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## **Producing effective messages in the multicommutating environment managing multitasking in organizational meetings**

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To the Graduate Council:

I am submitting herewith a dissertation written by Alla Kushniryk entitled "Producing effective messages in the multicommutating environment managing multitasking in organizational meetings." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Communication and Information.

Kenneth J. Levine, Major Professor

We have read this dissertation and recommend its acceptance:

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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We have read this dissertation  
and recommend its acceptance:

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Dr. Kenneth J. Levine

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Dr. Russell L. Zaretski

Accepted for the Council:

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Carolyn R. Hodges,  
Vice Provost and Dean of the Graduate School

**Producing Effective Messages in the Multicommunicating  
Environment: Managing Multitasking in Organizational Meetings**

A Dissertation presented for  
the Doctor of Philosophy  
Degree  
The University of Tennessee, Knoxville

Alla Kushniryk  
August 2008

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## **ACKNOWLEDGEMENTS**

I would like to express my appreciation to my mentor Dr. Kenneth J. Levine for his constant guidance, encouragement and inspiration. My sincere gratitude is also extended to my committee members, Dr. Michelle T. Violanti, Dr. Virginia W. Kupritz, and Dr. Russell L. Zaretzki for their support, constructive opinions, and suggestions through this project. I also thank and offer a special expression of gratitude to Iryna Loboda who created a custom course, and to Steve Bales who participated in the experiment.

I would like to express appreciation to my family for their encouragement and tolerance throughout the process. I wish to thank my fellow colleagues for their unconditional support and encouragement and special thanks to Charlie Gee, Bernardo Motta, and Chris Wohlwend. In addition, appreciation is extended to Laura Smith and all Communication 210 instructors for helping me to find participants for the study. Also, a special thanks to the undergraduate students who participated in the project.

Finally, I would like to acknowledge financial support from the Department of Communication Studies. Especially I would like to express my gratitude to Dr. John Haas and Sandy Cabbage. All of these listed have been instrumental in achieving this accomplishment and I extend my utmost appreciation.

## **ABSTRACT**

At some time during a week a corporate worker is likely to attend an organizational meeting. The availability of multiple wireless technologies makes it possible for meeting attendees to be engaged in multitasking, i.e., performing multiple tasks simultaneously. During meetings the attendees often take the opportunity to continue working on their projects, read and write e-mail messages or surf the Web. This study evaluated the impacts of such multitasking behaviors on individual performances in the multicommunicating environment.

The study used the experimental design. Respondents for this study were 154 undergraduate students in a large southeastern university. The participants accomplished two communication tasks simultaneously during the experiment: listening and writing. They were instructed to listen to a lecture presentation and at the same time write responses to an open-ended online survey questions, i.e., the participants of the study were multitasking.

The researcher compared several factors (social presence, multitasking abilities, polychronicity, task prioritization, and receiver apprehension) for three different treatments (multi task vs. single task, live presenter vs. virtual presenter, one channel vs. two channels). In addition, a scale to measure multitasking abilities was developed and validated during the experiment.

It was found that multitasking or completing two tasks simultaneously significantly decreases performances on both tasks. The performance on the listening task was decreased by 9.5%; the writing task performance was decreased by 11.2%. The researcher found no evidence that the degree of social presence could affect task

prioritization and performance in the multicommutating environment. However, multi-task performance was improved in the two-channel condition. Presenting the information in visual and oral forms significantly enhanced the information recall on the listening task. This finding suggests that the negative impact of multitasking can be reduced under certain conditions.

The results of the study also indicate that individuals differ in their abilities to multitask. It was found that the level of receiver apprehension affects not only processing outcomes as message information is being received and perceived, but also processing outcomes as message information is being produced. It seems relatively clear that being less apprehensive about listening is an index of better performance in the multicommutating environment.



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## CHAPTER I: INTRODUCTION

“Don’t bother me – I’m busy!” Attempting to accomplish more than one task at the same time or focusing on one’s work while distracted by something else can be difficult, but many do it every day. It has become a part of modern life. Technological advances have changed the contemporary work environment making it possible for people to perform more than one activity simultaneously or in rapid succession. In other words, technological advances have brought an increase in multitasking (Caroli & Van Reenen, 2001). Moreover, many jobs even require one to do so. For example, multitasking is one of the most important job requirements for pilots (Maschke & Goeters, 1991), as well as for school bus drivers, fire fighters, prevention supervisors, gaming dealers (Fleishman, Constanza, & Marshall-Mies, 1999), and salespersons (Stokes, Toth, Searcy, Stroupe, & Carter, 1999).

Studies have shown it is typical for managers, physicians, analysts, software developers, and small office workers to handle at least some multitasking due to numerous interruptions at work (e.g., Chrishom, Dornfeld, Nelson, & Cordell, 2001; Gonzalez, & Mark, 2004; Rouncefield, Hughes, Rodden, & Viller, 1994). Furthermore, multitasking has become commonplace in organizational meetings (Levine, Kusniryk, Allard, & Tenopir, 2006; Rennecker, Dennis & Hansen, 2006). Even in face-to-face corporate meetings, participants are no longer giving the meeting interaction their undivided attention (Wasson, 2004).

The previous findings suggest that multitasking in general leads to increased stress, process losses (Delbridge, 2000) and lower performance (Hembrooke & Gay, 2003; Rubinstein, Meyer & Evans, 2001). However, multitasking is not always a negative

experience; it can be viewed as a potentially useful time-management strategy (Bluedorn, 2002; Floro & Miles, 2003). For example, Wasson (2004) claims that multitasking in organizational meetings can enhance productivity when properly managed.

Very often, multitasking involves communication (e.g., talking on the phone while driving; surfing the Web while listening to a class lecture). For the purposes of this study, the concept of *multicommunicating* has been defined as accomplishing multiple-task *communication* goals in the same general time period either simultaneously or by engaging in frequent switches between individual tasks. The terms *multitasking* and *multicommunicating* are treated here as partial synonyms. *Multicommunicating* is a narrower term for *multitasking*, i.e. all multicommunicating is multitasking, but not all multitasking can be perceived as multicommunicating.

The following study (1) investigates the gap in communication multitasking research, specifically the lack of information concerning how to handle multicommunicating in organizational meetings to reduce the process losses, and (2) explores the possibilities to increase the overall performance level when multitasking.

The focus of this study is threefold. First, the paper focuses on communication aspects of multitasking. Second, a goal of the study is to determine conditions (e.g., degree of social presence and dual channels) that enhance or impede the productivity and performance while multicommunicating. Finally, a goal of the study is to determine the individual differences that specifically cause people to be good or bad at multicommunicating.

Social presence is an important condition that may affect meeting productivity. It is the degree to which a communication channel allows group members to perceive the

actual presence of other people and the resulting appreciation of an interpersonal relationship (Lowry, Roberts, Romano, Cheney & Hightower, 2006). This study investigates how the degree of social presence affects task prioritization and task performance in the multicommuting environment.

Paivio's dual coding theory (1986) is used to make the case for the benefits of computer-generated slides in multitasking situations. The theory posits that human information processing involves two independent, yet interconnected, systems: a verbal system and a visual system. It would seem that in the multicommuting environment, presenting information in both visual and verbal form enhances information recall/recognition and yields better results.

Lastly, individual differences influence task performance in multitasking situations (Delbridge, 2000). Receiver apprehension has been defined as an information processing syndrome producing anxiety when message processing demands exceed processing capacity (Preiss & Gayle, 1991). Wheelless, Preiss and Gayle (1997) propose to view information receiver apprehension as an in-process variable that interferes with individual performances that adapt to the environment. Apparently, in multicommuting environment, highly apprehensive individuals exhibit decreased performance, because multitasking generally leads to cognitive information overload (Lang, 2000).



## Multitasking and Multicommunicating

### *Multitasking Defined*

Scientists claim that the ability to perform several separate tasks consecutively while keeping the goals of each task in mind is a uniquely human trait (Koechlin, Basso, Pietrini, Panzer, & Grafman, 1999). Anthropologist Edward Hall (1959) began studying this phenomenon in the 1950s, labeling it *polychronic time use* or *polychronicity*. Hall (1959) described *time* as a cultural artifact, a “silent language,” communicating meaning through its use and culturally-agreed-upon perspectives and definitions. He considered *polychronicity* as only one of many aspects of culture and as a form of communication. Hall also asserted that people within a culture ‘preferred’ to behave more monochronically or more polychronically, as their society dictated (Hall & Hall, 1987).

Following Hall (1959), Bluedorn (2002) has defined *polychronicity* as a time personality or the extent to which “people (1) prefer to be engaged in two or more tasks or events simultaneously and are actually so engaged (the preference strongly implying the behavior and vice versa), and (2) believe their preference is the best way to do things” (p. 51). Thus, individuals who prefer to complete one task, activity, or project before becoming involved with another are said to be monochronic, whereas individuals who prefer to be involved with several tasks, activities, or projects at once are said to be polychronic (Bluedorn, 2002).

In the 1990s, *multitasking*, the new term for polychronicity drifted from computer culture into common practice (Manyutina, 2005). Since computers have become an essential part of our daily life, the term *multitasking* has slowly penetrated into our everyday vocabulary (Manyutina, 2005). However, the terms *multitasking* and

*polychronicity* are only partial synonyms (Bluedorn, 2002). In computing, multitasking is a method by which multiple tasks or processes share common processing resources. It means that a computer with a multiprocessor is able to execute two or more tasks simultaneously (Manyutina, 2005). This is the reason that the *multitasking* concept combines both speed and activity pattern dimensions rather than simply focusing on activity patterns as *polychronicity* (Bluedorn, 2002). Moreover, *multitasking* has become synonymous with the communication technology-infused workplace of today (Turner & Reinsch, 2007).

Other interdisciplinary terminologies for what is now known as *multitasking* include such terms as *task switching* (Monsell, 2003) *primary-secondary and concurrent activities* (Hendrix & Qualls, 1981), *joint production* (Peskin, 1982), *dovetailing* (Hefferan, 1982), *overlapping activities* (primary, secondary or tertiary) (Floro & Miles, 2003), and *multicommunicating* (Turner & Reinsch, 2007).

Deldridge (2000) defines multitasking as “accomplishing multiple-task goals in the same general time period by engaging in frequent switches between individual tasks” (p. 1). This definition of multitasking incorporates only task switching; it doesn’t take into consideration performing simultaneous activities. For example, should we consider “driving and talking on the phone” a task switching or performing two tasks simultaneously?

Explain possible variations in multiple tasks performance, Kieras, Meyer, Ballas, and Lauber (2000) classified multitasking into four broad categories. The first category is *discrete successive tasks*, which can be described as alternating rapidly between two tasks. This kind of multitasking is usually associated with computer use. For example,

while searching for or through electronic information, users are often thinking and working on multiple problems concurrently, but search systems require them to search sequentially (Spink, 2004). The second category is *discrete concurrent tasks*, when a primary and secondary task is performed simultaneously, with short delays between the two (listening to a lecture while searching for supporting information on the Internet). *Elementary continuous tasks* constitute the third category. In this case, a person performs one task continuously, with occasional insertion of short discrete tasks (e.g., interrupting Internet research with occasional checking of email). Lastly, the fourth category includes *compound continuous tasks*, when two primary tasks are performed concurrently (e.g., flying an airplane and communicating with air traffic controllers simultaneously).

Polak (1999) proposes another division of simultaneous activities into two different categories: *parallel* and *on-call activities*. He explains that parallel activities are such that two independent activities are done simultaneously, e.g. listening to the lecture and surfing in the Internet. On-call activities are those that limit our options for doing other things – the second activity constrains the first activity. An example of on-call activities is cooking while watching a sleeping child. Generally, the other activity has to do with the care of another person. Polak (1999) suggests that the major difference between on-call and parallel activities is that the latter have a stochastic time demand. He also notes that parallel activities are easy to aggregate, but on-call simultaneous activities are difficult to define and measure appropriately.

Bluedorn (2002) introduces the typology of simultaneous tasks, which is based on the degree of differences among the tasks. He argues that when considering multitasking behaviors, it matters whether the tasks are similar or vary along one or more dimensions.

For instance, is a person who engages simultaneously in several different tasks more polychronic than someone who engages simultaneously in the same number of similar tasks? Bluedorn (2002) proposes four types of behavior patterns: quantitative polychronicity, quantitative monochronicity, qualitative polychronicity, and qualitative monochronicity. A quantitative polychronic pattern involves engaging several similar tasks simultaneously, whereas a quantitative monochronic pattern involves engaging in a task and completing it and then moving on to another similar task. Conversely, the qualitative polychronic pattern involves engaging in several dissimilar tasks simultaneously; the qualitative monochronic pattern involves engaging in a task and completing it before engaging another but dissimilar task.

Thus, multitasking as a concept is more complex than defined by Deldridge (2000). Multiple tasks can be performed concurrently as well as successively. Thus, for the purposes of this study, *multitasking is defined as accomplishing multiple-task goals in the same general time period either simultaneously or by engaging in frequent switches between individual tasks.*

### ***Theory of Multitasking***

Several models of multitasking have emerged in psychology to explain how people multitask. One of the first theories in modern cognitive psychology to explain multitasking performance was Welford's (1952) single-channel theory. According to this theory, some mental processes needed for one task must necessarily wait whenever a person engages in another prior task. Broadbent (1958) adopted and expanded the *single-channel theory* into the *bottleneck theory*, which became a general theory of

attention that influenced the first generation of cognitive psychologists and communication scholars (Logan & Gordon, 2001). Bottleneck theorists (e.g. Broadbent, 1958) argue that interference occurs because certain mental operations cannot be divided, resulting in a bottleneck that allows only one task to pass through at a time.

According to *the limited capacity model* (Lang, 2000), people have only a limited pool of mental resources for processing information. When a primary task is combined with a secondary task, the person is charged with two tasks that compete for limited information processing resources. Combining two tasks, therefore, may lead to an overload of information that exceeds attentional capacity of resources, with the result that only part of the information can be processed, and the performance decreases.

In 1984, Pashler proposed a new *response selection bottleneck theory* according to which performance on each task is based on a series of processing stages that extend from stimulus and response. One of the stages is a bottleneck in the sense that we can do only one thing at a time. Processing in stages prior to the bottleneck can parallel another task, but processing in the bottleneck stage is dedicated to one task at a time.

Meyer and Kieras (1997) developed the *strategic response deferment theory*, which differs from *response selection bottleneck theory* in two critical aspects. First, it assumes there is no central bottleneck as a structural property of a cognitive system. The task switching entails two functionally distinct stages of executive control, goal shifting and rule activation, which are separable from the basic perceptual-motor and cognitive processes used for performing individual tasks. In other words, executive control involves two distinct, complementary stages: goal shifting (I want to do *this* now instead

of *that*) and rule activation (I'm turning off the rules for *that* and turning on the rules for *this*). Both stages help people unconsciously switch between tasks.

By nature, multitasking is composed of individual tasks, and these tasks could be anything including communication tasks. As Daly (1987) wrote, in communication research we need theoretical formulation of “how, when, and why... dispositions affect the way in which people communicate” (p. 32). Multitasking can be perceived as one of the ‘how’ dispositions which affect communication.

### ***Communication Aspects of Multitasking***

Turner and Reinsch (2007) introduce the concept of *multicommunicating* as a specific form of multitasking that involves engaging in multiple conversations at any one time. They attribute the increase in multicommunicating to media, such as chat and e-mail that allow communicators to compartmentalize interactions (i.e., interact with two people, neither of whom has access to the other conversation) and to regulate pace (e.g., by delaying a response to one person while responding to another). The researchers indicate that “multicommunicating should be distinguished from other forms of multitasking, because communication is interactive, requiring a person to monitor and to adapt to others while observing appropriate standards of etiquette” (p. 38).

Explaining how a person can participate simultaneously in more than one conversation, Turner and Reinsch (2007) use Greene's (1997, 2000) second generation action assembly theory of message production (AAT2). Green (1997, 2000) criticizes current goal-plan-action framework of message production as being too

static, coherent, and uniplanar. In contrast, Greene (2000) argues that the character of messages and message production is fluid, disjointed, and multiplanar. He writes that:

“The processes that give rise to message-relevant specifications are fast—blazingly fast” (p. 140). “I’m suggesting a characterization of messages and message-encoding processes in which mental states and entities are seen to be evanescent, fast, shifting, and parallel, where overt message components may be disjointed and incoherent, where actions are specified at multiple representational levels, and where the mechanisms that govern the interplay of thoughts and actions are seen as essential concerns” (p. 144).

Turner and Reinsch (2007) state that Greene’s (2000) concept of message production processes explains how a person can participate in multiple conversations:

“... a communicator moves through a series of steps in order, giving each step complete attention for a measurable period of time. But in the fast, flexible, and adaptive system described by Greene, steps may be processed in parallel and can be completed in blazingly fast surges that allow a communicator to nearly simultaneously engage in other activities, including other interactions” (p. 50).

Turner and Reinsch (2007) defined multicommutating only as engaging in multiple conversations at the same time. Communication happens at many levels, in many different ways. At the same time a person can be engaged not only in multiple conversations but also in multiple communication events (i.e. listening to the lecture and chatting with a friend; talking on the phone and writing email, etc.). Therefore, for the purposes of this study, *multicommutating is defined as accomplishing multiple-task communication goals in the same general time period either simultaneously or by engaging in frequent switches between individual tasks.*

### ***Enacting Multitasking***

The individual who is multitasking is operating under different conditions than the person who is performing a single task. The three characteristics of multitasking situations are: (1) interruptions or switch, (2) time stress, and (3) uncertainty (Delbridge, 2000). According to Delbridge (2000), the *first* obvious characteristic of multitasking is that there is a switch from one task to another. The individual must react to some cue in the environment, which interrupts whatever task the individual is currently performing and directs him/her to switch from that task to another. Delbridge (2000) explains that the act of interrupting the original task includes an element of distraction. That is, the cue (and switch) distracts the individual's performance on the current task. Even if the individual is free to continue to pursue an individual task rather than switching to the second, the distraction alone will be important to the multitasking process. She writes:

“Along with this interruption is the actual switch between tasks. In order to switch tasks the individual must a) register the cue directing him to switch, b) cease performance of the current task, and c) commence performance of the new task. These components mean that switching between tasks should require more resources than the sum of those required by each task separately” (Delbridge, 2000, p. 14).

The theory of activity regulation (Hacker, 1978, 1986) explains the harmful effects of interruptions. The theory posits that work is a goal-directed activity. Each individual goal is usually defined on the basis of the task as given, taking into account the external conditions and the worker's personal state and motivation. When an interruption occurs, the regulation of activity and associated cognitive processes are disrupted, and the



individual has to modify his or her action plans to include the interrupting event. First of all, interruptions call for a modification of the action plan to include the interrupting event and change the strategy for achieving the original goal within new constraints. In addition, further resources are often needed to deal with the demands of the interruption as well as the regulation of all activities collectively (Hacker, 1978, 1986; Rogelberg, Leach, Warr & Burnfield, 2006).

Another line of research has examined the nature of interruptions. Gillie and Broadbent (1989) found that the nature and complexity of an interruption affect how much performance will be disrupted. According to Zijstra, Roe, Leonora, & Krediet (1999), interruptions may affect a person's subsequent readiness to perform, first by directly influencing the psychological and psycho-physiological state of worker and then indirectly by affecting the task goal and/or resources available for action execution. In the similar manner, Zohar (1999) points out that when a continuing activity is interrupted by an external factor, the individual must exert greater effort to overcome the obstacle. As a result, greater effort depletes the resources that could have been allocated to complete the primary task, and may result in increased fatigue and negative mood. Negative mood can also occur because the rate of the progress toward completion of the primary task has been slowed.

Gonzalez and Mark (2004) discovered that in a contemporary workplace, people experience a high level of discontinuity in the execution of their activities because of interruptions. They concluded that in a typical day, people average about three minutes on a task and somewhat more than two minutes using any electronic tool or paper document before switching another task. Moreover, people tend to interrupt their work as

much as they are interrupted by others, and most interruptions in a workplace are due to face-to-face interactions (Gonzalez & Mark, 2004; O’Conaill & Frohlich, 1995). Also, due to new communication technologies, employees frequently participate in multiple, simultaneous, one-on-one interactions at work (Cameron & Webster, 2005; Turner & Tinsley, 2002).

The *second* explanation for why people multitask involves time stress. Haase, Dong and Banks (1979) extended the definition of polychronicity to include the extent to which an individual can cope with “environmentally produced stress stemming from stimulus-intense, information overload” (p. 271). According to Sullivan (2008), multitasking represents a resolution of sorts to the pressure of time for those with a restricted time for a multitude of tasks. However, multitasking itself is likely to lead to a greater sense of time pressure, because of additional stress associated with trying to do more than one thing at a time (Sullivan, 2008).

Studies have shown that persons who are “time squeezed” or too overloaded with work are likely to cope with pressure by performing secondary work activities in conjunction with primary activities, as in the cases of childcare and cooking, or childcare and shopping (Benton, 1989; Floro & Miles, 2003; Roldan, 1985). Wright (1988) also notes that individuals with high time salience are likely to perform multiple simultaneous tasks within an allotted amount of time. Studying the effects of dominant media norms within a high-tech organization, Turner, Grube, Tinsley, Lee and O’Pell (2006) found that the need for being involved in multicommuting behavior was connected to individuals’ perceptions of their frenetic work environment.

A 2005 survey of Americans aged 8 to 18 years conducted by the Kaiser Family Foundation found that the younger generation is packing more technology use within a day than ever before through multitasking (as cited in Cole, Steptoe, & Dale, 2006), suggesting that the trend toward using technologies to do more in shorter spans of time will continue.

Finally, different task prioritization can be the stimuli for multitasking. Delbridge (2000) states that multitasking situations usually include uncertainty and unpredictability. For example, individuals do not know when switches will occur, and often does not know the task to which they will be required to switch.

De La Casa, Gordillo, Mejias, Rangel and Romero (1998) identified three types of situations in which the individual may choose to multitask:

- 1) Dual task situation: Presents two tasks with a clear notion of their relative importance, where one task is primary, and the other task is secondary. In this case, the individual clearly knows which task is more important.
- 2) Interfering stimulation situation: Presents a single task and interfering stimulus. The individual has to cope with interruptions.
- 3) Ambiguous situation: The individual is given two tasks and is unclear which is the higher priority; as a result, he/she chooses to attempt both.

Clearly, interruptions, time stress and uncertainty are major characteristics of multitasking situations, and the reason why individuals accomplish multiple tasks at a time. These characteristics make the multitasking situation essentially different from when a single task is being performed.

## Statement of Research Problem

The corporate worker, at some time during his/her week, will likely be required to attend and/or to take part in an organizational meeting. In these meetings, the participants communicate, share information, generate ideas, organize ideas, draft policies and procedures, collaborate on the writing of reports, share vision, build consensus, and make decisions (Nunamaker, Dennis, Valasich, Vogel & George, 1991). Organizational meetings have long been considered a primary channel for information exchange within and between work units (McLeod & Jones, 1987; Panko 1992). Meetings serve multiple purposes, advancing work on a given task as well as fostering organizational relationships, which are important as they help establish a positive working environment within the organization (Bostrom, Anson, & Clawson, 1993).

The past two decades has brought advanced information technologies into meetings, which use sophisticated information management to facilitate cooperative participation in organization activities. Analyzing the technological advances, DeSanctis and Poole (1994) proposed the adaptive structuration theory (AST) of input-process-output (IPO) as a theoretical framework for studying technology use in meetings. AST provides a model that describes the interplay between advanced information technologies, social structures and human interaction” (DeSanctis & Poole, 1994, p.125), and “explains how communication processes mediate and moderate input-output relationships” (Poole & Jackson, 1992, p. 287).

The central concepts of AST are *structuration* (Giddens, 1979) and *appropriation* (Ollman, 1971), that provide a dynamic picture by which people incorporate advanced

technologies into their work practice. In articulating AST, DeSactis and Poole (1994) point out that group outcomes do not directly result from the effects of variables such as technology and task, but reflect the manner in which groups *appropriate* the structures of the technology and the context of its use. Appropriation refers to the manner in which structures are adapted by a group for its own use through a process of *structuration*, wherein structures are constantly produced and reproduced as the group's interaction process occurs.

DeSanctis and Poole (1994) wrote:

“AST focuses on social structures, rules and resources provided by technologies and institutions as the basis for human activity. Social structures serve as templates for planning and accomplishing tasks. Prior to development of an advanced technology, structures are found in institutions such as reporting hierarchies, organizational knowledge, and standard operating procedures.

Designers incorporate some of these structures into the technology; the structures may be reproduced so as to mimic their nontechnology counterparts, or they may be modified, enhanced, or combined with manual procedures, thus creating new structures within the technology. Once complete, the technology presents an array of social structures for possible use in interpersonal interaction, including rules and resources. As these structures then are brought into interaction, they are instantiated in social life. So, these are structures in technology, on the one hand, and structures in action, on the other.” (p.125).

According to DeSactis and Poole (1994), in an AST context, the use of advanced technologies can be described as an input-process-output framework. Under certain input

conditions such as technology and contextual factors, groups create and undergo the use process, which is characterized by their modes of appropriation, and in turn leads to certain outcomes, the predictability of which is based on the appropriation.

Poole, Holmes, Watson, and DeSanctis (1993) describe the input variables within the IOP model as: (1) individual/trait differences (background of the individual, group size, group history); (2) the type of task the group is facing; (3) environmental variables (physical environment, facilitation); (4) tools (announcements/invitations, agenda, support documents, minutes, displays); and (5) technology (computer based technologies, meeting evaluations). Poole et al. (1993) suggests that these input variables are under the control of the organization and can be modified if necessary to make the meetings more effective. Lastly, the outcome variables consist of outcome quality, satisfaction with the outcome, and satisfaction with the process.

The input factors, which are designed to help structure the group and the nature of the task to achieve their outcomes, influence the process variables within the IPO model (Weingart, 1997). Martins, Gilson and Maynard (2004) classify process variables into planning processes, action processes, and interpersonal processes:

“Planning processes encompass mission analysis, goal setting, strategy formulation, and other processes related to focusing the group's efforts. Action processes are those dynamics which occur during the performance of a group's task, such as communication, participation, coordination, and monitoring of the group's progress. Interpersonal processes refer to relationships among group members: they include conflict, tone of interaction, trust, cohesion, affect, and social integration, among others” (p. 812).

Levine, Kushniryk, Allard and Tenopir (2007) conducted a study of 77 organizational meetings within four high-tech organizations. It was found that multitasking behaviors occurred in more than half of the observed meetings, suggesting that this kind of behavior is becoming commonplace in corporate meetings. The availability of multiple information technologies makes it possible for attendees to perform several separate tasks simultaneously during the meetings. While there is no empirical evidence, it is likely that when employees bring their laptops to meetings and these meetings begin to last longer, the employees will begin to lose focus, begin to feel the pressures of management to complete various tasks, and/or take the opportunity to read e-mail or surf the web.

Prior studies (3M Meeting management team, 1994; Doyle & Straus, 1982; Green & Lazarus, 1991; Levine, Kushniryk, Allard, & Tenopir, 2006; Romano & Nunamaker, 2001; Rice, 1973) have concluded that managers and their subordinates can spend between 25 to 80 percent of their time in scheduled and unscheduled meetings. However, organizational meetings are often not as effective as they could be (Shaw, 1981). Many reviews and surveys (3M Meeting management team, 1994; Auger, 1987; Green & Lazarus, 1991; Mosvick & Nelson, 1987; Rice, 1973) reveal that meetings dominate workers' and managers' time and yet are considered to be costly, unproductive and dissatisfying. Nunamaker, Dennis, Valasich, Vogel and George (1991) wrote:

“Meetings may lack a clear focus. Group members may not participate because they are apprehensive about how their ideas will be received or because a few members dominate discussions... Meeting can end without a clear understanding or record of what was discussed” (Nunamaker et al., 1991, p. 40).

Most organizations spend between 7 and 15 fifteen percent of their personnel budget on meetings (Doyle & Straus, 1982; Monge, McSween, & Wyer, 1989). Green & Lazarus (1991) found that overall, *one-third of the time spent in meetings is unproductive*. The unproductive meeting time translates into a \$37 billion annual waste (Sheridan, 1989).

Rogelberg, Leach, Warr and Burnfield (2006) view unproductive meetings as a unique form of interruption that may reduce overall work productivity. In many cases, meeting attendance disrupts salient forms of goal achievement (e.g., when ongoing work had to be terminated or delayed to attend a meeting). Unproductive meetings have harmful effects on task performance because, as O’Connaill and Frohlich (1995) report, 41% of the time people do not resume their original task after an interruption. In this situation (i.e. in unproductive meetings), multitasking in meetings can be viewed as positive behavior that can potentially increase the productivity within an organization, because people can continue working on their primary tasks, and meetings can no longer be viewed as interruptions.

Wasson (2004) conducted a field study of virtual meetings in an organization with long-term experience in virtual collaboration. She found that multitasking *can enhance employee productivity when properly managed*, but has potential downsides. The researcher writes:

“Multitasking enhances employee productivity when it takes up “slack” in the employee’s attention resources that are not being utilized by the meeting.

Multitasking does not diminish the productivity of the meeting as long as



employees make the meeting their first priority and only put their excess attention resources into other activities” (Wasson, 2004, p. 56).

The other qualitative study (Rennecker, Dennis & Hansen, 2006) suggested a positive impact of multitasking behavior in organizational meetings. Using Goffman’s (1959) characterization of “front” and “backstage”<sup>1</sup> interaction practices, Rennecker et al. (2006) analyzed how the use of instant messaging in both face-to-face and technology-mediated meetings alters interaction boundaries. In an interview study of workers in two organizations, Rennecker et al. (2006) found that workers are often involved in multiple concurrent conversations during meetings. For instance, a worker could be engaged simultaneously in IM conversations with other meeting participants, his or her boss who may not be in the meeting, a subordinate outside the meeting, or his/her spouse. Rennecker et al. (2006) labeled this type of multicommuting as ‘invisible whispering, and proposed that it “constitutes a new communicative genre, typified by the use of instant messaging to communicate privately (purpose) during synchronous interaction with one or more others who may or may not be a participant in the ‘whispered’ exchange” (p. 5). The researchers identified six distinct subgenres of ‘invisible whispering’: (1) attending to the meeting, (2) providing focal task support, (3) providing social support, (4) directing the meeting, (5) participating in a parallel meeting, and (6) managing extra meeting activities.

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<sup>1</sup> Goffman’s (1959) conceptualized the social action as theater, segmented into “front” and “back” regions, each characterized by particular behavioral expectations and relationships among those present in that region. “Front” regions are characterized by the perception that one is in the presence of an “audience,” people who expect one’s behavior to be consistent with one’s official role. “Back” regions are characterized by interactions among “teammates,” people who share the same role with respect to the audience or who collaborate to foster the same impression.

Rennecker et al. (2006) concluded that instant messaging was used during both face-to-face and technology-mediated meetings to participate concurrently in “front” and “backstage” interactions, as well as to participate in multiple, concurrent, “backstage” conversations. Further, these IMs were used to manage and influence front-stage activities through concurrent backstage conversations. Moreover, the participants of the study overall seemed to perceive ‘invisible whispering’ or multicommutating as contributing to their individual and collective productivity of meetings.

Therefore, multitasking in meetings can be viewed as a time-saving strategy, which, if properly managed, can increase individual productivity, because individuals can continue working on their primary tasks, and meetings would no longer be viewed as interruptions. This point of view needs to be further explored and tested. For this realization the following questions are explored in this study:

Under what conditions can individual productivity be increased in the multicommutating environment?

What are the predictors of the individual productivity in the multicommutating environment?

## **CHAPTER II: LITERATURE REVIEW**

### **Correlates of Polychronicity and Multitasking**

Floro and Miles (2003) suggested that polychronicity and multitasking depends on a variety of economic, demographic and social factors. These include social norms, household life cycle and composition, educational level, sex, income and employment status. The researchers found that multitasking declines with the age and increases with education and income levels. Fully employed people are more likely to pursue simultaneous goals than the unemployed or part-time employed.

A commonly held perception is that women are more polychronic than men (Hall, 1983, p. 52). It is believed that it may be evolutionary and/or socially influenced. Prevailing social and gender norms influence the division of labor (Creighton, 1999). Society usually perceives breadwinning to be the primary role of men while childcare is principal work for women. These distinct social constructs have a number of implications. One is that they influence the division of labor within the household by creating time pressure for women as they are confronted with a multiplicity of roles (Creighton, 1999). Craig (2006) indicate that “compared to fathering, mothering involves not only more overall time commitment but more multitasking, more physical labor, a more rigid timetable, more time alone with children, and more overall responsibility for managing care. These gender differences in the quantity and nature of care apply even when women work full-time” (p. 259).

Studies in both developed and developing countries show commonalities among women's tendencies to multitask (Roldan, 1985; Benton, 1989; Lozano, 1989; Szebo &

Cebatorev, 1990; Moser, 1993; Floro & Miles 2003). Self-employed women frequently combine income-earning activities with domestic chores such as cleaning, cooking and childcare (Floro & Miles, 2003).

Neurological research on multitasking indicates that the switching of attention from one task to another occurs in the region immediately behind the forehead called Brodmann's Area 10, in the brain's anterior prefrontal cortex (Wood & Grafman, 2003). Brodmann's Area 10 is part of the frontal lobes, which are important for maintaining long-term goals and achieving them. Because the prefrontal cortex is one of the last regions of the brain to mature and one of the first to decline with age, young children do not multitask well, nor do most adults over 60 (Wood & Grafman, 2003; Koechlin, Basso, Pietrini, Panzer, & Grafman, 1999).

In their study of 310 randomly selected adult inhabitants of a residential neighborhood of Philadelphia, Kaufman, Lane, and Londquist (1991) found that polychronicity is positively correlated with the respondents' levels of formal education: the more formal education, the more polychronic the respondent. However, Kaufman et al. (1991) found no difference in preference for monochronicity and polychronicity in relation to age.

People's performances in dual tasks depend highly on their skills in the individual tasks (Alport, Antonis & Reynolds, 1972). That is, being skilled in one task allows a person to perform it and other tasks with negligible impact on the overall performance of both tasks. For example, a skilled driver might have little difficulty talking with a friend while driving, whereas a novice driver might find it difficult. However, Shallice McLeod and Lewis (1985) found even if the subject is highly skillful and trained in a

task performance, one should expect a decrement of anything up to 10% in performance as a result of the requirement to monitor two task simultaneously.

Konig, Buhner and Murling (2005) studied several cognitive variables associated with multitasking and found that working memory, fluid intelligence, and attention are all predictors of successful multitasking. The psychological research also indicates that people with Type A<sup>2</sup> personalities focus their attention primarily on central tasks and attend less to peripheral tasks than do Type B's<sup>3</sup> (Matthews & Brunson, 1979). This makes Type A personalities more polychronic. Moreover, introverts are less able to multitask than extroverts (Lieberman & Rosenthal, 2001).

In consumer research was found that polychronic people have a tendency to switch channels more, watch more programs simultaneously, and divide attention between television viewing and other activities (Lindquist & Kaufman-Scarborough, 2000).

The polychronic preferences may differ culturally. Based on his own ethnographic observations, Hall (1983) concluded that cultures in Mediterranean world were more polychronic than the cultures of Northwestern Europe. In the New World, Latin America was more polychronic than the United States (Hall, 1983). Gesteland (1999) classified Nordic and Germanic Europe, North America and Japan as monochronic; the Arab world, most of Africa, Latin America, and south and Southeast

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<sup>2</sup> Type A behavior pattern is characterized by competitiveness, achievement striving, impatience, and feeling of being under pressure. (Friedman & Rosenman, 1974).

<sup>3</sup> Type B behavior refers to the absence of the Type A characteristics or the presence of them at a much lesser degree (Friedman & Rosenman, 1974).

Asia as polychronic; with Russia, much of Eastern, Central Europe, and Southern Europe, China, Singapore, Hong Kong, and South Korea as “in between”. Furthermore, O’Hara-Devereaux and Johansen (1994) suggested that “polychronic time is characteristic of high-context people and monochronic time is characteristic of low-context people” (p. 61).

Several studies have examined these hypothesized cultural differences regarding polychronicity, but the results of these studies have generally not supported these predictions. For example, Tinsley (1998) found that American managers were more polychronic than Germans and Japanese managers, who did not differ from each other. Conte, Rizzuto and Steiner (1999) found that French and American students did not differ from each other on polychronicity.

Polychronicity has also been studied as a fundamental dimension of organizational culture (Onken, 1999; Bluedorn, Kalliath, Strube, & Martin, 1999). Onken (1999) suggested that polychronic organization value behaviors where individuals perform several tasks at once, such as talking on the phone and eating lunch simultaneously. Therefore, in polychronic organizations, more activities are scheduled during a day, with short periods of time spent on each of several projects as individuals move back-and forth among projects throughout the day. “Polychronic time stresses the involvement of people and the completion of transactions rather than adherence to schedules. Individuals who exist in polychronic cultures tend to interact with several people at once and are continually involved with each other. The flow of information is continuous, and polychronic people are immersed in each other’s business as they stay in touch with one another” (Onken, 1999, p. 232). Cotte and Ratneshwar (1999) noted that

in polychronic organizations people believe that it is appropriate to have a meeting with a colleague only to interrupt it several times to flag down someone who is passing by one's office to ask for verbal reports on different projects.

Studying polychronicity as a temporal dimension of organizational culture, Bluedorn et al. (1999) found that polychronicity was significantly, yet negatively correlated with punctuality values and an emphasis on schedules and deadlines. Following Bluedorn et al. (1999), Onken (1999) found a statistically significant positive correlation between polychronicity and organizational performance. Polychronic organizations that value polychronicity tend to be more productive.

Conte and Jacobs (2003) examined relationships between polychronicity and three work outcomes (i.e., lateness, absence, supervisory ratings of job performance), while also considering more traditional predictor constructs such as the Big Five personality dimensions of conscientiousness, extraversion, intellectance, agreeableness and neuroticism and cognitive ability. The researchers found that individual polychronicity was positively correlated to important organizational behaviors: lateness and absenteeism, and these relationships varied in according to respondents' gender, work experience, and cognitive ability. Polychronicity was also significantly, yet negatively correlated with a composite measure of supervisory performance ratings that assessed dependability, schedule adherence, and attentiveness on the job. Conte and Jacobs (2003) also found that polychronicity was negatively related to conscientiousness. Thus, polychronicity was significantly associated with both objective and subjective measures of job performance.

In order to study the effects of organizational norms on polychronic communication, Turner, Grube, Tinsley, Lee and O’Pell (2006) surveyed and interviewed the employees of a high tech organization. The researchers found that strong organizational norms for instant messaging (IM) and e-mail use, as well as supervisory behavior, influenced employees’ use of IM and e-mail and even more so when employees have strong polychronic orientations. Turner et al. (2006) revealed those individuals with high polychronic orientations were most flexible in their ability to adapt to the communication needs of the organization. Similarly, those with low polychronic orientations experienced difficulties in adapting to the organization’s communication media norms. In addition, individuals with low polychronic orientations reported having a hard time switching modes within multiple simultaneous conversations. They might be able to participate in multiple conversations at once if they were all instant messages (quantitative multitasking), but not when they involved telephone and instant messages (qualitative multitasking).

Thus, multitasking abilities or polychronicity is related to several variables:

- Gender, education level, and age;
- Achievement striving and extraversion;
- Working memory, fluid intelligence and attention;
- Skillfulness in task performance;
- Job performance;
- Ability to adapt to the communication needs of an organization;
- Lateness and absenteeism; and



- Conscientiousness.

The previous research has identified the correlates of multitasking, and now, let's look how multitasking affects productivity and performance.

### **Effects of Multitasking on Productivity**

Most studies testing multitasking productivity have shown that engaging in simultaneous activities decreases performance level. Whether attempting to multitask by performing two tasks at the same time, or by switching from one task to another in rapid succession, there is a time cost associated with multitasking.

Wylie and Allport (2000) conducted task-switching experiments in an effort to measure the “cost” or loss of time spent switching between activities. They labeled the time required to switch between and among tasks as “reaction time switching costs.” They noted that switching from one task to another requires a certain amount of time: the task switching usually occurs at least within tenth of a second delay. This switching also involves a change in attention and focus.

Rubinstein, Meyer and Evans (2001) studied patterns in the amounts of time lost when people switched repeatedly between two tasks of varying complexity and familiarity. In four experiments, the subjects switched between different tasks such as solving math problems or classifying geometric objects. The researchers measured subjects' speed of performance as a function of whether the successive tasks were familiar or unfamiliar, and whether the rules for performing them were simple or complex. The measurements revealed that for all types of tasks, subjects lost time when they had to switch from one task to another, and time costs increased with the complexity

of the tasks, so it took significantly longer to switch between more complex tasks. Time costs also were greater when subjects switched to tasks that were relatively unfamiliar. The switching between tasks takes significant amounts of time, several tenths of a second, which can add up when people switch back and forth repeatedly between tasks. Thus, Rubinstein et al. concluded that multitasking may seem more efficient on the surface, but may actually take more time in the end. According to the authors, people may choose strategies that maximize their efficiency when multitasking.

For example, Brown, Tickener and Simmonds (1969) studied the effects of telephoning while driving. In the experiment subjects were required to hear and verify sentences from the syntactic reasoning test giving a vocal “true” or “false” response. Subjects were required to drive around a course on an airfield that was laid out so as to have a number of “gates” between two sticks. The concurrent reasoning task appeared to have no effect on the subject’s capacity to steer between gaps that were large enough, but did impair judgments as to whether accept the gap or not. Also, multitasking increased the reasoning errors. Subjects needed more time to complete the circuit while talking on the phone in comparison to driving alone.

Pool, Koolstra and Van Der Voort (2003) examined the impact of soap operas as background viewing on homework performance. The results indicated that students simultaneously engaged in homework and TV viewing performed worse and used more time than students who were not multitasking.

Naveh–Benjamin, Craik, Perretta, and Tonev (2000) studied effect of multitasking on information encoding and retrieval. Their research revealed that information encoding process required more attention than information retrieval process, because the encoding

processes are more vulnerable to the effects of competing demands of multiple tasks. Naveh-Benjamin et al. (2000) also found that divided attention at the point of encoding was shown to significantly reduce memory. In their research of individuals switching between two specified tasks, one of which was to be learned and stored in memory, Naveh-Benjamin et al. (2000) concluded that as attention was switched to a secondary task and away from the first task, memory performance on the first task declined and secondary task performance improved. These findings are very important when multitasking is discussed in the context of its impact on learning.

Hembrooke and Gay (2003) measured the academic performance of undergraduate students who multitasked during lectures. The researchers devised an experiment in which two groups of students heard the same lecture and were tested immediately following the lecture. One group of students was allowed to use laptops to engage in browsing, search, and social computing behaviors during the lecture. Students in the other group were asked to keep their laptops closed for the duration of lecture. Hembrooke and Gay (2003) report degraded memory of lecture content in the open-laptop condition.

Another finding from this study was that when students were specifically instructed to learn, they processed information in more elaborate and semantically relevant ways:

“...enhanced browsing efficiency might be used as an index of a facilitation effect of time or practice. If students can become “better browsers”, or at the very least become more facile at self-monitoring their browsing behavior, the typical decrement found under multitasking conditions might be negated” (Hembrooke & Gay, 2003, 16).

This finding raises the question as to whether it possible to minimize the negative impact of multitasking on learning.

Several authors (e.g., Britton & Tesser, 1991; Bluedorn, 2002 ) even considered multitasking/polychronicity as *potentially useful time-management strategy*. Floro and Miles (2003) noted that multitasking is not necessarily a negative experience because the combination of multiple tasks can break the monotony of work. For example, listening to the radio while cooking prevents boredom. On the other hand, multitasking may lead to increased stress or diminished productivity, which may unfavorably affect the person's well-being.

Thus, multitasking is not always considered as a negative phenomenon which reduces productivity and performance. Investigating how precisely manage multitasking to reduce negative effects may be a potentially fruitful direction for communication research.

## **Social Presence**

Virtual meetings have become a vital component of today's workplace, especially in light of the global world economy (Anderson, McEwan, Bal & Carletta, 2007).

According to Adaptive Structuration Theory meeting technologies as an input variable are not directly affect processes, but rather processes will vary across groups based on how technology is appropriated (DeSanctis & Poole, 1994; Fulk, & Collins-Jarvis, 2001). However, the type of meeting technology used by group members is an important input as media technologies vary in *social presence*, i.e. "the degree to which a communication medium allows group members to perceive (sense) the actual presence of the

communication participants and the consequent appreciation of an interpersonal relationship, despite the fact that they are located in different places, that they may operate at different times, and that all communication is through digital channels” (Lowry, Roberts, Romano, Cheney & Hightower, 2006, p. 663).

Social presence theory was developed by Short, Williams and Christie (1976) to explain interpersonal effects between two interlocutors in organizational settings when using communication technologies such as telephone, audio channels, closed-circuit video channels, and face-to-face meetings. They characterize these communication mediums in terms of their potential to communicate verbal and nonverbal cues transmitting socio-emotional information in such a way that the other is perceived as ‘physically’ present. They suggest that the more verbal and nonverbal cues can be transmitted, the higher the perception of the ‘physical’ presence of the other will be.

Short et al. (1976) define social presence as the “degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships” (p. 65). They state that telecommunications media vary in their degree of social presence and these variations play an important role in determining the way individuals interact. Short et al. (1976) write that “social presence varies between different media, it affects the nature of the interaction and it interacts with the purpose of the interaction to influence the medium chosen by the individual who wishes to communicate” (p.65).

Short et al. (1976) propose that intimacy (Argyle & Dean, 1965) and immediacy (Wiener & Mehrabian, 1968) are the factors that contribute to the degree of social presence of the communication medium. According to Argyle & Dean (1965), communicating individuals tend to reach an optimum level of ‘intimacy’ in which

conflicting approaches and avoidance forces are in balance. Short et al. (1976), referring to Argyle and Dean (1965), see intimacy as “a function of eye-contact, proximity, conversation topic and so on; changes in one will produce compensating changes in the others ... eye-contact is generally sought after, but too much creates discomfort; for instance, eye-contact is reduced when people are placed very close together” (p. 53). Another example of the desire to reach an optimum level of intimacy is when “two people, if they are seated face-to-face, will try to adjust their seating positions until equilibrium is reached” (p. 72).

Wiener and Mehrabian (1968) define the concept of immediacy as communication behaviors that enhance closeness to and nonverbal interaction with another. Short et al. (1976) characterize it as a measure of the psychological distance which a communicator puts between himself and the object of his communication, or his addressee. They assume that the inability of communication technologies to transmit nonverbal cues would increase the psychological distance between communicators.

Short et al. (1976) link social presence to the nonverbal signals, including cues expressed by vision (e.g. facial expression, direction of gaze, posture, dress, physical appearance, proximity, eye contact, etc.), audition (e.g., voice volume, inflection, soft speaking), tactile (e.g., touching, shaking hands), and olfaction (e.g., smells, body odors). As a rule, the nonverbal cues relate to specific communication functions, such as mutual attention, channel control, feedback, illustrations, emblems, and interpersonal attitudes (Fulk, & Collins-Jarvis, 2001). Therefore, media that provide more communication cues are judged as being warm, personal, sensitive, and sociable (Short et al., 1976).

The four items proposed by Short et al. (1976) to measure social presence are the following: personal-impersonal, sensitive-insensitive, warm-cold, and sociable-unsociable. They ranked telecommunication media according the degree of social presence. This ranking in descending order is: face-to-face communication, video-conferencing, and finally audio-only (e.g., the telephone). Social presence theory argues that media with high degree of social presence are better suited to ambiguous and equivocal tasks that require resolution of different views and opinions among people. Conversely, lean media are better for uncertain tasks that require that quick transmission of information and facts (Short, et al., 1976). For example, Kydd and Ferry (1991) suggest that a medium strong on uncertainty reduction (like email) is relatively weak in equivocality resolution. Similarly, a medium high in equivocality resolution (like face-to-face meeting) is low on uncertainty reduction (Kydd & Ferry, 1991). According to Chimbaram and Jones (1993), introducing electronic meeting systems (EMS) to group decision-making processes adds an interesting twist to this continuum, because (EMS) is a hybrid medium that exhibits some aspects of lean media, such as computer conferencing and email, and some aspects of rich media, such as group meetings.

Media differ greatly in terms of social presence. For instance, video-conferencing has higher social presence than electronic mail (Rice & Associates, 1984). Media that are high in social presence also permit the transmission of rich information. i.e., they offer multiple channels of communication for exchanging verbal, non-verbal, and visual cues and permit the transmission of information of information rich in socio-emotional content (Daft & Lengel, 1986).

Results from communication studies indicate that email and computer conferencing have lower social presence and are less “warm” than face-to-face communication (Fulk, Steinfield, Schmitz & Power, 1987; Siegel, Dubrovsky, Kiesler & McGuire, 1986). Chimbaram and Jones (1993) have found that perceptions of social presence are greater in face-to-face groups than dispersed groups. Short, et al.’s (1976) study suggests that individuals can effectively transmit and receive a broader range of verbal and non-verbal cues in face-to-face meeting than they can in audio conference. Accordingly, traditional, unmediated face-to-face verbal communication provides the highest social presence (Miranda & Saunders, 2003), whereas computer-supported media provide lower social presence and virtual groups also experience relatively low social presence (Burke, Aytes, Chidabaram, & Johnson, 1999; Burke & Chidambaram, 1999; Miranda & Saunders, 2003; Roberts, Lowry & Sweeney, 2006; Lowry, Roberts, Romano, Cheney & Hightower, 2006).

The previous studies have found that the use of media with a small number of cues and communication channels tends to “depersonalize” the communication interactions (Rice, 1984, Siegel et al, 1986). Explaining this depersonalization, Culnan and Markus (1987) suggest that the mechanical characteristics of the system, such as bandwidth and the number of communication cues, alter interpersonal variables. On the other hand, Gunawardena (1995) and Gunawardena and Zittle (1997) argue that social presence is largely the attribute of the communication medium or the user’s perception of the medium. The results of their studies revealed that the participants felt that computer mediated communication (CMC) is a medium that is interactive, interesting, active and sociable. Further, they found that participants create social presence by projecting their



identities and building online communities through CMC, despite its lack of non-verbal and social context cues.

Media high in social presence (Short et al. 1976) also have been found to positively impact: (1) team effectiveness, efficiency, amount of communication, group cohesion (Carlson & Zmud, 1999; May & Carter, 2001; Roberts, Lowry, & Sweeney, 2006; Yoo & Alavi, 2001), (2) the relationships among team members (Pauleen & Yong, 2001), and (3) team commitment (Workman, Kahnweiler & Bommer, 2003).

Christie (1985) suggests that communicators' performance improves when media's ability to transmit social presence is matched to the social needs of a task. For instance, task-oriented activities such as problem solving might be carried out equally well using any medium, person-oriented activities such as conflict resolution are thought to require media high in social presence. Miranda and Saunders (2003) advocate *that the presence of the sender influences the recipients' understanding of the message*. They broaden social presence theory by acknowledging that the presence of others, including (but not limited to) the message sender, influences the nature and success of intersubjective interpretation. Miranda and Saunders (2003) wrote:

“Intersubjective interpretation is a social activity ill suited to media low in social presence. Intersubjective construction of meaning necessitates reciprocity. Media low in social presence tend to impede such reciprocity or interactivity. Even in “synchronous” settings such as an electronic meeting, because group members contribute information simultaneously, they attend to specific pieces of information asynchronously. Therefore, immediate reciprocity is difficult to accomplish. Low social presence makes it more likely that specific comments are

entirely ignored as individuals are unable to perceive others' urgency and consequential emotional reactions" (p.89).

As the research suggests, virtual meetings are lower on social presence. This can diminish the receivers understanding of the message, suggesting that virtual meetings may have lower overall outcome quality, satisfaction and productivity. There is no scientific evidence how the degree of social presence influences the multitask performance. In multitasking situations, the presence of the others may affect the task prioritization. For example, when our students surf Internet during class lectures, they, probably, consider their class participation as the primary task. Therefore, they put more effort into listening than into Internet browsing. During distance classes, when the teacher is not physically present, they may put less effort into listening and be even more distracted by browsing.

### **Computer-Generated Slides**

PowerPoint software has become a powerful presentation tool in corporate and government bureaucracies (Tufte, 2003), and in scientific and educational circles (Gates, 2002). Today, for many of us "watching a business presentation without accompanying PowerPoint slides is like watching a film without sound" (Levasseur & Sawyer, 2006, p.101). In fact, Microsoft estimates that 1.25 million PowerPoint presentations take place every hour (Mahin, 2004), and one study found that presentation software was used by meeting facilitators during more than a half (53%) of meetings in USA high-tech organizations (Levine, Kushniryk, Allard, & Tenopir, 2006).

Although presentation software has become a persuasive communicative medium,

the researchers are still debating the usefulness and effectiveness of PowerPoint presentations (Levasseur & Sawyer, 2006). Tufte (2003) criticized presentation software (or “slideware”) since it often reduces the analytical quality of presentations, weakens the verbal and spatial reasoning, and almost always corrupts statistical analysis. He argues that “PowerPoint is entirely presenter-oriented, and not content-oriented, not audience oriented... Slideware [PowerPoint] helps speakers to outline their talks, to retrieve and show diverse visual materials, and to communicate slides in tasks, printed reports, and Internet. Also to replace serious analysis with chart junk, over-produced layouts, cheerleader logotypes and branding, and corny clip art” (Tufte, 2003, p.4).

According to Pauw (2002), presentation software constrains interpersonal engagement. The arousing content on computer-generated slides shifts the audience’s attention from the presenter to the stimulating material projected on the screen, and lowers the quality of interactions (Levasseur & Sawyer, 2006). Levasseur & Sawyer (2006) suggest if computer-generated slides create an environment in which listener attention is primary focused on slides rather than on the presenter, this environment would largely conceal a presenter’s nonverbal immediacy behavior meaning that computer-generated slides impede close connection between presenter and listeners, and therefore also reduce information processing capabilities (Levasseur & Sawyer, 2006).

On the other hand, the research on PowerPoint effectiveness supports the evidence that computer-generated slides may increase sensory stimulation and improve information processing (Butler & Mautz, 1996; Dils, 2000). Paivio’s dual coding theory (1986) can be used to make the case for the benefits of computer-generated slides in the multicommutating environment. The theory posits that human information processing

involves two independent, yet interconnected, systems: a verbal system and a visual system. Presenting information in both visual and verbal form enhances recall/recognition and yield better results. Paivio (1986) writes: “Human cognition is unique in that it has become specialized in dealing simultaneously with language and with nonverbal objects and events. Moreover, the language system is peculiar in that it deals directly with linguistic input and output (in the form of speech or writing) while at the same time serving a symbolic function with respect to nonverbal objects, events and behaviors. Any representational theory must accommodate this functional duality. The most general assumption in dual coding theory is that there are two classes of phenomena handled cognitively by separate subsystems, one specialized for the representation and processing of information concerning nonverbal objects and events, the other specialized for dealing with language.” (p. 53).

According to Butler and Mautz (1996) computer-generated slides combine verbal (oral presentation) and slide text with visual elements (slide images). Therefore, when combined with traditional verbal presentation, computer-generated slides should better appeal to the broad array of listeners learning preferences. Overall, “the use of PowerPoint presentations can effectively reach verbal, kinesthetic, and visual learning styles” (Dils, 2000, p.102).

According to Levasseur and Sawyer (2006), computer-generated slides possess multiple attributes designed to produce more sensory stimulation in comparison to more traditional lecture aids such as a chalkboard or an overhead projector. In addition, these slides allow presenters to enhance lectures with both auditory and visual stimuli. Slide shows can incorporate sounds through transition sound effects, imported music files, etc.

The various attributes of computer-generated slides lead to messages with greater appeal to the human senses and alter the way listeners process messages (Levasseur & Sawyer, 2006).

Presentation software also provides structure to a presentation. Computer-generated slides aid the order and pacing of a presentation or lecture (Hlynka & Mason, 1998). They make it easier for presenters to give clear summaries (Lowry, 1999). In addition, accompanying lectures or presentations with presentation software is more efficient time management strategy than writing on a whiteboard or using transparencies (Daniels, 1999; Mantei, 2000).

The research regarding the impact of presenting the information with PowerPoint on information retrieval has been mixed and mostly conducted in the classroom settings measuring whether it improves student learning outcomes. Most of these studies utilized some variation of a two group post-test experimental design. Some researchers have found that it enhances student's academic performance (Lowry, 1999; Mantei, 2000; Weinraub, 1998) whereas others have found no effect (Butler & Mautz, 1996; Daniels, 1999; Ranking & Hoas, 2001).

Szabo and Hastings (2000) performed three studies to investigate the efficacy of digital PowerPoint lecturing in undergraduate classrooms. In the first study, students' opinion about PowerPoint lectures was surveyed after receiving all their lectures in one PowerPoint module. Grades of one cohort were then compared with the grades of another taking the same test one year earlier. The researchers found no significant differences. In the second study, students received a mock test one week following: (1) an overhead lecture, (2) a PowerPoint lecture and (3) a PowerPoint lecture with lecture notes. There

were no significant differences between the two PowerPoint lectures both of which resulted in higher grades than the overhead lecture. In the third study, two cohorts had two identical lectures, in a counterbalanced order, presented either with PowerPoint or by using overheads. The results revealed that the lecture difficulty, but not the method of lecturing, contributed to the grade differences on two mock tests. Szabo and Hastings (2000) suggested that the efficacy of PowerPoint lecturing may be case specific rather than universal.

The software packages used to construct computer-generated slides allow presenters to use text, visuals, sound, animation, slide background, etc. Unfortunately, very little research to date has examined the effects of various forms of computer-generated slides in presentations. Bartsch and Cobern (2003) in their first study compared “Basic PowerPoint” presentation with text only information against “Expanded PowerPoint” slide shows with pictures, sound, and moving text. Students performed worse on quizzes when PowerPoint presentations included non-text items such as pictures and sound effects. In the second study participants were shown PowerPoint slides that contained only text, contained text and a relevant picture, and contained text with a picture that was not relevant. The researchers found that students performed worse on recall and recognition tasks and had greater dislike for slides with pictures that were not relevant. Bartsch and Cobern (2003) concluded that PowerPoint can be beneficial, but material that is not pertinent to the presentation can be harmful to students’ learning.

Thus, overall the previous research suggests that presenting information in visual and oral forms improves the information recall/recognition. In multicommutating environment, the use of PowerPoint will be even more beneficial for the listeners. When

multitasking, people switch between the tasks, even though the reaction time is very short. Presenting information both orally and visually may help them to switch between the tasks more effectively, because they can read information from a slide at any convenient moment.

### **Individual Differences and Multicommunicating: Receiver Apprehension**

In 1970, McCroskey introduced the concept of communication apprehension and defined it as “a broadly based anxiety related to oral communication” (p. 270). This initial conceptualization of communication apprehension was mainly based on findings in public speaking. A decade later in a 1982 article McCroskey reconceptualized oral communication apprehension and indicated that this phenomenon should be viewed on a continuum from purely trait-like to purely state-like.

Wheless (1975) differentiated receiver apprehension from its parent construct of communication apprehension. He recognized that people are likely to experience anxiety when listening to messages as well as when sending messages. Wheless rationalized that an individual’s communicative roles of source or receiver function independently in affect-arousing contexts, and he termed receiver apprehension as “the fear of misinterpreting, inadequately processing and/or not being able to adjust psychologically to messages sent by others” (Wheless, 1975, 263). Therefore, while communication apprehension relates to self-evaluative social approval based on the sending of messages, receiver apprehension is associated with self-evaluation concerns based on the receiving of messages. In addition, Ayres, Wilcox and Ayres (1995) distinguish receiver

apprehension from communication apprehension by suggesting that communication apprehension is influenced by social evaluations whereas receiver apprehension is not:

“When we speak, our utterances are available for evaluation by others: but when we listen, whether we are adequately processing the information is not readily available for inspection. It seems to us that receiver apprehension and communication apprehension cannot be distinguished on this basis since both involve implicit or explicit social evaluation. Of course, receiver apprehension and communication apprehension differ in terms of the timing and nature of the evaluation. With communication apprehension, evaluation is usually immediate and is manifested in verbal and nonverbal feedback. With receiver apprehension, evaluation is often delayed. For example, a person listening to a lecture may not be tested on that material for several weeks: but when the test is administered, an evaluative mechanism is set to work. We submit that social evaluation of this nature is an important ingredient in receiver apprehension. It is also likely that the more explicit the evaluative process the more it engenders receiver apprehension. Listening to a lecture whose content will not be tested in any fashion ought to engender less receiver apprehension than a lecture with follow up test” (p.224).

Receiver apprehension has most often operationalized with the Receiver Apprehension Test (Wheless, 1975) and the Revised Receiver Apprehension Test (Wheless & Scott, 1976). Both scales are self-reported instruments consisting of 20 or 16 Likert-type items respectively. The reports ask the respondents how they feel when receiving messages in various decoding contexts.



Since Wheelless' initial conceptualization, scholars have determined that receiver apprehension is related to processing anxiety (Borzi, 1985; Wheelless, 1975), information processing (Beatty, 1981), cognitive complexity (Beatty & Payne, 1981), message complexity (Daly, Vandelisti, & Daughton, 1987), listening effectiveness (Daniels & Whitman, 1979; Roberts, 1986), willingness to listen (Roberts & Vinson, 1998), listening styles (Bodie & Villaume, 2003), education level (McDowell & McDowell, 1978; Preiss, Wheelless, & Allen, 1990), and listening styles (Bodie & Villaume, 2003).

Processing anxiety associated with encountering or anticipating messages is a characteristic finding in the receiver apprehension literature (Borzi, 1985; Wheelless, 1975). Wheelless, Preiss, and Gayle (1997) wrote:

“Although anxiety is a prominent feature of receiver apprehension, the direction of causality in this relationship is unclear: Anxiety may inhibit efficient information processing, and/or poor information processing may lead to inappropriate social behavior resulting in generalized anxiety” (p. 153).

Exploring causes and outcomes of receiver-based anxiety, Wheelless and Scott (1976) identified a “cognitive pattern” of highly apprehensive receivers who reported low confidence in their own ability to process information. This “cognitive pattern” of low confidence in information processing ability of apprehensive receivers occur due to (a) primary, or state anxiety which results from fear that arises in particular information-processing situations, such as reading or listening, or (b) a generalized trait-like, or secondary response associated with receiving new information (Wheelless et al., 1997).

Utilizing McReynolds' (1976) assimilation theory of anxiety, Beatty (1981) analyzed receiver apprehension as a function of a cognitive backlog. McReynolds' theory

argues that the major determinant of the anxiety is the magnitude of the backlog of unassimilated perceptual data. Cognitive backlog is a function of continued and persistent inputs of information which is either difficult to assimilate into existing attitude structures or is input at an unmanageable rate. Beatty (1981) found a positive relationship between receiver apprehension and cognitive backlog. He suggested that receiver apprehension is a function of unassimilated information due to processing difficulties. Beatty (1981) reasoned that encountering new information while in the state of cognitive backlog results in a secondary, generalized anxiety associated with receiving information.

Studying individual information processing abilities, Beatty and Payne (1981) found the negative relationship between level of receiver apprehension and the level of cognitive complexity. According to the cognitive complexity theory (Kelly, 1955), the individuals differ in the degree of cognitive complexity. Some use numerous dimensions or constructs and a complex set of rules for combining those dimensions into overall impressions and judgments. The others utilize only a few dimensions and a simple set of integration rules. Thus, highly complex persons compared to simpler ones process information with greater ease and flexibility. Beatty and Payne (1981) suggested that since cognitively simple persons should incur processing difficulties more frequently than do complex persons, they should likewise be more subject to experience anxiety associated with these complicated conditions. Over time, these anxiety reactions are linked with receiving and processing information. Obviously, the greater flexibility afforded by high levels of complexity reduces tendency to develop receiver apprehension.

The previous research suggests that not only cognitive complexity but also message complexity is related to receiver apprehension. For example, Daly, Vandelisti

and Daughton (1987) found that message complexity was positively correlated to receiver apprehension in that, the more difficult the message being received the more fear people felt about being able to adequately process that message.

Daniels and Whitman (1979) found that receiver apprehension also affects information recall. In their study of the effects of message structure, required recall structure, and receiver apprehension on the recall of message information, Daniels and Whitman (1979) reported that low apprehensive receivers recalled more than high apprehension receivers. The similar results on message recall reported Roberts (1986) who revealed the curvilinear correlation between receiver apprehensive and total listening ability. These findings are consistent with Roberts's (1986) arousal model, in which moderate arousal facilitates listening, whereas too much or too little arousal results in poor listening. Therefore, aroused receivers may be able to focus or concentrate on some listening tasks, however, demonstrate lowered listening effectiveness in settings where apprehension is heightened (Fitch-Hauser, Barker, Hughes, 1990).

The other study (Clark, 1989) revealed that women who tend to be more or less anxious listeners didn't comprehend messages similarly to men. Female participants of the study who score high on receiver apprehension did less well in listening tests than more confident members of the same gender; while the male participants, who scored high on the receiver apprehension scale, did not report the degraded performance. Consequently, Clark (1989) proposed that the gender of a listener affects the capacity to understand the message.

Several studies investigated if receiver apprehension lowers with education level. Receiver apprehension was found to be higher for high school students than college

students, and higher still for junior high students (McDowell & McDowell, 1978; McDowell, McDowell, Pullan, & Linbergs, 1981). Preiss, Wheelless, and Allen (1990) also discovered a negative relationship between education level and receiver apprehension. Proposed explanations for these effects have been that education may advance the procedure necessary to reduce receiver apprehension, or highly apprehensive students may leave the educational system earlier than low-apprehensive receivers (Preiss, et al., 1990).

Diminished information processing (Preiss, Wheelless, & Allen, 1990), drive motivation, cognitive interference, and skills deficit (Preiss & Kerksen, 1990) appear to be major outcomes of receiver apprehension. Studies indicate that highly apprehensive individuals report more unevaluated information (Beatty, 1981) and commit errors under stress (Block & Block, 1984). Preiss and Kerksen (1990) suggested that informationally unreceptive and apprehensive receivers are not internally motivated to process messages, and that leads to backlogs of unassimilated information. Consequently, the inability to access information is associated with poor skills related to information acquisition and processing. In multitasking situations, as multiple task performance leads to an overload of information (Lang, 2000), the backlogs of unassimilated information for highly apprehensive receivers will, probably, be increased.

Preiss and Gayle (1991) noted that “receiver apprehension is a broad-based information processing syndrome producing anxiety when message processing demands exceed processing capacity” (p.2). Wheelless, et al. (1997) further confined the notion of receiver apprehension as information reception apprehension suggesting that, while some receiver apprehension may be related to an irrational primary anxiety, most receiver

apprehension is related to a “secondary anxiety tied to...informational receptivity... grounded in cognitive processing deficiencies” (p. 166). In other words, Wheelless et al. (1997) proposed that there is a cognitive limit where apprehension may occur as a receiver attempts to process, interpret, and adjust to information.

Wheelless et al. (1997) claimed that information receiver apprehension can be viewed as an in-process variable that interferes with the performance of behaviors that adapt to the environment. “This notion suggests a pattern of cognitive responses to message stimuli that inhibits goal achievement and may be exacerbated by situational factors” (Wheelless et al., 1997, 178). In order to explain how this variable functions moment to moment as messages are perceived, prioritized, and processed, Waldron and Cegala (1992) proposed the notion of in-process conditions as a conceptual schema for revealing how cognitive structures affect individuals’ abilities to process, monitor, produce, and modify messages. They claimed that the study of in-process cognitions on the rational level should involve careful analysis of the environments to which the conditions are adopted. Waldron and Cegala (1992) offered an abbreviated list of the cognitive requirements of possible environments, which include: (a) processing of large amounts of information from internal and external sources; (b) *performance of multiple tasks simultaneously (or at least in rapid succession)*; (c) processing of ambiguous or conflicting verbal or nonverbal information; (d) processing information within restricted time limits, etc.

Wheelless and his colleagues suggested that Waldron and Cegala’s (1992) theorizing is quite compatible with informational reception apprehension, which affects processing outcomes as message information is being received and perceived. This

theorizing assumes that goal-related cognitive requirements may be assessed at the behavioral-environment level. The study of in-process conditions on the rational level should involve careful analysis of the environments to which conditions are adopted. Accordingly, receiver apprehension as an in-process variable may interfere with the performance of behaviors that adapt to the multicommutating environment, in which multiple communication tasks are performed simultaneously or in rapid succession.

### **Hypotheses and Research Questions**

Below there are several propositions representing the general theoretical implications discussed in chapters 1 and 2. Each represents one link between multicommutating and performance. These propositions are then operationalized by one or more hypotheses that tested in the experiments.

According to the strategic response deferment theory, people performing under multitasking conditions need more time to complete the individual tasks as multitasking is a type of task switching. The task switching usually occurs within, at least, a tenth of a second delay. This characteristic of multitasking leads to process losses not present when performing tasks individually. Because of this, people working in a multicommutating environment are at a disadvantage in terms of performance.

**Proposition 1:** Multitasking causes decreased performance levels when compared to individual task performance on the same tasks (see Table 1).

Proposition 1 will be tested with one hypothesis:

**Hypothesis 1:** Individuals perform better when involved in one communication task at a time (single task) than when involved in multicommutating (multi task).

**Table 1. Hypothesized performance in single task vs. multi-task condition**

| Task        | Listening                                   | Writing                                     |
|-------------|---|---|
| Multi task  | Perform average                             | Perform average                             |
| Single task | Perform better than in multi-task condition | Perform better than in multi-task condition |

According to social presence theory the presence of others, including (but not limited to) the message sender, influences the nature and success of intersubjective interpretation. Low social presence makes it more likely that a sender's comments could be entirely ignored as individuals are unable to perceive others' urgency and consequential emotional reactions. In a multicommuting environment, the degree of social presence affects participants' task prioritization. In the low social presence situation, the participants consider the writing task as their priority and listening as an interference. Consistent with previous findings (Naveh–Benjamin, Craik, Perretta, & Tonev, 2000), as attention is switched to a secondary task and away from the first task, memory performance on the first task declines and secondary task performance improves.

Taking into consideration this assumption of social presence theory, the following proposition has been developed:

**Proposition 2:** The degree of social presence affects participants' task prioritization (see table 2).

This proposition is tested with four hypotheses. Different task prioritization and social presence affects their performance.

**Table 2. Hypothesized performance in live vs. virtual-presenter group condition**

| Group condition | Listening                                | Writing                                       |
|-----------------|--|---|
| Face-to-face    | Perform better than in virtual condition | Perform average                               |
| Virtual         | Perform average                          | Perform better than in face-to-face condition |

**Hypothesis 2a:** Participants in a live-presenter group perform better than participants in a virtual-presenter group on the listening task in the multicommutating environment.

**Hypothesis 2b:** Participants in a virtual group perform better than participants in a live-presenter group on the writing task in the multicommutating environment.

The social presence theory can be also examined from a different perspective. In a multicommutating environment, multiple task performance may reduce the degree of social presence because participants have to constantly shift their attention between two tasks. Thus, the interaction is perceived as less warm, personal, sociable and sensitive.

**Hypothesis 2c:** Participants in a multi-task group report a lower degree of social presence in comparison to participants in a single task group.

The dual coding theory posits that human information processing involves two independent, yet interconnected, systems: a verbal system and a visual system. Presenting information in both visual and verbal forms enhances recall and recognition and yields better results. Also, the psychological research (e.g. Wylie & Allport, 2000) claims that while multitasking, people switch between the tasks, even though the reaction time is



very short. Supporting the oral presentation with PowerPoint slides helps the participant switch between tasks more effectively because they can read the information from the slide ahead of time and then switch to another task. Thus, the information recall improves. However, the dual-channel condition does not affect the individual performances on the writing task.

**Proposition 3:** Presenting information in both visual and verbal forms improves information recall in a multicommutating environment (see Table 3).

The following hypothesis tests this proposition.

**Hypothesis 3:** Presenting information in both visual and verbal forms enhances participants' information recall on a listening task in the multicommutating environment.

On the other hand, presentation software constrains interpersonal engagement. The content on the PowerPoint slides shifts the audience's attention from the presenter to the material projected on the screen and lowers the quality of interaction. Thus, in a dual-channel situation, the impact of social presence is diminished.

**Table 3. Hypothesized performance in one-channel vs. dual-channel conditions**

| Channel condition | Listening                                    | Writing         |
|-------------------|--|-----------------|
| One channel       | Perform average                              | Perform average |
| Dual Channels     | Perform better than in one-channel condition | Perform average |

**Hypothesis 3a:** Participants in a dual-channel group report a lower degree of social presence in comparison with participants of a single channel group.

The prior research (e.g. Konig, Buhner, & Murling, 2005) suggests that people differ in multitasking abilities.

**Proposition 4.** The individual differences influence the participants' performance in the multicommutating environment .

Proposition 4 is tested with three hypotheses:

A commonly held perception is that women are better at multitasking is tested with the following hypothesis:

**Hypothesis 4a:** In the multicommutating environment, female participants will perform better than male participants.

Polychronicity is a personality trait that distinguishes between those who prefer to be engaged in two or more tasks or events simultaneously and are actually so engaged from those that would prefer to be only engaged in one task. Polychronic individuals are likely to perform better in a multicommutating environment than monochronic individuals.

**Hypothesis 4b:** Individuals who score high on the polychronicity scale perform better in the multicommutating environment than individuals who score low on the scale.

The concept of multitasking is related to the concept of polychronicity, however multitasking combines both speed and activity pattern dimensions rather than simply focusing on activity patterns as polychronicity. As a part of the experiment, the

multitasking scale is developed and validated. Individuals who score high on the multitasking scale can perform better than those who score low.

**Hypothesis 4c:** In the multicommutating environment, the individual's level of performance is positively correlated with participants' multitasking experiences.

Receiver apprehension is viewed as a broad-based information processing syndrome producing anxiety when message processing demands exceed processing capacity. In multicommutating situations, multiple communication task performance usually leads to an overload of information and increase in backlogs of unassimilated information, which leads to lower listening effectiveness. So, while multicommutating, highly apprehensive participants will exhibit decreased levels of performance on the listening task.

**Proposition 5:** Receiver apprehension, as an in-process variable, interferes with the task performance in the multicommutating environment.

This proposition is tested by the following hypothesis:

**Hypothesis 5:** Multicommutating interacts with receiver apprehension. While multicommutating, those with a high receiver apprehension perform lower on a listening task than those with a low receiver apprehension.

## **CHAPTER III: METHODS**

### **Participants**

Respondents for this study were 154 undergraduate students enrolled in introductory Communication courses (63 men and 91 women) in a large southeastern university. Research participation was a part of Communication 210 course requirement. Options were available for not participating in this study. The students who were enrolled in Communication 201 received extra credit for participation. The majority of participants (89 percent) were 18 - 21 years of age. To assess race of participants, individuals were asked to indicate which of seven categories they mostly identified with. They reported a variety of ethnic backgrounds (11 - African-Americans, 4 - Asian, 131 - Caucasian, 3 -Hispanic, 3 - Mixed Background, and 2 - Other). The students signed up for the experiment in advance. On the assigned day of the experiment, each participant read the informed consent form (see Appendix A).

The experiment included an on-line component. The university IT services created a custom course with 300 anonymous accounts on the university BlackBoard system. At the beginning of each experiment, each participant of the study was assigned the anonymous user ID and password to be able to log into the custom course.

When the participants logged into the custom course using their anonymous accounts, this was considered as their consent for participation in the study. They had a right to decline to participate in the study without penalty and withdraw from the study at any time without penalty and without loss of benefits.

The custom course was created for the following purposes: (1) to make the participation anonymous; (2) to make it possible for each student to participate in an online chat function; and (3) to collect and store survey responses from each participant. The participants were instructed to log into the custom course using their anonymous accounts.

### **Tasks Overview**

The participants of the study had two communication tasks to accomplish during the experiment: listening (15 min) and writing (10 min). The students were not instructed which of the tasks was primary and which was secondary. The listening task was in a form of a lecture (see Appendix B). The lecturer had an expertise in the topic and experience in teaching undergraduate and graduate courses in the large southeastern university. The participants were instructed to open the on-line chat window and respond to the text message that would be sent by chat moderator (principal investigator) during the lecture presentation. Five minutes after the beginning of the lecture, the moderator sent a text message to all participants. The message contained instructions on how to proceed to the writing task survey. All the survey questions were open-ended and required full answers (see Appendix C):

*“Please click on the ‘Writing Task’ button and proceed to the survey. You have 10 minutes to complete the survey. There is no right or wrong answers to any of these questions. All questions are open ended. Please answer the questions in the space provided. You can type in as many words as you want. Please, give full answers to the survey questions. Don’t abbreviate words.”*

The participants were not instructed to stop listening to the lecture after the moderator sent them the text message. They were instructed to write as much as they could while listening to the lecture and to keep on writing by the end of the lecture. They had to listen to the lecture and answer the survey questions simultaneously, i.e. the participants of the study were multicommutating. The survey was timed to last only 10 minutes so the students would finish writing the survey responses by the end of the lecture. When the lecture was over, they stopped writing the responses. The performance in the writing task was measured by the quantity of the written responses to the survey questions. Each individual received a final score that corresponded to the number of written characters.

At the end of the lecture, the participants of the study completed a multiple-choice quiz on the information presented in the lecture (see Appendix D). Each individual received a final score that corresponded to the number of correct answers. To motivate the participants, the eight best performing participants, those who received the highest score on the listening and writing tasks were awarded gift certificates.

### **Dependent Variable**

The individual performance in the multicommutating environment was measured by adding the scores earned by each participant after completing both the listening and the writing tasks. In order to give both variables equal weight, z-scores for both listening and writing were computed. The individual performance score in all four different groups was calculated using the following formula:

$$\textit{Individual Performance} = z\text{-score}(\textit{listening}) + z\text{-score}(\textit{writing})$$

Therefore, an individual's performance was measured by adding the z-scores earned from both the listening and the writing tasks. The higher scores represented better performances.

### **Independent Variables**

The study used an experimental research design to test the hypotheses presented earlier. The three treatments were: (1) task (single vs. multi), (2) social presence (live vs. virtual presenter), and (3) channel (one channel vs. dual channel). All experiments were run in one and the same computer lab and same time of the day (5pm) on Mondays, Tuesdays, and Thursdays. The lab environmental conditions remained constant during all experiments. There was no background noise or any kind of distractions for the participants. There were four experimental groups each consisting of 37-40 participants. The lab capacity was 19-20 seats, so the experiment for each treatment was repeated twice. The presenter stood in front of the computer stations. All the participants looked forward to presentation. Figure 1 is a picture of the lab in which all the experiments took place.



Figure 1. Lab condition

Condition 1 (labeled ‘Virtual-presenter group’) was a multi-task / one-channel / virtual-presenter group (40 participants);

Condition 2 (labeled ‘Live-presenter group’) was a multi-task / one-channel / live-presenter group (37 participants);

Condition 3 (labeled ‘Single task group’) was a single-task / one-channel / virtual-presenter group (37 participants);

Condition 4 (labeled ‘Two channel group’) was a multi-task / dual channel / live-presenter group (40 participants).

The first experiment was designed to measure the subjects’ performance under the multi-task / one-channel / virtual-presenter condition. The 40 participants of condition 1 listened to the previously recorded lecture on their computers. They were instructed to complete listening and writing tasks simultaneously (see Table 4). The lecturer did not use PowerPoint during his presentation.

The 37 participants of condition 2 listened to the live presentation and wrote messages simultaneously. The presenter was physically present in the room. In this case, the presentation was not supported by PowerPoint either.

During the third induction, 37 participants were assigned to the single-task condition. They listened to the previously recorded lecture on their computers. The lecturer did not use PowerPoint for his presentation. The students were instructed to complete listening and writing tasks sequentially. They listened to the lecture for 15 minutes. When the lecture was over they were asked to complete a 10-minute writing task.



Condition 4 was the dual-channel condition. The participants of group 4 listened to the presenter who was physically present in the room and wrote survey responses simultaneously. In the dual-channel condition the lecture (oral channel) was supported by PowerPoint presentation (visual channel). The summary of all conditions is presented in table 4.

To test hypotheses 4a through 5, the participants were administered the following scales: (1) multitasking scale (Kushniryk, 2008), polychronic-monochronic tendency scale (Lindquist & Kaufman-Scarborough, 2007); (2) social presence scale (Short, Williams & Christie, 1976); and (3) receiver apprehension test (Wheless, 1975). The example of the survey can be found in Appendix E.

**Table 4. Experimental groups**

|          | <b>Group 1</b>            | <b>Group 2</b>             | <b>Group 3</b>            | <b>Group 4</b>             |
|----------|---------------------------|----------------------------|---------------------------|----------------------------|
| <b>T</b> | <b>Multi task:</b> the    | <b>Multi task:</b> the     | <b>Single task:</b> the   | <b>Multi task:</b> the     |
| <b>R</b> | tasks are performed       | tasks are performed        | tasks are performed       | tasks are performed        |
| <b>E</b> | simultaneously            | simultaneously             | sequentially              | simultaneously             |
| <b>A</b> |                           |                            |                           |                            |
| <b>T</b> | <b>Virtual presenter:</b> | <b>Live presenter:</b> the | <b>Virtual presenter:</b> | <b>Live presenter:</b> the |
| <b>M</b> | the lecture was           | presenter was              | the lecture was           | presenter was              |
| <b>E</b> | previously recorded.      | physically present in      | previously recorded.      | physically present in      |
| <b>N</b> | The participants          | the room.                  | The participants          | the room                   |
| <b>T</b> | watched the               |                            | watched the               |                            |
|          | presentation on their     |                            | presentation on their     |                            |
|          | computers                 |                            | computers                 |                            |
|          | <b>One channel:</b> the   | <b>One channel:</b> the    | <b>One channel:</b> the   | <b>Two channels:</b> the   |
|          | participants listened     | participants listened      | participants listened     | information was            |
|          | only to oral              | only to oral               | only to oral              | presented orally           |
|          | message; no               | message; no                | message; no               | (lecture) and              |
|          | PowerPoint is used.       | PowerPoint is used.        | PowerPoint is used.       | visually (using            |
|          |                           |                            |                           | PowerPoint).               |

*Polychronicity.* Five-item Polychronic-Monochronic Tendency Scale (Lindquist & Kaufman-Scarborough, 2007) was employed to assess the individual's polychronic-monochronic tendency. Lindquist & Kaufman-Scarborough (2007) define this scale as "a five-item comprehensive 'reflective' single factor model. A reflective model is one where such things as the inherent (latent) tendency, position, or value structure of a person results in or drives certain behaviors, positions or feelings" (p.255).

This Likert-type scale was designed to measure: (1) preference to behave more monochronically or more polychronically, (2) to what extent a person reports typically behaving as preferred, (3) whether a person is comfortable behaving this way, (4) whether a person likes to juggle two or more activities at a time, and (5) whether a person sees behaving in his/her preferred way as the most efficient way to use time. Lindquist and Kaufman-Scarborough (2007) report excellent internal consistency value of this scale, i.e. Chronbach's alpha was .93. This scale was used to test the validity of the multitasking scale.

*Social presence.* The degree of social presence was measured using the original measure developed and tested by Short et al. (1976). As previously noted, social presence refers to the degree of salience of the other person in the communication interaction and the consequent salience of the interpersonal relationship. The social presence measure has been successfully tested in several empirical studies (e.g. Gunawardena & Zittle, 1997; Yoo & Alavi, 2001). A higher score represents a communication interaction with a higher degree of social presence. Four bi-polar scaled items characterized by dimensions such as personal/impersonal, sensitive/insensitive,

warm/cold and social/asocial will be assessed immediately after the session, using a seven-point semantic differential technique (Osgood, Suci, & Tannenbaum, 1957).

*Receiver apprehension.* The Receiver Apprehension Test (Wheeless, 1975) was used to assess subjects' levels of receiver apprehension. This instrument consists of twenty Likert-type items requiring subjects to reflect upon how they generally feel while receiving information. Previous research has documented both the reliability (.68-.94) and validity of the Receiver Apprehension Test as a measure of listening anxiety (e.g. Wheelless, Preiss, & Gayle, 1997).

*Task prioritization.* The participants of the study were not instructed which task (listening or writing) was primary and which one was secondary. Immediately after each session the participant ranked the tasks based on their perceived importance.

## CHAPTER IV: RESULTS

### Individual and Group Performances

The participants of the study completed listening and writing tasks during the experiment. In the multi-task condition, the individuals were asked to complete both tasks simultaneously. In the single-task condition, they were instructed to complete the tasks sequentially. The other manipulated treatments were live vs. virtual presenter and one channel vs. dual channels. In the live-presenter condition, the lecturer was physically present in the room, while in the virtual-presenter condition the participants watched the recorded lecture on their computers. In the one-channel condition, the live presenter delivered his lecture only orally. In the dual-channel condition, the live presenter used PowerPoint presentation software to support the oral message with the written one.

During the experiment, each respondent was exposed to a lecture on the history of ancient philosophy. After the lecture presentation, each participant of the study was instructed to take an 18-item quiz on information recall (see Appendix D). Each individual received a final score that corresponded to the number of correct answers. Analyzing the data collected from the participants of all four groups revealed the listening task scores had  $M=10.95$ ,  $SD=2.85$ , with a range of 4-17.

In addition, as part of the experimental inducement, each individual wrote the answers to the open-ended survey questions. Here some of the examples of their responses:

**Responses to question 1.** I am very glad you are participating in this study. I hope you have had fun during your spring break today. What did you do during the spring break?

*“I went to Panama City Beach for Spring break this summer. My friends and I had a great time on the beach having fun in the sun and the water”* (Respondent 006).

*“Nothing. I was incredibly sick the whole time and only recently got better. I actually was on pain killers because of my broken foot and cold medicine for my cold. So I was very high the whole time”* (Respondent 032)

*“During spring break, I went to Charleston, SC. My boyfriend is over visiting from Ireland. We went to Charleston to visit my grandparents and my aunt and uncle. We toured the city and got to see many historical places and things”* (Respondent 056).

*“I went home and relaxed for most of my break. I met up with several of my friends from home and went shopping several times. At the end of break I went to Nashville to see my grandmother. I wish it could have been longer though”* (Respondent 123).

**Responses to question 5.** In which part of the United States you would like to live? Why?

*“I would like to live in Florida because it is almost always hot down there, and I currently have a beach house in West Palm Beach. I love the sun, water, boating, and fishing. Florida is the ideal place to partake in these activities”* (Respondent 016).

*“I would absolutely love to live in Washington, D.C. It is absolutely my favorite city. I go every other year to visit. The museums, statues, all of it. I love it all. It's a city also where I won't have to drive. And I plan on going into politics. so that will be a great city”* (Respondent 034).

*“I would like to live in Colorado, but only if I got to live in the Rocky Mountains. I really like to ski, and it is constantly snowing on the slopes in most seasons there, which would be completely awesome”* (Respondent 065).

*“I would like to live in New York or maybe Atlanta. Why? Mostly because I want to be surrounded by the city and be somewhere where there is a lot going on”* (Respondent 128).

**Responses to question 7. If you won a million dollars how would you spend it?**

*“I would give ten percent to the Catholic Church. Then I would buy guns, put away 200,000 for grad and PhD school, and buy a house. That should get me started in my live”* (Respondent 009).

*“I would pay off my college education, get a car, and get a better apartment. Maybe go to Vegas also”* (Respondent 057).

*“I would travel and see the world. I would go everywhere that I wanted to go, and go for a long time. I really want to travel, so that's how I'd spend the money”* (Respondent 096).

*“First, I'm sure I would be taxed on it. After paying the taxes, I would give a gift to the church. Then I would divide to money into my different accounts by percentages.”* (Respondent 154).

The individual performance on the writing task was measured by counting the number of characters they produced ( $M=1039.49$ ,  $SD= 437.54$ , with a range 148 – 2733).

After examining the individual performances, the data were analyzed in terms of how the individual performances differed across the four conditions. The descriptive statistics of group performances can be found in Table 5. The participants in the virtual-presenter group had the lowest scores in listening and writing task performance, while the participants of the single-task group achieved the highest scores on both tasks.

**Table 5. Group performances**

|                     | Group             | N  | Mean    | Std. Deviation | Minimum | Maximum |
|---------------------|-------------------|----|---------|----------------|---------|---------|
| Writing task scores | virtual presenter | 40 | 925.55  | 461.31         | 148.00  | 2107.00 |
|                     | live-presenter    | 37 | 958.81  | 334.88         | 171.00  | 1676.00 |
|                     | single task       | 37 | 1280.13 | 519.42         | 436.00  | 2733.00 |
|                     | Two channel       | 38 | 1003.68 | 324.95         | 475.00  | 1674.00 |
| Listening scores    | virtual presenter | 40 | 10.05   | 2.96           | 4.00    | 16.00   |
|                     | live-presenter    | 37 | 10.48   | 2.62           | 4.00    | 15.00   |
|                     | Single task       | 37 | 11.86   | 2.78           | 7.00    | 17.00   |
|                     | Two channel       | 40 | 11.45   | 2.75           | 6.00    | 16.00   |

### **Single-task vs. Multi-task condition**

To determine if multitasking causes decreased performance levels when compared to individual task performance on the same tasks (Hypothesis 1), the individual performances in the virtual-presenter versus single-task group were analyzed. The participants in the both groups listened to the recorded lecture on their computers. People in the virtual-presenter group were assigned to the multi-task condition, while the individuals in the single-task group performed under the single-task condition. The *t*-test for the equality of means revealed significant mean differences in individual performances between the two groups  $t(75)=-3.86, p=.00$  (two-tailed). The overall performance in the single-task environment was better than in the multi-task situation. Hotteling's two-sample *t* test for multivariate analysis revealed the significant mean differences in the individual performances in both listening  $t(75)=7.63, p=.00$  (two-tailed), and writing tasks  $t(75)=10.06, p=.00$  (two-tailed). The participants of the single-task group scored higher on both tasks (see Table 5).

The next step of the investigation was to determine whether the individual performances were significantly different between the single-task group and live-presenter group. The *t*-test found a significant difference  $t(72)=-3.49, p=.00$  (two-tailed) in the overall performances of the participants in the single-task group vs. live-presenter group. Hotteling's two-sample *t* test also uncovered the considerable mean differences in individual performances in both listening  $t(72)=4.81, p=.03$  (two-tailed), and writing tasks  $t(72)=10.00, p=.00$  (two-tailed). The individuals in the single-task group scored higher on both tasks (also see Table 5). Thus, Hypothesis 1 was supported.



## Task Prioritization and Social Presence

To determine whether the degree of social presence influenced the performance while multicomputing (Hypotheses 2-2e), and whether the dual-channel condition affected the individual perceptions of the degree of social presence (Hypothesis 3a), the students were asked to (1) indicate their perception of task priority by answering the question if they considered the listening task to be the primary/secondary task, or if they perceived both tasks as equally important; (2) evaluate the degree of social presence using the social presence scale (Short et al., 1976). The results are presented in Table 5.

The data analysis showed that task prioritization did not differ across the groups ( $\chi^2(4, N=154)=4.64, p=n.s.$ ). As such, Hypothesis 2a was not supported; there were no significant differences in task prioritization between the live-presenter group and virtual-presenter group.

The four-item social presence scale (Short et al., 1976) was used to measure the degree of social presence during the lecture presentations. For this experiment, the degree of social presence had a mean 9.91 and standard deviation 3.84, with an alpha reliability of .81. The item means were found to be 2.47 on the 7-point Likert scale, and item variances 1.45. Overall, the participants of the study reported very a low degree of social presence during the experiments. The one-way analysis of variances between all four groups (ANOVA) revealed no significant differences in the degree of social presence between all groups ( $F(3, 154)=.69, p=n.s.$ ).

**Table 6. Task prioritization**

|                                   | Group             |                |             |             | Total |
|-----------------------------------|-------------------|----------------|-------------|-------------|-------|
|                                   | virtual presenter | live-presenter | single task | Two channel |       |
| Listening task was primary        | 17                | 16             | 23          | 19          | 75    |
| Listening task was secondary      | 18                | 16             | 9           | 15          | 58    |
| Both tasks were equally important | 5                 | 5              | 5           | 6           | 21    |
| Total                             | 40                | 37             | 37          | 40          | 154   |

Hypotheses 2a and 2b tested whether the difference between task prioritization and the degree of social presence would affect the performance. The overall performance on the listening task in the live-presenter group increased only 2.3% in comparison with the virtual-presenter group. The writing task performance was increased by 1.1%.

The overall productivity on listening and writing tasks was calculated as sum of earned scores by all participants in a group divided by the sum of the maximum possible scores. For example, the individual performances in the virtual-presenter group on the listening task ranged from 4 to 16 points. The 40 participants in the virtual-presenter group earned overall 458 points on listening task performance. The highest total points that a participant could earn were 18 points on the listening test. Ideally, the participants of the study could earn 720 points if everyone received a perfect score. The productivity of the virtual group is 402 divided by 720 equals .5583 or 55.83%. The productivity of a

live-presenter group is  $388/667=.5817$  or 58.17%. Thus, the overall group performance on the listening task in the live-presenter group increased by 2.3% in comparison with the virtual-presenter group.

However, this increase in performance was not considerable; the *t*-tests uncovered no significant differences between students' performances on both listening ( $t(75)=-.682$ ,  $p=n.s.$ ) and writing ( $t(75)=-.360$ ,  $p=n.s.$ ) tasks in a live-presenter group and virtual-presenter group. Consequently, Hypothesis 2- 2e, and 3a were not supported.

### **Dual Channels**

To assess whether presenting information in both visual and verbal forms enhances participants' information recall on a listening task in the multicommutating environment (Hypothesis 3), the mean score of the listening task was compared across the groups. The participants' performance in the virtual group versus the dual-channel group was found to be significantly different  $t(78)= -2.18$ ,  $p= .03$  (two-tailed). The mean of the listening task performance in the virtual group was 10.05 with  $SD=2.75$ , while the mean listening task performance in two-channel group was higher ( $M=11.45$ ,  $SD=2.96$ ). The individual performances on the listening task in the live-presenter group increased by 7.8% in comparison with the virtual-presenter group. Thus, the participants in the two channel groups performed better on the listening task than did the participants of the virtual-presenter group. However, the participants in the live-presenter group did not produce the significant mean differences in listening task performances as compared to those in the two channel group ( $t(75)=-1.57$ ,  $p=n.s.$ ). The two channel group performance on the listening task improved only by 5.5% compared to the live-presenter group.

A comparison of the single-task group performance ( $M=11.86$ ,  $SD= 2.78$ ) with the two channel group performance ( $M=11.45$ ,  $SD=2.75$ ) revealed no significant mean differences ( $t(75)=.65$ ,  $p=n.s.$ ). The two channel group performance decreased only by 1.7% as compared to the single-task group. As shown in the Figure 1, the participants in the single-task group demonstrated the best performance in listening. At the same time, the participants of the two channel group did a little bit worse than the individuals in the single-task group. In comparison with the virtual-presenter group and live-presenter group performances, the participants of the two-channel group showed improvement in listening.

The analysis of variance for the writing task performances between the three multi-task groups (virtual-presenter group, live-presenter group, and two channel group) revealed no significant differences ( $F(2, 117)= .41$ ,  $p=n.s.$ ). As hypothesized, the dual-channel condition did not have an impact on the writing task performance in the multicommuting environment. However, it was found the individuals in the single-task group produced more written messages (10.9% increase) than the participants in the two-channel group ( $t(73)=2.77$ ,  $p=.00$ ). The mean differences across the groups are depicted in Figure 2. The percentage increases in group performances are summarized in Table 7.

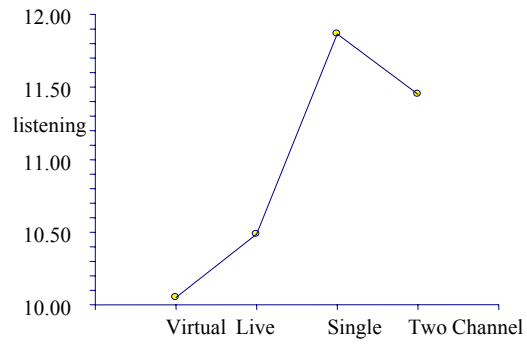


Figure 2. Means of listening task scores across the groups

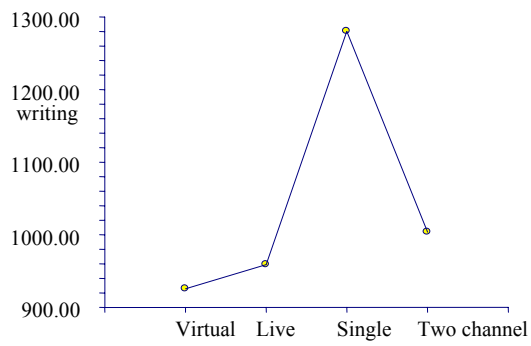


Figure 3. Means of writing task scores across the groups

**Table 7. Improvement in live-presenter, single task and two channel group performances compared to virtual-presenter group**

|                      | Listening task | Writing task |
|----------------------|----------------|--------------|
| Live-presenter group | 2.3%           | 1.1%         |
| Single-task group    | 9.5%           | 11.8%        |
| Two channel group    | 7.8%           | 0.9%         |

### **Sex Differences and Multicommunicating**

To determine whether women performed better than men in the multicommunicating environment (Hypothesis 4a), the Hotteling's two-sample *t* test was applied to test sex differences within the individuals' performances. The analysis revealed no significant sex difference in performances ( $t(113)=4.48, p=n.s.$ ).

### **Polychronicity**

Another hypothesis (4b) addressed the question whether polychronic individuals would perform better under the multitasking condition than monochronic individuals. The Polychronic-Monochronic Tendency Scale (Lindquist & Kaufman-Scarborough, 2007)

was used to assess the level of individuals' polychronicity. For the experiment, the scale had  $M=15.67$ ,  $SD= 4.38$ , and an alpha reliability  $=.91$ . The overall item mean was  $3.13/5$  indicating that the participants of the study had tendencies to be more polychronic than monocronic. To find out whether polychronic individuals performed better in a multicommutating environment, a Pearson correlation was run on performance and polychronicity scores. The test revealed no significant correlation between polychronicity and overall performance ( $r(115)=.05$ ,  $p=n.s.$ ), polychronicity and listening ( $r(115)=.13$ ,  $p=n.s.$ ), and polychronicity and writing ( $r(115)=-.05$ ,  $p=n.s.$ ) in the multicommutating environment. No statistically significant difference was found in the polychronicity scores for men and women.

### **Multitasking**

The multitasking scale was developed by the researcher and found to be reliable. The survey questionnaire consisted of 19 initial items. The 19-item scale demonstrated acceptable alpha reliability ( $\alpha=.82$ ). Balancing the need for a high level of internal consistency and sufficient variance in item responses, 16 of the original 19 items were retained. Three items, which had less than 0.3 inter-item correlations (see Table 8), were removed from the scale: *I like talking on the phone while I am driving*, *I frequently listen to music when exercising*, *I usually read when I eat*. The index for internal consistency (Chronbach's alpha) for the 16-item Multitasking Scale became .83. The correlations between individual items and the total scale scores ranged from .25 to .61. The scale had  $M=51.01$ ,  $SD=9.97$ . The overall item mean was  $3.18/5$ , indicating that participants of the study scored higher than average on the multitasking abilities.

**Table 8. Multitasking scale item reliability**

|   | Scale Mean if<br>Item Deleted | Scale Variance<br>if Item Deleted | Corrected<br>Item-Total<br>Correlation | Cronbach's<br>Alpha if<br>Item<br>Deleted |
|---|-------------------------------|-----------------------------------|--|---|
| <b>I like talking on the phone while I am driving (deleted item).</b>   | <b>57.9732</b>                | <b>109.486</b>                    | <b>.148</b>                            | <b>.827</b>                               |
| <b>I frequently listen to music when exercising (deleted item).</b>   | <b>56.6913</b>                | <b>111.026</b>                    | <b>.151</b>                            | <b>.824</b>                               |
| I frequently flip between different shows when watching television.   | 57.2349                       | 107.532                           | .255                                   | .821                                      |
| I can easily understand and comprehend material presented in class lectures while I am doing something unrelated. | 58.3758                       | 102.723                           | .499                                   | .808                                      |
| I frequently IM (Instant Message) while I am performing other work on my computer.                                | 58.4899                       | 103.576                           | .287                                   | .822                                      |
| Multitasking stresses me out.   | 57.7114                       | 101.761                           | .604                                   | .804                                      |
| I often concentrate on completing one task before moving on to another.   | 58.3490                       | 99.107                            | .579                                   | .803                                      |
| I feel overwhelmed trying to handle more than one task at a time.   | 57.8523                       | 100.154                           | .614                                   | .802                                      |
| I frequently do other tasks while talking on the phone.   | 57.2148                       | 107.508                           | .281                                   | .819                                      |
| It is easy for me to keep track of multiple projects simultaneously.  | 57.8054                       | 106.455                           | .397                                   | .814                                      |
| I find it difficult to concentrate on tasks when people talk to me.   | 58.5436                       | 105.507                           | .375                                   | .815                                      |
| I like to have a TV on while I read.  | 59.2617                       | 102.776                           | .422                                   | .812                                      |
| I often listen to music when studying (working).  | 58.1208                       | 102.837                           | .315                                   | .820                                      |
| I frequently try to accomplish several projects or tasks at the same time.  | 58.2282                       | 101.839                           | .544                                   | .806                                      |
| I agree with the saying: "To do two things at once is to do neither".   | 57.8591                       | 99.162                            | .590                                   | .803                                      |
| Multi-tasking makes me tired.   | 58.0134                       | 103.581                           | .465                                   | .810                                      |
| I usually close programs/browsers before opening other programs/browsers when using a computer.                   | 57.3557                       | 100.596                           | .507                                   | .807                                      |
| I frequently keep multiple programs/browsers open on my computer.   | 57.3691                       | 100.910                           | .498                                   | .808                                      |
| <b>I usually read when I eat (deleted item).</b>  | <b>58.8121</b>                | <b>107.235</b>                    | <b>.211</b>                            | <b>.825</b>                               |



The Pearson correlation revealed a high positive correlation between multitasking scores and polychronicity scores ( $r(152)=.71, p=.00$ ). Thus, the multitasking scale is reliable. In addition, there was no statistically significant difference between the multitasking scores for men and women. The next step of the research was to undertake a factor analysis of the 16-item data to identify different indices of multitasking. Data reduction was carried out using a principal components Varimax rotation factor solution approach. The extraction was based on Eigenvalues of at least 1. The Scree Plot indicated a four-factor solution, as did the variances explained. The identified four underlying factors in the data explained 57% of variance (see Table 9).

Factor 1 items *I feel overwhelmed trying to handle more than one task at a time, Multitasking stresses me out, Multi-tasking makes me tired, It is easy for me to keep track of multiple projects simultaneously, I agree with the saying: "To do two things at once is to do neither," I often concentrate on completing one task before moving on to another* were highly inter-correlated. These items describe the ‘general multitasking abilities’ or ‘attitudes towards multitasking.’ The factor analysis also showed items *I often listen to music when studying (working), I like to have a TV on while I read, I frequently flip between different shows when watching television, I can easily understand and comprehend material presented in class lectures while I am doing something unrelated* as highly correlated. These items are related to breaking the monotony of work. The items in the second factor were specifically written to measure the ability to perform primary and secondary task simultaneously. The items *I usually close programs/browsers before opening other programs/browsers when using a computer, I frequently keep multiple programs/browsers open on my computer,* which referred to ‘computer’ multitasking, loaded together for a third factor.

**Table 9. Component matrix**

|   | Component   |             |             |             |
|---|-------------|-------------|-------------|-------------|
|   | 1           | 2           | 3           | 4           |
| I feel overwhelmed trying to handle more than one task at a time.   | <b>.765</b> | .101        | .132        | .260        |
| Multitasking stresses me out.   | <b>.738</b> | .096        | .056        | .242        |
| Multi-tasking makes me tired.   | <b>.715</b> | -.111       | .352        | -.024       |
| It is easy for me to keep track of multiple projects simultaneously.  | <b>.683</b> | .070        | -.063       | .112        |
| I find it difficult to concentrate on tasks when people talk to me.   | <b>.601</b> | .212        | .027        | -.078       |
| I agree with the saying: "To do two things at once is to do neither".   | <b>.593</b> | .267        | .323        | .125        |
| I often concentrate on completing one task before moving on to another.   | <b>.493</b> | .130        | .237        | .471        |
| I often listen to music when studying (working).  | .089        | <b>.786</b> | .173        | -.169       |
| I like to have a TV on while I read.  | .361        | <b>.609</b> | -.025       | .041        |
| I frequently flip between different shows when watching television.   | -.083       | <b>.559</b> | .118        | .158        |
| I can easily understand and comprehend material presented in class lectures while I am doing something unrelated. | .270        | <b>.470</b> | .097        | .357        |
| I usually close programs/browsers before opening other programs/browsers when using a computer.                   | .182        | .147        | <b>.911</b> | .103        |
| I frequently keep multiple programs/browsers open on my computer.   | .110        | .161        | <b>.901</b> | .174        |
| I frequently do other tasks while talking on the phone.   | -.041       | .029        | .083        | <b>.723</b> |
| I frequently try to accomplish several projects or tasks at the same time.  | .232        | .527        | .041        | <b>.538</b> |
| I frequently IM (Instant Message) while I am performing other work on my computer.                                | .176        | .018        | .070        | <b>.534</b> |

One of the very interesting findings of this study was that the items *I frequently do other tasks while talking on the phone, I frequently try to accomplish several projects or tasks at the same time, I frequently IM (Instant Message) while I am performing other work on my computer* were also highly inter-correlated. It is possible that these items are related to time pressure factors and may constitute another variable in multitasking abilities.

Hypothesis 4 posited that the relationship between the subject's performance scores and the multitasking scores would be positive, i.e. the more a person was engaged in multitasking the better the performance in the multicommutating environment. For this purpose, the final multitasking scores were correlated with the overall performance scores, (the listening task scores plus the writing task scores). It was found that there was not a significant relationship between overall performance and multitasking experiences ( $r(115)=.176, p=n.s.$ ), as well as the writing task performance and multitasking experiences ( $r(115)=.028, p=n.s.$ ). However, the multitasking experiences were positively correlated with the individual performance on the listening task ( $r(115)=.208, p=.02$ ). This result guided the researcher to analyze which of the four factors of the Multitasking Scale predicts performance on both tasks under the multi-task condition.

A linear regression was conducted on the four factor scores to determine if one of the factors could predict the subjects' performances. The backward elimination regression procedure eliminated the insignificant variables (factor 2, factor 3, and factor 4) and determined that only factor 1 items *I feel overwhelmed trying to handle more than one task at a time, Multitasking stresses me out, Multi-tasking makes me tired, It is easy for me to keep track of multiple projects simultaneously, I agree with the saying: "To do*

*two things at once is to do neither", I often concentrate on completing one task before moving on to another* were a significant predictor of the overall performances on the both tasks  $t(1)=2.65, p=.01, \beta=.24$ . Factor 1 items were labeled 'Attitudes towards Multitasking Subscale.' This factor items explained 5.8% of the variance in performance in the multicommutating environment. The factor 1 item scores were found to be predictors of the listening task performance  $t(1)=2.96, p=.00, \beta=.26$ . The subscale scores explained 6.4% of variance of the individuals' performances on the listening task. However, the subscale scores were not a predictor of performance on the writing task ( $t(1)=.64, p=n.s$ ).

Considering the improvement of the predicted power of the Attitudes towards Multitasking Subscale, the researcher decided to add one more item to this subscale. Item *I can easily understand and comprehend material presented in class lectures while I am doing something unrelated* was specially designed to measure individual abilities to multitask during lectures. A linear regression analysis was used to test whether adding one more item to the subscale would make its prediction power more accurate. The test revealed that the 8-item Attitudes towards Multitasking Subscale explained 6.5% (comparing to 5.8% of the 7-item scale) of the variance in performance in the multicommutating environment ( $t(1)=2.78, p=.00, \beta=.256$ ). This improved 8-item scale was found to be a better predictor of the listening task performance ( $t(1)=3.19, p=.00, \beta=.288$ ), which explained 8.3% of the variance in listening task performances under multi-task condition. Nevertheless, there was no relationship between the updated subscale score and writing task performances.

## Receiver Apprehension

Hypothesis 5 predicted that individuals with a higher receiver apprehension score would perform at a lower level on the listening task than the individuals with a higher score. The analysis uncovered no significant relationship between the listening task performance and receiver apprehension ( $r(115)=-.179, p=.055$ ), and also no relationship between the writing task performance and receiver apprehension ( $r(115)=-.138, p=n.s.$ ). The overall performance on both tasks was significantly and negatively correlated with the individual's receiver apprehension score ( $r(115)=-.218, p=.02$ ), suggesting that those who had higher receiver apprehension performed at a lower rate than those who scored lower when engaged in both tasks.

The median split technique was used to determine if low apprehensive individuals performed better in the multitasking environment. The participants reported their receiver apprehension scores with  $M=43.98, SD=10.44, MD=42$ , with a range from 22 to 72. The reported scores were split into two groups. Group one consisted of the low apprehensive individuals who scored 42 and lower, while group two was composed of the high apprehensive individuals who scored 43 and higher. The two sample  $t$ -test revealed significant differences in individual overall performances on both listening and writing tasks  $t(111)=2.48, p=0.01$ . The low apprehensive individuals performed significantly better than the high apprehensive individuals in the multicommutating environment. However testing writing and listening scores separately, the  $t$ -test uncovered no significant differences between low apprehensive and high apprehensive participants on listening task ( $t(111)=1.31, p=n.s.$ ) and writing task ( $t(111)=1.30, p=n.s.$ ) performances.

## **Predictors of Multi-task Performance**

The research question posited what variables predicted individual performances in the multicomputing environment. A multiple regression analysis was conducted to address this question. The predictor variables were the scores on the 8- item 'attitudes towards multitasking' index, receiver apprehension, degree of social presence, polychronicity scales, and the categorical variables sex, task prioritization, and group condition. The dependent variable was overall performance. The regression equation yielded an  $F(7, 117)=2.63, p=.01$ . The R-squared coefficient was equal .152, indicating that 15.2% of the variance in respondents' performances could be explained by the predictor variables.

The results of the statistical analysis indicate that not all of the variables are significant in predicting an individual's performance under multitasking conditions (see Table 10). The significant predictors are the attitudes towards multitasking index, receiver apprehension, and group condition. The degree of social presence, polychronicity, task prioritization, and sex of the participants were not found to be significant predictors of individual performances.

**Table 10. Performance predictors in the multicomcommunicating environment**

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| Model                                 | Unstandardized Coefficients |             | Standardized Coefficients | T             | Sig.        |
|---------------------------------------|-----------------------------|-------------|---------------------------|---------------|-------------|
|                                       | B                           | Std. Error  | Beta                      |               |             |
| (Constant)                            | -.877                       | .949        |                           | -.924         | .358        |
| <u>Attitudes towards multitasking</u> | <u>.070</u>                 | <u>.029</u> | <u>.300</u>               | <u>2.395</u>  | <u>.018</u> |
| <u>Receiver apprehension</u>          | <u>-.024</u>                | <u>.011</u> | <u>-.207</u>              | <u>-2.249</u> | <u>.027</u> |
| Social presence                       | -.003                       | .033        | -.010                     | -.102         | .919        |
| Polychronicity                        | -.048                       | .038        | -.158                     | -1.262        | .210        |
| <u>Group condition</u>                | <u>.213</u>                 | <u>.100</u> | <u>.199</u>               | <u>2.128</u>  | <u>.036</u> |
| Sex                                   | -.006                       | .259        | -.002                     | -.024         | .981        |
| Task prioritization                   | .149                        | .174        | .078                      | .857          | .393        |

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**Table 11. Supported hypotheses**

| Hypotheses    | Content   |               |
|---------------|---|---------------|
| Hypothesis 1  | Individuals perform better when involved in one communication task at a time (single task) than when involved in multicommutating (multi task).   | Supported     |
| Hypothesis 2  | Participants of a live-presenter group consider the listening task as the priority, while the participants of a virtual group consider the writing task as the priority.  | Not supported |
| Hypothesis 2a | Participants of a live-presenter group perform better than participants of a virtual group on the listening task in the multicommutating environment.   | Not supported |
| Hypothesis 2b | Participants of a virtual-presenter group perform better than participants of a face-to-face group on the writing task in the multicommutating environment.   | Not supported |
| Hypothesis 2c | Participants of a multi-task group report a lower degree of social presence in comparison to participants of a single-task group.   | Not supported |
| Hypothesis 3  | Presenting information in both visual and verbal forms enhances participants' information recall on a listening task in the multicommutating environment. The dual-channel condition does not affect the individuals' performances on the writing task. | Supported     |
| Hypothesis 3a | Participants of a dual-channel group report a lower degree of social presence in comparison with participants of a single channel group.  | Not supported |
| Hypothesis 4a | In the multicommutating environment, female participants perform better than male participants.   | Not supported |
| Hypothesis 4b | Individuals who score high on the polychronicity scale perform better in the multicommutating environment than individuals who score low.   | Not supported |
| Hypothesis 4c | In the multicommutating environment, the individual performances are positively correlated with participants' multitasking experiences.   | Supported     |
| Hypothesis 5  | Multicommutating interacts with receiver apprehension. While multicommutating, those with a high receiver apprehension perform worse on a listening task.   | Supported     |



## **CHAPTER V: DISCUSSION and LIMITATIONS**

### **Discussion**

The primary purpose of this research was to investigate the predictors of individual performances in the multicommutating environment. The results indicated that environment as well as individual differences are significant predictors of individual performances within the multi-task condition. The regression analysis found that group condition, attitudes towards multitasking, and the degree of receiver apprehension are the best predictors of individual performances in the multicommutating environment.

The results of the study also revealed that multitasking or accomplishing two tasks either simultaneously or in the rapid succession decreases the overall individual performance outcomes. On the other hand, the results of the study also suggest that this decrease in individual performances can be reduced under certain conditions.

The findings are consistent with the Levine, Kushniryk, Allard and Tenopir (2007) study suggesting that multitasking has become an important variable in the input-process-output model of Adaptive Structuration Theory. Multitasking can be controlled or managed by the organizations. This control can be exerted by the organizations deciding whether to allow meeting attendees to do anything other than follow the meeting agenda and focus all of their attention on the speaker. However, the meeting environment may encourage or discourage meeting attendees to simultaneously pursue different goals. In this type of situation, Levine, et al. (2007) suggested that multitasking may be considered both an input variable and output variable, which affects the overall outcome quality, satisfaction and productivity of the meetings.

### ***Group Condition***

Consistent with the Naveh–Benjamin, Craik, Perretta, and Tonev (2000) study it was found that multitasking significantly decreases memory and performance on the listening task. At the same time it was found that multitasking not only decreases the performance of the listening task but also it affects performance of the writing task. The participants of the single-task group remembered more information from the lecture and were able to produce more written messages than those who were multitasking. The findings provide quite convincing evidence that focusing on one task leads to better performance of that task as compared with alternating among two tasks.

On the other hand, it took 25 minutes for the participants of the single-task group to complete the assignments while the participants of the multi-task groups completed the same two tasks in 15 minutes. Even though multitasking decreases performance, it still can be viewed as a time-saving strategy.

The researcher hypothesized that in the multicommutating environment, the presence of the lecturer (i.e., the degree of social presence) might affect the task prioritization and performance. In the virtual-presenter condition the participants of the study might consider the listening task as being secondary and the writing task as being the most important. In the live-presenter situation the task prioritization would be different; the individuals would assume that listening was their priority while writing was the interfering task. This task prioritization would affect the performance, as the participant would perform on the writing task in the virtual-presenter condition, and on the listening task in the live-presenter condition. The researcher examined how both social presence and task prioritization influence the overall performance in the

multicommunicating environment. The results showed that neither social presence nor task prioritization influenced the performance in the multi-task condition.

The results of the study are consistent with Gunawardena (1995) and Gunawardena and Zittle (1997) findings that social presence is not largely the attribute of the communication medium but the user's perception of the medium. In the multitasking environment, the perceived degree of social presence was the same in the virtual- and live-presenter conditions.

This research did not find evidence that the presence of the sender can influence the recipients' understanding of the message (Miranda & Saunders, 2003). The findings didn't confirm the hypothesis that, in the virtual-presenter condition, it is more likely that specific comments are entirely ignored as individuals are unable to perceive others' urgency and consequential emotional reactions. The experiment uncovered that the presence of the sender did not affect the performance on the listening as well as on the writing tasks.

Although this work did not find the link between social presence and task prioritization in multi-task groups, the majority of participants (62%) of the single-task group (see Table 5) indicated that they considered the listening task as their priority, and the writing task as being secondary. The task prioritization was different but not as hypothesized between virtual- and live-presenter condition, but between single-task and multi-task conditions. The possible explanation of these findings is that multitasking situations usually include uncertainty and unpredictability (Delbridge, 2000). In single-task situations, the individuals are less confused with the task priority.

One interesting finding indicates that the listening task performance can be improved if the oral message is supported by the written one. The participants of the dual-channel group showed a significant improvement on the listening task in comparison with the participants of the virtual-presenter group.

The findings also contradict one of the assumptions of the limited capacity theory of information processing (Lang, 2000), which posits that an arousing message can impede information processing. Adding computer-generated slides to a lecture places additional information processing demands upon the audience because arousing material makes particularly high demands on information processing resources. The opposed relationship exists between humans' processing capacity and arousing messages that consume this capacity. Thus, according to this theory presenting the information orally and visually can overload information processing resources. An audience experiencing such overload is unable to effectively encode, store, or retrieve messages (Lang, 2000).

More importantly, if computer-generated slides in the classroom overloaded participants' information processing resources, then there was a good chance that the participants of the study would have performed lower on the listening task in the dual-channel condition. On the contrary, the subjects in the dual-channel condition significantly improved the individual performances on the listening task.

These results are consistent with the assumptions of the dual coding theory (Paivio, 1986). The theory posits that human information processing involves two independent, yet interconnected, systems: a verbal system and a visual system. Moreover, humans are able to process visual information more readily than auditory information (Basil, 1994). Thus, presenting information in both visual and verbal forms enhanced

lecture recall and yielded better results in listening task performances under the multi-task condition.

In addition, the results of the study were also consistent with the assumptions of the strategic response deferment theory (Meyer & Kieras, 1997). This theory posits that when people multitask they are not actually performing two tasks simultaneously, they are switching between the tasks even if the task switching occurs within a tenth of a second delay. Therefore, supporting the presentation with the PowerPoint helped the participants to switch between the tasks more effectively. When their attention was switched from listening to the writing task, in the dual-channel condition, the participants of the study had a possibility “to catch up” with the lecture by reading the information from the slides. In the one-channel condition the participants of the study did not have this possibility, so their performance on the listening task decreased.

These findings can be used to construct a strong argument in support of PowerPoint in the multicomcommunicating environment.

### ***Sex Differences and Multicomcommunicating***

The finding regarding biological sex was especially interesting because the widely-held belief that women in general are better at multitasking than men was not supported by the data. The overall performance on both listening and writing tasks and the performance on individual task did not differ between men and women. It was also found that women did not even score significantly higher on polychronicity and multitasking abilities. Thus, this study replicates the findings of the study by Francis-

Smythe and Robertson (1999) that also found no statistically significant difference in polychronicity scores between men and women.

The possible explanation of the results is that the majority of the participants of the study were 18-21 year olds. The females' polychronic and multitasking tendency is often thought to be connected with the division of labor within households, which creates more time pressure for women and involves not only more overall time commitment but more multitasking (Craig, 2006; Creighton, 1999). The 18-21-year-old females are not confronted with the multiplicity of roles within the households, therefore the sex differences in overall performances, polychronicity scores and multitasking scores were not found. Further, this generation has grown up engaging in multitasking on the computer where this was not the case for earlier generations.

### ***Polychronicity and Multitasking***

As discussed earlier, the polychronicity construct is expected to include measures of preferred behavior and feelings about both polychronicity and monochronicity and what they perceive is right for them. Polychronicity was not found to be a predictor of the performances in the multicomputing environment. The individual preference to be engaged in simultaneous activities does not actually mean that this person can perform better under the multi-task condition. The study revealed that 18-21-year-old undergraduate students on average scored very high on polychronicity (overall mean values 3.13/5). Lindquist and Kaufman-Scarborough (2007) reported the average mean of 2.67/5 on the Polychronic – Monochronic Tendency Scale. In their study the respondents'

ages varied from 18 to 45. Thus, the 18-21-year-old undergraduate students have a tendency to be more polychronic than the older generation.

The multitasking concept combines both speed and activity pattern dimensions rather than simply focusing on activity patterns as polychronicity. As part of the experiment, the 16-item Multitasking Scale was developed and tested. This scale was found to have an acceptable reliability level (Chronbach's alpha .83). To assess the scale's construct validity, correlations were also run between Polychronic – Monochronic Tendency and Multitasking scales. The correlation of .71 is at the 'large' level, meaning that these two scales are related. The research confirms that multitasking abilities are multi-faceted. A reflective model is composed of four main indicators: 1) general multitasking abilities and attitudes toward multitasking, 2) computer multitasking, 3) ability to perform primary and secondary tasks simultaneously, and 4) multitasking caused by time pressure. These results, coupled with the alpha scores of the test, warrant the conclusion that the Multitasking Scale is a reliable and valid measure of an individual's multitasking abilities.

### ***Multicommunicating***

The statistical analysis of the data showed that polychronicity and multitasking abilities are not predictors of the individual overall performances in the multicommunicating environment. Multitasking abilities were found to be only the predictors of the listening task performances. However, one of the facets of the multitasking scale 'general multitasking abilities and attitudes toward multitasking' was found to be a predictor of the individual performances in the multicommunicating

environment. This subscale includes eight items: *I feel overwhelmed trying to handle more than one task at a time, Multitasking stresses me out, Multi-tasking makes me tired, It is easy for me to keep track of multiple projects simultaneously, I agree with the saying: "To do two things at once is to do neither", I often concentrate on completing one task before moving on to another, I can easily understand and comprehend material presented in class lectures while I am doing something unrelated.* These results of the study suggest that the construct of multitasking is multi-faceted, and multicomputing is one of the facets of multitasking.

### ***Receiver Apprehension***

The results from the initial hypothesis assessing relationship between receiver apprehension and listening task performance demonstrated some support for the claim that highly apprehensive individuals do not perform well in the multicomputing environment. The results of the study were quite unexpected because only the relationship between overall performance and receiver apprehension was found. These findings are consistent with Wheelless' et al. (1997) claim that information receiver apprehension can be viewed as an in-process variable that interferes with the performance of behaviors that adapt to the environment. In the multicomputing environment the level of receiver apprehension affects not only processing outcomes as message information is being received and perceived, but also processing outcomes as message information is being produced. It seems relatively clear that being less apprehensive about listening is an index of better performance under within the multi-task condition.



## **Limitations and Future Research**

Like other social science research, this project has several limitations. This study employs an experimental design such that it inherits the limitations of this research methodology. Using a controlled laboratory environment with both a tightly scripted conditions and a limited time frame suggests limited generalizability of the results of this research. Therefore, any results from this investigation should be considered in light of group characteristics, message content, technology environment, and context.

A similar limitation involves the use of convenience sample for this study. The researcher used student participants of similar demographic backgrounds because of the challenge in the nature and execution of the study. The choice of the participants was based on the following factors: 1) the study objective was to see how individuals' performances change in the multicomputing environment; and 2) the only demographic variable that was taken into consideration was sex of the participants. However, it is important to note that the reported results are only generalizable to these undergraduate students in a large Southeastern public university.

An experimental study of this nature always raises questions related to the Hawthorn effect, and the concern that the participant's behavior may have changed as a result of being observed. In the virtual-presenter group, the participants of the study were supposed to listen to the lecture recorded on their computers. The presence of the presenter was hypothesized to influence task prioritization and consequently the task performance. During the experiment in the virtual-presenter condition, the observer was still present in the lab and the participants were still observed. The presence of the

observer might have affected the task prioritization and the participants put the same amount of effort into the listening task as in the live-presenter group. This is probably the explanation why the performances in virtual and live-presenter conditions did not differ significantly.

Several new research questions emerged from this study. These include the following: (1) What relationship exists between multi-communication and demographic variables such as age and educational level? (2) What is the impact of multicommunicating on group decision making? (3) What individual characteristics, other than receiver apprehension and multitasking abilities, are predictors of the individual performances in the multitasking environment? (4) To what extent is the preference for multicommunicating a cultural phenomenon?

For example, future research can investigate individual performances in the multicommunicating environment involving participants of different ages. The undergraduate students differ from the general population not only in age, socioeconomic status, and general education level, but also possibly in skills and attitudes towards multitasking. Multitasking is usually related to availability of technology. The 18-21 year olds grew up with more technology available than, for example, 30 year old people. The 18-21 year olds may have significantly different multitasking abilities than older generations.

Second, organizational meetings usually involve decision making, except for information sharing meetings (Wasson, 2004). Five types of organizational meetings have been identified which are common in the workplace: ceremonial and social (Volkema & Niederman, 1996), informational and training (Burlison, 1990), problem

solving (Doyle & Straus, 1976), monitoring and coordinative (Napier & Gershenfeld, 1989), and delegating tasks (Kieffer, 1988). These different meeting types range from task to relational purposes; and in all of them meeting attendees participate in the decision making processes. The study did not address this important aspect of the organizational meeting. According to DeSactis and Poole (1994), adaptive structuration theory of input-process-output groups create and undergo the use process, which is characterized by their modes of appropriation, and in turn leads to certain outcomes, the predictability of which is based on the appropriation. Multitasking and decision making are two process variables that influence meeting outcomes. In the present study, the participants were completing listening and writing simultaneous tasks simultaneously. In the future it will be interesting to study how multicommutating interferes with a decision making task, i.e. how the individuals cope with performing three task simultaneously.

Third, the study revealed that some people may be better than others in multicommutating. It was found significant negative correlation between receiver apprehension and performance under multi-task condition. The future research can explore the possible existing relationships between multicommutating and other communication variables such as communication apprehension, communication competence, locus of control, listening styles, etc.

Further, Bluedorn (2002) grounded his work on polychronicity in the work of Edward Hall (1983) suggesting that one's preference for and multitasking might be cultural. It would be useful to examine if multitasking abilities vary culturally.

Finally, field research in actual organizations with working groups would potentially provide more insights.

## **Conclusion**

This study evaluated the impacts of multicommutating behavior on individual performances on listening and writing tasks and overall productivity.

Multicommutating was defined as accomplishing multiple-task communication goals in the same general time period either simultaneously or by engaging in frequent switches between individual tasks.

The researcher compared several factors (social presence, multitasking abilities, polychronicity, task prioritization, and receiver apprehension) for three different treatments (multi task vs. single task, live presenter vs. virtual presenter, one channel vs. two channels). In addition, the scale to measure multitasking abilities was developed and validated during the experiment.

It was found that multitasking or completing two tasks simultaneously significantly decreases performances on both tasks. The performance on the listening task was decreased by 9.5%; the writing task performance was decreased by 11.2%. The researcher did not find the evidence that the degree of social presence could affect task prioritization and performance in the multicommutating environment. However, multi-task performance was improved in the two-channel condition, i.e. presenting the information in visual and oral forms significantly enhanced the information recall on the listening task. This finding is of particular interest to practitioners because it suggests the process losses of multitasking can be reduced under certain conditions.

The researcher believes these findings will help organizations and project groups to better manage their face-to-face and virtual meetings, thus leading to a greater project success rate. Further, these findings can be used to advance future investigations into the relationship between multicomputing and group communication quality and group performance.

## **REFERENCES**

- 3M Meeting Management Team, & Drew, J. (1994). *Mastering meetings: Discovering the hidden potential of effective business meetings*. New York: McGraw-Hill.
- Alport, D. A., Antonis, B., & Reynolds, P. (1972). On the division of attention: A disproof of the single channel hypothesis. *Quarterly Journal of Experimental Psychology*, *24*, 255-265.
- Anderson, A.H., McEwan, R., Bal, J., & Carletta, J. (2007). Virtual team meetings. An Analysis of communication and context. *Computers in Human Behavior*, *23*, 2558-2580.
- Argyle, M., & Dean, J. (1965). Eye contact, distance and affiliation. *Sociometry*, *28*, 289–304.
- Ayres, J., Wilcox, A.K., & Ayres, D.M. (1995). Receiver apprehension: An explanatory model and accompanying research. *Communication Education*, *44*, 223-235.
- Bartsch, R.A. & Cobern, K.M. (2003). Effectiveness of PowerPoint presentations in lectures. *Computers and Education*, *41*, 77-86.
- Basil, M. (1994). Multiple resource theory I: Application to television viewing. *Communication Research*, *21*, 177-207.
- Beatty, M.J. (1981). Receiver apprehension as a function of cognitive backlog. *Western Journal of Speech Communication*, *45*, 277-281.
- Beatty, M.J. (1985). The effects of anticipating listening (state) anxiety on the stability of receiver apprehension scores. *Central States Speech Journal*, *36*, 72-76.
- Beatty, M.J., & Payne, S.K. (1981). Receiver apprehension and cognitive complexity. *Western Journal of Speech Communication*, *45*, 363-369.

- Benton, L. (1989). Homework and industrial development: Gender roles and restructuring in the Spanish shoe industry. *World Development*, 1, 255-266.
- Bluedorn, A.C. (2002). *The human organization of time: Temporal realities and experience*. Stanford, CA: Stanford University Press.
- Bluedorn, A.C., Kalliath, T.J., Strube, M.J., & Martin, G.D. (1999). Polychronicity and the inventory of polychronic values: Development of an instrument to measure a fundamental dimension of organizational culture. *Journal of Managerial Psychology*, 14, 205–230.
- Bock, D.G., & Bock, H.B. (1984). The effects of positional stress and receiver apprehension on leniency errors in speech evaluation: A test of rating error paradigm. *Communication Education*, 33, 337-341.
- Bodie, G.D., & Villaume, W.A. (2003). Aspects of receiving information: The relationship between listening preferences, communication apprehension, receiver apprehension, and communicator style. *International Journal of Listening*, 17, 47-67.
- Borzi, M.G. (1985). A rose by any other name is not the same: An examination into a nature of shyness and other related constructs (Doctoral dissertation, University of Florida). *Dissertation Abstracts International*, 47, 344-A.
- Bostrom, R.P., Anson, R., & Clawson, V.K. (1993). Group facilitation and group support systems. In L.M, Jessup & J.S. Valacich (Eds.). *Group Support Systems: New Perspectives* (pp. 146-168). New York: MacMillian.
- Britton, B.K., & Tesser, A. (1991). Effects of time-management practices on college grades. *Journal of Educational Psychology*, 83, 405-410.



- Broadbent, D. E. (1958). *Perception and communication*. Elmsford, NY: Pergamon Press.
- Brown, I.D., Tickener, A.H., & Simmonds, D.C.V. (1969). Interference between concurrent tasks of driving and telephoning. *Journal of Applied Psychology*, *53*, 419-424.
- Burke, K., & Chidambaram, L. (1999). How much bandwidth is enough? A longitudinal examination of media characteristics and group outcomes. *MIS Quarterly*, *23*, 557-580.
- Burke, K., Aytes, K., Chidabaram, L., & Johnson, J. (1999). A study of partially distributed work groups: The impact of media, location, and time on perceptions and performance. *Small Group Research*, *30*, 453-490.
- Burleson, C.W. (1990). *Effective meetings: The complete guide*. New York: Wiley.
- Butler, J.B., & Mautz, R.D. (1996). Multimedia presentations and learning: A laboratory experiment. *Issues in Accounting Education*, *11*, 259-280.
- Cameron, A. F., & Webster, J. (2005). Unintended consequences of emerging communication technologies: Instant messaging in the workplace. *Computers in Human Behavior*, *21*, 85-103.
- Carlson, J.R., & Zmud, R.W. (1999). Channel expansion theory and the experiential nature of media richness perceptions, *Academy of Management Journal*, *42*, 153–170.
- Caroli, E., & Van Reenen, J. (2001). Skill-biased organizational change? Evidence from a panel of British and French establishments. *The Quarterly Journal of Economics*, *116*, 1449-1492.

- Chimbaram, L., & Jones, B. (1993). Impact of communication medium and computer support on group perceptions and performance: A comparison of face-to-face and dispersed meetings. *MIS Quarterly*, *18*, 465-491.
- Chisholm, C.D., Dornfeld, A.M., Nelson, D.R., & Cordell, W.H. (2001). Work interrupted: A comparison of workplace interruptions in emergency departments and primary care offices. *Annals of Emergency Medicine*, *38*, 146-151.
- Christie, B. (1985). *Human Factors of Information Technology in the Office*. New York: Wiley.
- Clark, A.J. (1989). Communication confidence and listening competence: An investigation of the relationships of willingness to communicate, communication apprehension, and receiver apprehension to comprehension of content and emotional meaning in spoken messages. *Communication education*, *38*, 237-248.
- Cole, W., Steptoe, S., & Dale, S. (2006, March 27). The multitasking generation. *Time*, *167*, 48-55.
- Conte, J. M., Rizzuto, T. E., & Steiner, D. D. (1999). A construct-oriented analysis of individual-level polychronicity. *Journal of Managerial Psychology*, *14*, 269–287.
- Conte, J.M., & Jacobs, R.R. (2003). Validity evidence linking polychronicity and big five personality dimensions, absence, lateness, and supervisory performance rating. *Human Performance*, *16*, 1007-129.
- Cotte, J., & Ratneshwar, S. (1999). Juggling and hopping: What does it mean to work polychronically? *Journal of Managerial Psychology*, *14*, 184–204.
- Craig, L. (2006). Does father care mean fathers share?: A comparison of how mothers and fathers in intact families. *Gender and Society*, *20*, 259-280.

- Creighton, C. (1999). The rise and decline of the 'male breadwinner family' in Britain. *Cambridge Journal of Economics*, 23, 519-41.
- Culnan, M.J., & Markus, M.L. (1987). Information Technologies. In F. M. Jablin, L. L. Putnam, K.H. Roberts, and L.W. Porter (Eds.), *Handbook of organizational communication: An interdisciplinary perspective* (pp. 421-443). Newbury Park, CA: Sage.
- Daft, R.L., & Lengel, R.H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32, 554-571.
- Daly, J.A. (1987). Personality and interpersonal communication: Issues and directions. In J.C. McCroskey & J.A. Daly (Eds.), *Personality and interpersonal communication* (pp.13-41). Newbury Park, CA: Sage.
- Daly, J.A., Vandelisti, A.L., & Daughton, S.M. (1987). The nature and correlates of conversational sensitivity. *Human Communication Research*, 14, 167-202.
- Daniels, L. (1999). Introducing technology in the classroom: PowerPoint is the first step. *Journal of Computing in Higher Education*, 10, 42-56.
- Daniels, T.D., & Whitman, R.R. (1979). The effects of message structure, required recall structure, and receiver apprehension upon recall of message information. Green Bay, WI: University of Wisconsin. (ERIC Document Reproduction Service No. ED178 979).
- De la Case, L.G., Gordillo, J.L., Mejias, L.J., Rangel, F., & Romero, M.F. (1998). Attentional strategies in Type A individuals. *Personality and Individual Differences*, 24, 59-69.

- Delbridge, K.A. (2000). *Individual differences in multi-tasking ability: Exploring the nomological network*. Unpublished doctoral dissertation, Michigan State University, East Lansing.
- DeSanctis, G, & Poole, M.S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science*, 5, 121-147.
- Dils, A.K. (2000). Using technology in a middle school social studies classroom. *International Journal of Social Education*, 15, 102-112.
- Doyle, M., & Straus, D. (1982). *How to make meeting work: The new interaction method*. New York: Jove Books.
- Doyle, M., & Straus, D. (1982). *How to make meeting work: The new interaction method*. New York: Jove Books.
- Fitch-Hauser, M., Barker, D.A, & Hughes, A. (1990). Receiver apprehension and listening comprehensive: A linear or curvilinear relationship. *The Southern Communication Journal*, 56, 62-71.
- Fleishman, E.A., Constanza, D.P., & Marshall-Mies, J. (1999). Abilities. In N.G. Peterson, M.D. Mumford, W.C. Borman, P.R. Jeanneret, & E.A. Fleishman (Eds.), *An Occupational information system for the 21<sup>st</sup> century: The development of O\*NET* (pp.175-195). Washington D.C.: American Psychological Association.
- Floro, M.S. & Miles, M. (2003). Time use, work and overlapping activities: Evidence from Australia. *Cambridge Journal of Economics*, 27, 881-904.
- Francis-Smythe, J., & Robertson, I. (1999). Time-related Individual Differences. *Time & Society*, 8, 273–292.

- Friedman, M. & Rosenman, R.H. (1974). *Type of behavior and your heart*. New York: Knopf.
- Fulk, J., & Collins-Jarvis, L. (2001). Wired meetings. In F. M. Jablin, & L. L. Putman (Eds.), *The new handbook of organizational communication: Advances in theory, research, and methods* (pp. 624-663). Thousand Oaks, CA: Sage Publications.
- Fulk, J., Schmitz, J., & Steinfield, C. (1990). A social influence model of technology use. In J. Fulk, C. Steinfield (Eds.) *Organizations and Communication Technology* (pp.117-142). Newbury Park, CT: Sage.
- Fulk, J., Steinfield, C., Schmitz, J., & Power., G. (1987). A social information processing model of media use in organizations. *Communication Research, 14*, 529-552.
- Gallupe, R., Dennis, A., Cooper, W., Valacich, J., Bastianutti, L., & Nunamaker, Jr. J. (1992). Electronic brainstorming and group size, *Academy of Management Journal, 35*, 350–369.
- Gates, P. (2002, May/June). Where's the power? What's the point? *Across the Board, 39*, 45-47.
- Gesteland, R.R. (1999). *Cross-cultural business behavior: Marketing, negotiating, and managing across cultures*. Copenhagen: Copenhagen Business School Press.
- Giddens, A. (1979). *Central problems in social theory*. Berkeley, CA: University of California Press.
- Gillie, T., & Broadbent, D. (1989). What makes interruptions disruptive? A study of length, similarity and complexity. *Psychological Research, 50*, 243-250.
- Goffman, E. (1959). *The presentation of self in everyday life*. Garden City, New York: Anchor Press.

- Gonzalez, V.M., & Mark, G. (2004). "Constant, constant multitasking craziness":  
 Managing multiple working spheres. *Proceedings of CHI, ACM Press*, 97-104.
- Green, W.A., & Lazarus, H. (1991). Are today's executives meeting with success?  
*Journal of management development*, 10, 14-25.
- Greene, J.O. (1997). A second generation action assembly theory. In J.O. Greene (Ed.)  
*Message production: Advances in communication theory* (pp. 151-170). Mahwah,  
 NJ: Erlbaum.
- Greene, J.O. (2000). Evanescent mentation: An ameliorative conceptual foundation for  
 research and theory on message production. *Communication Theory*, 10, 139-155.
- Gunawardena, C.N. (1995). Social presence theory and implications for interaction  
 collaborative learning in computer conferences. *International Journal of  
 Educational Communications*, 1, 147-166.
- Gunawardena, C.N., & Zittle, F. (1997). Social presence as a predictor of satisfaction  
 within a computer mediated conferencing environment. *American Journal of  
 Distance Education*, 11, 8-25.
- Haase, R. F., Dong, Y. L., & Banks, D. (1979). Cognitive correlates of polychronicity.  
*Perceptual and Motor Skills*, 49, 271-282.
- Hacker, W. (1978). *Allgemeine Arbeits- und Ingenieurspsychologie, Psychische Struktur  
 und Regulation von Arbeitstätigkeiten*. Bern: Huber Verlag.
- Hacker, W. (1986). *Arbeitspsychologie*. Berlin: VEB Deutscher Verlag der  
 Wissenschaften.
- Hall, E. T. (1959). *The Silent Language*. Garden City, NY: Anchor/Doubleday.
- Hall, E. T. (1983). *The dance of life: Other dimensions of time*. Garden City, N.Y.:

Anchor Press.

Hall, E.T. (1976). *Beyond culture*. Garden City, NY: Anchor Press/Doubleday,.

Hall, E. T., & Hall, M. R. (1987). *Hidden Differences: Doing Business with the Japanese*. Garden City, NY: Anchor Press/Doubleday.

Hall, E.T., & Hall, M.R. (1990). *Understanding cultural differences*, Intercultural Press, Yarmouth, ME.

Hefferan, C. (1982). Workload of married women. In K.K. School and K. Tippet (Eds.), *Family Economics Review* (pp. 10-15). Hyattsville, MD: Agricultural Research Service.

Hembrooke, H. & Gay, G. (2003). The laptop and the lecture: The effects of multitasking in learning environments. *Journal of Computing in Higher Education*. 15, 1-19.

Hendrix, P. & Qualls, W. (1981). Assessing the validity of subjective measures of household task responsibility with time-budget data. In K. Bernhardt et al. (Eds.), *1981 Educator's Conference Proceedings* (pp. 143-145). Chicago: American Marketing Association.

Hlynka, D. & Mason, R. (1998). 'PowerPoint' in the classroom: What is the point?. *Educational Technology*, 38, 45-48.

Kaufman, C.F., Lane, P.M., Lindquist, J.D. (1991). Exploring more than 24 hours a day: *A preliminary investigation of polychronic time use*. *The Journal of Consumer Research*, 18, 392-401.

Kayser, T.A. (1995). *Mining group gold: How to cash in on the collaborative brain power of a group* (2<sup>nd</sup> ed). Chicago, IL: Irwin.

Kelly, G.A. (1955). *The psychology of personal constructs*. New York: Norton.

- Kieffer, G. D. (1988). *The strategy of meetings*. New York: Warner
- Kieras, D.E., Meyer, D.E., Ballas, J.A., & Lauber, E.J. (2000). Modern computational perspectives on executive mental processes and cognitive control: Where to from here? In S. Monsell & J. Driver (Eds.), *Control of cognitive processes: Attention and performance* (pp. 681-712). Cambridge, MA: MIT Press.
- Koechlin, E., Basso, G., Pietrini, P. Panzer, S., & Grafman J. (1999, May). The role of the anterior prefrontal cortex in human cognition. *Nature*, *199*, 148-151.
- Konig, C.J., Buhner, M., & Murling, F. (2005). Working memory, fluid intelligence, and attention are predictors of multitasking performance, but polychronicity and extraversion are not. *Human Performance*, *18*, 243-266.
- Kushniryk, A. (2008, February). *The development of a communication specific multitasking measurement instrument*. Paper presented at 30<sup>th</sup> Annual Research Symposium of the College of Communication and Information, Knoxville, TN.
- Kydd, C.T., & Ferry, D.L. (1991). Computer supported cooperative work tools and media richness: An introduction of the literature. *Proceedings of the Twenty-Fourth Annual Hawaii International Conference on Systems Sciences, Volume III*. Los Alamitos, CA: IEEE Society Press.
- Lane, P., Kaufman, C., & Londquist, J. (1989). Exploring more than 24 hours a day: A preliminary investigation of polychromic time use. *Journal of Consumer Research*, *18*, 392-401.
- Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication*, *50*, 46-70.



- Lang, A., Potter, R. F., & Bolls, P. D. (1999). Something for nothing: Is visual encoding automatic?. *Media Psychology, 1*, 145-163.
- Levasseur, D.G. & Sawyer, J.K. (2006). Pedagogy meets PowerPoint: A research review of the effects of computer-generated slides in the classroom. *The Review of Communication, 6*, 101-123.
- Levine, K.J., Kushniryk, A., Allard S., & Tenopir, C. (2006, November). *What happens when work-groups meet?: An analysis of meetings in high-tech organizations*. Paper presented at the annual meeting of the National Communication Association, San Antonio, TX.
- Levin, K.J., Kushniryk, A., Allard S., & Tenopir, C. (2007). *Multitasking in organizational meetings: A new component of the process variable*. Paper will be presented at the annual meeting of the National Communication Association, Chicago, IL.
- Lieberman, M.D. & Rosenthal, R. (2001). Why introverts can't always tell who likes them: Multitasking and non-verbal decoding. *Journal of Personality and Social Psychology, 80* (2), 294-310.
- Lindquist, J. D., & Kaufman-Scarborough, C. (2000). Polychrons and Monochrons: How Do They Watch and Use Television. In Harlan E. Spotts, & H. Lee Meadow (Eds.), *Developments in Marketing Science* (Vol. 23, pp. 204–208). Coral Gables, FL: Academy of Marketing Science.
- Lindquist, J.D., & Kaufman-Scarborough, C. (2007). Development and validation the Polychronic-Monochronic Tendency Model: PMTS scale. *Time Society, 16*, 253-284.

- Logan, G.D., & Gordon, R.D. (2001). Executive control of visual attention in dual-task situations. *Psychological Review*, *108*, 393–434.
- Lowry, P.B., Roberts, T.L., Romano, Jr., N.C., Cheney, P.D., & Hightower, R.T. (2006). The Impact of Group Size and Social Presence on Small-Group Communication: Does Computer-Mediated Communication Make a Difference?. *Small Group Research*, *37*, 631-661
- Lowry, R.B. (1999). Electronic presentation of lectures – effect upon student performance. *University Chemistry Education*, *3*, 18-21.
- Lozano, B. (1989). *The Invisible Force: Transforming American Business with Outside and Home-Based Workers*. New York: The Free Press.
- Mahin, L. (2004). PowerPoint pedagogy. *Business Communication Quarterly*, *67*, 219-222.
- Mantei, E.J. (2000). Using Internet class notes and PowerPoint in physical geology lecture: Comparing the success of the computer technology with traditional teaching techniques. *Journal of College Science Teaching*, *29*, 301-305.
- Manyutina, Y. (2005). *Technology and language change*. Unpublished Doctoral dissertation, Kyiv National University, Ukraine.
- Martins, L.M., Gilson, L.L., & Maynard, M.T. (2004). Virtual teams: What do we know and where do we go from here. *Journal of Management*, *30*, 805-835.
- Maschke, P., & Goeters, K.-M. (1999). *Job analysis of ab-initio flight students in comparison with active line pilots*. Hamburg, Germany: DZLR.
- Matthews, K.A. & Brunson, K. M. (1979). Allocation of attention and Type A coronary prone behavior. *Journal of Personality and Social Psychology*, *37*, 20081-2090.

- May, A., & Carter, C. (2001). A case study of virtual team working in the European automotive industry, *International Journal of Industrial Ergonomics*, 27, 171–186.
- McCroskey, J.C. (1982). Oral communication apprehension: A reconceptualization. In M. Burgoon (Ed.), *Communication Yearbook*, 6 (pp. 136-170). Beverly Hills: Sage.
- McCroskey, J.C. (1970). Measures of communication bound anxiety. *Communication Monographs*, 37, 269-277.
- McCroskey, J.C., Beatty, M.J., Kearney, P., & Plax, T.G. (1985). The content validity of the PRCA-24 as a measure of communication apprehension across communication contexts. *Communication Quarterly*, 33, 165-173.
- McDowell, E. E., & McDowell, C. E. (1978). An investigation of source and receiver apprehension at the junior high, senior high and college levels. *Central States Speech Journal*, 29, 11-19.
- McDowell, E. E., McDowell, C. E., Pullan, G., & Linbergs, K. (1981). An investigation of source and receiver apprehension between the United States and Australian students at the high school and college levels. Paper presented at the meeting of the International Communication association. Association, Minneapolis, MN. (ERIC Document Reproduction Service No. ED 206-033)
- McLeod, R. Jr., & Jones, J. W. (1987). A framework for office automation. *MIS Quarterly*, 11, 86-104.

- McReynolds, P. (1976). Assimilation and Anxiety. In M. Zuckerman and C. D. Spielberger (Eds.) *Emotions and Anxiety: New Concepts, Methods, and Applications* (pp. 35-86). New York: John Wiley and Sons.
- Meyer, D.E., & Keiras, D.E. (1997). A computational theory of executive cognitive processes and multiple-task performance: Part 1. Basic processes. *Psychological Review*, *104*, 3–65.
- Miranda, S.M., & Saunders, C.S. (2003). The social construction of meaning: An alternative perspective on information sharing. *Information Systems Research*, *14*, 87-106.
- Monge, P.R., McSween, C., & Wyer, J.A. (1989). A profile of meetings in corporate America: Results of the 3M meeting effectiveness study, Annenberg School of Communications, University of Southern California, Los Angeles, CA
- Monsell, S. (2003). Task switching. *Trends in Cognitive Sciences*, *7*, 134-140.
- Moser, C. (1993) Adjustment from below: Low-income women, time, and triple role in Guayaquil, Ecuador. In S. Radcliffe and S. Westwood (Eds.), *Viva: Women and popular Protest in Latin America*, New York and London: Routledge.
- Mosvick, R.K. & Nelson, R.B. (1987). *We've got to start meetings like this! A guide to successful business management*. New York: Scott Foresman & Co.
- Napier, R.W., & Gershenfeld, M.K. (1989). *Groups: Theory and experience*. Boston: Houghton Mifflin.
- Naveh-Benjamin, M, Craik, F. I. M., Perretta, J. G., & Tonev, S. T. (2000). The effects of divided attention on encoding and retrieval processes: The resiliency of retrieval processes. *The Quarterly Journal of Experimental Psychology*. *53* (3), 609-625.

- Nunamaker, J.F., Dennis, A.R., Valasich, J.S. Vogel, D.R., & George, J.F. (1991).  
Electronic meeting systems to support group work. *Communications of the ACM*,  
34, 40-61.
- O'Connaill, B., & Frohlich, D. (1995). Timespace in the workplace: Dealing with  
interruptions. *Proceedings of CHI 95, ACM Press*, 262-284.
- O'Hara-Devereaux, M., & Johansen, R. (1994). *Global work: Bridging distance, culture,  
and time*. San Francisco, CA: Jossey-Bass.
- Ollman, B. (1971). *Alienation: Marx's conception of man in capitalist society*.  
Cambridge: Cambridge University Press.
- Onken, M.H. (1999). Temporal elements of organizational culture and impact on firm  
performance. *Journal of Managerial Psychology*, 14, 231-243.
- Osgood, C. E., Suci, G., & Tannenbaum, P. H. (1957). *The measurement of meaning*.  
Urbana: University of Illinois Press.
- Paivio, A. (1986). *Mental representations: a dual coding approach*. New York: Oxford  
University Press.
- Panko, R.R. (1992). Managerial communication patterns. *Journal of Organizational  
Computing*, 2, 95-122.
- Pashler, H. (1984). Processing stages in overlapping tasks: Evidence for a central  
bottleneck. *Journal of Experimental Psychology: Human Perception and  
Performance*, 10, 358-377.
- Pauleen, D.J., & Yoong, P. (2001). Facilitating virtual team relationships via Internet and  
conventional communication channels, *Internet Research*, 11, 190-202.

- Pauw, A. P. (2002). Discoveries and dangers in teaching theology with PowerPoint. *Teaching Theology and Religion*, 5, 1, 39-41.
- Peskin, J. (1982). Measuring household production for the GNP. In School, K.K. and Tippet, K. (Eds.), *Family Economics Review* (pp. 16-25). Hyattsville, MD: Agricultural Research Service.
- Pollak, R. (1999, August). Notes on time use. *Monthly Labor Review, Bureau of Labor Statistics*, 7-11.
- Pool, M.M., Koolstra, C.M., & Van Der Voort, T.H.A. (2003). Distraction effects of background soap operas on homework performance: An experimental study enriched with observational data. *Educational Psychology*, 23, 361-380.
- Poole, M.S., & Jackson, M.H. (1992). Communication theory and group support systems. In L.M. Jessup & J.S. Valacich (Eds.), *Group support systems: New perspectives* (pp. 282-293). New York: Macmillan.
- Poole, M.S., Holmes, M., Watson, R., & DeSanctis, G. (1993). Group decision support systems and group communication: A comparison of the decision making in computer-supported and non-supported groups. *Communication Research*, 20, 176-123.
- Preiss, R.W., & Gayle, B.M. (1991). Path analyses of models for receiver apprehension: State, trait, and information processing. Paper presented at the annual meeting of the Western Speech Communication Association, Atlanta, GA.
- Preiss, R.W., Wheelless, L.R., & Allen, M. (1990). Potential cognitive processes and consequences of receiver apprehension: A meta-analytic review. *Journal of Social Behavior and Personality*, 5, 155-172.

- Preiss, R.W., & Kerksen, J.D. (1990). *Receiver apprehension and educational skills: Five tests of the limited capacity hypothesis*. Paper Presented at the annual meeting of the Western Speech Communication Association, Sacramento, CA.
- Rankin, E.L. & Hoas, D.J. (2001). The use of PowerPoint and student performance. *Atlantic Economic Journal*, 29, 113.
- Rennecker, J., Dennis, A.R., & Hansen, S. (2006). Reconstructing the stage: The use of instant messaging to restructure meeting boundaries. *Proceedings of the 39th Hawaii International Conference on System Sciences*, 1-10.
- Rice, P.L. (1973). Making minutes count. *Business Horizons*, 18-20.
- Rice, R. E. (1984). Evaluating new media systems. *New Directions for Program Evaluation*, 23, 53-71.
- Rice, R.E., & Associates. (1984). *The new media: Communication, research, and technology*. Beverly Hills, CA: Sage.
- Roberts, C. V. (1986). A validation of the Watson-Barker Listening Test. *Communication Research Reports*, 3, 115-119.
- Roberts, C.V., & Vinson, L. (1998). Relationship among willingness to listen, receiver apprehension, communication competence, and dogmatism. *International Journal of Listening*, 12, 40-56.
- Roberts, T.L., Lowry, P.B., & Sweeney, P.D. (2006). An evaluation of the impact of social presence though group size and the use of collaborative software on group member “voice” in face-to-face and computer-mediated task groups. *IEEE Transactions on Professional communication*, 49, 28-43.

- Rogelberg, S.G., Leach, D.J., Warr, P.B., & Burnfield, J.L. (2006). "Not another meeting!" Are meeting time demands related to employee well-being? *Journal of Applied Psychology, 91*, 86-96.
- Roldan, M. (1985). Industrial outworking, struggles for the reproduction of working class families and gender subordination. In N. Radcliffe and E. Minione (Eds.), *Beyond the Employment: Household, Gender and Subsistence*, Oxford: Basil Blackwell.
- Romano, N.C., & Nunamaker, J.F. (2001). Meeting Analysis: Findings from research and practice. *Proceedings of the 34<sup>th</sup> Hawaii International Conference on System Sciences, USA*, 1-13.
- Rouncefield, M., Hughes, J.A., Rodden, T., & Viller, S. (1994). *Working with "constant interruptions": CSCW and the small office* (Research Report CSCW/10/1994). Lancaster, England: Lancaster University.
- Rubinstein, J. S., Meyer, D.E., & Evans, J.E. (2001). Executive control of cognitive processes in task switching. *Journal of Experimental Psychology, 27*, 763-797.
- Shallice, T., McLeond, P., & Lewis, K. (1985). Isolating cognitive modules with dual-task paradigm: Are speech perception and production separate processes? *Quarterly Journal of Experimental Psychology, 37*, 507-532.
- Shaw, M. (1981). *Group Dynamics: The Psychology of Small Group behavior* (3rd ed). McGraw-Hill, New York.
- Sheridan, J.H. (1989). A \$37 billion waste. *Industry Week, 238*, 11-12
- Short, J., Williams, E., & Christie, B. (1976). *The Social Psychology of Telecommunications*. London: Wiley.



- Siegel, J., Dubrovsky, V., Kiesler, S., & McGuire, T.W. (1986). Group processes in computer-mediated communication. *Organizational Behavior and Human Decision Processes*, 37, 157-187.
- Spink, A. (2004). Multitasking information behavior and information task switching: an exploratory study. *Journal of Documentation*, 60, 336-351.
- Sproul, L.S. (1984). The nature of managerial attention. *Advances in Information Processing in Organizations*, 1, 9-27.
- Steiner, I.D. (1972). *Group process and productivity*. Academic Press, New York.
- Stokes, G.S., Toth, C.S., Searcy, C.A., Stroupe, J.P., & Carter, G.W. (1999). Construct/rational biodata dimensions to predict salesperson performance: Report on the U.S. Department of Labor Sales Study. *Human Resource Management Review*, 9, 185-218.
- Sullivan, O. (2008). Business, status distinction and consumption strategies of the income rich, time poor. *Time Society*, 17, 5-26.
- Szabo, A. & Hastings, N. (2000). Using IT in the undergraduate classroom: Should we replace the blackboard with PowerPoint?. *Computers and Education*, 35, 175-187.
- Szebo, L. & Cebotarev, E.A. (1990). Women's work patterns: A time allocation study of rural families in St.Lucia. *Canadian Journal of Development studies*, 11, 259-278.
- Tinsley, C. (1998). Models of conflict resolution in Japanese, German, and American cultures. *Journal of Applied Psychology*, 83, 316-323.

- Tobia, P. M., & Becker, M.C. (1990). Making most of meeting time. *Training and Development Journal*, 44, 34-38.
- Tufte, E.R. (2003). *The cognitive style of PowerPoint*. Cheshire, CN: Graphics Press LLC.
- Turner, J. W., & Tinsley, C. (2002, August). *Polychronic communication: Managing multiple conversations at once*. Paper presented at the annual meeting of the Academy of Management, Denver, CO.
- Turner, J.W., & Reinsch, N.L. (2007). The business communicator as presence: Multicomunicating, equivocality and status at work. *Journal of Business Communication*, 44, 36-58.
- Turner, J.W., Grube, J.A., Tinsley, C.H., Lee, C., & O’Pell, C. (2006). Exploring the Dominant Media: How Does Media Use Reflect Organizational Norms and Affect Performance?. *Journal of Business Communication*, 43, 220-250.
- Valacich, J.S., Dennis, A.R., & Connolly, T. (1994). Idea generation in computer-based groups: A new ending to an old story, *Organizational Behavior and Human Decision Processes*, 57, 448–467.
- Volkema, R. J., & Neiderman, F. (1996). Planning and managing organizational meetings: an empirical analysis of written and oral communication. *The Journal of Business Communication*, 33, 275-296.
- Waldron, V.R., & Cegala, D.J. (1992). Assessing conversational cognition: Levels of cognitive theory and associated methodological requirements. *Human Communication Research*, 18, 599-622.

- Wallis, C., Steptoe, S. & Cole, J.E. (2006, January 16). Help! I've lost my focus. *Time*, 167, 72-77.
- Wasson, C. (2004). Multitasking during virtual meetings. *Human resource planning*, 27(2), 47-60.
- Weingart, L. (1997). How did they do that? The ways and means of studying group process. In L. L. Cummings & B. Staw (Eds.), *Research in organizational behavior* (Vol. 19, pp. 189–239). Greenwich, CT: JAI Press.
- Weinraub, H.J. (1998). Using multimedia authoring software: The effects on student learning perception and performance. *Financial Practice and Education*, 8, 88-92.
- Welford, A. T. (1952). The “psychological refractory period” and the timing of high speed performance: A review and a theory. *British Journal of Psychology*, 43, 2-19.
- Wheless, L. R., & Scott, M. D. (1976). The nature, measurement, and potential effects of receiver apprehension. Paper presented at the meeting of the International Communication Association, Portland, OR.
- Wheless, L. R., Preiss, R. W., & Gayle, B. M. (1997). Receiver apprehension, informational receptivity, and cognitive processing. In J. A. Daly, J. C. McCroskey, J. Ayres, T. Hopf, & D. M. Ayres (Eds.), *Avoiding Communication: Shyness, reticence, and apprehension* (2nd ed.) (pp. 151-187). Cresskill, NJ: Hampton Press.
- Wheless, L.R. (1975). An investigation of receiver apprehension and social context dimensions of communication apprehension. *The Speech Teacher*, 24, 261-268.

- Wiener, M., & Mehrabian, A. (1968). Language within language: Immediacy, and a channel in verbal communication. New York: Appleton-Century-Crofts.
- Wood, J.N. & Grafman J. (2003, February). Human prefrontal cortex: Processing and representational perspectives. *Nature Reviews: Neuroscience*, 4, 139-147.
- Workman, M., Kahnweiler, W., & Bommer, W. (2003). The effects of cognitive style and media richness on commitment to telework and virtual teams, *Journal of Vocational Behavior*, 63, 199–219.
- Wright, L. (1988). The Type A behavior pattern and coronary artery disease. *American Psychologist*, 43, 2-14.
- Wylie, G. & Allport, A. (2000). Task switching and the measurement of “switch costs”. *Psychological Research*, 63, 212 – 233.
- Yoo, Y., & Alavi, M. (2001). Media and group cohesion: Relative influences on social presence, task participation, and group consensus. *MIS Quarterly*, 25, 371-390.
- Zijstra, R.H., Roe, R.A., Leonora, A.B. & Krediet, I. (1999). Temporal factors in mental work: Effect of interrupted activities. *Journal of Occupational and Organizational Psychology*, 72, 163-185.
- Zohar, D. (1999). When things go wrong: The effect of daily work hassles of effort, exertion, and negative mood. *Journal of Occupational and Organizational Psychology*, 72, 265-283.

## **APPENDIXES**

## **Appendix A: Informed consent statement**

### **INTRODUCTION**

You are invited to be a part of an experimental study that will explore the impact of multitasking behavior on individuals' performances. The research will be completed as a part of the investigator's dissertation for the Ph.D. in communication. The researcher intends to submit the completed study to conferences and for publication.

### **INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY**

During the experiment you will be given two communication tasks to accomplish simultaneously: listening and writing. The listening task will be in a form of a 15 min lecture presentation. At the end of the lecture you will be asked to complete a test on the information presented in the lecture. The test will be given in the form of a quiz (multiple choice questions) on the lecture content. The other task will consist of writing text messages. At some point during the lecture presentation, the chat moderator will send you a text message with a link to a questionnaire. You will be asked to log in and complete this questionnaire while listening to the lecture. At the end of the experiment you will complete several questionnaires designed to measure your multitasking abilities and listening preferences. The **total duration** of the study is approximately **40 min**.

### **RISKS**

There are no anticipated risks involved in this study.

## **BENEFITS**

One potential benefit of this study is that the author plans to seek publication of findings. This can help extend the body of knowledge to other researchers and practitioners. By giving your consent to participate in the study you acknowledge that the findings may be published. Published findings will not identify you in any way.

## **CONFIDENTIALITY**

Each participant of the study will be assigned an ID number to keep responses anonymous. The information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study unless participants specifically give permission in writing to do otherwise. No reference will be made in oral or written reports which could link participants to the study.

## **CONTACT INFORMATION**

If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study,) you may contact the researcher, Alla Kushniryk at 101 Communication Building and (865)974-8200. If you have questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-3466.

## **PARTICIPATION AND CONSENT**

Your participation in this study is voluntary; you may decline to participate without penalty. If you are less than age 18, please notify the researcher and do not participate in

the study. If you are age 18 and older and you decide to participate, log into the custom course with the assigned anonymous ID. This action will be considered as your consent to participate in this study. You may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed you data will be returned to you or destroyed.



## **Appendix B: Listening task**

### **Aristotle**

**Aristotle** was a Greek philosopher, a student of Plato and teacher of Alexander the Great. He wrote on many different subjects, including physics, metaphysics, poetry, theater, music, logic, rhetoric, politics, government, ethics, biology and zoology.

Aristotle (together with Socrates and Plato) is one of the most important philosophers in the history of Western thought. He was the second philosopher, after Plato, to systematize philosophy and science. His thinking on physics and science had a profound impact on medieval thought, which lasted until the Renaissance, and the accuracy of some of his biological observations was only confirmed in the last century. His logical works contain the earliest formal study of logic known and were not superseded until the late nineteenth century by the works of Frege and Boole. In the Middle Ages, Aristotelian metaphysics had a profound influence on philosophical and theological thinking in the Islamic and Jewish traditions, and on Christian thought, where its legacy is still felt in Christian theology, for example in Orthodox theology, and especially within the Catholic tradition shaped by scholasticism and the work of Albertus Magnus and Thomas Aquinas. All aspects of Aristotle's philosophy continue to be the object of active academic study today.

Though Aristotle wrote many treatises and elegant dialogues (Cicero described his literary style as "a river of gold"), it is thought that the majority of his writings are now lost. They were lost and rediscovered several times, and it is believed that only about one fifth of the original works have survived.

Aristotle was born in Stageira, Chalcidice in 384 BCE. His father was the personal physician to King Amyntas of Macedon (this likely accounts for Aristotle's interest in biology). Aristotle was trained and educated as a member of the Greek aristocracy. At about the age of seventeen, he went to Athens to continue his education at Plato's Academy. Aristotle remained at the academy for nearly twenty years, not leaving until after Plato's death in 347 BC. He then traveled with his fellow academy member Xenocrates to the court of Hermias of Atarneus in Asia Minor. While in Asia, Aristotle traveled with Theophrastus of Eressos to the island of Lesbos, where together they researched the botany and zoology of the island. Aristotle married Hermias' daughter (or niece) Pythias. She bore him a daughter, whom they named Pythias. Soon after Hermias' death at the hands of the Persians, Aristotle was invited by Philip of Macedon to become tutor to Alexander the Great (who was 13 years old).

After spending several years tutoring the young Alexander, Aristotle returned to Athens. By 335 BC, he established his own school there under the patronage of Alexander, known as the Lyceum. Aristotle conducted courses at the school for the next twelve years. While in Athens, his wife Pythias died, and Aristotle became involved with Herpyllis of Stageira, who bore him a son whom he named after his father, Nicomachus. According to the Suda, a Byzantine Encyclopedia, he also had an eromenos (adolescent male lover), Palaephatus of Abydus.

It is during this period in Athens when Aristotle is believed to have composed many of his scientific treatises. Earlier Aristotle had written many dialogues in the Platonic style, but only fragments of these have survived. The works that have survived are in treatise form and were not, for the most part, intended for widespread publication,

as they are generally thought to be lecture aids for his students. His most important treatises include *Physics*, *Metaphysics*, *Nicomachean Ethics*, *Politics*, *De Anima (On the Soul)*, the *Poetics*, and the six treatise collection of logical works, or *Organon*. These works, although connected in many fundamental ways, vary significantly in both style and substance.

Aristotle not only studied almost every subject possible at the time, but made significant contributions to most of them. In physical science, Aristotle studied anatomy, astronomy, economics, embryology, geography, geology, meteorology, physics and zoology. In philosophy, he wrote on aesthetics, ethics, government, metaphysics, politics, psychology, rhetoric and theology. He also studied education, foreign customs, literature and poetry. His combined works constitute a virtual encyclopedia of Greek knowledge. It has been suggested that Aristotle was probably the last person to know everything there was to be known in his own time.

Upon Alexander's death, anti-Macedonian sentiment in Athens once again flared. After Demetrius Poliorcetes freed the city from Macedonian control, Eurymedon the hierophant denounced Aristotle for not holding the gods in honor (Aristotle was considered to be a Macedonian sympathizer. Aristotle fled the city to his mother's family estate in Chalcis, explaining, "I will not allow the Athenians to sin twice against philosophy" (the first sin being against Socrates). However, he died in Euboea of presumed natural causes within the year (in 323 BC). Aristotle left a will and named chief executor his student Antipater, in which he asked to be buried next to his wife, and left the Deanship of his school to Theophrastus.

Aristotle's works were lost and rediscovered several times, and it is believed that about one fifth of his original works have survived.

The story of the original manuscripts of his treatises is described by Strabo in his *Geography* and Plutarch in his *Parallel Lives*. The manuscripts were left from Aristotle to his successor Theophrastus, who in turn willed them to Neleus of Scepsis. Neleus supposedly took the writings from Athens to Scepsis, where his heirs let them languish in a cellar until the first century BC, when Apellicon of Teos discovered and purchased the manuscripts, bringing them back to Athens. According to the story, Apellicon tried to repair some of the damage that was done during the manuscripts' stay in the basement, introducing a number of errors into the text. When Lucius Cornelius Sulla occupied Athens in 86 BC, he carried off the library of Apellicon to Rome, where they were first published in 60 BC by the grammarian Tyrranion of Amisus and then by philosopher Andronicus of Rhodes, who named and fixed the canon in the form which we have today.

## Appendix C: Writing task

**Question 1.** I am very glad you are participating in this study. I hope you have had fun during your spring break today. What did you do during the spring break?

**Question 2.** Please tell me what did you have for lunch today?

**Question 3.** What are some of the foods you usually have for lunch during the week?

**Question 4.** What kinds of food are your favorites? Why?

**Question 5.** In which part of the United States you would like to live? Why?

**Question 6.** What is your favorite TV show? Why?

**Question 7.** If you won a million dollars how would you spend it?

**Question 8.** If you could have any pet what would you get? Why?

**Question 9.** What would be your dream job? Why?

**Question 10.** What do you think of the UT men's basketball team this season?

## Appendix D: Listening task quiz

**Question 1** Aristotle was

- Answer**
- Macedonian philosopher
  - Roman philosopher
  - ✓ Greek philosopher

**Question 2** Aristotle was born in

- Answer**
- ✓ 384BC
  - 383BC
  - 324BC

**Question 3.** Aristotle was a student of

- Answer**
- Alexander the Great
  - ✓ Plato
  - Socrates

**Question 4** Aristotle wrote on different subjects except for

- Answer**
- ✓ math
  - biology
  - ethics
  - philosophy

**Question 5** Aristotle's thinking on physics and science had a profound impact on medieval thought, which lasted until

- Answer**
- last century
  - ✓ the Renaissance
  - late 19th century

**Question 6** Aristotelian metaphysics had a profound influence on philosophical and theological thinking

- Answer**
- in Buddhism and Taoism
  - ✓ in the Islamic and Jewish traditions
  - of Socrates and Plato

**Question 7** Aristotle was married

**Answer**  only once  
 twice  
 never married

**Question 8** The accuracy of some of Aristotle's biological observations was only confirmed

**Answer**  in the last century  
 in the Middle Ages  
 in the 21st century

**Question 9** Aristotle's father was \_\_\_\_\_ to King Amyntas of Macedon

**Answer**  personal secretary  
 personal bodyguard  
 personal physician

**Question 10** At about the age of seventeen, Aristotle went to Athens to continue his education

**Answer**  at Plato's Academy  
 at Hermias' Academy  
 at Alexander's academy

**Question 11** Aristotle was invited by Philip of Macedon to become tutor to

**Answer**  Herpyllis of Stageira  
 Hermias of Atarneus  
 Alexander the Great

**Question 12** Aristotle had

**Answer**  a daughter  
 two daughters  
 a daughter and a son

**Question 13** It is believed that only about \_\_\_ of Aristotle's original works have survived

**Answer**  a half  
 one fifth  
 one third

**Question 14** Aristotle wrote many \_\_\_\_\_ in the Platonic style

**Answer** stories  
essays  
✔ dialogues

**Question 15** It is believed that Aristotle

**Answer** ✔ died of natural causes  
was killed by anti-Macedonian coalition upon Alexander's death  
was executed by Demetrius Poliorcetes who freed Athens from  
Macedonian control upon Alexander's death

**Question 16** Aristotle was buried next to

**Answer** ✔ his wife  
his daughter  
his male lover

**Question 17** After Aristotle's death his manuscripts were stored \_\_\_\_\_ until the first century BC.

**Answer** in the library of Athens  
in the library of Alexandria  
✔ in the basement of a private house

**Question 18** Aristotle's manuscripts were first published in \_\_\_\_\_ in 60BC.

**Answer** in Athens  
✔ in Rome  
in Scepsis



## Appendix E: Survey

### Part I Tasks

*Instructions:* You have listened to the lecture presentation. Please respond to the following scales in terms of how you would describe the atmosphere of interaction during the lecture. Check on of the answers to indicate your judgment or evaluation of your experience communicating with the presenter.

In your opinion, how **personal** was the interaction during the lecture?

- 1)  Very impersonal
- Impersonal
- Somewhat Impersonal
- Neutral
- Somewhat personal
- Personal
- Very personal

How **sensitive** was the interaction?

- 2)  Very insensitive
- Insensitive
- Somewhat insensitive
- Neutral
- Somewhat sensitive
- Sensitive
- Very sensitive

How **warm** was the interaction?

- 3)  Very cold
- Cold
- Somewhat cold
- Neutral
- Somewhat warm
- Warm
- Very warm

How **social** was the interaction?

- 4)  Very unsocial
- Unsocial
- Somewhat unsocial
- Neutral
- Somewhat social
- Social
- Very Social

2. You have just finished completing two tasks: 1) listening to the lecture and 2) writing responses to the short online survey. In your opinion, which of the following tasks do you consider to be the primary task and which do you think was the secondary task?

**Listening task**

\_\_\_\_\_ was primary (most important) \_\_\_\_\_ was secondary (less important) \_\_\_\_\_ equally important

**Writing task**

\_\_\_\_\_ was primary (most important) \_\_\_\_\_ was secondary (less important) \_\_\_\_\_ equally important

**Part II. Measuring the Ability to Perform Simultaneous Activities**

**Directions:** *This questionnaire contains statements that people might use to describe themselves. Please, indicate to which you agree or disagree with each of the following statements, using the scale where*

- 1= Strongly disagree**
- 2= Disagree**
- 3= Neither**
- 4= Agree**
- 5= Strongly agree**

1. I like talking on the phone while I am driving.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

2. I frequently listen to music when exercising.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

3. I frequently flip between different shows when watching television.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

4. I can easily understand and comprehend material presented in class lectures while I am doing something unrelated.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

5. I frequently IM (Instant Message) while I am performing other work on my computer.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

6. Multitasking stresses me out.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

7. I often concentrate on completing one task before moving on to another.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

8. I feel overwhelmed trying to handle more than one task at a time.

Strongly Disagree    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    \_\_\_\_\_    Strongly Agree  
    1            2            3            4            5

9. I frequently do other tasks while talking on the phone.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
10. It is easy for me to keep track of multiple projects simultaneously.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
11. I find it difficult to concentrate on tasks when people talk to me.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
12. I like to have a TV on while I read.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
13. I often listen to music when studying (working).  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
14. I frequently try to accomplish several projects or tasks at the same time.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
15. I agree with the saying: "To do two things at once is to do neither".  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
16. Multi-tasking makes me tired.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
17. I usually close programs/browsers before opening other programs/browsers when using a computer.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
18. I frequently keep multiple programs/browsers open on my computer.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
19. I usually read when I eat.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
20. I prefer to do two or more activities at the same time.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
21. I typically do two or more activities at the same time.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
22. Doing two or more activities at the same time is the most efficient way to use my time.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5
23. I am comfortable doing more than one activity at the same time.  
 Strongly Disagree      Strongly Agree  
 1      2      3      4      5

24. I like to juggle two or more activities at the same time.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5

**Part III. Listening Styles**

*Instructions:* The following statements apply to how various people feel about receiving communication. Indicate if these statements apply to how you feel by noting whether you (5) *strongly agree*, (4) *agree*, (3) *are undecided*, (2) *disagree*, or (1) *strongly disagree*.

1. I feel comfortable when listening to others on the phone.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
2. It is often difficult for me to concentrate on what others are saying.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
3. When listening to members of the opposite sex I find it easy to concentrate on what is being said.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
4. I have no fear of being a listener as a member of an audience.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
5. I feel relaxed when listening to new ideas.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
6. I would rather not have to listen to other people at all.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
7. I am generally overexcited and rattled when others are speaking to me.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
8. I often feel uncomfortable when listening to others.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
9. My thoughts become confused and jumbled when reading important information.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
10. I often have difficulty concentrating on what others are saying.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
11. Receiving new information makes me feel restless.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5
12. Watching television makes me nervous.  
 Strongly Disagree                                            Strongly Agree  
    1        2        3        4        5

13. When on a date I find myself tense and self-conscious when listening to my date.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
14. I enjoy being a good listener.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
15. I generally find it easy to concentrate on what is being said.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
16. I seek the opportunity to listen to new ideas.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
17. I have difficulty concentrating on instructions others give me.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
18. It is hard to listen or concentrate on what other people are saying unless I know them well.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
19. I feel tense when listening as a member of a social gathering.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5
20. Television programs that attempt to change my mind about something make me nervous.  
 Strongly Disagree      Strongly Agree  
 1 2 3 4 5

**Demographics**

1. Sex:  Male  Female
2. Ethnicity (please indicate which group you mostly identify with):  
 African-American  Asian  Caucasian  Hispanic  
 Mixed Background  Other
3. Age:  18-21  22-25  26-35  36-50  51 or older

**Thank you for your participation!**

## VITA

Alla Kusniryk was born in Ukraine and graduated from Chernitsi State University, Ukraine with a Diploma of Higher Education in English Language and Literature. She earned Candidate of Philological Sciences Degree in Germanic Languages from Lviv National University, Ukraine during which time she worked as a lecturer in Chernivtsi National University, Ukraine. In CNU she taught *English as a Second/Foreign Language* at all levels, *Writing, British and American Studies*, and *Theoretical English Grammar* courses. Based on her excellent teaching evaluations and research Alla was selected as a finalist in a nation-wide competition to continue her education in the USA. In fall of 2003, Alla attended the University of Tennessee to pursue a Doctorate of Philosophy in Communication and Information. The doctoral degree will be received in August 2008.

Alla Kushniryk has presented and/or been accepted to present a number of papers at annual meetings of Southern States Communication Association, National Communication Association, Midwest Association of Public Opinion Research, and several linguistic conferences. Additionally, she has published a number of articles on language analysis as a sole author.