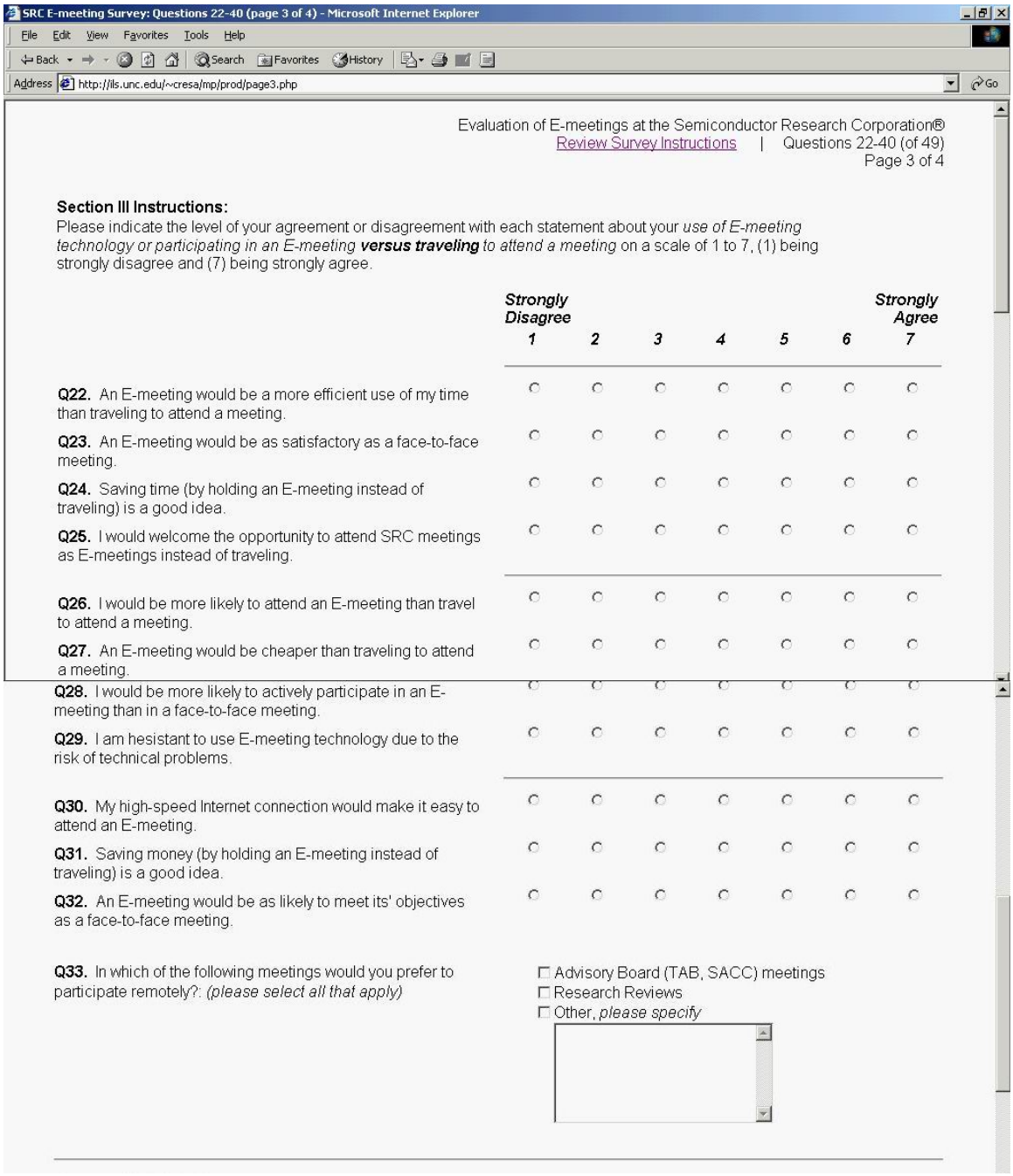
Page 3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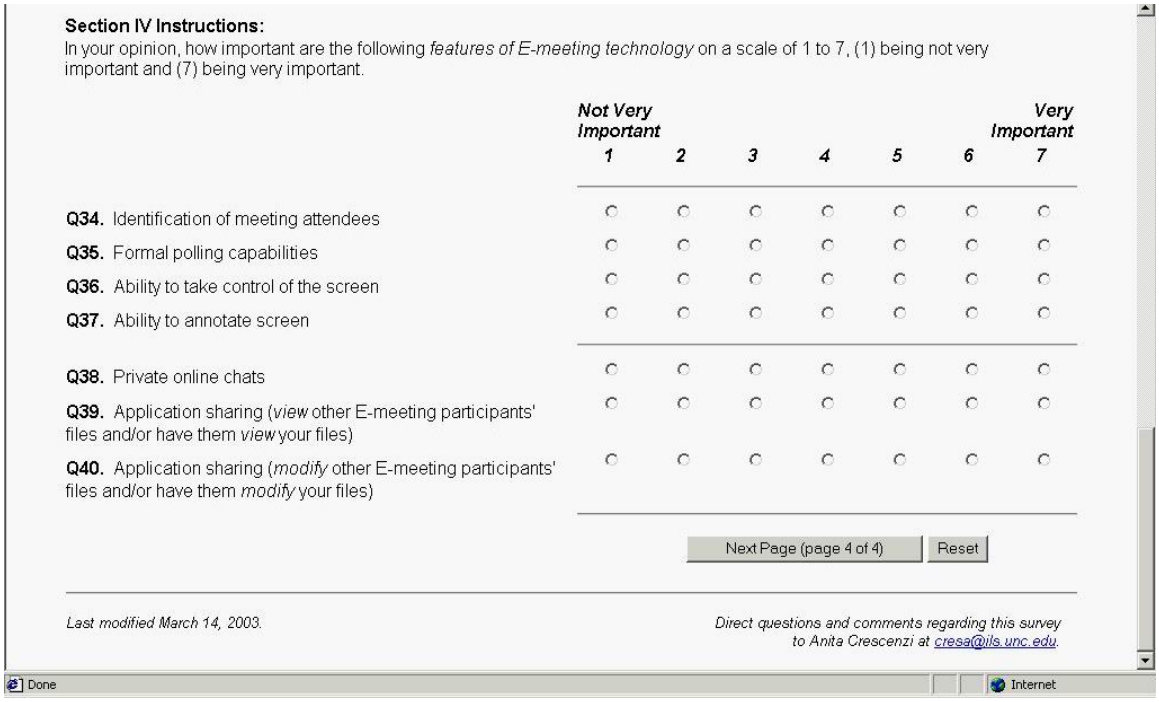
Evaluation of E-meetings at the Semiconductor Research Corporation®
Review Survey Instructions | Questions 22-40 (of 49)
Page 3 of 4
Section III Instructions:
Please indicate the level of your agreement or disagreement with each statement about your use of E-meeting technology or participating in an E-meeting versus traveling to attend a meeting on a scale of 1 to 7, (1) being strongly disagree and (7) being strongly agree.
Strongly Disagree
1 2 3 4 5 6 7
Strongly Agree
Q22. An E-meeting would be a more efficient use of my time than traveling to attend a meeting.
Q23. An E-meeting would be as satisfactory as a face-to-face meeting.
Q24. Saving time (by holding an E-meeting instead of traveling) is a good idea.
Q25. I would welcome the opportunity to attend SRC meetings as E-meetings instead of traveling.
Q26. I would be more likely to attend an E-meeting than travel to attend a meeting.
Q27. An E-meeting would be cheaper than traveling to attend a meeting.
Q28. I would be more likely to actively participate in an E-meeting than in a face-to-face meeting.
Q29. I am hesistant to use E-meeting technology due to the risk of technical problems.
Q30. My high-speed Internet connection would make it easy to attend an E-meeting.
Q31. Saving money (by holding an E-meeting instead of traveling) is a good idea.
Q32. An E-meeting would be as likely to meet its' objectives as a face-to-face meeting.
Q33. In which of the following meetings would you prefer to participate remotely?: (please select all that apply)
Advisory Board (TAB, SACC) meetings
Research Reviews
Other, please specify



Section IV Instructions:
In your opinion, how important are the following *features of E-meeting technology* on a scale of 1 to 7, (1) being not very important and (7) being very important.

	Not Very Important 1	2	3	4	5	6	*Very Important* 7
Q34. Identification of meeting attendees	○	○	○	○	○	○	○
Q35. Formal polling capabilities	○	○	○	○	○	○	○
Q36. Ability to take control of the screen	○	○	○	○	○	○	○
Q37. Ability to annotate screen	○	○	○	○	○	○	○
Q38. Private online chats	○	○	○	○	○	○	○
Q39. Application sharing (*view* other E-meeting participants' files and/or have them *view* your files)	○	○	○	○	○	○	○
Q40. Application sharing (*modify* other E-meeting participants' files and/or have them *modify* your files)	○	○	○	○	○	○	○

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Last modified March 14, 2003.

Direct questions and comments regarding this survey to Anita Crescenzi at cresa@ils.unc.edu.

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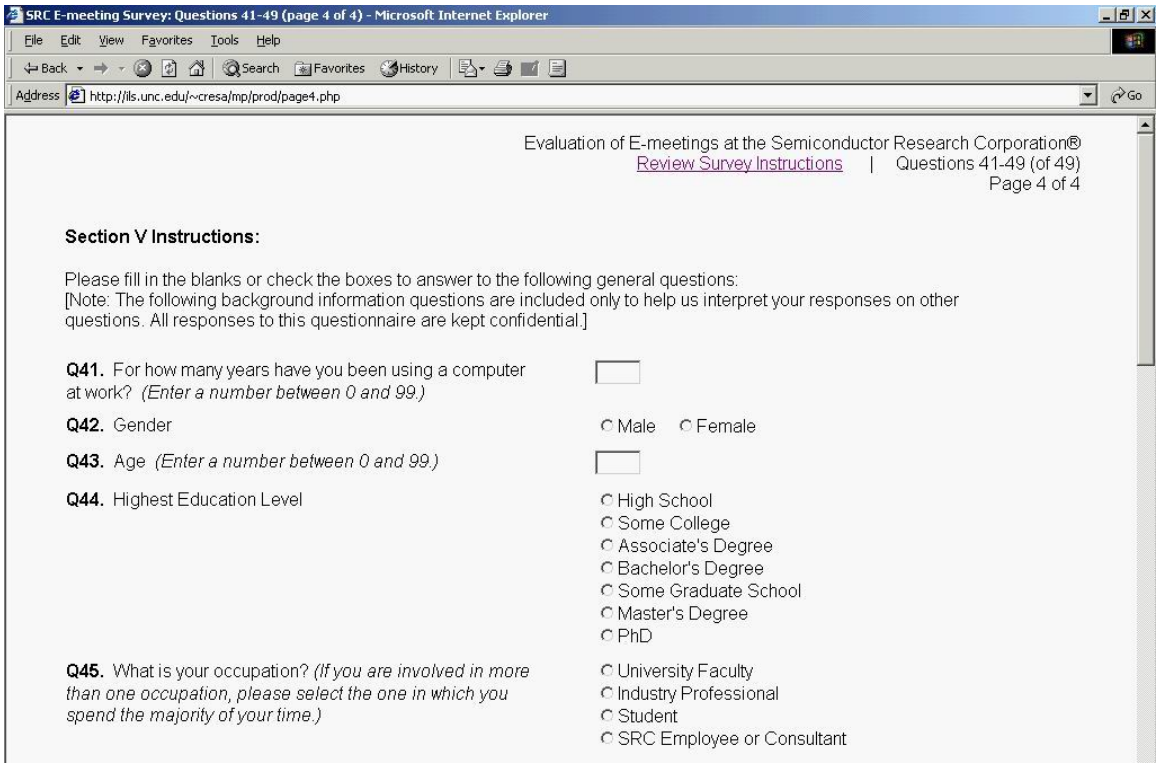
Page 4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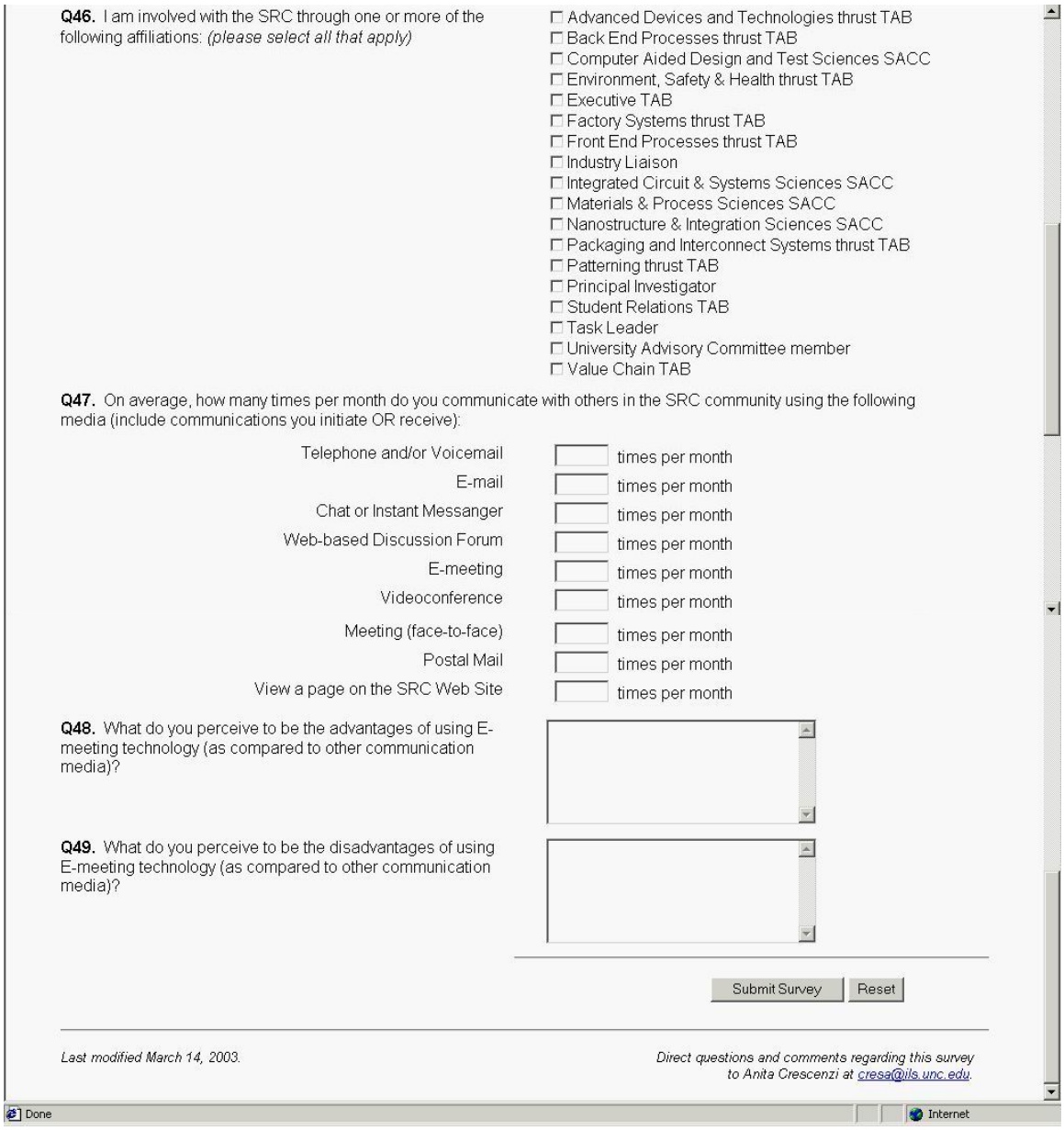
Evaluation of E-meetings at the Semiconductor Research Corporation®
Review Survey Instructions | Questions 41-49 (of 49)
Page 4 of 4
Section V Instructions:
Please fill in the blanks or check the boxes to answer to the following general questions:
[Note: The following background information questions are included only to help us interpret your responses on other questions. All responses to this questionnaire are kept confidential.]
Q41. For how many years have you been using a computer at work? (Enter a number between 0 and 99.)
Q42. Gender
Male
Female
Q43. Age (Enter a number between 0 and 99.)
Q44. Highest Education Level
High School
Some College
Associate's Degree
Bachelor's Degree
Some Graduate School
Master's Degree
PhD
Q45. What is your occupation? (If you are involved in more than one occupation, please select the one in which you spend the majority of your time.)
University Faculty
Industry Professional
Student
SRC Employee or Consultant



Q46. I am involved with the SRC through one or more of the following affiliations: *(please select all that apply)*

- ☐ Advanced Devices and Technologies thrust TAB
- ☐ Back End Processes thrust TAB
- ☐ Computer Aided Design and Test Sciences SACC
- ☐ Environment, Safety & Health thrust TAB
- ☐ Executive TAB
- ☐ Factory Systems thrust TAB
- ☐ Front End Processes thrust TAB
- ☐ Industry Liaison
- ☐ Integrated Circuit & Systems Sciences SACC
- ☐ Materials & Process Sciences SACC
- ☐ Nanostructure & Integration Sciences SACC
- ☐ Packaging and Interconnect Systems thrust TAB
- ☐ Patterning thrust TAB
- ☐ Principal Investigator
- ☐ Student Relations TAB
- ☐ Task Leader
- ☐ University Advisory Committee member
- ☐ Value Chain TAB

Q47. On average, how many times per month do you communicate with others in the SRC community using the following media (include communications you initiate OR receive):

Telephone and/or Voicemail	☐ times per month
E-mail	☐ times per month
Chat or Instant Messanger	☐ times per month
Web-based Discussion Forum	☐ times per month
E-meeting	☐ times per month
Videoconference	☐ times per month
Meeting (face-to-face)	☐ times per month
Postal Mail	☐ times per month
View a page on the SRC Web Site	☐ times per month

Q48. What do you perceive to be the advantages of using E-meeting technology (as compared to other communication media)?

Q49. What do you perceive to be the disadvantages of using E-meeting technology (as compared to other communication media)?

Submit Survey | Reset

Last modified March 14, 2003.

Direct questions and comments regarding this survey to Anita Crescenzi at cresa@ils.unc.edu.

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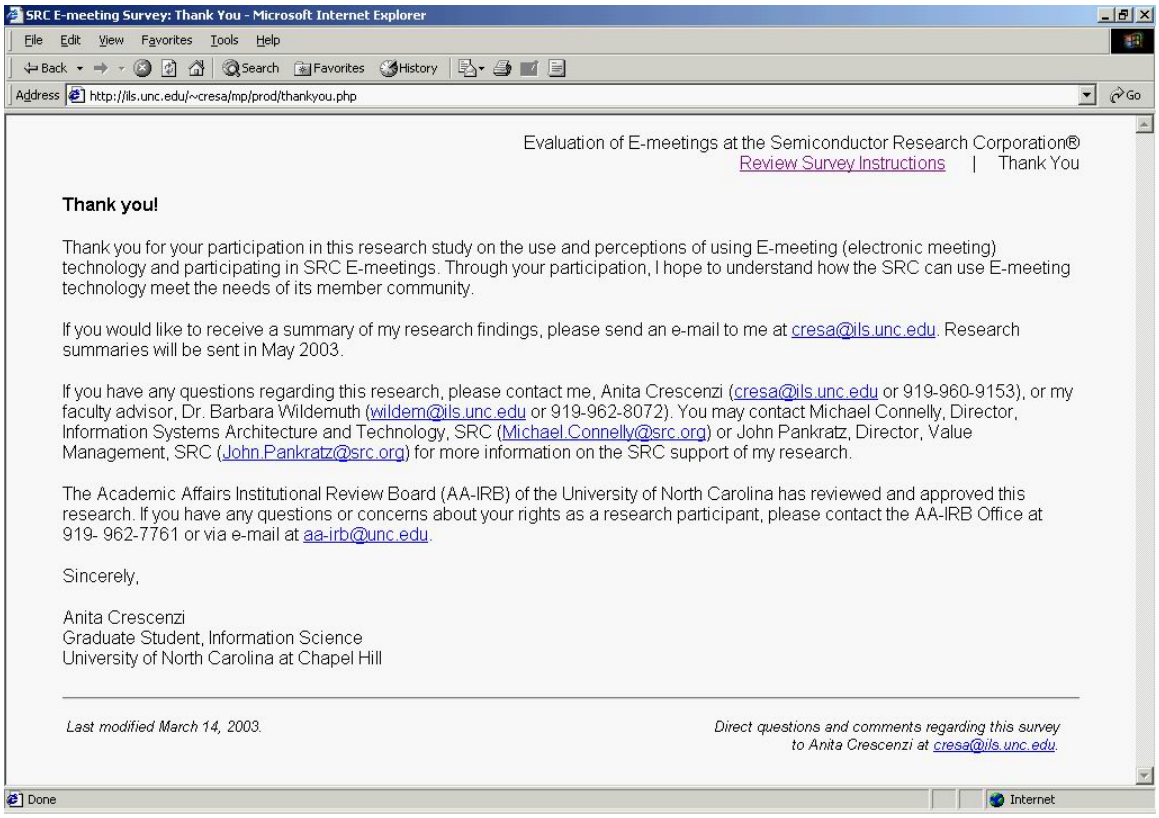
Thank You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Evaluation of E-meetings at the Semiconductor Research Corporation®
Review Survey Instructions | Thank You
Thank you!
Thank you for your participation in this research study on the use and perceptions of using E-meeting (electronic meeting) technology and participating in SRC E-meetings. Through your participation, I hope to understand how the SRC can use E-meeting technology meet the needs of its member community.
If you would like to receive a summary of my research findings, please send an e-mail to me at cresa@ils.unc.edu. Research summaries will be sent in May 2003.
If you have any questions regarding this research, please contact me, Anita Crescenzi (cresa@ils.unc.edu or 919-960-9153), or my faculty advisor, Dr. Barbara Wildemuth (wildem@ils.unc.edu or 919-962-8072). You may contact Michael Connelly, Director, Information Systems Architecture and Technology, SRC (Michael.Connelly@src.org) or John Pankratz, Director, Value Management, SRC (John.Pankratz@src.org) for more information on the SRC support of my research.
The Academic Affairs Institutional Review Board (AA-IRB) of the University of North Carolina has reviewed and approved this research. If you have any questions or concerns about your rights as a research participant, please contact the AA-IRB Office at 919- 962-7761 or via e-mail at aa-irb@unc.edu.
Sincerely,
Anita Crescenzi
Graduate Student, Information Science
University of North Carolina at Chapel Hill
Last modified March 14, 2003.
Direct questions and comments regarding this survey to Anita Crescenzi at cresa@ils.unc.edu.
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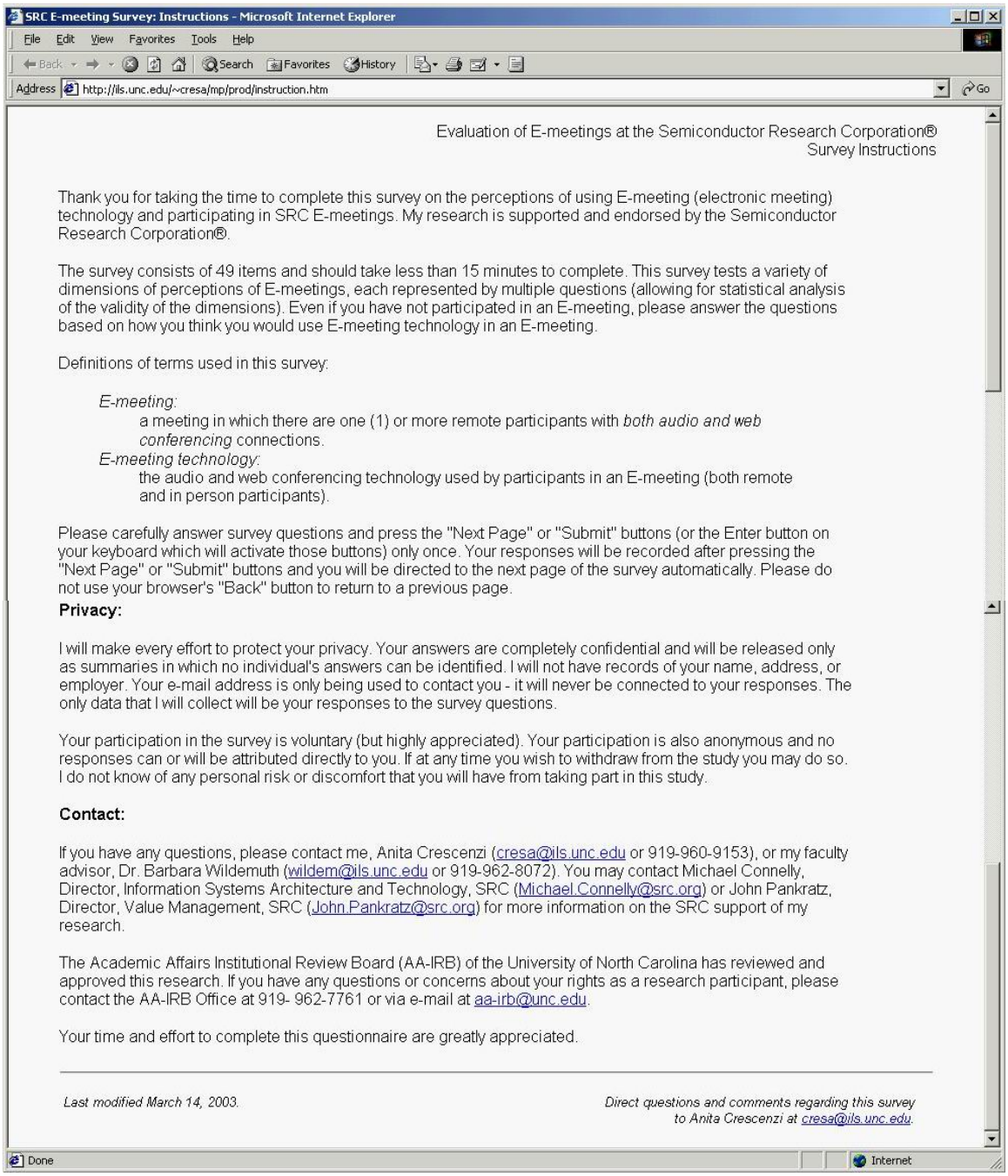
Instructions



Appendix B: Pre-notice E-mail

From: cresa@ils.unc.edu (Anita Crescenzi)
Subject: SRC authorized member survey

Within the next couple of days, I will send you an e-mail request to fill out a brief web survey of the use and perceptions of using E-meeting (electronic meeting) technology and participating in E-meetings with the Semiconductor Research Corporation®. I would greatly appreciate it if you could take a few moments to complete the survey. By doing so, you will help ensure that I have the best information possible.

I am a graduate student at the University of North Carolina and former SRC employee and I am conducting this research study as part of a master's thesis under the supervision of Dr. Barbara Wildemuth, a professor at UNC. My research is supported and endorsed by the Semiconductor Research Corporation®.

The purposes of this research are to explore 1) the use and perceptions of E-meetings and E-meeting technology, 2) factors influencing use of E-meetings and E-meeting technology, and 3) a better understanding of how the SRC can use E-meetings and E-meeting technology to meet the needs of its member community.

Your participation in the survey is voluntary (but highly appreciated). Your participation is also anonymous and no responses can or will be attributed directly to you. If at any time you wish to withdraw from the study you may do so. I do not know of any personal risk or discomfort that you will have from taking part in this study.

If you have any questions, or feel that you are being contacted in error, please feel free to contact me, Anita Crescenzi (a graduate student at the University of North Carolina at Chapel Hill and former SRC employee) by e-mail at cresa@ils.unc.edu or by phone at 919-960-9153. You may contact Michael Connelly, Director, Information Systems Architecture and Technology, SRC (Michael.Connelly@src.org) or John Pankratz, Director, Value Management, SRC (John.Pankratz@src.org) for more information on the SRC support of my research.

Thank you in advance for your cooperation.

Sincerely,

Anita Crescenzi
cresa@ils.unc.edu
Graduate Student, Information Science
University of North Carolina at Chapel Hill

Appendix C: Request for Participation E-mail

From: cresa@ils.unc.edu (Anita Crescenzi)
Subject: Request and link to SRC authorized member survey

As you may recall from my preliminary note to you, I am writing to invite you to complete a web survey as part of a research study of the member community of the Semiconductor Research Corporation®. I am a graduate student at the University of North Carolina and former SRC employee and I am conducting this research study as part of my master's thesis under the supervision of Dr. Barbara Wildemuth, a professor at UNC.

The purposes of this research are to 1) explore the use and perceptions of using E-meetings and E-meeting technology, 2) determine factors influencing use of E-meetings and E-meeting technology, and 3) gain a better understanding of how the SRC can use E-meetings and E-meeting technology to met the needs of its member community.

What Will Happen During the Study

I ask that you complete one web-based survey even if you have never participated in an E-meeting or used E-meeting technology. You may complete the survey anytime before noon (12 pm EST) March 28, 2003. You will need a web browser and an Internet connection to complete it. Generally, completing the survey should take less than 15 minutes.

Your Privacy and Rights

I will make every effort to protect your privacy. Your answers are completely confidential and will be released only as summaries in which no individual's answers can be identified. I will not have records of your name, address, or employer. Your e-mail address is only being used to contact you – it will never be connected to your responses. The only data that I will collect will be your responses to the survey questions.

Your participation in the survey is voluntary (but highly appreciated). Your participation is also anonymous and no responses can or will be attributed directly to you. A total of 400 people are invited to participate in this study. If at any time you wish to withdraw from the study you may do so. I do not know of any personal risk or discomfort that you will have from taking part in this study. If for some reason you prefer not to complete the survey and to not receive follow-up e-mails, please let me know by replying to this e-mail.

By completing the survey, you will help ensure that I have the most accurate data on the use and perceptions of using E-meeting (electronic meeting) technology and participating in E-meetings with the Semiconductor Research Corporation®. Through your participation, I eventually hope to understand how the SRC can use E-meetings and E-meeting technology to meet the needs of its member community.

Completing the survey

To take the survey:

1. From a computer with an active Internet connection, point your web browser to http://ils.unc.edu/~cresa/mp/prod/page1.php.
2. Input 57433 as the passcode (the ID number given to all respondents to access the survey).
3. Click the "Begin Survey" button to begin the survey.
4. The survey will be active until noon (12 pm EST) March 28, 2003.

To receive a summary of the findings, please reply to this e-mail.

Contact

If you have any questions, please contact me, Anita Crescenzi (cresa@ils.unc.edu or 919-960-9153), or my faculty advisor, Dr. Barbara Wildemuth (wildem@ils.unc.edu or 919-962-8072). You may contact Michael Connelly, Director, Information Systems Architecture and Technology, SRC (Michael.Connelly@src.org) or John Pankratz, Director, Value Management, SRC (John.Pankratz@src.org) for more information on the SRC support of my research.

The Academic Affairs Institutional Review Board (AA-IRB) of the University of North Carolina has reviewed and approved this research. If you have any questions or concerns about your rights as a research participant, please contact the AA-IRB Office at 919-962-7761 or via e-mail at aa-irb@unc.edu.

Thank you very much for helping with this important study. It's only with the generous help of people like you that this research can be successful.

Sincerely,

Anita Crescenzi
cresa@ils.unc.edu
Graduate Student, Information Science
University of North Carolina at Chapel Hill

Appendix D: Followup E-mail

From: cresa@ils.unc.edu (Anita Crescenzi)
Subject: Followup and link SRC authorized member survey

I am writing to thank you for your participation in my research study on the use and perceptions of using E-meeting (electronic meeting) technology and participating in E-meetings with the Semiconductor Research Corporation®. Through your participation, I eventually hope to understand how the SRC can use E-meetings and E-meeting technology to meet the needs of its member community.

If you have not yet completed the survey, you can do so by visiting http://ils.unc.edu/~cresa/mp/prod/page1.php and entering 57433 as the passcode. The survey generally takes less than 15 minutes to complete. I will make every effort to protect your privacy.

If you have any questions, please contact me, Anita Crescenzi (cresa@ils.unc.edu or 919-960-9153), or my faculty advisor, Dr. Barbara Wildemuth (wildem@ils.unc.edu or 919-962-8072). You may contact Michael Connelly, Director, Information Systems Architecture and Technology, SRC (Michael.Connelly@src.org) or John Pankratz, Director, Value Management, SRC (John.Pankratz@src.org) for more information on the SRC support of my research.

The Academic Affairs Institutional Review Board (AA-IRB) of the University of North Carolina has reviewed and approved this research. If you have any questions or concerns about your rights as a research participant, please contact the AA-IRB Office at 919-962-7761 or via e-mail at aa-irb@unc.edu.

Thank you very much for your valuable time.

Sincerely,

Anita Crescenzi
cresa@ils.unc.edu
Graduate Student, Information Science
University of North Carolina at Chapel Hill

Appendix E: Thank You E-mail

From: cresa@ils.unc.edu (Anita Crescenzi)
Subject: Thank you - SRC authorized member survey

Thank you for your participation in my research study on the use and perceptions of E-meeting technology and participating in E-meetings with the Semiconductor Research Corporation®. Through your participation, I eventually hope to understand how the SRC can use E-meetings and E-meeting technology to meet the needs of its member community.

If you would like to receive a summary of my research findings, please reply to this e-mail if you have not already requested a summary of the findings. Research summaries will be sent in early May 2003.

Sincerely,

Anita Crescenzi
cresa@ils.unc.edu
Graduate Student, Information Science
University of North Carolina at Chapel Hill