Chapter 17
Research Methodologies for Multitasking Studies

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ABSTRACT

The research on multitasking is scattered across disciplines, and the definitions of multitasking vary according to the discipline. As a result, the research is not coherent nor consistent in the approaches taken to understanding this phenomenon. In this chapter, the authors review studies on multitasking in different disciplines with a focus on the research methodologies used. The three main research paradigms (empirical-analytical, interpretive, and critical) are used as a framework to understand the nature of the research. The strengths and weaknesses of the research in each of the paradigms are examined, and suggestions are made for utilizing different research methodologies to bring clarity to the research in this field. Such an endeavor will help to build interdisciplinary and multidisciplinary research and help guide future research and theory building.

INTRODUCTION

Research on multitasking has a long history. In the 1930s, researchers found that Americans often performed more than one activity at the same time (Cantril & Allport, 1935). Two decades later American households became enamored with television as a source of entertainment. The sight and sound of televisions playing in the background at all times of the day in millions of households became an all too familiar sight. Families ate, played, read, and congregated around television sets as a precursor to other forms of multitasking. By the end of 1980s, personal computers and portable music devices became common fixtures at home and work. The next decade saw a meteoric rise of portable devices such cell phones and laptops. Consumers became adept at pairing their daily

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activities with media use whether they were at the office or in the park. In many ways, technological innovations have become the catalyst to the modern phenomenon of multitasking.

Multitasking has been defined as doing several things at the same time or as switching quickly between several different tasks (Baddeley, 1996; Meyer & Kieras, 1997). Different terms have been used to refer to this phenomenon in different disciplines. For instance, the terms dual tasking and task switching have been used in cognitive sciences, psychology and neurosciences (e.g., Baddeley, 1996; Rubinstein, Meyer, & Evans, 2001; Logan & Gordon, 2001; Monsell, 2003). The terms multitasking, media layering and media multitasking have been used in information sciences, human-computer interaction, communication, psychology, and media studies (e.g., Meyer & Kieras, 1997; Rideout, Foehr, & Roberts, 2010; Spink & Park, 2005). The term polychronicity has been used in anthropology, organizational learning, and human performances (e.g., Bluedorn, Kalliath, Strube, & Martin, 1999; Hall, 1959).

The literature across different disciplines has led to comprehensive but often times confusing arrays of knowledge on the topic of multitasking. Knowledge about multitasking has not been shared well, especially not across disciplines. As a result, many scholars claim that little research has been done on multitasking, as they do not look at the research from other disciplines; or when they do, they cannot find the terms they have in mind. Additionally, the studies conducted have used the methodologies prevalent in particular disciplines, often without recognizing or accepting other types of methodologies. When research in a field becomes fragmented through the language used, the disciplines involved, and more pertinent to our chapter here, the variety of research paradigms and methodologies involved, communication among scholars breaks down and our knowledge of the involved issues suffers as a result.

The purpose of this chapter, therefore, is to review studies on multitasking in different disciplines with a focus on the research methodologies used. We use the three main research paradigms and their accompanying methodologies as the framework to examine the existing literature on multitasking. Such a review, we hope, will help researchers see the strengths and weaknesses of studies in different fields, help build interdisciplinary and multidisciplinary research, and help guide future research and theory building. First, we examine the way multitasking is defined in different disciplines.

**TERMS AND DEFINITIONS OF MULTITASKING IN DIFFERENT DISCIPLINES**

A number of definitions have been proposed to explain people’s preferences for tasks and how their attention may be affected when they perform two or more tasks. Table 1 summarizes some common definitions of the multitasking phenomenon.

A number of issues need to be unpacked with respect to what is happening within the research field. First, it is quite clear that one word may mean many different things to researchers working in different contexts. This is understandable, as the foci of various research efforts differ given the body of knowledge being sought. For instance, the concept of “polychronicity” introduced by anthropologists and scholars in organizational learning focuses on how people in different cultures perceive time or prefer to use their time (Bluedorn, 2002; Hall, 1959), while the concepts of “dual task” or “task switching” introduced by psychologists and neuroscientists focus on brain, executive control and cognitive processes (Just et al., 2001; Meyer & Kieras, 1997; Rubinstein, Meyer & Evans, 2001). These scholars were looking at the same phenomenon, but they examined it from different angles: time versus brain, and preferences versus cognitive abilities. As a result, the same vocabulary may refer to different issues; different vocabularies emerge to describe the same phenomena in different ways.
Table 1. Sample definitions of multitasking from various disciplines (in alphabetical order of the terms)

<table>
<thead>
<tr>
<th>Terms</th>
<th>Fields of Study</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual task</td>
<td>Psychology</td>
<td>A procedure in experimental (neuro)psychology that requires an individual to perform two tasks simultaneously in order to compare performance with single-task conditions (Navon &amp; Gopher, 1979)</td>
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<tr>
<td>Interleaving</td>
<td>Computer Science</td>
<td>A method for making data retrieval more efficient by rearranging or renumbering the sectors on a hard disk or by splitting a computer’s main memory into sections so that the sectors or sections can be read in alternating cycles (Dictionary.com)</td>
</tr>
<tr>
<td>Media layering</td>
<td>Media Studies</td>
<td>The simultaneous use of and/or exposure to multiple sources of disparate electronic and non-electronic media, some of which are interactive (Gardner, 2008)</td>
</tr>
<tr>
<td>Media multitasking</td>
<td>Media Studies; Psychology</td>
<td>Concurrent use of multiple media (Roberts, Floehr, &amp; Rideout, 2005)</td>
</tr>
<tr>
<td>Metatasking</td>
<td>Information science</td>
<td>Focused multitasking… a process that involves undertaking any number of tasks that ultimately accomplish one primary objective (Zimmerman, 2007)</td>
</tr>
<tr>
<td>Multitasking</td>
<td>Information technology; Communication; Media Studies</td>
<td>Rapid task switching involving information technologies - in situations involving co-location and interpersonal interaction, such as checking e-mail during a meeting or instant messaging during group work (Bell, Compeau, &amp; Olivera, 2005)</td>
</tr>
<tr>
<td>Multitasking</td>
<td>Information Science</td>
<td>Engagement in individual and discrete tasks that are performed in succession. It is implied that there is necessarily some time spent switching between tasks. The switching between tasks is a part of the sequential processing of information and necessitates the selection of information that will be attended to, processed, encoded and stored (Dzubak, 2007)</td>
</tr>
<tr>
<td>Multitasking</td>
<td>Computer Science</td>
<td>The concurrent performance of several jobs by a computer or 2. The performance of multiple tasks at one time (Merriam-Webster Dictionary, 2008)</td>
</tr>
<tr>
<td>Multitasking (Computer multitasking)</td>
<td>Computer Science; Information Science</td>
<td>Structuring of a program into two or more parts that can be executed in parallel (Phillips &amp; Rosen, 1986)</td>
</tr>
<tr>
<td>Multitasking</td>
<td>Cognitive Science; Linguistics; Psychology; Neuroscience</td>
<td>The ability to handle the demands of multiple tasks simultaneously (Lee &amp; Taatgen, 2002)</td>
</tr>
<tr>
<td>Multitasking</td>
<td>Psychology; Neuroscience</td>
<td>The execution of multiple task threads, coordinated by a serial cognitive processor and distributed across other available resources (e.g., perceptual and motor resources) (Salvucci &amp; Taatgen, 2008)</td>
</tr>
<tr>
<td>Multitasking (Task switching)</td>
<td>Psychology</td>
<td>Accomplishing multiple-task goals in the same general time period by engaging in frequent switches between individuals and tasks (Delbridge, 2000)</td>
</tr>
<tr>
<td>Parallel processing</td>
<td>Psychology</td>
<td>Two or more mental processes that are carried out simultaneously (American Psychology Association glossary)</td>
</tr>
<tr>
<td>Parallel processing (Computer multitasking)</td>
<td>Computer Science</td>
<td>The simultaneous use of more than one central processing unit or processor core to execute a program or multiple computational threads (Siegel, 1990).</td>
</tr>
<tr>
<td>Polychronicity</td>
<td>Anthropology; Organization Learning; Workforce Productivity</td>
<td>Polychronicity is a continuum, and preferences exist for degrees of engagement. At one extreme is the pattern of focusing on one task at a time, interpreting other potential tasks and events as interruptions and attempting to shield one’s chosen task from such interference. The other extreme is actually open-ended, it involves engagement in several tasks simultaneously, sometimes literally simultaneously and sometimes in a frequent back-and-forth engagement pattern (Bluedorn, 2002).</td>
</tr>
<tr>
<td>Task switchingor set switching</td>
<td>Psychology</td>
<td>An executive function and a kind of cognitive flexibility that involves the ability to shift attention between one task and another (Monsell, 2003).</td>
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</table>
activities by scholars in different fields. Obviously, different factors, internal and external, human and environmental, have impacts on our preferences and abilities for multitasking (Lin, 2009). It is safe to surmise that there are likely to be problems when we work cross-functionally, unless there is some higher order helping to standardize the terms, so that the nuances and ambiguities can be reduced or integrated into a generalized and meaningful understanding of what multitasking means.

Second, many empirical studies we have seen to date are sophisticated research efforts combining neuroscience, psychology, and computer science, using fast changing eye-tracking and brain scanning technologies such as the functional Magnetic Resonance Imaging (fMRI), and presenting the representations of findings over a “snapshot” period of time. Both the knowledge and technologies are developing quickly. The science keeps changing as to how to depict what activity is happening from a particular focus in the brain, and how to collate that information with other concurrent or asynchronous activities in the same brain over an extended period of time. What is emerging is a set of collated, multi-colored pathways that sweep through the hippocampus and central part of the brain. Despite the strides that we have made, scientists are unsure how best to represent what is going on in the human brain over time. And due to the limitations of our current technologies, we are often reduced to imperfect representations of isolated brain activities over a very short period of time, during a very specific set of predetermined conditions. Great advances are happening each day in the area of brain research, but this does not necessarily extend our understanding of what is behind multitasking.

Partially related to these different definitions, researchers have examined issues related to doing several things at the same time or switching between tasks using several different methods. In the following section, we discuss, in general, the nature of research paradigms and methodologies within each paradigm. We then go on to examine the research on multitasking within this framework and discuss the possible gaps in the research.

**RESEARCH PARADIGMS AND METHODS**

The theoretical foundation of this paper is based on the three kinds of knowledge proposed by Jurgen Habermas (1971), namely, instrumental knowledge, practical or communicative knowledge (Mezirow, 1991), and emancipatory knowledge.

Instrumental knowledge is the kind of knowledge which allows us to manipulate and control the environment, predict observable physical and social events, and take appropriate actions. Empirical methodologies produce technically useful knowledge; knowledge is established by reference to external reality, using the senses. It is assumed that there is an objective world made up of observable phenomena, and the laws governing those phenomena systems can be identified through science. It is assumed that science operates independently of human perceptions. Habermas (1971) criticizes instrumental rationality in that it can become a pervasive ideology that is reified; that is all knowledge is seen to be instrumental in nature. Following the emphasis during the Age of Enlightenment, empirical scientific methods were most often viewed as being superior to subjective, qualitative, or spiritual ways of knowing. Only recently (in the last 20 to 30 years) has this point of view been criticized in the social sciences and education as not allowing a deeper, more open understanding of human interactions. The empirical-analytical paradigm includes the experimental, quasi-experimental, causal-comparative, and correlational methodologies.

The second kind of knowledge is based on our need to understand each other through language. Habermas (1971) calls this practical knowledge. Human beings have always been social creatures, instinctively forming groups, tribes, communities, cultures, and nations in order to satisfy their mutual
needs. In order for people to survive together in groups and societies, they must communicate with and understand each other. There are few scientific laws governing these communications; when we communicate with others, we engage in interpretation of what others are saying based on our own values and experiences. This does not mean that communicative knowledge is entirely individual. All societies share and transmit social knowledge, that is, a code of commonly accepted beliefs and behaviors. As a society we come to agree on how things should be in relation to standards and values, moral and political issues, educational and social systems, and government actions. Communicative or practical knowledge is derived from a shared interpretation and consensus of what is “true.” Habermas criticizes practical knowledge as being too dependent on subjective understanding. He argues that people may misinterpret the world around them based on distorted assumptions about themselves or society. We want social knowledge to be objective and concrete, and therefore we may stop questioning the systems around us, unaware of the distortions that exist in our assumptions. The research paradigm used to acquire communicative knowledge is the interpretive paradigm. Data are mostly qualitative, and research methodologies include case studies, grounded theory, phenomenology, narrative inquiry, appreciative inquiry, arts-based research, and self-study.

Habermas calls the third kind of knowledge emancipatory. By nature, people are interested in self-knowledge, growth, development, and freedom. Emancipatory knowledge is gained through a process of critically questioning ourselves and the social systems within which we live. The philosophical foundation of emancipatory knowledge lies in critical theory. In this paradigm, instrumental and communicative knowledge are not rejected but are seen as limiting. If we do not question current scientific and social theories and accepted truths, we may never realize how we are constrained by their inevitable distortions and errors (for example, student learning can be assessed by standardized tests, self-directed learning is relevant to all cultures). Without the possibility of critical questioning of ourselves and our beliefs, constraining knowledge can be accepted by institutions, communities, and cultures. The research paradigm that is relevant for constructing this kind of knowledge is the critical paradigm. Data are mostly qualitative, and specific methods include action research, participatory research, critical research, and feminist research.

Next, we examine the research methods currently used in the studies of multitasking within the framework of the research paradigms. Our goal is to address the fragmentation of the research and to move on to ways in which research can become more integrated and relevant to all disciplines.

**RESEARCH METHODS USED IN MULTITASKING STUDIES**

As scholars who have conducted and published research in multitasking in the last five or so years, we have collected and continue to collect hundreds of articles on the topic of media multitasking in multiple disciplines. In addition, university library databases, Google scholars, and online scholar networking sites such as ResearchGate have been used to track new publications on this topic. These articles and efforts have served as the baseline for our data analysis.

For the purpose of this chapter, we analyzed 45 articles from different disciplines focusing on research paradigms and methods. Although we selected the articles randomly, we also tried to include a diverse group of publications using different definitions of multitasking. In addition, we included works that have been frequently cited in the literature. As it was immediately clear to us that most research was in the empirical-analytical paradigm, we made an effort to find articles that would include the interpretive and emancipatory research paradigms. By doing so, we hope to present a more balanced overview of work on
multitasking studies out there. In the following sections, we summarize the research questions, research paradigms, and research methodologies we found in the articles we examined.

**Empirical-Analytical Paradigm**

As mentioned earlier, most of the studies we examined were in the empirical-analytical paradigm. Table 2 provides an overview of the research questions asked and the methods used by researchers working in the empirical-analytical paradigm. It also includes the terms used and the general field that the publication falls in. To our surprise, many of the studies did not state explicit research questions, hypotheses, or research purposes. In those cases, we discerned the research question or questions from the description of the procedures used in the article.

**Interpretive Paradigm**

Compared to the empirical-analytical paradigm, we found very few studies that were classified as being in the interpretive paradigm. We discuss this later in the chapter; it appears to be a weakness in the research on multitasking that relatively few researchers have used the in-depth approach available in the interpretive paradigm. This is particularly interesting given that scholars in this area do not have an agreed upon definition of multitasking (see Table 1). It is usual that areas in which there are a limited understanding of the phenomenon under study is better addressed by interpretive methodologies (Merriam & Kim, 2012).

**Critical Paradigm**

As mentioned earlier, we did not find any articles that could be classified in the critical paradigm in our initial random pool of articles, even after a targeted search for research on multitasking that might have used this paradigm.

The critical paradigm includes the methodologies of action research, participatory action research, critical research, and feminist research. Action research and participatory action research address practical problems in education—how do we improve practice? Action research follows a problem solving model in which the researcher takes participants through several cycles of strategies design to improve teaching and learning. Participatory action research has the same goal and follows a cycle of problem solving with action, reflection, assessment at the center of each cycle, but it includes the participants as co-researchers in the investigation. Critical research is concerned with understanding oppression in a teaching and learning context; this could be relevant for those scholars interested in multitasking in different cultures. And feminist research is focused on the experiences of women from a critical perspective. It could be relevant to examine gender differences in relation to multitasking. Such questions appear to have been neglected in research on multitasking. It seems to us that this field is ripe for research not only in the interpretive paradigm, but perhaps especially in the critical paradigm.

**ANALYSIS AND DISCUSSION**

In this section, we first explore the limitations of empirical-analytical research on multitasking. We then go on to consider how research in the interpretive paradigm and research in the critical paradigm (which may be non-existent) has the potential to contribute to the field.

An analysis of the studies on multitasking quickly revealed the limitations and gaps of research on multitasking. First, there is a lack of consensus on operationalizing and measuring multitasking. Given that the majority of the research on multitasking is in the empirical-analytical paradigm, this is problematic. In the empirical-analytical paradigm, research questions take the form of “What is the effect of X on Y?”
Table 2. Sample studies with elements of empirical-analytical paradigm

<table>
<thead>
<tr>
<th>Citations</th>
<th>Research Purposes or Questions</th>
<th>Methodologies</th>
<th>Fields of Study</th>
<th>Terms Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adamczyk &amp; Bailey (2004)</td>
<td>Do different interruption moments have different impacts on user emotional states and positive social attribution?</td>
<td>Empirical: Experimental design</td>
<td>Human-Computer Interaction (HCI)</td>
<td>Interruption</td>
</tr>
<tr>
<td>Baddeley (1996)</td>
<td>To explore working memory through the central executive system</td>
<td>Empirical: Experimental design</td>
<td>Experimental Psychology</td>
<td>Dual task</td>
</tr>
<tr>
<td>Baddeley, Chincotta, &amp; Adlam (2001)</td>
<td>To investigate the storage and utilization of action control programs (the role of working memory in the operation of a simple action-control plan or program involving regular switching between addition and subtraction)</td>
<td>Empirical: Experimental design</td>
<td>Experimental Psychology</td>
<td>Task switch</td>
</tr>
<tr>
<td>Beaufret, et al. (2008)</td>
<td>To determine whether dual task–related changes in walking speed were associated with recurrent falls in frail older adults.</td>
<td>Empirical: Correlational design</td>
<td>Geriatrics</td>
<td>Dual task</td>
</tr>
<tr>
<td>Benabou (1999)</td>
<td>To determine the links between the individual’s time perspective (polychronicity) and several dimensions of corporate temporal culture</td>
<td>Empirical: survey instruments</td>
<td>Managerial Psychology</td>
<td>Polychronicity</td>
</tr>
<tr>
<td>Bishop (2000)</td>
<td>To examine the relationship between multitasking and venture performance</td>
<td>Empirical: Correlational design (surveys)</td>
<td>Management</td>
<td>Multitask</td>
</tr>
<tr>
<td>Burgess, Veitch, Costello, &amp; Shallice (2000)</td>
<td>Theory construct (results suggest that there are three primary constructs that support multitasking: retrospective memory, prospective memory, and planning, with the second two drawing upon the products of the first).</td>
<td>Empirical: Experimental design</td>
<td>Neuropsychologia</td>
<td>Multitask</td>
</tr>
<tr>
<td>Carrier, Cheever, Rosen, Benitez, &amp; Chang (2009)</td>
<td>This study investigated whether changes in the technological /social environment in the United States over time have resulted in concomitant changes in the multitasking skills of younger generations.</td>
<td>Empirical: Causal-comparative design</td>
<td>Computer in Human Behavior</td>
<td>Multitask</td>
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<tr>
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</thead>
<tbody>
<tr>
<td>Foerde, Knowlton, &amp; Poldrack (2006)</td>
<td>To examine the impact of a secondary task on primary task and memory systems</td>
<td>Empirical: Experimental Design (fMRI scan)</td>
<td>Neurosciences</td>
<td>Dual task</td>
</tr>
<tr>
<td>Judd (2013)</td>
<td>This study seeks to define and describe key task switching and multitasking behaviors adopted by students.</td>
<td>Empirical: Experimental Design (with computer logs)</td>
<td>Computers &amp; Education</td>
<td>Multitask</td>
</tr>
<tr>
<td>Judd &amp; Kennedy (2010)</td>
<td>To study on-campus internet use by undergraduate students</td>
<td>Empirical: Experimental Design (with logs of on-campus computer and Internet use)</td>
<td>Computers &amp; Education</td>
<td>Multitask</td>
</tr>
<tr>
<td>Junco (2012)</td>
<td>Question 1: How frequently do college students in the United States use Information Communication Technologies (ICTs) during class? Question 2: Controlling for demographic variables, high school grade point average, and Internet skills, how does frequency of using technology during class relate to academic performance as measured by overall semester GPA?</td>
<td>Empirical: Correlational design (surveys)</td>
<td>Computers in Human Behavior</td>
<td>Multitask</td>
</tr>
<tr>
<td>Just et al. (2001)</td>
<td>Are two non-overlapping cortical systems interfering with each other in dual cognitive tasks?</td>
<td>Empirical: Experimental design (fMRI scans)</td>
<td>Neuroimage</td>
<td>Dual task</td>
</tr>
<tr>
<td>Monsell (2003)</td>
<td>What are the control processes that reconfigure mental resources for a change of task?</td>
<td>Empirical: Experimental design</td>
<td>Cognitive Sciences</td>
<td>Task switch</td>
</tr>
<tr>
<td>Ophir, Nass, &amp; Wagner (2009)</td>
<td>Are there systematic differences in information processing styles between chronically heavy and light media multitaskers?</td>
<td>Empirical: Experimental design</td>
<td>Psychology; Communication</td>
<td>Multitask</td>
</tr>
<tr>
<td>Poposki &amp; Oswald (2010)</td>
<td>This article describes the initial development of a new measure of individual polychronicity, a construct indicating a preference for multitasking as opposed to performing only one task at a time.</td>
<td>Empirical: Causal-comparative design (surveys)</td>
<td>Human Performance</td>
<td>Polychronicity</td>
</tr>
<tr>
<td>Rideout, Foehr, &amp; Roberts (2010)</td>
<td>The study investigated the amount and nature of media use among American youth.</td>
<td>Empirical: Questionnaire and diaries</td>
<td>Media Studies</td>
<td>Media multitask</td>
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<table>
<thead>
<tr>
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<th>Research Purposes or Questions</th>
<th>Methodologies</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Rosen, Carrier, &amp; Cheever (2013)</td>
<td>The study was designed to examine task switching by middle school, high school and college students studying classroom material in their typical study environment, rather than in a laboratory setting, and determine how often students switch from studying to another task, why they switch, and how this impacts their ability to learn. (five hypotheses)</td>
<td>Empirical: Experimental design (observations and surveys)</td>
<td>Computers in Human Behavior</td>
<td>Task switch</td>
</tr>
<tr>
<td>Rubinstein, Meyer, &amp; Evans (2001)</td>
<td>To formulate and test a model of executive control that accounts more fully for task cuing, operation complexity, RSI, and other related factor effects on the time costs of task switching</td>
<td>Empirical: Experimental design</td>
<td>Human Performance; Psychology</td>
<td>Task switch</td>
</tr>
<tr>
<td>Siklos &amp; Kerns (2004)</td>
<td>The study was designed to investigate whether children with Attention Deficit Hyperactivity Disorder (ADHD) demonstrate a deficit in multitasking, measured by their performance on a modified Six Elements Test designed for use with children (C-SET).</td>
<td>Empirical: Experimental design</td>
<td>Clinical Neuropsychology</td>
<td>Multitask</td>
</tr>
<tr>
<td>Song, et al. (2013)</td>
<td>To analyze the effects of media multitasking on youngsters by applying eye tracking technology to see their switching patterns between a primary task and interference ones.</td>
<td>Empirical: Experimental design (with eye-tracking)</td>
<td>International Journal of Multimedia and Ubiquitous Engineering</td>
<td>Media multitask</td>
</tr>
<tr>
<td>Spink, Ozmutlu, &amp; Ozmutlu (2002)</td>
<td>The objectives of the studies were to: (1) Determine the prevalence of multitasking seeking and searching over multiple studies in different information environments. (2) Analyze the characteristics of the multitasking information seeking and searching processes. (3) Compare the characteristics of the multitasking search sessions with single-topic search sessions. (4) Determine any factors that may indicate a topic change during a user search session.</td>
<td>Empirical: Experimental designs</td>
<td>Information Science</td>
<td>Multitask</td>
</tr>
<tr>
<td>Spink &amp; Park (2005)</td>
<td>Explores and speculates on a new direction in human information behavior (HIB) research. Explores the interplay between information behavior and non-information behavior tasks.</td>
<td>Proposes Empirical and Theoretical development</td>
<td>Human Information Behavior (HIB)</td>
<td>Multitask</td>
</tr>
<tr>
<td>Sullivan &amp; Gershuny (2013)</td>
<td>Main hypothesis: the main factors likely to be associated with both domestic outsourcing and the multitasking of domestic/caring tasks are gender, family structure (age and presence of children), employment status (reflecting time availability), and couples’ joint and individual economic resources (with six sub-hypotheses).</td>
<td>Empirical: Causal-comparative design (diaries)</td>
<td>Social Science Research</td>
<td>Multitask</td>
</tr>
<tr>
<td>Wang &amp; Tcherney (2012)</td>
<td>If multitasking is harming our work performance, deteriorating our cognitive functions, and even threatening our safety, why do we increasingly multitask?</td>
<td>Empirical: Experimental design</td>
<td>Communication</td>
<td>Multitask</td>
</tr>
<tr>
<td>Wood, et al. (2011)</td>
<td>The purpose of the study was to examine the impact of multi-tasking with digital technologies while attempting to learn from real-time classroom lectures in a university setting.</td>
<td>Empirical: Experimental design</td>
<td>Computers and Education</td>
<td>Multitask</td>
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</table>
(X being the independent variable and Y being the dependent variable). We have seen that there is no clear definition of multitasking, so we have an independent variable that is not defined, or at least not consistently defined across studies. This stems from multitasking being viewed in a variety of ways across disciplines. There is no clear independent variable to be studied in the empirical-analytical paradigm. This means, in turn, that there is limited possibility of developing a coherent body of research literature on multitasking. The research literature is a collection of studies addressing a variety of aspects of learning which may, or may not, have anything to do with each other. There is no one theoretical framework, and following from that, there is no clear idea of what is being studied.

Second, there are limited instruments or methodologies available to measure multitasking behaviors. Given that there is no consensus on what multitasking means, this problem is compounded. Assuming that multitasking is part of a neurological process, we are currently limited in our ability to see what is actually happening inside of even a single human brain at any one given point of time in space. The best we may be able to do is to re-create or depict either brain electrical activity or brain chemical activity at the instant of experimentation or testing. We know through years of observations that when a human is injured in a particular locus of the brain, certain normal brain functionalities are routinely affected. For tests using fMRI, unless the conditions of the research state otherwise, we assume that the person being observed can hear, see, taste, feel, and think normally. Even when we have certain undeniable observed effects, we still have a problem with explaining to another person what we have actually observed in the participant’s brain and over what a short period of time. The problem is like trying to explain to someone who has been blind from birth what the color purple looks like. Not only do we have difficulty with the issue of using a common relational knowledge base, we have another more difficult problem of expressing what is occurring over time. While new technology simulations might help us to envision these sequences over time, the challenge with the human brain is that it rarely is doing only one thing at a time.

Third, even if we ignore the problem of there being no consistent view of what multitasking is, current research has focused on the involuntary nature of multitasking. Most research has been conducted in lab settings and takes a strongly positivist stance with controlled experiments to identify the optimum distribution of tasks across input and output modality. Clearly, what happens in lab experiments does not often represent a complete or accurate picture of what happens in real life. For instance, real life media multitaskers are in a natural flow of multitasking. They are more internally driven, self-directed, and choose their own targets and directions. While in a constructed lab environment research participants are often asked to perform certain tasks with an external direction and work inside of a presupposed set of assumptions (Lin, 2009). Such discrepancies naturally lead to disconnections between research and practice, and reduce the impact of research on practice. Therefore, it is important that more interpretative and emancipatory research paradigms are incorporated into the multitasking studies in order to obtain a much-needed in-depth approach to understanding this phenomenon.

There are various reasons why the empirical-analytical research paradigm dominates multitasking studies. From about the 1930s or 1940s until the 1980s, the scientific or empirical-analytical research was considered more “objective” and therefore more valuable in education and the social sciences (hence the oxymoron of “social science”), reflecting Habermas’s (1971) concern that instrumental knowledge becomes reified. This perception lingers in some fields. The perception also lingers that interpretive and emancipatory research are more difficult to do and also more difficult to publish. Although this is clearly no longer the case, researchers often still feel that
they are doing more valid and reliable work if they are quantifying their research. That quantification trivializes meaning in applied fields such as education and the social sciences is not necessarily realized in view of the strong and deeply embedded assumptions about the nature of research. It takes a paradigm shift in order for more scholars to be trained and to be encouraged to conduct research using other research paradigms.

The Potential of the Interpretive Paradigm Research

In the previous section, we outlined the problematic nature of conducting empirical-analytical research in an area where there is no consistent theoretical framework upon which to base hypotheses and in which there is no consistent definition of the dependent variable under investigation. Table 3 shows some examples of interpretive research in this area, but it is clear that much more can be done, and for those researchers who prefer to work in the empirical-analytical paradigm, interpretive research can provide the groundwork for that research.

As mentioned previously, several research methodologies are used in the interpretive paradigm: case study, grounded theory, ethnography, phenomenology, narrative inquiry, appreciative inquiry, and arts-based research. In a case study, the researcher conducts an in-depth exploration of the nature of a specific group or individual; this could be a classroom, a school, a cultural group, an organization, or one person. A case study utilizes data from a variety of sources—interviews, discussion groups, documents, artifacts, journals, curricula, observations, and so forth (Merriam, 2009). A researcher could ask questions such as: How does this class engage in multitasking? How does this one individual engage in multitasking in a learning context? How does this specific cultural group use or not use multitasking? The results of a case study could be then used to generate hypotheses for further empirical study if desired, but it is not necessary to extend an interpretive study into the empirical-analytical domain for it to be meaningful.

The grounded theory methodology is the most appropriate approach to take in an area where theory development is non-existent, poorly described, or inadequate to explain the phenomenon of interest. Grounded theory research has as its goal the development of theory based on an inductive approach to data analysis (Glaser & Strauss, 1967). Data is usually collected through interviews and/or observations, but other data sources can be employed as well. A constant comparative method is used to analyze the data; this means that data units are compared to each other to determine which data units are similar to each other and different from another data unit. From this comparison, categories or groups of data are formed. Then the properties of the category are defined. Hypotheses are generated by combining the categories and the properties. For example, a category might be “satisfaction with doing several tasks simultaneously.” A property of that category could be that individuals listen to music while studying. The resulting hypothesis could be: “Learners who listen to music while studying are more satisfied with the learning accomplished when they study.”

Narrative inquiry and arts-based research are also good choices for investigating an area where the theoretical perspectives are weak. Narrative inquiry uses story telling as a source of data (Clandinin & Connelly, 2000), and arts-based research uses the arts (for example, drawing, sculpting, painting, poetry, music, or fiction) as a means of describing people’s experiences and/or as a means of disseminating the research results (Finley, 2008). These methodologies are especially interesting in that they can use multitasking to study multitasking; for example, participants could draw and listen to music to describe their experiences, or participants could create a drama to explain what multitasking means to them. This could be a more meaningful way to make sense of
### Table 3. Sample studies with elements from the interpretive paradigm

<table>
<thead>
<tr>
<th>Citations</th>
<th>Research Purposes and Questions</th>
<th>Methodologies</th>
<th>Fields of Study</th>
<th>Terms Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baron (2006)</td>
<td>What is the multitasking behavior of undergraduates who were engaged in IM conversations? Why multitasking while doing IM?</td>
<td>Mixed methods (with surveys and brief focus group interviews)</td>
<td>Linguistics</td>
<td>Multitask</td>
</tr>
<tr>
<td>Czerwinski, Horvitz, &amp; Wilhite (2004)</td>
<td>To understand the influence of interruptions on task switching for information workers</td>
<td>Interpretive: Diaries</td>
<td>Computer-human interaction (CHI)</td>
<td>Task switch</td>
</tr>
<tr>
<td>Cotte, &amp; Ratneswar (1999)</td>
<td>This study addresses three main questions: 1) What meanings do individuals create for polychronic behavior? 2) How does this individually-created meaning influence the implications of this behavior for the individual and the workgroup? 3) What role, if any, does ethnic group play in influencing the individual meanings of polychronic behavior?</td>
<td>Interpretive: Phenomenology</td>
<td>Managerial Psychology</td>
<td>Polychronicity</td>
</tr>
<tr>
<td>Lin &amp; Bigenho (2011)</td>
<td>How do the evolving learning environments equipped with new media and technology interact with the cognitive aspects of note taking for learning?</td>
<td>Mixed methods (with experiments, note analyses, and interviews)</td>
<td>Computers in the School</td>
<td>Multitask</td>
</tr>
<tr>
<td>Ofer &amp; Schneider (2011)</td>
<td>To examine the simultaneous performance of tasks in their everyday context… specifically, the authors examined: 1) how frequently working mothers and fathers multitask, in which contexts they multitask, and the types of activities that are typically combined when multitask; 2) whether multitasking in different contexts in associated with variation in parents’ sense of well-being; and 3) to what extent patterns and emotional correlates of multitasking differ by gender.</td>
<td>Interpretive: Mixed methods (with surveys, Experience Sampling Method)</td>
<td>Anthropology; Sociology</td>
<td>Multitask</td>
</tr>
<tr>
<td>Spink (2003)</td>
<td>The major goal of the study is to conduct a case study to investigate empirically the nature of an information seeker’s multitasking information behavior and information task switching. The research goals explored in this study were: 1) to examine how an information seeker conducts multitasking information behaviors; 2) to examine the patterns of multitasking information behavior and information task switching; and 3) to test a mix of observational, diary and interview data collection techniques and provide a baseline for further research using a larger sample of information seekers.</td>
<td>Interpretive: Case study (with diaries, observations, and interviews)</td>
<td>Information Science</td>
<td>Multitask</td>
</tr>
<tr>
<td>Su &amp; Kortum (2009)</td>
<td>The purpose of this study was to provide a rich description of on-hold caller multitasking behavior. The goal is to produce objectively verified secondary tasks representative of typical caller behavior.</td>
<td>Interpretive: Ethnography</td>
<td>Human-Computer Interaction (HCl)</td>
<td>Multitask</td>
</tr>
<tr>
<td>Su &amp; Mark (2008)</td>
<td>Has the prevalence of communication media in the workplace created more opportunities for interaction, and consequently, interruptions, or rather, has the expanded number of projects that people are involved in created more need for communication and thus interruptions? Are these two phenomena inseparable?</td>
<td>Interpretive: Ethnography</td>
<td>Human-Computer Interaction (HCI)</td>
<td>Multitask</td>
</tr>
</tbody>
</table>
the phenomenon than trying to capture it in one medium (written or spoken words).

These are just some examples of how research on multitasking could benefit from alternative and innovative methodologies. The more traditional interpretive methodologies such as phenomenology or ethnography could also be relevant depending on the particular aspect of multitasking that the researcher is interested in. Phenomenology focuses on the “essence of the lived experience;” that is, how participants experience the phenomenon in real life, and then taking that experience down to its essence—its core meaning (Spiegelberg, 1975). Ethnography focuses on the cultural context of the experience; culture can mean a school cultural, an organizational culture, or an ethnic culture. The researcher takes on the role of a participant observer and immerses himself or herself in the same culture as the participants in order to understand what is going on (van Maanen, 1988).

In the next section, we discuss the potential of research in the critical paradigm for advancing knowledge about multitasking. In this paradigm, the goal is quite different—the goal is change at a variety of levels.

The Potential of the Critical Research Paradigm

The critical research paradigm encompasses at least four methodologies. As we mentioned earlier, the main methodologies include action research, participatory action research, critical research, and feminist research. Action research is used to address practical problems in practice; participatory action has the same goal, but the participants are actively involved in the research process. Critical research and feminist research have social justice goals. It is the first two methodologies that would be most relevant to furthering our understanding of multitasking as it happens in practice.

In action research, the researcher, who is also usually a practitioner, is bothered by a problem and wants to find a solution to the problem or a way of changing the practice to address the problem (Pine, 2009). In order to do so, he or she goes through two or more cycles of action, reflection, and assessment in the practice setting. The first cycle is determined in advance, but further cycles depend on the outcomes of the first cycle. For example, a researcher may be bothered by the possibility that multitasking during classroom instruction actually hinders learning while students insist that it enhances their learning. The researcher may feel that multitasking distracts students from the instruction being presented; the students may feel that they learn better when they are stimulated by a variety of activities or sensory inputs. In this case, the researcher/practitioner could begin with a strategy where students are able to listen to music while they engage in individual or group work. This action would continue for a specified amount of time (perhaps a week or two), then learning would be assessed. The researcher would reflect on the outcome, whether it is positive or negative, and then try another strategy that perhaps increases the amount of multitasking that takes place, perhaps encouraging students to use personal technology devices during class. Again, there would be an assessment and reflection stage in the cycle. The researcher continues until he or she feels that the problem has been addressed in a satisfactory way.

Even more promising for the study of multitasking is participatory action research where the participants (students, staff, teachers, parents) are involved in the research process. Participants not only give advice on what research questions need to be asked, but they also participate in data collection, data analysis, and reflection on the results of the research cycle. It is for this reason that Kincheloe (1991), in his classic and powerful book on teachers as researchers, calls this a “path to empowerment.” He contrasts the traditional research scenario in which research is something done to someone to the scenario in which participants do research with the researcher. For example, the researcher who is concerned with the problem of multitasking hindering or enhancing learning
could engage a small number of teachers and their students as co-researchers. Together, they would determine the research questions and the procedures for answering them. In an educational setting, it is particularly interesting for students to have input into the research process as opposed to being passive “subjects” in a study over which they have no say. It is the students (and their teachers) who likely know the important questions to be asked and how to answer them. Although it used to be the case that it was difficult to get funding for a research project that could not be clearly described from beginning to end, this is no longer the case as funding agencies are increasingly aware of the advantages of participatory action research in education. Similarly, researchers may be concerned about being able to publish articles based on participatory action research, but there are now numerous top tiered journals (for example, the *Adult Education Quarterly*, the *Journal of Transformative Education*) that regularly publish participatory action research studies.

We see research in the critical paradigm, which is almost non-existent in the field of multitasking, to be a promising new approach to studying this area. Any researcher who is willing to be a pioneer and conduct new innovative research should consider taking this path.

**FUTURE RESEARCH DIRECTIONS**

The following can be further questions to examine research methods for multitasking studies:

1. What questions need to be asked?
2. What criteria are used to define the field?
3. How can research address the problem of defining what multitasking means?
4. What methodologies should be used to further our understanding of multitasking?
5. Whose interests may have been neglected in the research?

While a linear way of thinking may be the shortest distance to get to one pre-determined research point critical to building a knowledge base, how do we simultaneously make use of networked global paradigms to arrive at a more useful representation (in the long run) of what is actually happening in the brain? Are men’s and women’s brains wired differently? Are the brains of children who have evolved in an age of ubiquitous computing wired differently than the brains of their grandparents?

**CONCLUSION**

Although it may not be possible to generate an accurate snapshot of the research methodologies used in multitasking studies, we can safely estimate that in the United States over 95% of the published research articles on multitasking are empirical-analytical studies.

Yet, the empirical studies may not, and probably do not capture a panoramic view of what is actually going on of multitasking phenomenon. For instance, our common sense and experience tell us that as humans, we have been multitasking in a familial environment from the beginning, performing such chores as gathering wood and cooking while doing multiple other needful tasks such as tending a baby or protecting a small child. However, the challenges come when the people who are framing the research questions tend to look at the problem in only one way, or based on only one paradigm.

We understand that many of these restrictions are placed in order to fulfill the requirements of disproving a null hypothesis, creating a blind test or an unbiased participant or creating an operation that has the fewest number of degrees of freedom to make a research point. For several decades, empirical-analytical research dominated research, but if we look further back, we find the brilliant research conducted by Piaget, Freud, and Jung (for example)—interpretive research that changed our understanding of human behavior.
and development for all of the following decades. Now, again, in recent decades scholars have come to realize that the empirical-analytical paradigm is not well-suited to understanding teaching and learning. Unfortunately, this understanding has not yet reached the scholars who are exploring multitasking studies. We hope that this chapter will encourage discussion and change in this field.

What is obvious though is that we have bigger, more pressing, even blatantly erroneous problems attached to our initial lines of questioning. What makes this form of research non-trivial? What happens if only the empirical-analytical methodology is adopted from the onset? Given that brain research is advancing so rapidly, what types of disruptive technologies will make this form of brain research pointless? Even if we understood perfectly how most healthy human brains work internally, what difference would it make for humans if artificial intelligence converged on humankind as early as 2021? If it is discovered that humankind can be biologically augmented with computer implants in the next ten years to become more efficient at multitasking, what does this mean for the future of teaching, learning and personal transformation? Our research paradigms must be broad enough to allow us to capture other more inclusive perspectives.

In his famous “law of requisite variety” W. Ross Ashby posited that “only variety can control variety” (1959). Coming up with a mathematical formula to describe a control system operating on a complex system where the system’s disturbances (inputs) were of increasing variety, he showed that there was a needed level of variety required in the control system’s regulator (a set of described possible goals) in order to define and stabilize the overall system’s number of outcomes or outputs. If one were to apply this law to the current state of multitasking studies, it is clear that there are not enough forms of possible inquiry currently underway in order to help stabilize the research state-space. In other words, there are many more possible sets of outcomes with respect to multitasking that have yet to be defined. This is why systematically there needs to be many more research paradigms in play.

REFERENCES


Research Methodologies for Multitasking Studies


**KEY TERMS AND DEFINITIONS**

**Dual Task:** A procedure in experimental (neuro) psychology that requires an individual to perform two tasks simultaneously in order to compare performance with single-task conditions (Navon & Gopher, 1979).

**Media Multitasking:** Concurrent use of multiple media (Roberts & Rideout, 2005).

**Polychronicity:** A continuum, and preferences for degrees of engagement. At one extreme is the pattern of focusing on one task at a time, interpreting other potential tasks and events as interruptions and attempting to shield one’s chosen task from such interference. The other extreme is actually open-ended, it involves engagement in several tasks simultaneously, sometimes literally simultaneously and sometimes in a frequent back-and-forth engagement pattern (Bluedorn, 2002).

**Research Method:** A procedure for carrying out research that is based on the research paradigm within which the research is being done.
**Research Paradigm:** A philosophical perspective on the meaning of research, including assumptions about objectivity, subjectivity, and the nature of knowledge.

**Task Switch:** An executive function and a kind of cognitive flexibility that involves the ability to shift attention between one task and another (Monsell, 2003).