PROTOCOL NARRATIVE FOR EXPEDITED OR FULL COMMITTEE RESEARCH

University of California, Irvine
Institutional Review Board
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For IRB Office Use Only

Lead Researcher Name: Gloria Mark
Study Title: Multitasking as a Collaborative System: Examining the Millennial Generation

NON-TECHNICAL SUMMARY

Provide a non-technical summary of the proposed research project that can be understood by IRB members with varied research backgrounds, including non-scientists and community members. The summary should include a brief statement of the **purpose of the research** and **related theory/data supporting** the intent of the study as well as a brief description of the **procedure(s) involving human subjects**. ***This summary should not exceed ½ page.***

This research investigates how Millennials, young people having grown up with the Internet, can become effective future information workers. More and more, studies are suggesting that multitasking with digital media is associated with errors, stress and degraded performance. Whereas most investigations have approached multitasking as an individual activity, in this research, we propose taking a new perspective on multitasking: focusing on multitasking as a collaborative social system. In the age of social media use among Millennials, this research program will investigate how interactive media impacts multitasking behavior.
We will ask the following main research questions:

- How does growing up as a digital native affect one's skill as a multitasker?
- Do Millennials experience information overload and distraction through their connectivity?
- How does online media experience affect how Millennials learn, communicate, and behave with each other face-to-face—all skills needed by information workers?
- What is the relationship between Millennials' degree of connectivity and their work performance?

We will use a mixed-methods approach: ethnographic techniques, computer activity logging, heart rate monitoring, and diaries to collect detailed activity of Millennials' multitasking behavior to answer our research questions.

SECTION 1: PURPOSE AND BACKGROUND OF THE RESEARCH

1. Describe **the purpose of the research** project and state the overall objectives, specific aims, hypotheses (or research question) and scientific or scholarly rationale for performing the study.
2. Provide the **relevant background information** on the aims/hypotheses (or research question) to be tested and the procedures/products/techniques under investigation.

3. Include a description of the **predictor and outcome variables**, as appropriate.
4. Include a critical evaluation of **existing knowledge**, and specifically identify the information gaps that the project intends to address.
5. Describe **previous research** with animals and/or humans that provides a basis for the proposed research. **Include references/citations**, as applicable.
   This section should not exceed 4 pages.

The Internet began to emerge as a mass phenomenon only about 15 years ago. Yet even in this short amount of time, it has had a profound influence on the lives of people in the US and throughout the world. A new generation has now been raised with the Internet in their lives since early childhood. These young people, born in the early to mid-1990's, sometimes referred to as digital natives, Generation Y, or the Millennials, were three years old or younger when the Internet began to become widely adopted in the U.S. Many of these Millennials are now in college. Members of this generation will be the future information workers of our country.

Information work involves particular behavioral and cognitive skills and strategies in addition to technical skills. Information workers are generally engaged in multiple activities with various people and varying levels of commitment; yet workers must also maintain a high degree of situational awareness. This holds true for many types of information workers such as software developers, scientists, engineers, health care workers, managers, financial analysts, journalists, stockbrokers, and lawyers. What is common in most or all types of information work is that people must continually monitor the work situation utilizing information from various devices, displays, and people. Therefore, an understanding of how people can effectively manage digital and offline information to switch between tasks, handle interruptions, maintain situational awareness, communicate with people effectively, and resume interrupted work, i.e., to become more effective *multitaskers*, is critical in our modern information society.
Is multitasking problematic for people? In recent years, researchers in fields as diverse as management science, human-computer interaction, and organizational science suggest that the topic deserves attention. Studies of information workers have revealed that they multitask and manage interruptions to a great extent, switching low-level task activities (e.g., telephone calls, document-writing) on average every 3 minutes, and switching higher-level activities (i.e. projects) on average every 10.5 minutes [Gonzalez and Mark, 2004]. Multitasking is associated with high levels of stress [Mark et al., 2008].

Considering Millennials, it is an open question as to how this generation manages digital information considering that a significant portion of young people's daily lives is spent using digital media. Studies have discovered that youth average more than 7.5 hours online each day [**Error! Reference source not found.**], much for leisure time, i.e., not school-related. A question we address in our study is whether Millennials, who grew up with the Internet, have developed information management skills such as the ability to maintain situational awareness, rapidly organize, find information through their networks, and communicate efficiently online—in short, the skills to effectively multitask in a digital environment, and those needed as future information workers.

While studies have examined the use of individual technologies among Millennials (e.g., text messaging, gaming, blogging, and social networking, no one has examined the *entire ecology* of technology use for these young people and its effect on their school performance and social lives. By ecology, we refer to the pattern of relationships between people and their digital environment. In our view, to truly understand the capabilities that young people have as digital information users, and the effects that connectivity have on their work performance and their lives, we need to understand the interplay of people with their entire digital environment: their use

of, and their switching between, different technology devices and applications.

In this study, we are interested in studying the multitasking behavior of Millennials. Multitasking will not go away; the Millennials will enter an information workforce where they will deal with multiple collaborations, communications, and types of information. The Internet, still in its infancy, will only continue in its technological development and in its penetration more broadly into our lives. What kinds of skills are needed to manage living in a world where physical things are digitally linked? As more information becomes available digitally, and as the speed and ease of access of information increases, will these changes lead to even more information overload and distraction?

Taking a holistic view of technology use, several studies have looked at the social effects of living in a "wired" environment, including the Homenet study [Kraut et al., 1998]. A few studies however have looked at people's technology use at a second-by-second micro-level. The only known study of Millennials' multitasking behavior was based on self-reports about general media use [Bianco et al., 2006]. This has limitations, since people have biases, e.g. they retrospectively overestimate the amount of time that they spend using media. Therefore, a more accurate method of examining multitasking behavior is required through *in situ* observations triangulated with observations and logging data.

As this is an observational study, our main variables are:

- Number of application/task switches per time unit
- Average length of time on task using digital media or in a face-to-face interaction
- Level of stress, as measured by heart rate variability
- NASA workload measures
- Perceived measures of productivity
- Qualitative data from ethnographic observation
- Self-reported diary entries on interactions and digital media use

Whereas the Millennials constitute an age group that was born since the 1990s, we have chosen to focus on the multitasking behavior of university students. First, we prefer to study young adults (ages 18-22) rather than younger Millennials to better understand how Millennials multitask outside of the constraints of their parents or guardians, which are more typically imposed on youth under the age of 18. Secondly, we are especially interested in university students because they are more likely than their same-age counterparts outside the university to have future careers working with information to produce knowledge.

We are interested in focusing on multitasking behavior of university students while school is in session. The reason is that we will be able to study how these students manage their time between work-related and personal activities using digital media. We are interested in how Millennials balance and integrate digital media into their lives, and the effect that digital media use has on off-screen interactions. We are particularly interested to discover the skills that Millennials, as networked individualists have developed in using digital media.

References

Blanco, L. and Rosen, L. (2006). Multitasking across generations. Kaiser Family Foundation Study. Available at http://www.csudh.edu/psych/Multitasking_Across_Generations_Blanco_and_Rosen.pdf

Gonzalez, V. and Mark, G. (2004). "Constant, Constant, Multi-tasking Craziness": Managing Multiple Working Spheres. *Proceedings of ACM CHI'04*, Vienna, Austria, April 26-29.

Kraut, R. E., Patterson, M., Lundmark, V., Kiesler, S., Mukhopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological wellbeing?
American Psychologist, 53, (9), 1017-1032.

Mark, G., Voida, S. and Cardello, A. (2012). "A Pace Not Dictated by Electrons": An Empirical Study of Work Without Email. *Proceeding of the thirtieth annual SIGCHI conference on Human factors in computing systems (CHI'12)*, ACM Press.

Mark, G., Hausstein, D., and Kloecke, U. (2008). The cost of interrupted work: More speed, more stress. *Proceeding of the twenty-sixth annual SIGCHI conference on Human factors in computing systems (CHI'08)*, Florence, Italy, ACM Press, pp. 107-110.

Mark, G., Gonzalez, V., and Harris, J. (2005). No Task Left Behind? Examining the Nature of Fragmented Work. *Proceedings of ACM CHI'05*, Portland, OR, April 2-7, 321-330. (18% acceptance rate).

Rideout, V., Foehr, U.G. and Roberts, D. F. (2010). Generation M2: Media in the Lives of 8-18 Year Olds. The Henry J. Kaiser Family Foundation.
http://www.kff.org/entmedia/upload/8010.pdf.

SECTION 2: ROLES AND EXPERTISE OF THE STUDY TEAM

List all study team members below.

1. Identify each **member's position** (e.g., Associate Professor, graduate or undergraduate student) and **department**, and describe his or her **qualifications, level of training and expertise.** Include information about relevant licenses/medical privileges, as applicable.
2. Describe each team member's **specific role and responsibility** on the study.
3. **Faculty Sponsors** - list as Co-Researchers and describe their role on the project; include oversight responsibilities for the research study.
4. Explain who will have **access to subject identifiable data**.
5. Indicate who will be **involved in recruitment, informed consent process, research procedures/interventions, and analysis of data.**

Lead Researcher:
Dr. Gloria Mark is Professor in the Informatics Dept. at UCI and is lead researcher. She will take part in all aspects of the study: observations, data collection and interviews during the study. She will participate in analyzing data and writing articles. She will be involved in the informed consent process and recruitment of subjects for interviews. Dr. Mark has conducted empirical research on human behavior and technology use since 1991. From 1991-92, she conducted empirical research at the Electronic Data Systems Capture Lab, an electronic meeting room environment. From 1994–99, she conducted field observations, interviews, and laboratory studies with several groups including members of a German Federal Ministry, while she was a researcher at the German National Research Center for Information Technology. From 2000–12 she has been conducting field observations and laboratory studies while a faculty member at UCI. Her field studies have taken place in organizations. She will have access to data collected from subjects. The data will be identifiable.

Co-Researcher:
Dr. Mark Warschauer is Professor in the Department of Education at UCI and specializes in the role of digital media in education. He has studied students' uses of digital media, their attitude toward digital media use, and the relationship of digital media use to learning outcomes in a wide range of contexts. He will take part in all aspects of the study: observations, data collection and interviews during the study. He will participate in analyzing data and writing articles. He will be involved in the informed consent process and recruitment of subjects for interviews. He will have access to data collected from subjects. The data will be identifiable.

Research Personnel:
Yiran Wang is a second year graduate student in the Informatics Department. She will participate in all aspects of the study: observations, data collection, interviews, analyzing data, writing articles. She will be involved in the informed consent process and recruitment of subjects for interviews. She will have access to data collected from subjects. The data will be identifiable.

SECTION 3: RESEARCH METHODOLOGY/STUDY PROCEDURES

A. Study Design and Procedures

1. Provide a **detailed chronological description of all study activities** (e.g., pilot testing, screening, intervention/interaction/data collection, and follow-up) and **procedures**. Include an explanation of the study design (e.g., randomization, placebo-controlled, cross-sectional, longitudinal, etc.)
   a. Indicate how much **time will be required of the subjects**, per visit and in total for the study.
   b. Indicate the **setting where each procedure will take place**/be administered (e.g. via telephone, clinic setting, classroom, via email). ***Note:*** *If any of the procedures will take place at off-campus locations (e.g., educational institutions, businesses, organizations, etc)* ***Letters of Permission*** *are required.*
   c. If a procedure will be completed more than once (e.g., multiple visits, pre and post survey), indicate **how many times** and the **time span** between administrations.
2. **For studies that involve routine (standard of care) medical procedures:**
   Make clear whether procedures are being done for clinical reasons or for study purposes, including whether the procedures are being done more often because of the study. Use the following guidelines to determine the extent to which standard procedures and their associated risks need to be described in protocol:
   a. If the standard procedure is not explicitly required by the study protocol, the protocol need not describe that procedure or its risks.
   b. If the standard procedure is a main focus of the study (e.g., one or more arms of a randomized study is standard) or is explicitly required by the study protocol, the protocol must include a full description of the procedure and its risks.]
3. It is **strongly recommended** that you include a table of visits, tests and procedures. Tables are easier to understand and may help to shorten long repeated paragraphs throughout the narrative.
4. If study procedures include collecting **photographs, or audio/video recording**, specify whether

any subject identifiable information will be collected and describe which identifiers will be collected, if any.
5. Describe how the **subject's privacy will be protected** during the research procedures. ***Note**: This is not the same as confidentiality (see the Privacy and Confidentiality web page).*
6. Be sure to submit **data collection instruments** for review with your e-IRB Application (e.g., measures, questionnaires, interview questions, observational tool, etc.).

We will do a mixed-methods study, using ethnographic techniques and sensors.

We will use two main ethnographic techniques: participant observation and use of long post-study interviews. All observations will be done on the UCI campus during the subjects' school day. The use of these methods provides a rich corpus of data for understanding the complex actions and relationships in which we are interested. The level of detail required for our research demands that we be able to capture the details of the informant's behavior with respect to the structure and the content of the activities that they perform. We will shadow informants for a single day (along with computer logging), using a "shadowing" observation technique similar to the ones used in previous time management studies [e.g. Gonzalez and Mark, 2004]. The researcher will shadow the informant throughout the school day and follow her, whenever possible, to class or other activities.

Whenever the individual performs an action with media such as opening a computer application, checking Facebook, making a phone call, texting, or interacting with others, the researcher will annotate the time (to the second) as well as other details of the event. All interactions with others will also be documented, including details about the topic of the conversation, and references to media use. The researcher will try to capture as much detail as possible. Whenever something is not clear, the researcher will note it and ask the informant at the end of the day. We designed an activity-tracking log, used in previous studies [Gonzalez and Mark, 2008] where we will transcribe the observation notes collected during the day. In the tracking log we include the time stamps, data about the type of event (e.g., "updating Facebook status"), the resources using during the action (e.g., phone, Excel, Word, cell phone, calendar), and the people participating in the event. This method of structured observation has been successfully used in other past studies of multitasking by LR Mark of this proposal [Gonzalez and Mark, 2004; Mark et al., 2005].

Computer activity logging

We will supplement observations with computer activity logging technologies and stress monitoring to observe informant's multitasking and communication practices, as well as mood and stress levels. This will enable us to achieve a larger sample of informants for a longer period of observation. We will utilize an electronic activity logging program developed in prior work [Mark et al., 2012] to capture the switching of windows on the computer. This program will capture timestamps, applications used, and Internet sites. We will also adapt this program for use on mobile phones to capture timestamps, counts and length of texting/phone calls. No content will be captured. Though computer activity logging provides us with fine-grained data of application, window switching, and texting, its limitation is that we cannot capture activity outside of the computer. Therefore, ethnographic observation and diary studies will be triangulated with the computer activity logging data. The computer activity logging program will be installed on the informant's computer and mobile devices (with their consent) and will log each time the informant switches windows of documents or programs. It will record the length of time that the informant spends on each document or application but will not record the content. We will observe each informant for a single day and monitor their activity with the logging program for a total of 7 days—2 weekends and a 5-day school week.

No content will be recorded or observed. Only the time spent on an application will be recorded as well as the type of application (e.g. Word, Excel) and the URL of the website. No title of any document will

be recorded.

Measuring stress and arousal

We will also measure stress and arousal during media use. Heart rate variability (HRV) is widely used as an indicator of mental stress (cf Bernston et al., 1997). In order to measure stress and arousal, our informants will also be asked to wear a heart rate monitor consisting of a chest strap during the day (after Mark et al., 2012]. Heart rate monitors, which are comfortable, can be worn under clothing without being visible, and which people often forget they are wearing, have been successfully used by PI Mark with information workers in the workplace to measure stress levels associated with different technology use [Mark et al., 2012]. Heart rate monitors are generally worn during sport activity. We will look at relationships of HRV with different levels of multitasking. The participant will wear a non-obtrusive heartrate monitor on a chest strap. This will be the FDA-approved Garmin Forerunner heartrate monitor which consists of a chest strap and wristwatch receiver. Participants will wear this heartrate monitor during the day for the duration of their participation in the study.

Diary studies and interviews

We will ask informants to keep diaries to record subjective experiences, which have also been used successfully in multitasking studies [Czerwinski et al., 2004]. Diaries are a useful methodology for eliciting "think out-loud" comments i.e. for informants to explicate what they are thinking about at the time they are using the media. The diary data will be triangulated with the observations and logging. After the end of the participant's study time, we will conduct a semi-structured long interview where we ask about their activity management strategies and about some events that happened during the observation and logging. Interviews provide an essential opportunity to hear participants' perspectives. The interviews will be audio recorded and transcribed, and combined with interviewer notes to glean insights and analyze patterns across informants.

Internet shut-off

We will design an intervention, in which multitasking is observed both with and without Internet use. From a scientific perspective, Internet shutoff enables us to understand how social and work behavior changes when a person is cut off from the Internet and their electronic social network for a period of time. It is only by comparing a baseline condition (the status quo, i.e., Internet media usage) with an experimental manipulation (the absence of Internet) that we can directly examine the effects that Internet use has on task focus and offline behavior. This inverted perspective enables us to understand whether it is possible to create an environment where people can focus more closely on their tasks. Given that it has been shown that people self-interrupt often when using digital media [Gonzalez and Mark, 2004], would people be able to spend longer durations on tasks when the Internet is not available and when social expectations of responding to others online is no longer a concern? Second, this enables us to discover whether social behaviors offline change without use of the Internet. Third, we expect that not having access to the Internet would provide the participants with insight on their own Internet use.

After the informants have completed the sensor and ethnographic observations described above, we will ask for participation for further involvement in the study for seven more days where they will cut off use of the Internet on laptops, iPads, etc., and mobile devices. Subjects will still be able to access data that resides on their local computers (laptops, iPads) and can use the phone calling capability of their mobile devices. They will not be able to use networking capabilities. Thus, a subset of our informants (20) will be studied with (for seven days) and then without Internet access for a period of seven days (five days when classes are in session and two weekend days). Baseline measures will thus consist of our first logging and observations. These informants in the subset will experience networked digital media cutoff for a seven-day period. Subjects will be able to access documents from their local computer but not from the Internet. If participants need to access the network for schoolwork or for an urgent matter, we will make arrangements for this (i.e. by making an exception for them or have the

subject ask a friend to retrieve information from the network). Ethnographic observation will take place on one day of baseline and one day of digital media cutoff, to triangulate with the electronic (sensor) data capture. Participants will keep daily diaries and we will conduct pre- and post-study interviews.

Tables 1 and 2 show the schedule of observations.

Days	Pre-study	Day 1	Days 2-7	Post-study
Observations		X		
Electronic monitoring		X	X	
Heartrate monitor		X	X	
Diary use		X	X	
Semi-structured interview	X			X
Survey Instruments	X	X	X	X

Table 1. Schedule of digital media observation and data collection

Days	Pre-study	Day 1	Days 2-7	Post-study
Observations		X		
Electronic monitoring		X	X	
Heartrate monitor		X	X	
Diary use		X	X	
Semi-structured interview	X			X
Survey Instruments	X	X	X	X

Table 2. Schedule of Internet cutoff observation and data collection for subset of informants

The following survey instruments will be administered:

- Polychronicity preference (*approx. 2 minutes, once at baseline*)
- NASA workload scale *(approx. 1 minute, and at the end of each day of baseline and intervention)*
- Subjective measures of productivity and technology use (*approx. 1 minute, once at the end of each day of the baseline and intervention*)

Total amount of time pre-study: 18 minutes
Total amount of time required of digital media shutoff intervention participants during baseline, days 1-7: 14 minutes
Total amount of time required of digital media shutoff intervention participants on days 1-7 of intervention: 14 minutes
Total amount of time required of all participants after last day of study (to be scheduled at a convenient time, e.g. during lunch): ~60-75 minutes
Time spent recording in diaries will vary per informant, but we expect no longer than 10 min. per day

References:

Berntson, G., Bigger, J., Eckberg, D., Grossman, P., Kaufmann, P., Malik, M., Nagaraja, H., Porges, S., Saul, J., Stone, P., and van der Molen, M. Heart rate variability: Origins, methods, and interpretive caveats. Psychophysiology 34, 6 (1997), 623–648.

Czerwinski, M., Horvitz, E. & Wilhite, S. (2004). A diary study of task switching and interruptions. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '04)*. New York: ACM

Press. pp. 175–182.

B. Statistical Analysis Plan

1. **Variables of Interest** - Clearly identify the primary outcome(s) and key factor(s) of interest.
2. **Statistical goal** - State the statistical goal(s) of the study (e.g., Comparison of group means, estimation of the proportion of success, estimation of variability for future study design, etc.).
3. **Statistical approach** - Describe the statistical approach(es) to be used to address the study's statistical goal(s) (e.g., T-test to compare means, confidence interval estimate(s), etc.). ***Note:*** *Required for ICTS SRC review.*
4. **Secondary analyses** - Clearly state any secondary analyses to be performed including secondary outcomes and comparison groups along with the statistical methods that will be used to perform the secondary analyses. ***Note:*** *Required for ICTS SRC review.*

If a statistical analysis plan is not appropriate for your study design, please describe a non-statistical plan for assessing your study results.

To understand the complex environment in which multitasking occurs, we need to triangulate different types of data. To address our multi-faceted research questions, we propose a mixed-methods methodology, drawing on research methods in which our research team has significant expertise, including in-depth ethnographic observation, field experiments, semi-structured interviewing, electronic activity logging, and diary studies.

Time stamped log data will be analyzed using temporal pattern analysis and standard ANOVA statistical tests will be performed to determine whether significant differences can be observed in measures associated with multitasking (e.g., mean time between task switches, mean number of tasks per day, mean number of windows per task) between the baseline and digital media intervention conditions. We will also look at differences based on TLX workload measures and polychromic preference scores.

We will use correlations between stress, multitasking and other measures.

We will build regression models to understand the factors that contribute to stress (e.g. amount of technology use, particular media used, workload for that day, etc.). We will also build models that can describe multitasking behavior.

Grounded theory (Strauss and Corbin, 1998) will be used to analyze the qualitative data. The PIs have extensive experience in field methods and quantitative methods used to study routines, communication patterns, and technology use in organizations.

Reference:
Strauss, A.L. & Corbin, J.M. (1998): *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, CA: Sage Publications.

SECTION 4: SUBJECTS (PERSONS/CHARTS/RECORDS/SPECIMENS)

A. Number of Subjects (Charts/Records/Biospecimens)

1. Indicate the **maximum number of subjects to be recruited/consented** on this UCI protocol. This is the number of potential subjects you may need to recruit to obtain your target sample size. This number should include projected **screen failures and early withdrawals**. ***Note:*** *The IRB considers individuals who sign the consent form to be "enrolled" in the research.* 2. For **Mail/Internet surveys** include the number of people directly solicited. 3. If the study involves use of **existing charts, records, biospecimens**, specify the maximum number that will be reviewed/tested to compile the data or the sample population necessary to address the research question.
The maximum number of subjects will be 1000. We are accounting for withdrawals and technology problems.
4. Of the maximum number of subjects listed above, indicate the **target sample size** for the study. This is the number of subjects expected to complete the study or the number necessary to address the research question. 5. *For social/behavioral research*, the maximum sample size is often similar to the target sample size. If the **maximum sample size** is significantly greater (i.e., ≥ 1.5x) than the **target sample size** provide a justification. 6. For studies where multiple groups of subjects will be evaluated, **provide a breakdown per group** (e.g. controls vs. experimental subjects; children vs. adults; by age group).
Our target sample size will be 200 subjects and of these, 20 participants in the digital media shutoff condition.
7. For **multi-center research**, indicate the overall sample size for the entire study (across all sites).
[X] Not applicable - This study is <u>not</u> a multi-center research study.
8. Explain **how the overall target sample size was determined** (e.g., power analysis; precision estimation). 9. Demonstrate that the **target sample size will be sufficient** to achieve the study goal and should coincide with the statistical approach **described in Section 3B**. 10. **Sources and information** of assumed group effects and variability should be supplied (e.g., pilot data; data from related literature).
The sample size was determined by a review of related literature. Although we plan on

collecting in-depth data from our participants, the high degree of variability reported in individual information work practices requires that we include as many participants as possible in the study.

B. Inclusion and Exclusion Criteria

1. Describe the **characteristics and provide justification** for inclusion of the proposed subject population. At a minimum include information about the age and gender of the study population.
2. Describe **different subject groups** (e.g., students and teachers; control group and treatment group(s), children and adults) separately.

Participants will be adults between the ages of 18-22 (inclusive) who are students at UCI. We expect that all subjects will have a good command of English. We will try to have a balanced sample of males and females.

3. Provide the **inclusion and/or exclusion criteria** for the proposed subject population, as applicable.

[X] Not applicable – This is not a clinical investigation and/or the characteristics of the population sufficiently describe the proposed subject population.

Our only inclusion criteria is that participants use a variety of information technologies and applications: email, Internet, Word, Excel, landline phone, cell phone, etc. We expect that nearly all UCI students will fit this criteria.

4. If **exclusion** is based on age, gender, pregnancy/childbearing potential, social/ethnic group, or language spoken (e.g., Non-English Speakers), **provide a scientific rationale**.

We are only interested in interviewing and observing English-speaking consenting adults between 18-22 years of age (inclusive). No other exclusion criteria will be used.

SECTION 5: RECRUITMENT METHODS AND PROCESS

A. Recruitment Methods

Please check **all** applicable recruitment methods that apply to the study. Place an "**X**" in the bracket **[ ]** next to the recruitment method.

[ ] This study involves no direct contact with subjects (i.e., use of existing records, charts,

specimens)

- ***Skip to Section 6.***

[X] UCI IRB approved advertisements, flyers, notices, and/or media will be used to recruit subjects. ***Submit advertisements for IRB approval.***

- Passive Recruitment - Potential subjects initiate contact with the study team.
- ***Complete Question 5B - Explain where recruitment materials will be posted.***

[ ] The study team will recruit potential subjects who are unknown to them (e.g., convenience sampling, use of social networks, direct approach in public situations, random digit dialing, etc.)

- Active Recruitment – Researchers contact potential subjects.
- ***Complete Question 5B.***

[ ] The UCIMC Clinical Trials web page will be used. ***Submit the UCIMC Standard Research Recruitment Advertisement for IRB approval.***

- Passive Recruitment - Potential subjects initiate contact with the study team.
- ***Skip to Section 6.***

[ ] The study will be listed on Clinicaltrials.gov. ***Note:*** *This is required for all clinical trials.*

- Passive Recruitment - Potential subjects initiate contact with the study team.
- **Skip to Section 6.**

[ ] The UCI Social Sciences human subject pool will be used. ***Submit the Social Science Human Subject Pool Recruitment Advertisement for IRB approval.***

- Passive Recruitment - Potential subjects initiate contact with the study team.
- ***Skip to Section 6****.*

[ ] Study team members will contact potential subjects who have provided permission to be contacted for participation in future research studies.

- Active Recruitment – Researchers contact potential subjects.
- ***Complete Question 5B – Explain when and how these individuals granted permission for future contact; provide the IRB protocol numbers, if applicable.***

[X] Study team members will approach their own patients, students, employees for participation in the study.

- Active Recruitment – Researchers contact potential subjects.
- ***Complete Question 5B.***

[ ] Study team members will send UCI IRB approved recruitment materials (e.g., recruitment flyer, introductory letter) to colleagues asking for referral of eligible participants.*

- Passive Recruitment – Potential subjects initiate contact with the study team or
- Active Recruitment – Colleagues get permission from interested individuals to

release contact information to researchers. Researchers contact potential subjects.
- ***For Active Recruitment, complete Question 5B.***

***Note:** Additional requirements for using this recruitment method are included in the Protocol Narrative instructions.*

[ ] Study team members will provide their colleagues with a UCI IRB approved introductory letter. The letter will be signed by the treating physician and sent to his/her patients to inform them about how to contact study team members.
- Passive Recruitment - Potential subjects initiate contact with the study team.
- The IRB approved letter must be sent by the treating physician.
- The study team does not have access to patient names and addresses for mailing.
- ***Skip to Section 6.***

[ ] UCI study team members will screen UCIMC medical records to determine subject eligibility and approach patients directly about study participation.*
- Active Recruitment – Researchers contact potential subjects.
- ***Complete Appendix T to request a partial waiver of HIPAA Authorization.***
- ***Complete Question 5B.***

* ***Note** Additional requirements for using this recruitment method are included in the Protocol Narrative instructions.*

[ ] Other Methods: <indicate the recruitment method(s) here>
- ***Complete Question 5B, as applicable.***

B. Recruitment Process

1. Based on the methods checked above, describe and provide **details of the recruitment process** (i.e. when, where, by whom and how potential subjects will be approached, e.g. screening medical charts, findings subjects during routine patient visits, etc.).
2. If you will recruit by mail, e-mail, or phone, explain how potential subjects' **contact information will be obtained**.
3. If active recruitment methods will be used (i.e., researchers will make direct contact with subjects for the purpose of recruitment), explain how the individual's **privacy will be protected**. ***Note:** This is not the same as confidentiality (see the Privacy and Confidentiality web page).*

We will post flyers on the UCI campus and will make announcements in classes, with the permission of our UCI faculty colleagues. We will furnish our emails and students will contact us privately. This will maintain students' privacy.

SECTION 6: INFORMED CONSENT PROCESS

1. Specify **how consent will be obtained** and describe the specific **steps for obtaining informed consent**.
2. Include information about **when and where** consent will take place and the **length of time** subjects will be given to decide whether they wish to participate.
3. If study team members will approach their own patients, students, or employees for participation in the study, explain what precautions will be taken to **minimize potential undue influence or coercion**, and **how compromised objectivity will be avoided**.
4. If children are involved in this study, please describe the **parental permission** process and the **child assent** process.
5. Be sure to **submit the consent/assent document(s)** with your e-IRB Application (i.e. Study Information Sheet, Recruitment script, Consent Form, etc.).
6. If this study involves the creation, use, or disclosure of Protected Health Information (PHI), specify the process for **obtaining HIPAA Authorization**. Be sure to submit the HIPAA Research Authorization form with your e-IRB Application.

Check all that apply:

[X] Written (signed) informed consent will be obtained from subjects. Signed informed consent, parental permission, and/or child assent will be obtained from subjects, as applicable. ***Describe the informed consent process.***

[ ] Requesting a waiver of written (signed) informed consent (i.e., signed consent will not be obtained)**.** Informed consent, parental permission and/or child assent will be obtained from subjects, as applicable. **Explain how informed consent will be obtained.** ***Complete Appendix P.***

[ ] Requesting a waiver of informed consent (i.e., consent will not be obtained). ***Complete Appendix O. Skip to Section 7.***

Participants will be provided with a Study Information Sheet in classes as part of the recruitment process for the study which detail a description of risks, and benefits associated with the study and they can ask for clarification from members of the research team via email or phone.

Written consent forms will be given to volunteers, clarification provided (if necessary), and signatures gathered prior to any data collection. This consent will be obtained in person by a member of the research team for all of the participants. We will make ourselves available via telephone to provide clarifications about the study or answers to participants' questions before they sign the document. We would also ensure that the consent forms are signed and faxed (or scanned and emailed) back to us prior to the beginning of data collection in order to provide individuals with a way to opt out of participating without having to relay that decision through a professor or colleague.

7. **Non-English Speaking Participants:** In order to consent subjects who are unable to read and speak English, the English version of the consent form must be translated into appropriate languages once IRB approval is granted.

Check all that apply:

[X] Not applicable - Only individuals who can read and speak English are eligible for this study.

[ ] The English version of the consent form will be translated into appropriate languages for non-English speaking subjects once IRB approval is granted. An interpreter will be involved in the consenting process. ***Note:*** *The IRB must officially stamp the translated consent forms.*

[ ] Requesting a short form consent process. ***Complete Appendix Q.***
The short form process will be used for the following languages:
[ ] All non-English languages
[ ] All non-English languages except Spanish
[ ] Other languages (specify): <Type here>

SECTION 7: RISK ASSESSMENT AND POSSIBLE BENEFITS

Note: *Review of the instructions for this section is strongly recommended.*

A. Risk Assessment

Place an "**X**" in the bracket **[ ]** next to the level of review (based upon the investigator's risk assessment).

[ ] This study involves greater than minimal risk to subjects and requires **Full Committee review.**

[X] This study involves no more than minimal risk and qualifies as **Expedited research**.
Provide justification below for the level of review and for the applicable Expedited Category(ies) that you have chosen:

We submit our proposal for Expedited Review under Categories 4, 6, and 7. The study protocol presents no more than minimal risk to participants because the probability and magnitude of harm or discomfort anticipated in the proposed research is not greater than that ordinarily encountered in the daily lives of the general population.

Category 4 because we will be collecting data using externally worn, commercially available heart rate monitoring devices, which are routinely used in sports.

Category 6 because we will be collecting data for research purposes using audio recordings. In order to mitigate potential privacy risks associated with participation in the study, we will also keep the names of the study subjects confidential in any publications.

Category 7 because we will be researching group characteristics and behavior in this observational study.

B. Risks and Discomforts

1. Describe the **risks/potential discomforts** (e.g., physical, psychological, social, economic) associated with **each** intervention or research procedure.
2. Describe the expected frequency (i.e., **probability**) of a given side effect or harm and its severity (e.g., mild, moderate, severe).
3. If subjects are **restricted from receiving standard therapies** during the study, describe the risks of those restrictions.
4. If collecting identifiable private information, address the risk of a **potential breach of confidentiality**.

The potential risks associated with this study are:

- the potential for a breach of confidentiality, should data inadvertently be lost or shared
- the potential for increased stress or workload due to being cut off from the Internet.

There may be added stress due to being 'cut-off' from others because the subject will not be able to contact others via the Internet and likewise others will not be able to contact them via the Internet. However, they will be able to make phone calls.

5. Discuss what steps have been taken and/or will be taken to **prevent and minimize** any risks/ potential discomforts to subjects (address physical risks as well as other risks such as the potential for a breach of confidentiality). Examples include: designing the study to make use of procedures involving less risk when appropriate; minimizing study procedures by taking advantage of clinical procedures conducted on the subjects; mitigating risks by planning special monitoring or conducting supportive inventions for the study.

We will undertake substantive data protection measures in order to minimize the risk of a breach of confidentiality, including storing all study data on password-protected computers and using encryption software, as well as coding all data with a participant number at the time of collection and maintaining the coding list separately from the data.

We will minimize the risk of participants sharing confidential or restricted data in a number of ways. First, to prevent our exposure to confidential information in email or other media, we will not collect any data related to content—only process, i.e. of task switching. Second, we will provide a mechanism to suspend data collection on the participants' desktop computers and ensure that all participants are aware of and know how to use this feature. Finally, we will allow the participants access to anonymized versions of their data before undertaking our analyses so that any confidential or restricted information can be redacted by them.

We do not believe an increased level of stress will create a significant discomfort for our participants, but we will allow participants to cease participation in the study if participation in the digital media cutoff conditions is deemed to seriously impair their ability to accomplish their work or if concerns are raised by the participants' professors. From past experience (Mark et al., 2012), stress decreased significantly when email was cut off.

C. Potential Benefits

1. Discuss the potential benefits that may accrue **directly to subjects.** ***Note:*** *Compensation is not a benefit. Do not include it in this section.*

[X] There is no direct benefit anticipated for the subjects.

2. Describe the **potential societal/scientific benefit(s)** that may be expected from this study.

There has been an explosion in the technical development of digital devices and applications with less research devoted to how people use digital information in its entirety. Overall, our results will contribute towards plans and policies that schools and organizations can enact to help people manage their work and use of digital devices more effectively. While there has been much concern given to preventing worker “burnout” and lowering stress among information workers, we feel that our study can provide concrete results of how digital technologies contribute to distraction and stress. People who possess high situational awareness are better able to self-organize and take initiative and we believe that less distraction and stress will increase awareness. The study will elicit requirements for technology design that can help people better manage their multitasking, reduce errors, and increase their situational awareness. We also believe that our study will help people make more effective use of digital media and thus improve future work life, productivity and satisfaction. Our study results will generalize in many ways to a wide range of future and current information workers.

We also expect that our study will lead more people to conduct research in multitasking. As the development of digital devices and applications continues to flourish, it becomes increasingly important to focus on the corresponding infrastructure that can support multitasking. Overall, our results can be used to help prevent errors and burnout and improve performance among information workers due to multitasking.

D. Risk/Benefit Assessment

Explain why the study risks are reasonable in relation to the **potential benefits** to subjects and society.

This study places the participants at minimal risk, equivalent to what one would expect in the course of everyday university work. Given the substantive potential benefits that the study stands to provide in producing better understandings of the role of digital communications in task management and improvements in collaboration, we feel that this minimal risk is reasonable and justified.

SECTION 8: ALTERNATIVES TO PARTICIPATION

1. Describe the **standard or usual care** activities at UCI (or study site) that are available to prospective subjects who do not enroll in this study, as applicable. 2. Describe other **appropriate alternative procedures** to study participation that are available to prospective subjects. 3. If no alternatives exist, indicate that the only alternative is non-participation
[X] No alternatives exist. The only alternative to subjects is not to participate in the study.

SECTION 9: ADVERSE EVENT REPORTING/MANAGEMENT AND COMPENSATION FOR INJURY

A. Adverse Events and Unanticipated Problems

1. Indicate that you are familiar with **UCI's Adverse Events/Unanticipated Problems** reporting policy and procedures. See http://www.research.uci.edu/ora/hrpp/adverseexperiences.htm for details.
[ ] Although this study involves no interaction/intervention with research subjects (i.e., involves the use of records, charts, biospecimens) an unanticipated problem may still occur (e.g., a breach in confidentiality), the researchers are aware of UCI's Unanticipated Problems involving Risk to Participants or Others reporting policy and procedures and will comply with this policy. **[X] This study involves interaction/intervention with research subjects.** The researchers are aware of UCI's Unanticipated Problems involving Risk to Participants or Others reporting policy and procedures and will comply with this policy.
2. **If this study involves interaction/intervention with research subjects,** explain how the research team will **manage adverse events and unanticipated problems** that may occur during the study or after completion of the study (i.e., provide a plan).
[ ] Not applicable - This study involves **no interaction/intervention** with research subjects (i.e., involves the use of records, charts, and/or biospecimens). **OR** We are familiar with UCI's Adverse Events Unanticipated Problems reporting policy and procedures. The researchers will report any adverse event to the IRB as soon as possible, within 10 working days after we learn of the event.

B. Compensation for Injury

For **Full Committee protocols**, explain how costs of treatment for research related injury will be covered.

[X] Not applicable - This study involves no more than minimum risk and qualifies as **Expedited research**.

[ ] Researchers are familiar with and will follow UC policy regarding treatment and compensation for injury. If subjects are injured as a result of being in the study, UCI will provide necessary medical treatment. The costs of the treatment may be covered by the University of California, the study sponsor, or billed to subject or the subject's insurer just like other medical costs, depending on a number of factors. The University and the study sponsor do not normally provide any other form of compensation for injury.

[ ] Other: <Type here>

SECTION 10: PARTICIPANT COSTS

1. If subjects or their insurers will be charged for study procedures, **identify and describe those costs.**
2. Explain why it is **appropriate to charge those cost** to the subjects or their insurers. Provide supporting documentation as applicable (e.g., FDA Device letter supporting charges).

[ ] Not applicable - This study involves no interaction/intervention with research subjects (i.e., involves the use of records, charts, biospecimens).

[X] There are no costs to subjects/insurers.

SECTION 11: PARTICIPANT COMPENSATION AND REIMBURSEMENT

1. If subjects will be compensated for their participation, explain **the method/terms of payment** (e.g., money; check; extra credit; gift certificate).
2. Describe the **schedule and amounts of compensation** (e.g., at end of study; after each session/visit) including the total amount subjects can receive for completing the study.
3. Specify whether subjects will be **reimbursed for out-of pocket expenses**. If so, describe any requirements for reimbursement (e.g., receipt).

Note: *Compensation should be offered on a prorated basis when the research involves multiple sessions.*

[ ] Not applicable - This study involves no interaction/intervention with research subjects (i.e., involves the use of records, charts, biospecimens).

[ ] No compensation will be provided to subjects.

[X] No reimbursement will be provided to subjects.

OR

We will compensate participants with money at the end of the study. Subjects will receive $50 at the completion of the study if we only collect their baseline data, and they will receive an additional $150 if we cut off their digital media use. Total compensation is $200.

SECTION 12: CONFIDENTIALITY OF RESEARCH DATA

1. Indicate all identifiers that may be included in the research records for the study. Check all that apply:

   Note: *If this information is being derived from a medical record; added to a medical record; created or collected as part of health care, or used to make health care decisions it qualifies as PHI under HIPAA. The subject's HIPAA Research Authorization is required or a waiver of HIPAA Authorization must be requested (Appendix T).*

[ ] No subject identifiers are obtained (i.e., researchers will not collect information that can link the subjects to their data)

OR

[X] Names	**[ ]** Social Security Numbers	**[ ]** Device identifiers/Serial numbers
[ ] Dates*	**[ ]** Medical record numbers	**[ ]** Web URLs
[ ] Postal address	**[ ]** Health plan numbers	**[ ]** IP address numbers
[ ] Phone numbers	**[ ]** Account numbers	**[ ]** Biometric identifiers
[ ] Fax numbers	**[ ]** License/Certificate numbers	**[ ]** Facial Photos/Images
[ ] Email address	**[ ]** Vehicle id numbers	**[ ]** Any other unique identifier

[ ] Other (Specify all): <Type here>

* birth date, treatment/hospitalization dates

2. Explain how data will be **recorded.**

Check all that apply:

[X] Paper documents/records
[X] Electronic records/database
[X] Audio recording
[ ] Video recording
[ ] Photographs
[ ] Biological specimens
[X] Other(s) (specify): Heart Rate Monitor: Heart rate data with timestamps will be collected

from subjects. The monitor records heart rate approximately every few seconds.

3. Indicate **how data will be stored, secured** including paper records, electronic files, audio/video tapes, biospecimens, etc.

Note: *If the research data includes subject identifiable private information and/or Protected Health Information, the storage devices or the electronic research files must be encrypted.*

Electronic Data (check all that apply):
[X] Coded data; code key is kept separate from data in secure location.
[ ] Data includes subject identifiable information. ***Note:*** *Encryption software is required.* (Provide rationale for maintaining subject identifiable info)**:** <Type here>
[X] Data will be stored on secure network server.
[X] Data will be stored on stand alone desktop computer (not connected to network/internet)
[ ] Other (specify here): <Type here>

Hardcopy Data, Recordings and Biospecimens (check all that apply):
[ ] Coded data; code key is kept separate from data in secure location.
[ ] Data includes subject identifiable information (Provide rationale for maintaining subject identifiable info)**:** <Type here>
[X] Data will be stored in locked file cabinet or locked room at UCI/UCIMC.
[ ] Data will be stored locked lab/refrigerator/freezer at UCI/UCIMC.
[ ] Other (specify here): <Type here>

Data on Portable Devices:
4. Describe the **portable device(s) to be used** (e.g. laptop, PDA, iPod, portable hard drive including flash drives).
5. Specify whether **subject identifiable data** will be stored on the device. If so, **justify why** it is necessary to store subject identifiers on the device.

Note: *Only the "minimum data necessary" should be stored on portable devices as these devices are particularly susceptible to loss or theft. If there is a necessity to use portable devices for initial collection of identifiable private information, the portable storage devices or the research files* ***MUST BE ENCRYPTED****, and subject identifiers transferred to a secure system as soon as possible.*

[ ] Not applicable – No study data will be maintained on portable devices.

OR

During the data collection phase, participant data will be stored on their own computers and stored on the heart rate monitors. All of these data will be coded, anonymized (when appropriate), aggregated, and stored on UCI-owned laptops at the conclusion of the data collection phase. Additional data will be stored in project-specific field notebooks and on digital audio on the research team members' computers. The laptop computers used to store and analyze the data will all be password-protected, and all data will be encrypted. Field notebooks

will be stored in a locked cabinet in the locked offices of Dr. Mark and Dr. Warschauer and will be kept separate from the coded data.

Data Access:

6. Specify who, besides the entities listed below, will have **access to subject identifiable private data and records**.
7. If there is a **code key**, specify who on the research team will hold the key, and who will have access to the key.
8. If publications and/or presentations will include **subject identifiable information**, specify where the data will be **published and/or presented** and address how the study team will obtain permission from subjects.

Note: *Authorized UCI personnel such as the research team and the IRB, the study sponsor (if applicable), and regulatory entities such as the Food and Drug Administration (FDA) and the Office of Human Research Protections (OHRP), may have access to study records to protect subject safety and welfare. Any study data that identifies the subjects should not be voluntarily released or disclosed without the subjects' separate consent, except as specifically required by law. Publications and/or presentations that result from this study should not include subject identifiable information; unless the subject's separate consent has been obtained.*

[ ] Not applicable – No subject identifiers will be collected.
[X] Not applicable – Only the entities listed above will have access to subject identifiable private data and records.

Data Retention:

9. Explain **how long subject identifiable research data** will be **retained**. The data may include a code with a separate code key or the data may include subject identifiers.

Notes:

- ***If more than one of the options below is applicable*** *[e.g., the study involves children],* ***records should be kept for the longer period****.*
- *Research documentation involving Protected Health Information (PHI) should be retained for six years (e.g., IRB documentation, consent/assent forms –* ***NOT*** *the actual PHI). Investigators must destroy PHI at the earliest opportunity, consistent with the conduct of this study, unless there is an appropriate justification for retaining the identifiers or as required by law.*

[ ] Not applicable. No subject identifiable research data will be retained.

[ ] Destroy once data collection is completed

[ ] Destroy at the earliest opportunity, consistent with the conduct of this research. Specify timeframe: <Type here>

[ ] Destroy after publication/presentation

[ ] Maintain for approximately <Type here> years. (e.g., 3 months, etc.)

[X] Maintain in a repository indefinitely. Other researchers may have access to the data for future research. Any data shared with other researchers, will not include name or other personal

identifying information. Note: ***Appendix M is required.***

[ ] Research records will be retained for seven years after all children enrolled in the study reach the age of majority [age 18 in California] as this study includes children .

[ ] Research records will be retained 25 years after study closure as this study involves in vitro fertilization studies or research involving pregnant women.

[ ] As this is a FDA regulated study, research records will be retained for two years after an approved marketing application. If approval is not received, the research records will be kept for 2 years after the investigation is discontinued and the FDA is notified.

[X] Other: Data collected on the sensing devices (e.g., heart rate monitors, will be coded, anonymized (as appropriate), aggregated onto laptop computers, and then erased from the individual subject devices at the conclusion of the data collection phase of the study. The computer files, fieldnotes, and digital recordings will be kept for 10 years. Aggregated data will be kept indefinitely. Interviews will be done on digital audio files stored on the computer. Subject identifiers will be destroyed after the subject has completed the study.

Data Destruction:

10. If audio or video recordings will be taken, specify the **timeframe for the transcription and/or destruction of the audio and video recordings.**
11. If photographs will be collected, specify the **timeframe destruction of photographs.**

[ ] Not applicable – No audio/video recordings or photographs will be collected.
[X] Audio or video recordings transcribed; specify time frame: within six months
[ ] Audio or video recordings destroyed; specify time frame: after 10 years
[ ] Audio or video recordings maintained indefinitely
[ ] Photographs destroyed; specify time frame: <Type here>
[ ] Photographs maintained indefinitely

Certificate of Confidentiality:

12. Specify whether a Certificate of Confidentiality (COC) has been or will be requested from the NIH. If yes, explain in what situations personally identifiable information protected by a COC will be disclosed by the UCI study team.

Note: *If the COC has been secured a copy of the COC Approval Letter should accompany the IRB application or be provided to the IRB upon receipt.*

[X] Not applicable – No COC has been requested for this study.