

THE EFFECTS OF ONLINE CONTENT STRUCTURE ON  
ATTENTION & MEMORY: EXPLORING OPTIMAL STRUCTURE  
FOR NEWS ON CORPORATE WEB SITES

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by  
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The undersigned, appointed by the Dean of the Graduate School,  
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THE EFFECTS OF ONLINE CONTENT STRUCTURE ON ATTENTION &  
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A candidate for the degree of Master of Arts.

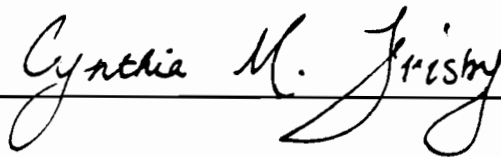
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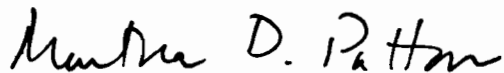
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## DEDICATION

To my grandmother, Josephine Sloss. Although you passed several years before my college career ever began, I often think of what pride you would have felt in my hard work and dedication. Throughout my years at the Missouri School of Journalism, I walked the same halls as you, wondering if I would ever develop your poise and stoic nature. I always imagined you sharing my accomplishments with me throughout my life, my graduation, wedding, perhaps becoming a mother. I am so very grateful for the time we shared together. Your spirit is a central part of my being. I will remember you always.

To Mom and Dad. Without your example, vision, and encouragement I would not be where I am today. Although all three of us have chosen paths that have led us in different directions, we will always be a family.

Mom, you have shown me how to live a full and vibrant life, you have instilled in me perspective, and you have given me true friendship.

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ABSTRACT

This study examined the effects of online content structure on attention and memory as indicators to overall communication effectiveness. For the purposes of this study, content structure was defined as either Bite-Snack-Meal (BSM), which involved presentation of information through several clickable hyperlinks, or traditional, inverted pyramid news writing without hyperlinks.

The design was a mixed 2 (content structure) x 6 (article) repeated measures design. Heart rate was collected during a 10 second baseline period and during stimulus exposure. A multiple choice recognition test and a short answer cued recall test were utilized to measure memory.

Attention and encoding were tested by submitting the data to a repeated measures ANOVA. Findings suggest that content structure does impact allocation of cognitive resources for controlled attention. BSM requires less effort and fewer cognitive resources allocated during exposure with no significant memory differences.

## CHAPTER 1: INTRODUCTION

The purpose of this study is to reveal how content structure of online news articles affects cognitive processing – attention and recognition. Different packaging of content within a hypermediated environment likely solicits different cognitive processing requirements from the reader. A content structure which employs a greater level of cognitive economy is advantageous in terms of communicating a message most effectively and efficiently. For communication practitioners, the Web is fast becoming a preferred media channel; it is the intention of this thesis to help inform practice through empirical research and thoughtful analysis of optimal communication formats within the online environment. Through this study, cognitive processing demands of reading online news articles are revealed, and best practices illuminated.

In this study, content structure is defined as either Bite-Snack-Meal, which involves presentation of information through several clickable hyperlinks, or traditional, inverted pyramid news format without any hyperlinks. Both content structures are currently being utilized within the industry. The traditional and BSM content structures likely present different information processing demands to Web users. The BSM approach may be more aligned with the enhanced control and information-seeking (and therefore processing) nature of the Internet.

This study was executed through testing a new structure of content which, unlike a traditional print inverted pyramid format, takes full advantage of the node/link nature of



the Web. Within the industry this new type of text formatting is termed *Bite-Snack-Meal* (BSM) Web authoring. The BSM content structure has grown out of the recommendation from strategic communicators that information on the Web must be manageable and aligned with the nature of the medium. Similar to the traditional news style formatting, BSM information is also typically presented in a hierarchical design from most to least relevant. However, rather than an entire story residing on one static page, information is divided into manageable pieces of information over several physical pages according to user consumption patterns. The end result of BSM is a condensed version of traditional material – in a simplified and stripped down design.

The Web is fast becoming a preferred media channel for practitioners. Large corporations rely heavily on a Web presence as a channel to communicate with stakeholder groups. Lattimore, Baskin, Heiman, and Toth (2004) note, “Because of fast, direct, and consistent contact with key constituencies, Internet technology advances almost every facet of public relations practice” (p. 373). A typical document format utilized by public relations practitioners is the online news release. In order to best communicate persuasively and with maximum efficiency and effectiveness, cognitive processing demands of the online news release must be studied and understood.

Research, extrapolated from other cognitive processing studies suggest that certain qualities of BSM (such as alignment with the learning process) will yield an experience characterized by less effort and enhanced learning. It is through this perspective that this thesis provides insight into how best and most effectively communicate with stakeholder groups. The results support strong recommendations on

how to best disseminate information, in an asynchronous manner, within online environments.

This study also adds knowledge to the body of research on cognitive processing of media messages. Results will assist social scientists in better understanding how the brain processes computer mediated messages, and also contribute substantively to knowledge of the study of new media and cognitive/emotional processing.

To test cognitive processing demands of online news releases, an experiment was conducted in which participants (N = 45) read news releases formatted in both traditional and BSM structures. After reading the articles, participants completed a recognition and cued recall test. Heart rate data was collected as a physiological indicator of attention. Participants were students who were recruited from a large state university.

## CHAPTER 2: LITERATURE REVIEW

The Internet provides outstanding opportunities for organizations to deliver information to publics with enhanced speed, agility, and relevance. However, the modus operandi for many businesses with Web sites has been to simply upload digital versions of printed materials such as newsletters and news releases (Barnhurst, 2002; Neilson, 2000). The practice of information repurposing without augmentation is termed *shovelware*. An illustration of this phenomenon can be found within the newspaper industry. In a recent article, Barnhurst (2002) noted, “Stories online differ very little from those printed in the originating newspaper... the text of staff-generated stories in the print edition was almost always identical to the text online” (p. 477). These print news documents are typically written in an inverted pyramid style. Guth and Marsh explain:

The inverted pyramid represents the traditional organization of a news story. Where the pyramid is widest, the information in the story is most important. The narrowing of the pyramid represents the decreasing importance of information as a news story progresses toward its ending... In public relations, most news releases use the inverted pyramid organization (2003, p. 314).

The behavior of shoveling inverted pyramid format and structure online is potentially problematic in terms of communicating most effectively with stakeholders. Since computer mediated communication (CMC) is inherently different in structure and user reception than other media, these medium characteristics warrant a second look at the fundamentals - namely message structure.

In the fast paced world of corporate communications, practitioners are faced with short deadlines and limited resources. The Internet offers an attractive solution to this resource crunch. Although the Web can be a highly effective channel for communication, without best practices and knowledge of writing for the Web, resultant communication effectiveness is often dramatically reduced. Practice and observation suggest that communication through new media is not always the favored channel choice, but due to resource constraints is deemed *good enough*. In the organizational communication literature this term is known as *satisficing* –a combination of the words satisfying and sufficing (Goodrich, Stirling, & Frost, 1998). This satisficing behavior among practitioners is undoubtedly causing communication deficiencies. Ihator (2001) argued, “To achieve organizational goals, corporations must manage their message content, packaging and dissemination” (p. 16). Standards for excellence must be developed in order for organizations and individuals to take full advantage of the communication and relationship-building opportunities that new media have to offer. In order to accomplish this goal, empirical research must be commissioned and executed.

In a study of organizational media channels, Russ, Daft, and Lengel (1990) found that “The image of the modern firm is one of strong reliance on computer and ‘high tech’ communication” (p. 151). This move toward high tech systems has been widely implemented due to low adoption costs, among other advantages. Stevens, Williams, & Smith (2000) have recognized the corporate sensibility that utilization of new technology will result in a competitive advantage. However, scholars and practitioners have found that “Although new technology is often implemented, the strategic implications are not

often considered” (Whitworth, 1994, p. 30). Even though corporations are quick to adopt technological advances in communication (Caulkin, 2004), they often do not consider the strategic implications of their actions.

This lack of knowledge and informed action on the part of communication specialists could (and likely does) result in inefficiencies in communication. Essentially, organizations are implementing what they deem are best-in-class productivity solutions in order to maintain competitiveness, but they have not adopted equally excellent practices/procedures for these very *solutions*. Not only could communication efficiency be sacrificed but also long-term damage in effectiveness of the entire communication system could occur. Within strategic communications, permanent damage, such as audience erosion, can occur with the simplest of mistakes – like targeting the incorrect stakeholder group or saturating the market. However communication faux pas like these are somewhat intuitive and simple solutions may be leveraged from experience with other media channels. What is more intriguing about new media communications is improving efficiency of communication through alterations of less obvious elements, such as structure of text. In order to examine how strategic communicators can get more bang for their buck, empirical research must be commissioned.

One small specialization of new media research is the study of the use of content structure in new media. Currently, practitioners are using all sorts of formats and rationales for their communication practices; however, there has not been rigorous study on which formats translate best to online presentation. Varying structures of content inherently pose different cognitive processing demands on the reader. For example,

research has found that people read text 25 percent slower on a computer screen than in print (Nielsen, 2000), which is an indicator that there are fundamental differences in the processing of print and computer mediated information. A recent finding from human-computer research suggests that in addition to a decreased rate of reading, people do not always read text on computers; they scan (Eveland & Dunwoody, 2002). In this light, it seems premature to simply leverage a content structure from print media to the Web when it is clear that the cognitive demands and overall experience are quite different.

Beyond intra-medium cognitive processing differences, quite a bit of inter-media research holds relevance to this thesis. Researchers, like Eveland and Dunwoody (2002), have identified cognitive processing differences in new versus old media. In their 2002 study of learning potential from print and online sources, the researchers yielded this insight, “From a practical standpoint, our findings suggest that the Web as a system of information delivery can be used to influence information processing and increase learning compared to traditional print” (2002, p. 48). They also found that elaboration of information and selective scanning mediate cognitive processing. Somewhat intuitively, they found that elaboration enhanced learning on the Web while selective scanning appeared to limit it (Eveland & Dunwoody, 2002, p.48). Naturally, there are several cognitive processing mechanisms at play, in addition to pure structural differences between media, which result in differences in learning. Even though these results demonstrate differences in memory potential, they do not explicitly answer the question as to which media is superior in processing through overall reduction of cognitive load.

In the same 2002 study, Eveland and Dunwoody found that hypertext was “generally” inferior to print, in terms of learning. Cognitive processing was measured through two self-report instruments, one gauging elaboration and the other examining selective scanning. Although the data were statistically significant, several inherent limitations emerge from self-report measures. A self-report measure makes the assumption that participants are insightful enough to accurately and reliably gauge his or her own learning and behavior – which is not always the case when measuring latent variables such as controlled attention and learning. Additionally, self-reports are not sensitive enough to gauge things like attention and cognitive load over time. Eveland and Dunwoody’s Web inferiority finding is rather controversial because much of the theory applied to new media (structural isomorphism) suggests that the Web would be superior in processing. This provides some evidence that interactive and user-controlled experiences are inferior to other, more traditional, interfaces, like print. However, more research is needed to substantiate these limitations of computer-mediated environments (CMEs). Although the findings of Eveland and Dunwoody’s study are interesting, they give little or no practical recommendation of how to best communicate.

In fact, it is not only high-level, conceptual theory calling for such a shift in content structure from a traditional, linear format to a more visual-spatial and hypermediated design. For example, practitioner Jacob Nielsen suggests managing texts into smaller, more manageable nodes for better reception. Hypertext media are fundamentally different from other media. “Hypertexts are visual-spatial requiring the users to think differently than they do when they read print documents (verbal-linear

texts). As visual-spatial texts, hypermedia urge users to perceive information in three dimensions” (Johnson-Sheehan & Baehr, 2001, p. 22). Rather than absorbing data in a linear format, similar to the structure of this sentence, the larger paragraph and body of text in which the paragraph is contained, hypermediated data may be accessed with little regard for order or sequence (Nielsen, 1990). Hypermedia’s organizational format requires users to orient themselves within the environment and determine which points of data/content to visit next. Instead of moving only forward and backward over a predetermined track, such as the experience of reading a book, hypermediated texts are equipped with the technology to – at any given point - enable the user to explore in-depth elements. From an information processing perspective, hypermedia presents an entirely different method for encoding of information.

## MEDIA BACKGROUND & DEFINITION

The Internet and World Wide Web (Web) are hypertext mediums. Hypertext is the format of the Internet just like print is the format of newspapers, magazines and books. The principle differentiating feature of hypertext from other media is that it links bits of information together through hyperlinks. Hypertext is the language of new media, but new media is anything but uniform. It is prudent to define *new media* and how it is different from other, more *traditional* media. In recent decades (since the explosion of the personal computer and the Internet) scholars have typically defined new media as computer-mediated communication (CMC). That is a communication that is received by



a group or individual through a software interface. Although this definition of new media and CMC encompasses several technologies such as e-mail, instant messaging, RSS, and net-meetings, for the purposes of this study the definition will be narrowed to encompass only online applications, namely the online environment of Web pages.

The basic units of hypertext are the node and link; however, scholars and practitioners have reached little consensus as to what constitutes a node (Nielson, 1990; Eveland & Dunwoody, 2000). Although most agree that a node is *piece of information that can stand-alone as a coherent thought or concept*, there are no systems or standard measures established to make such categorizations. For example, with a high level of expertise and familiarity on a particular topic, an individual could require far less description of a concept for adequate explication. Herein lies the flaw in the definition of the node: it is dependent on individual user perception and content meaning. As complicated as language and expression can be, there seems no sensible method to operationalize this hazy definition of the fundamental characteristics of hypermedia. Perhaps a better solution is defining the node according to the source. In essence the same way we think of chapters in a book; predefined packets of information organized by the author. This application of a node at the source's discretion fits well with the current landscape of hypermedia content managers simply group together what makes sense to them. Still, it appears that there is a dissonance between the conceptual definition of a node and its operational application on the Internet.

Given these issues, it is not surprising that the definition of a node is less about encapsulation of the term/concept and more about the node's transcendence of barriers.

For example, a node is a somewhat abstract concept that does not have a length, comprehension, or location requirement giving it no standardized format. There is more certainty about what a node is not rather than what it is. It is difficult to define any idea without tools and standards by which to define it. However, for the purposes of this study, a node will be conceptualized as a grouping of text, which is capable of having an independent locus (such as a Web page) and stand-alone meaning (note that stand-alone meaning will be determined through environmental content analysis).

An important distinction of hypermedia is that information within the channel is broken into manageable pieces of information which *link* to other nodes of information. Although nodes of texts are capable of being interpreted as stand-alone units, their utility is often increased when associated with other related nodes – a synergy can be achieved. The bridging of two independent nodes functions to relate ideas, build complex associations of information – and in the case of news writing on corporate Web sites, linking of nodes enables stories to be told in a sophisticated manner with the potential to have both elements of breadth and depth (a challenging feat for the linear format). By interlinking complex and detailed information, a more complete and integrated web of text and information is achieved. Rather than reading a library of books and trying to make relevant connections, a visual spatial organization enables those diverse texts to already be interlinked. Essentially, the work of others in formatting the information into a visual-spatial design takes one step out of the process of internalization.

Hypertext is the language, technology and format of the Web similar to how the format of radio is an auditory element. Although some say that McLuhan's (1967)

proclamation that “The medium is the message” was a bit extreme, the format and structure of any medium’s communication has a direct impact on the modality of function and how the information is processed. To interact with any medium, there are basic rules of engagement defined by that very medium. In the case of the Internet and standard Web page format, a rule of navigation includes the forward and back buttons/function and live links. Structural elements define the user experience and limit the versatility of the medium.

Given this fundamental difference in medium characteristics, it comes as little surprise that the information processing demands vary between hypermediated and non-hypermediated texts. However, the exact elements of difference are challenging to define and examine. Hypermediated texts present several unique demands on the cognitive processing system. It is presumptuous to assume that only a handful of factors contribute to this difference. A more conservative observation identifies both user and media elements, which contribute to processing differences. For the purposes of this study, cognitive processing was measured and analyzed through heart rate as a physiological indicator of controlled allocation of cognitive resources to encoding a stimulus.

## THEORIES OF INFORMATION PROCESSING

There are several theories within the realm of information processing that can potentially be utilized to explore optimal content structure within a CME. This section details relevant works from such theories as structural isomorphism, media richness, and user control/experience. Upon review of these theories, it is crucial to consider each theory's overall goodness-of-fit to the research topic. Explication and application of these diverse perspectives to this study will yield direction in terms of selecting a suitable theoretical approach.

A popular avenue for uses and effects research in CME is schema theory or structural isomorphism - based on integrated network theory. This research track evolved from Vannevar Bush's imagination of Memex as a medium to extend the processing capacity of the human brain. As early as 1932, Bush philosophized about Memex, short for *Memory Extender*, a system conceptually similar to the Internet (Nielson, 1990). The theory of structural isomorphism suggests that CMC will enhance learning because the Web is structured in a similar fashion as the human information processing system (Wicks, 1991; Eveland & Dunwoody, 2001). Jonassen (1988) said, "Because hypertext is a node-link system based upon semantic structures, it can map fairly directly the structure of knowledge it is representing" (p. 14). Additionally, Wicks (1991) noted, "Schema theory suggests that people are active processors of information and that schematic thinking derives from the need to organize thinking for the purpose of cognitive economy" (p. 119). Other scholars like Hawkins and Daly (1988) have

described schemas within the learning process as a tool to simplify complexity of information and relationships between concepts.

According to this theoretical framework, information that is formatted in a structure more compatible with hypermedia (use of nodes and links) would result in enhanced processing and greater cognitive economy. This notion of text structure mirroring neuropathways has not been fully supported in research. Naturally, cognitive processing is a multidimensional construct that is challenging to measure with innumerable confounding and intervening variables.

Looking closer at proximity and relevance, Kaakinen, Hyona and Keenan (2002) examined the effects of reader perspective on levels of text processing. In addition to motives for accessing information, the researchers utilized an integrated network structure by suggesting that stimuli activate user knowledge structures within the brain (referred to as scenarios). This translated into what the authors refer to as the effortless-encoding hypothesis; the idea that the encoding of highly relevant information does not require additional processing resources. This hypothesis was not supported as cognitive load was increased with message involvement. It should be noted that Kaakinen et al. (2002) found that participants had better memory of perspective relevant information.

In 2004, Eveland, Marton and Seo posited that “Based on the notion of structural isomorphism, cognitive elaboration – the making of mental connections among pieces of new information as well as old information in memory - should be encouraged more by a linked than unlinked online news site” (p. 89). However, this prediction was not supported. Subjects in non-linked treatments scored higher in tests of factual knowledge

(Eveland, Marton & Seo, 2004). Perhaps more hypermediated formats are too distracting to enhance the learning process.

It is curious that so few schema studies on new media have yielded support for the theory. Perhaps it is because this area of study (although dating back to the 1930s) is still poorly understood and therefore, poorly operationalized and studied. It is also possible that the lack of support is characteristic of a much more fundamental weakness in construct validity. Although this topic has been researched in many ways Eveland and Dunwoody (2001), “little research has been conducted on the influence of hypermedia use on the structure of human memory” (p. 87).

In addition to the weaknesses already identified in the literature, there are several other elements that limit structural isomorphism’s suitability as a theoretical foundation for this study. Though rather compelling on paper, the fact remains that few studies, within the realm of social science research, have done much more than identify weaknesses. Most notably, this theory lacks the robustness and power to generate testable hypotheses for a study like this thesis. True, a general research question regarding content structure of online text could be developed, but structural isomorphism does not permit more specific and rigorous examination. In terms of scope, the theory and resultant method used to study cognitive processing of content structure must hold together at a magnified and nuanced level. Structural isomorphism does not provide this level of specificity or a reliable enough track record to adopt as a theoretical perspective for this study.

Moving on to other theories of information processing, media richness emerges as an appealing perspective due to its focus on channel structure and cognitive load. As such, media richness may also be examined as a tool to understanding cognitive processing of mediated messages. The theory also lends itself to the practical/manifest characteristics of media which are of particular relevance to the external focus of this thesis. Media richness is a concept developed from organizational communication studies. The theory states that media can differ among several dimensions, which determine a medium's relative richness. Overall richness depends on the presence of (1) feedback, (2) multiple cues, (3) language variety, and (4) personal focus (Valacich, Peranka, George, and Nunamaker, 1993). Through this perspective, interpersonal communication is considered the richest channel due to availability of cues, feedback opportunities, etc. The richer a medium, the higher likelihood that a complex message/concept would be communicated successfully. In terms of cognitive processing, this theory suggests that an appropriate media must be selected to provide the optimal processing opportunity. If the message is too complex for the medium, a disproportionate amount of effort will be spent trying to encode and decipher the information. If the media is too rich for the message, no orienting will occur and the audience will be more likely to disengage. Media richness theory would support a content structure better aligned with media characteristics in order to minimize cognitive load while maintaining interest. In this case, theory calls for a content structure that mirrors the medium, one that utilizes and exploits the Web's hypermediated nature.

As technology has evolved making media more interactive and user tailored, an opportunity to communicate more complex messages with reduced cognitive load has arisen. Given that hypermedia provides a more sophisticated format for information presentation, new and better suited content structuring must be developed in order to maximize the previously described relationship between media characteristics and message format. Application of media richness to this scenario suggests that the current practice of shoveling print formatted information into a hypermediated environment results in low structure complexity (stagnant and void of nodes/links), and therefore, inhibits optimal processing. Media richness theory would support a content structure better aligned with media characteristics. In this case, theory calls for a content structure that mirrors the medium, one that utilizes and even exploits the Web's hypermediated assets.

However, in considering this theory as a potential foundation for this thesis, it becomes clear that media richness is exceedingly basic, and not suitable for a data based, experimental design –such as this research study. Media richness lends itself more to a methodology of a textual analysis of content within a mediated environment. It does not permit for development of an experimental design with specific, testable hypotheses. It is the very descriptive/developmental strengths of this theory that severely limit any quantitative analysis. Because media richness is too general – a tool of description of elements already existing in a media environment and best applied in inter-media analysis – it is not suitable as a theoretical foundation for the study of content structure and cognitive processing.



Yet another information processing theory that might shed light on new media content packaging is the study of user control. Since navigation through the hypertexts is non-linear and a somewhat three-dimensional experience (Eveland & Dunwoody, 2002), researchers like Steinberg (1989) have suggested that, “Learner control [theory] will maintain attention longer, involve students more deeply, and perhaps give students greater insights” (p. 117). Through the perspective of user control, the structure of the Internet allows a “to each his own” path to cognition. Eveland and Dunwoody (2002) said, “Hypermedia, the technology behind the Web, is presumed by user control theory to be beneficial for learning compared to traditional media and other forms of instruction” (p. 37). The Internet is fundamentally driven through user control – active participation is required. In terms of information processing, user control theory seems to have a positive impact for content of high relevance to the receiver (Kaakinen et al., 2002).

Human-computer interaction (HCI) has also been examined as an external tool to enhance cognition. Kozma (1987) proposed that computers could aid human learning through: supplementing limited working memory, making relevant and previously learned information available, enabling quick retrieval of information, and prompting the learner to structure to integrate and interconnect new ideas with previous ones. Mayer and Chandler (2001) examined the ability of user interaction to reduce cognitive load on working memory. It is clear within the education literature that CMEs have the potential to enhance not only learning capacity, but also efficiency of learning, richness of content, and overall experience.

Through empowerment of space and path, individual users can customize their learning experience. User control theory suggests that hypertext media may be superior in learning through this theoretical perspective. Steinberg (1989) noted, “Learner control of instruction is intuitively appealing. The argument is that students will be more motivated if allowed to be in control of their own learning” (p. 117). However, as Steinberg noted, users must be motivated and active in order for this theory to hold water. Eveland and Dunwoody (2002) said:

A major assumption of user control theory is that individuals actually do take advantage of the opportunity provided by the Web to structure learning based on individual motivations... User control theory assumes that in addition to being selective, users make their decisions properly to advance learning... A number of scholars have questioned the quality of decision-making processes employed by those with user control, particularly novices in the content area (Dillon & Gabbard, 1998; Milheim & Martin, 1991; Park, 1991; Shin et al., 1994; Steinberg, 1989) (p. 38).

Lang, Borse, Wise, and David (2002) found that user control had a negative relationship with recognition. The authors discovered that user control resulted in less time viewing the material, resulting in lower recognition. So, although hypermedia may be more effective at individualization (user control) and mirroring cognitive processes (schema theory), it is clear that decision-making mode and motivation to attend to the media are the ultimate gatekeepers to cognition. Finneran and Zhang (2003) described the optimal candidate for user control as someone who is autotelic, “A person [that] is focused on the process of the activity more than the end result or extrinsic rewards” (p. 477). Naturally, not every person in every instance is aligned with an autotelic goal orientation. Therefore, to some degree, user control theory has limited application potential at this juncture. Although user control is undoubtedly a intervening variable in

processing news on corporate Web sites, the current research and highly unreliable nature of its effect (varying per individual motivations) make it difficult to isolate.

Dependency upon information-seeking mode of the media consumer is a dangerous direction to head when attempting to understand the fundamental process and most efficient structure elements of text presentation online. User control theory should be studied and applied as an explicit variable in subsequent studies that are built upon a strong foundation and understanding of the information processing demands which users face. In other words, ability to process and ease of digestion must be understood before idiosyncratic behavior may be isolated and studied.

The Internet is fundamentally driven through user control – active participation is required (albeit at varying degrees). In terms of information processing, user control seems to have a positive impact for content of high relevance to the receiver. The beauty of a user centric media is that information of high interest may be attended to with additional resources while information of little consequence may be avoided entirely. This allows the user to have a more efficient and gratifying processing experience. However, rational thinking and motivation are essential to this process. Since this thesis is concerned solely with corporate Web sites, motivation to attend to message content was held at a constant, given that any user viewing such material would likely have interest in it as evidence by the navigation to the specific site. This study focused exclusively on cognitive processing ability with respect to different content structures.

In addition to the issue of user control theory potentially complicating this study with the introduction of elements beyond the scope of cognitive processing (motivation),

it also carries with it several other limitations that garner it insufficient for use and application in this thesis. Although it is intuitively appealing and does an excellent job describing why a user guided session within a CME is preferred, it does not give a researcher tools robust enough to pull apart intricacies of the multiple layers of cognitive processing. User control theory introduces too many variables to be examined in a singular experiment. As such, it will not play a central role in this study – however, it is noted that user control provides an interesting context by which to understand environmental dynamics.

All three of these theories, structural isomorphism, media richness, and user control prescribe a Web content structure that takes advantage of the medium's inherent characteristics. Unlike shoveling sender controlled print articles online, the synthesis of these theories demonstrate the many weaknesses and dangers of current industry practices. A content structure better aligned with these constructs of memory pathways, medium alignment and user engagement is being recommended. However, based on these theories, there is no realistic method by which to test it while keeping a high degree of control and specificity. Even so, each theory provides some insight into how information processing is discussed in literature and how it is perceived by scholars. In the section that follows, Lang's Limited Capacity Model of Mediated Message Processing will be examined in depth. It is this theory that will drive both the research inquiries and method, due to the model's overall suitability to studying media messages within an experimental design.

## THEORETICAL FOUNDATIONS

In order to identify and understand the processing differences at play, a theoretical framework must be applied. This thesis embraces the Limited Capacity Model of Mediated Message Processing as a fundamental knowledge structure. Collecting data under a limited capacity processing framework can help strategic communicators move beyond intuition and provide empirical insights into the information processing demands of reading text online. The first step in the process to maximize cognitive economy is to understand how people process information within hypermediated environments. Although there are numerous research methods that could be utilized to accomplish this goal, the more free-from-error and scientifically grounded the method is, the better. Through testing explicit content formats and their resultant effectiveness (based on physiological response to stimulus), standards and recommendations emerge.

Annie Lang's (2000) Limited Capacity Model of Mediated Message Processing proposes that individuals have limited cognitive resources to allocate to the processes of encoding, storage and retrieval of information contained within a media message. Through this framework, it is inferred that cognitive resources are limited. Further, how well a message gets into memory depends on resources allocated to the individual subprocesses. The model also identifies two modes of processing, controlled and automatic. Bargh (1989) described controlled processing as flexible, intentional and individual, while automatic processes are defined as "Unintentional, involuntary, effortless (i.e., not consumptive of limited processing capacity), autonomous, and

occurring outside of awareness” (p. 3). Controlled processing and difference over time is the focus of this study.

Within the Limited Capacity Model, Lang (2000) suggests orienting responses, abrupt changes in consumption experience (such as video cuts), have the potential to improve cognition of a message. An orienting response is an automatic response to attention, which has been known to occur in relation to environmental change. However, too much of a good thing, in the case of limited processing theory, is bad. Too many video cuts, for example, have the potential to overwhelm the processing system and reduce cognition. Limited processing fundamentally assumes that there is a point of information overload, which will inhibit the function of cognition. Orienting is a fight or flight like reaction that is analyzed over exposure periods not typically exceeding 10 seconds. Because this thesis’s locus of interest is more toward aggregate exposure to relatively non-novel stimulus, orienting was not examined.

Lang suggests that there are three levels of processing (encoding, storage and retrieval) which function independently to allocate cognitive resources. Encoding is the process of perception made possible through information gathering from sensory receptors. This is the first step to internalization. Although capable of perceiving a breadth of the environment, encoding is characterized by short-term memory (Lang, 2000). The allocation of cognitive resources can be measured through heart rate; while how effectively information is encoded into working memory can be measured through recognition tests (a self report measure). Storage is the process of linking new information “to previously encoded information (or memories)” (p. 50). Storage is

measured through a cued recall test. Retrieval is the final sub-process of the Limited Capacity Model. “Retrieval is the process of searching the associative memory network for a specific piece of information and reactivating it in working memory” (p. 50). This mode measures storage through a free recall test. The Limited Capacity Model theory functions as an excellent framework for the study of efficiency and effectiveness of media messages because it makes explicit distinctions between the different stages of cognitive processing. In separating the processes of encoding, storage, and retrieval, individual allocations are revealed and conclusions may be drawn regarding the message’s ability to be learned (in terms of attention required and memory).

Lang’s theory presents a comprehensive model to studying the “black box” and mediated messages. Since three levels of cognition are identified and isolated, researchers may study message effectiveness at increasing degrees of cognition. Through application of the Limited Capacity Model of Mediated Message Processing, cognitive load, level of involvement, and comprehension can be empirically measured and analyzed.

Before this framework was applied to online media, scholars applied it to print and broadcast. For example, a 2003 study by Grabe, Lang, and Zhao examined the effect of structural packaging differences on the cognitive processing of television news shows. The study found the more attention grabbing, “bells and whistles of tabloid production features enhance memory” (p. 387). In other words, structural features produce orienting responses on television. This finding has been proven true of certain structural features of new media as well.

Moving toward examination of CMEs, Lang et al. (2002), through the lens of limited capacity, sought to identify elements of online persuasive messages that elicit orienting responses. Within three distinct experiments, the researchers found that headline text on a computer screen did not produce an orienting response (however borders placed around text appeared to elicit an orienting response). The study also revealed that deviant material had a higher recognition than non-deviant, perhaps due to inherent novelty. User control was found to have a negative relationship with recognition. According to this article, user control negatively affects recognition, which is counter to prevailing thought and theorizing. The authors suggest that user control resulted in less time viewing the material, which resulted in lower recognition. Although opposite to classic user control theory from the education literature, this finding seems valid as a true reflection of reality and a phenomenon occurring everyday within CMEs, where motivation and relevance mediate memory. In addition to user control, Lang et al. (2002) suggested that text does not produce an orienting response –which counters the notion that “news” and information seeking is a primal survival technique. It is also curious that text does not elicit an orienting response while visuals do. The results of this study are strong due to replication; however, the authors are still unclear about the nature of the findings. Application of these results to a writing style study suggest that no orienting will occur in either condition.

Although this thesis primarily focuses on the investigation of hypermediated texts, examination of cognitive processing studies of hypermediated information is useful. Recently, Diao and Sundar (2004) examined both pop-up structure and



advertisement animation in relation to cognitive processing. Data collected from psychological and physiological measures found results that were “consistent with contemporary theories of [orienting response] and visual attention, which suggest that people tend to orient automatically toward those mediated messages that are novel and unexpected” (p. 556). Banner ads, surprisingly, were found to elicit greater participant recognition while pop-ups had greater recall. Aside from theory development, this study demonstrates that pop-up advertisements do not overload the processing system. Implications suggest that perhaps pop-up ads are within the acceptable range of interactivity for the hypermediated media message structure. Although this study did not focus on text processing in a CME, it does support the notion that text will likely not overload the processing system if large flashing and animated visuals do not. In terms of complexity, novelty, and overall cognitive load, it is commonly known within the cognitive processing literature that hypermediated texts are less complex than visuals or other hypermediated information.

Sundar and Kalyanaraman (2004) also explored the cognitive impact of animation in online advertising (similar to Lang et al., 2002). The research found that animation is psychologically significant to limited processing online messages. This study demonstrated that structural features can, and do, have implications on processing media messages online. The research topic of content structure and the Web is explicitly linked to both advertising and online processing through format variations; therefore, this study helps support the foundation of this thesis. In this case, augmenting a message structure

element increased learning. The variation of this study will be the replacement of visual advertisements with body text.

In examination of cognitive processing of linear texts, Anderson (1990) highlighted the link between the flow of text and user processing. In an experiment comparing memory for two texts identical in content but varying in structure, memory for the hierarchically formatted passage (high relevance between adjacent information and flow of text) received an 85% recall of facts while the scrambled (random organization of sentences) story yielded a 32% recall. The more closely related items are, the more efficiently they are processed. Anderson also introduced Kintsch and van Dijk's Text Comprehension Model in which a passage is segmented by the various propositions it contains. Essentially, new propositions must have some relation to previous propositions in order for the reader to understand the content. This model can be applied to hypermedia's node and link associations. In order to be successful in communication, Anderson would likely conclude that nodes and links need to be tightly related in a logical manner. This contextual perspective helps explain why far less information can be retained from thoughts paired together in random, non-sequential, order. Hierarchical ordering of thoughts within a given text also lessens the cognitive load the reader must withstand in order to process. Logically-ordered text with an accompanying high-level strategy improves the efficiency and effectiveness of cognitive processing. Anderson's findings paired with Nielson's (2000) recommendation for simplified Web authoring suggest that the most efficiently processed content would be hierarchical, simplified, and somewhat repetitive in order to enhance learning. These findings help substantiate the

current state of affairs of organizational communication through new media channels where CMC is not being designed most effectively in terms of strategic communication and appropriate structuring for effectiveness.

Eveland and Dunwoody (2000) suggested, “Under the assumption of limited cognitive capacity, the effort spent orienting oneself to the information space – sometimes called cognitive overhead – consumes some or all of the cognitive effort that might otherwise be invested in more meaningful processing of the content” (p. 223). Therefore, an appropriate avenue of investigation for this thesis is cognitive economy. Getting the most effective processing for the minimum effort; a true attempt toward effective satisficing through alternative structural designs of text. Implementation of a concept like cognitive economy is different from satisficing because cognitive economy seeks out the optimal route with respect to medium resource allocation while satisficing only stipulates an adequate application. Within the context of corporation communication through hypermedia, this shift in ideological focus will result in a little more forethought, but no perceptible increase in work or resource allocation. Communication will be more efficient and effective with only a minor increase in resource allocation.

Limited capacity theory is the deep structure of this study on content structure based on concepts derived from integrated network theory, media richness, and user control. It provides a solid foundation for uses and effects research and it has been proven as a solid method through numerous studies that have adopted the framework. Through a limited capacity perspective, this study examines the processing effectiveness

of online mediated messages in CMEs. Specifically, this study addressed the following research question:

RQ: How does content structure of online news articles (defined as prevalence of node/links) affect cognitive processing?

Fleshing out the dynamics of predicted cognitive processing differences will be achieved by examining both attention requirements, in terms of efficiency, and overall memory effectiveness. Intuitively, in Lang's Limited Capacity Model of Mediated Message Processing, the more efficiently a message can be encoded allots greater cognitive resources conducive to a more successful learning environment. In terms of attention requires to encode a mediated message, traditional content structure is posited to require more cognitive resources than BSM. Through BSM's alignment with the characteristics of hypermedia, namely nodes and links. It is posited to require less effort (or input) to attend to. Based upon basic principles of cognitive load and text processing, was predicted that a simplified content structure would reduce cognitive load associated with encoding:

H1: News releases formatted in traditional content structure will require more effort to encode than BSM formatted news releases as evidenced by greater cardiac deceleration during exposure to news releases in a traditional structure compared to BSM formatted articles.

Although not always fully supported within the literature, prevailing ideas about cognitive processing suggest that hypermediated information processing on the Web will be more effective, in terms of memory, than non-hypermediated content. Therefore, a simplified content structure paired with increased links/nodes (BSM) would be more successful than a traditional style (inverted pyramid) story residing on a singular node in

information processing due to its modular and nodal construction. Additionally, given that cognitive processing resources are limited, according to Lang's model, a content structure with less resource requirements for encoding should allow for an environment conducive to maximized memory opportunity. Therefore, it was posited that:

H2: Recognition for article content presented on a Web site will be greater for news releases in a BSM structure compared to the traditional formatted articles.

H3: Cued recall for article content presented on a Web site will be greater for news releases in a BSM structure compared to the traditional formatted articles.

## CHAPTER 3: METHODOLOGY

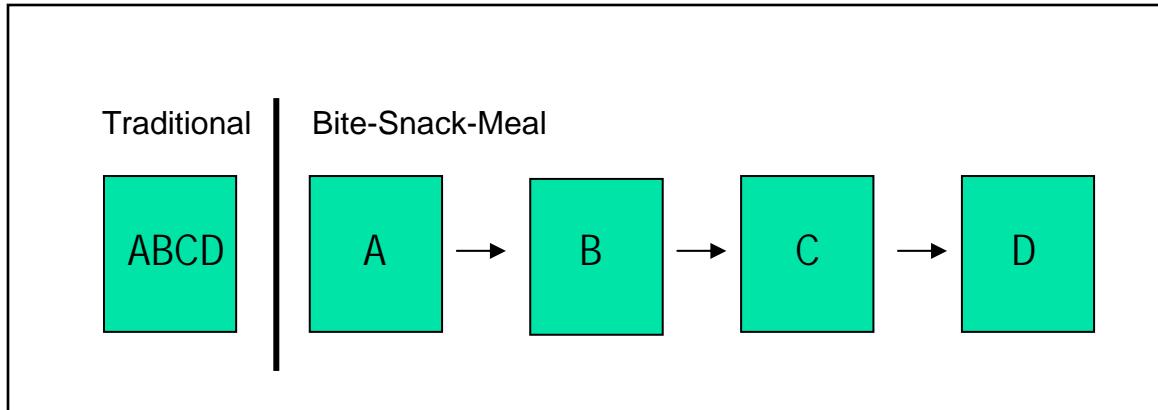
### EXPERIMENTAL DESIGN

The design of this experiment was a mixed 2 (content structure) x 6 (article) x 6 (order), repeated measures design. Content structure and article were within-subjects factors. Within this model, order functioned as a between-subjects factor to control for primacy and recency effects. Participants were randomly assigned one of six article orders (see Appendix A for thesis orders). Content structure had two levels, traditional and BSM structure. Articles represented six topics at both levels of content structure. Content structure was a repeated factor (see Appendix B for article legend).

### INDEPENDENT VARIABLE

Content structure was the independent variable (IV) examined in this study. Content structure is the manner in which information is written into text for presentation on a Web site. This was manipulated by formatting articles in both traditional structure and BSM structure. Operationally, the independent variable of content structure varies on a continuum of what many term “interactivity” – the hypermediated characteristics of the Web. Within this experiment, the condition’s content was structurally altered to appear on several interlinking pages while the control stimulus resided on a single page (see Figure 1).

FIGURE 1  
GRAPHICAL REPRESENTATION OF CONTENT STRUCTURE



## DEPENDENT VARIABLES

*ATTENTION:* Attention was conceptualized as controlled allocation of cognitive resources to encoding. Attention was measured by obtaining participants' heart rate during exposure. The study of media message processing has been conducted with heart rate as an indicator of controlled attention in numerous social science studies (Lang, 1994; Bolls, Lang, Potter, 2001). Heart rate, in five-second intervals were collected during exposure. Change scores were computed over time for analysis. A five second time interval was selected because of the preservation of data trends without the overly dynamic pattern typical of heart rate data. Additionally, the relationship between content structure was explicit enough to smooth over data without sacrifice to statistical outputs. (For complete rationale, please refer to section reviewing H1 experiment results in CHAPTER 4 : RESULTS).

*RECOGNITION:* Recognition is the process of perception made possible through information – gathering from sensory receptors – the first step to data internalization.

Recognition was conceptualized as how well information was encoded into working memory and measured through a 24-question recognition, four-response, multiple-choice test. Four questions were developed for each article (see Appendix C for recognition questions per article). Overall question difficulty and locus of subject content were controlled.

*CUED-RECALL:* Cued-recall is the process of linking new information to existing knowledge. Cued-recall is conceptualized as how well information was stored in long-term memory and is measured by a cued recall test (see Appendix D for specific cued recall instructions per article). The test consisted of a one-sentence article cue and a second sentence requesting a typed recall: “You just read a story about ARTICLE TOPIC HERE. Please describe all details and information that you can remember from that article.”

## STIMULUS DERIVATION

Stimulus material was developed by formatting articles into the two distinct content structures (see Appendix E for stimulus material). One condition was represented by traditional content formatting, which is commonly leveraged from print to the Web (Barnhurst, 2002) – also known as shovelware, a term synonymous with traditional content structure. The second condition, BSM, was classified as a structure that takes advantage of the node and link capabilities of hypertext – physically residing on multiple pages (see Figure 1). The traditional stimuli required the article reside on a single page,



while the BSM version broke the news release into four portions all residing on different (linked) pages. It is important to note that while structure/format was varied between conditions, actual content – words, sentences, paragraphs – remained constant across conditions per topic.

A fractionated design manifested in six articles placed in two formats resulting in twelve, distinct stimuli (Appendix B). Six orders were developed for control of placement effects (Appendix A). Article content was designed explicitly for the study. In an effort to maximize external validity, a content analysis was utilized to derive article characteristics: topic, tone, length, and readability. The 2004 Fortune 100 list was used as the sample frame of which 25 organizations were randomly selected (see Appendix G for sample list). Five articles from each site were analyzed. Final article topics included news releases about: (1) a new hire announcement, (2) a dividend release, (3) a joint venture, (4) a scholarship competition, (5) a new product, and (6) a new contract. In the interest of continuity of any brand attitudes, a single organizational name was used: Edgenet Corporation.

In order to ensure consistent readability between articles, each article – divorced from content structure – was submitted to a rigorous readability analysis. Pretesting content with participants was avoided due to the inherent weakness of reliance on self-reported information. Instead, each article was submitted to mathematical analysis. The Flesch Reading Ease Formula was utilized in this capacity due to its usage in other social science research studies and tool availability (Shuptrine & McVicker, 1981; Macklin, Bruvold, Shea, 1985; Flesch, 1951). Bruce and Ruben (1988) said, “Readability formulas

are widely used in a variety of situations where estimates of text complexity are thought to be necessary” (p. 7). The authors also noted that this form of readability testing is becoming an increasingly common method of analysis. Microsoft Word’s built-in readability formulas were used for the readability analysis for this study (see Appendix H for fomulas). In addition to mirroring environmental conditions through readability formulas, articles were also controlled in length, characters per word, and words per sentence (see Appendix I for readability statistics).

## PROCEDURE

The primary researcher welcomed the participant and discussed informed consent both orally and in writing with each participant. After consent was given, the subject was prepped for data collection. Participants were instructed to follow the instructions on the screen. After stimulus exposure, participants were given a distracter task. Then each participant was given a cued recall test followed by a recognition test. Once all the data was collected, participants were debriefed, any questions were answered and the participant was dismissed. A detailed laboratory protocol document may be found in Appendix J.

## PARTICIPANTS

Participants (N = 45) were recruited through classroom visits at a large state university. 88 percent of the sample was female. Participants were recruited through a classroom visit (see Appendix K for recruitment script). In exchange for their participation, subjects received three points of extra credit. Within the context of experimental research, convenience samples (such as this case) are acceptable if assignment to conditions is randomized. In order to achieve randomization, participants were assigned unique identification numbers that had already been randomized through a simple function in Microsoft Excel. Additionally, presentation of questions, both recognition and cued recall, was randomized within topic by utilizing MediaLab's between- and within-group randomization function.

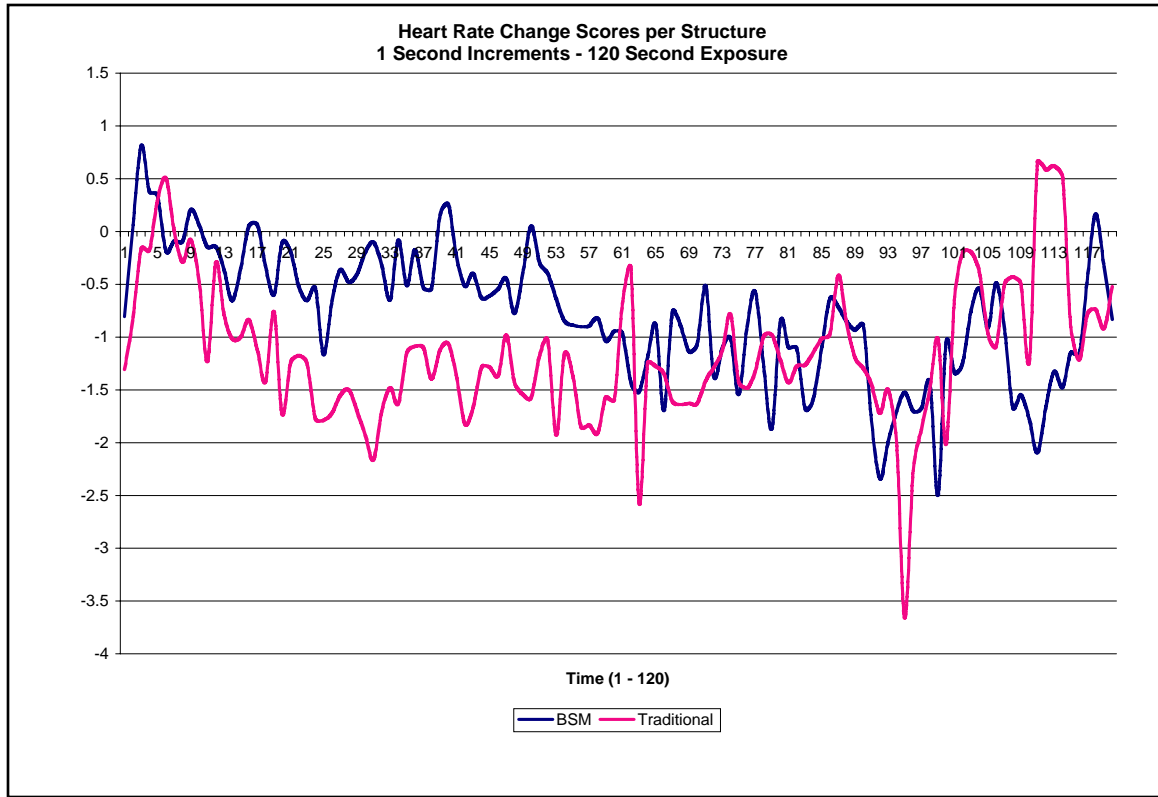
## CHAPTER 4: RESULTS

### *HYPOTHESIS 1*

The first hypothesis predicted that heart rate would decelerate less during exposure to BSM structured news releases than exposure stories in traditional format. This hypothesis was tested by submitting the data to a 2 (content structure) x 6 (article topic) x 120 (time) repeated measures ANOVA. To accomplish this, heart rate was collected throughout exposure. Baseline data was collected for 10 seconds prior to stimulus exposure for the purpose of change score computation –which allows comparison between subjects and conditions. Change scores were computed over time for analysis.

Due to the independence of reading pace, exposure duration varied per participant per article (12 articles total). In order to prepare the data for the repeated measures ANOVA, data per article were limited to 120 seconds of exposure (see Figure 2). Two minutes functioned as an intuitive choice as average reading pace predicted a complete exposure to take approximately 120 seconds. Additionally, this value enabled minimal loss of data while also reducing manipulations like substituting averages for missing data. A limit of 120 seconds was selected in order to perform adequate analysis. Data from 45 participants were submitted for analysis. Data from six participants were lost due to a combination of experimenter, equipment, and participant error.

FIGURE 2  
HEART RATE CHANGE SCORES PER CONTENT STRUCTURE – 120 SECONDS

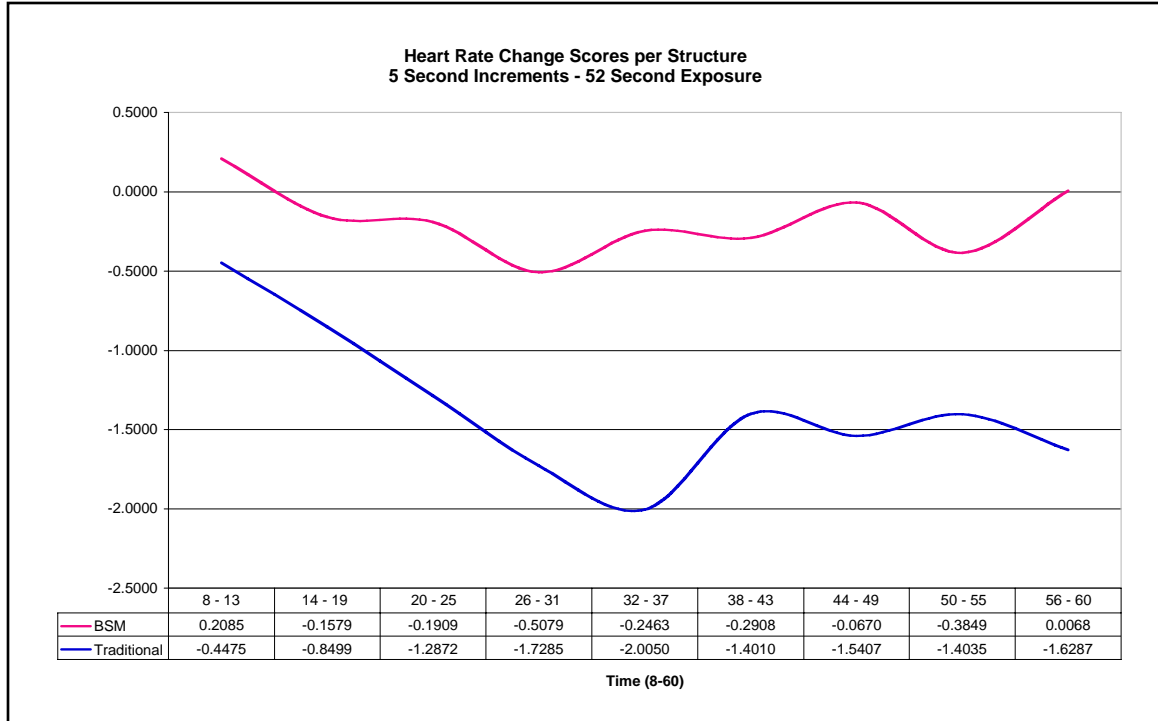


No main effect of content structure on heart rate over time was found. Upon graphical analysis, it became evident that although heart rate did exhibit differences according to content structure prior to second 70, this difference disappeared into an identical change score pattern (statistically similar) for the second half of exposure (see Figure 1). In order to isolate and analyze the first half of exposure, seconds 61-120 were disregarded from further analysis. Seconds 1-8 were also excluded from analysis due to inconclusive onset effects. Therefore, it was determined that seconds 8-60 were the most characteristic of content structure differences and were submitted to a repeated measure ANOVA (see Figure 2). This constraint of time was justified through thoughtful

exploration of when, precisely, differences in content structure would likely manifest paired with the similar behavior between conditions post time 60. Essentially, seconds 8-60 were the locus of difference and were subsequently analyzed for significance. This is consistent with the progression within the stimulus material. The BSM versions included the majority of links to content nodes in the first half of exposure. In this respect, the data accurately reflected exactly where and when the content structure differences would produce attention differences.

Once time was constrained to the appropriate interval, it was also decided to further illuminate the data by averaging time over five-second intervals (i.e., first five seconds, second 5 seconds, etc.) to smooth the overly dynamic data points (see Figure 3). This averaging over time was the most appropriate data treatment because H1 predicted effects that were consistent with the aggregate exposure rather than individual time units. Additionally, this averaging is a valid and conservative manipulation as data is being reduced, not added. In this sense, an averaging demonstrates the overall strength of the trend identified. If the difference between content structures was superficial, any averaging would function to converge the data. By isolating to location of heart rate change score differences and simplifying the data, a main effect of content structure on heart rate was found to approach statistical significance at  $p < .1$ ,  $F = 2.64$ ,  $\eta^2 = .07$ , observed power = .35.

FIGURE 3  
HEART RATE CHANGE SCORES PER CONTENT STRUCTURE – 52 SECONDS



*HYPOTHESIS 2*

Hypothesis two predicted that encoding would be greater for BSM content-structured stories than traditional content structure. Encoding was measured through a recognition test comprised of 24 multiple-choice questions. Scores, respective to content structure, were submitted to a Paired Samples T-test. There was no significant mean difference observed. Hypothesis two was not supported.

*HYPOTHESIS 3*

Hypothesis three predicted that storage would be greater for BSM content structure stories than traditional content structure. Storage was measured through an

open-ended cued recall test (Appendix D). Responses were quantified according to number of correct mentions of specific content details. Scores, respective to content structure, were submitted to a Paired Samples T-Test. There was no significant mean difference observed. Hypothesis three was not supported.



## CHAPTER 5: DISCUSSION

This experiment sought to illuminate the relationship, if any, between content structure and cognitive processing of news releases on corporate Web sites. The results presented are the first step in understanding this relationship between format of online news releases and cognitive processing. Through execution, it has been revealed that all else equal, overall cognitive economy is maximized through BSM content structure. Heart rate, a measure of attention and encoding, decelerated more during exposure to news releases in traditional content structure. Through the lens of the Limited Capacity Model of Mediated Messages, this finding indicates that traditional content structure requires greater resources to attend to and process than BSM structure, which in turn requires less cognitive resources. Interestingly, although there was a measurable difference in heart rate change scores, encoding and storage (measures through recognition and cued recall, respectively) exhibited no significant variance between groups.

As noted in the previous chapter, heart rate over time for the duration of exposure did not reveal significance. However through examination of heart rate over time, true insight was gained. This analysis revealed that the significant difference in heart rate between conditions occurred during the first half of exposure (before time 61). Consistently, across topic, participant and condition, a nearly identical (statistically similar) change score over time pattern emerged. In comparison to the first half of

exposure, the latter half was characterized with consistent and similar deceleration from baseline. It is believed that this pattern is indicative of a fatigue effect. Participants, across the board, exerted more effort to process the second half of the article –with exception to the last 15 seconds in which it is speculated that subjects skimmed rather than read (perhaps excited or relieved to reach the end of the article). It is curious that this pattern emerged throughout format and condition. Given that each news release averaged around 400 words (slightly shorter than the average news release according to content analysis), these results suggest that perhaps this industry standard length is not ideal for the cognitive processing of computer mediated text. Intuition would predict the opposite cognitive load effect with news releases, since content is typically frontloaded. One would assume that the end of an article would require less resources to encode due to the proportionately lesser content contained within it. More research should explicitly examine fatigue effects in reading online text. Results would be applicable both in the academic knowledge building and communications practice.

Though this fatigue effect was stumbled upon quite by accident, it rivals the findings explicitly sought out in this thesis, in terms of value – particularly to the practitioner audience. Although not mentioned until this late chapter, the beginnings of this thesis were born out of an internship experience in employee communications at The Dow Chemical Company. As such, when the opportunity arose to present preliminary findings to Dow’s public affairs team, the action aligned both the goals of maximizing value of this research and also coming full-circle. As apposed to academic conference presentations, the Dow presentation and discussion took on a completely different

direction. During the research presentation to both Intranet and Internet communications specialists at Dow in July 2005, it was revealed that their primary interest in this research study was not necessarily the validation gained directly from the hypotheses, rather the identification of a potential fatigue effect.

Although Dow was keenly interested with how this thesis's findings address their communications practices with internal and external stakeholders, at the end of the presentation, the major finding of this thesis with respect to content structure and cognitive processing was nothing more to the team than another piece of "proof" that they are doing well. Not to say that there is not a place for academic research in the practitioner realm – quite the opposite. The communications team was very accepting and open minded about the whole experience. So much so that when there was a brief mention of an observed fatigue effective in the middle of the presentation, each person in the room took note and all had questions waiting at the end of the presentation. If they were interested with these findings, they were flat-out intrigued by the fatigue effect and how it applied to their communication challenges.

As noted in the review of literature, it is speculated that many organizations still struggle with best practices for hypermediated communication with stakeholders. The questions raised by the Dow communication specialists regarded optimal news release word length and user behavior. "Why does cognitive load increase so much after one minute?" asked an internal communication specialist and Intranet content editor. "I keep telling people that we need to keep our news articles short enough to maintain attention and anything over 400 words is entering a danger zone." A Dow.com communications

specialist then keyed in, “Our Webtrends tell us that users spend an average of 1 minute or less on individual news stories. Maybe this [fatigue] effect and the Webtrends results are talking about the same thing.” In fact, it is very possible that this fatigue effect hold some explanatory value for current audience behavior. Irrespective of any academic motivations for more detailed investigation of reader fatigue, there is solid evidence that such a study would be of high relevance and extreme interest to practitioners. For the time being, this study helped to begin discussion at major Fortune 50 organization; therefore, achieving on the author’s undisclosed goals for this work.

The encounter of brainstorming and scheming with practitioners was both insightful and somewhat seductive, but it only gets the word out – it does not necessarily explicate the findings. To complete this analysis, it is back to the research study at hand and interpreting the results. With disregard to the data after minute 1, differences between content structures emerged. Although these results were only significant approaching  $p < .1$ , further analysis reveals this is likely a result of power. As such, results can be discussed with enhanced confidence (90%) of error avoidance. Although a small effect size was not entirely surprising to find, consideration of such a phenomenon was completely neglected on the front-end of the study. Sample size should have been greater due to expectation of a relatively small effects size. It has been demonstrated in other research that text on computer screens does not elicit automatic responses because it is neither novel nor surprising. Text on a computer screen is typical, expected, and likely something to which users have habituated. It’s an activity that most college students and business professionals partake in for hours every day. Additionally, the

operational difference between BSM and traditional content structure was simply a series of hyperlinks and content spread out in four Web pages as apposed to one. The habituation of reading text on the screen and the small difference between conditions naturally suggest that any main effect observed would likely be a small effect. This was demonstrated in the results in which  $F = 2.64$ , a small effect relative to other research in media effects. Future studies along this line of research should consider larger sample sizes to achieve an acceptable level of significance.

However, given the limitations of significance, it is clear that there is an effect occurring between the conditions. BSM content structure requires less effort to encode. Although this difference is not perceivable to the subject, the brain and sympathetic nervous system indicate overall cognitive load is greater for the articles organized within a traditional content structure. What is more, memory ability between conditions is constant. Paired together, it becomes evident that BSM is superior in efficiency and effectiveness, as it produces the same result with less resource allocation. Even though the difference in controlled attention was not substantial, over time and repetition, any reduction in cognitive load could potentially result in less fatigued readers who have the ability to read more, and perhaps even retain more (although not demonstrated in this study).

The Limited Capacity Model of Mediated Message Processing posits that resources are finite and the less allocation to one function of cognitive processing, the greater amount available for the more sophisticated tasks of storage and retrieval (Lang, 2000). In this study, BSM content structure performed at the same level of memory

ability with less resource consumed by attention. According to Lang's model, the greater resources remaining in the BSM condition should translate to greater storage and retrieval. One weakness of this study was, due to the within-subjects design, only storage or retrieval could be examined – not both. As such, retrieval (as it was least related with the theory of structural isomorphism and schema theory) was not measured. It is possible that differences in content structure and memory performance reside not in storage (which was measured and yielded no difference, but in retrieval of information). It is also possible that the recognition and cued recall instruments utilized for this study were not sensitive enough to measure subtle differences in performance. It is recommended for future study in this area that researchers design news articles with concrete concepts and straightforward writing. The stimulus material for this study was based on a content analysis of 25 Fortune 100 companies. As a result, reading level was relatively high and content littered with conceptual content – perhaps not best suited for a valid gauge of memory. Additionally, it is recommended that future studies enhance the sensitivity of the memory test by including a larger number of questions, and also more concrete facts within the articles to subsequently be recalled.

This study helps inform theory and adds knowledge to what is known about how the brain processes mediated messages. Considering again, attention as input and memory as output, it becomes clear, as evidence by this study, that the relationship between attention and memory is not perfectly correlated. Lang's theory would predict that less cognitive resources devoted to attention would then have an negative correlation with memory –as it would be predicted to have greater resources available. In terms of

overloading the processing system, limited capacity makes sense. However, intuitively it seems that more energy put forth toward attending to a message might actually enhance storage and retrieval in a non-overloading environment. What is more, the results of this thesis do not support the supposition that a desired attention environment will result in enhanced memory. Through this experiment in content structure, it was found that memory did not vary between conditions. Perhaps this study was too narrowly focused. The relationship between attention and memory is undoubtedly influenced by elements like relevance and motivation. If relevance and motivation indeed enhance memory capacity of mediated messages, it is likely that they would also enhance resources allocated to attention. The idea that both attention and memory would require more resources (not balancing each other out as in Lang's model) suggests that the brain process information slightly differently than what theory can explain. Although theories are always simplified versions of reality, the result of this study suggests that Lang's theory might be disregarding critical elements to cognitive processing of mediated messages. This study does not identify those elements, rather it identifies holes and inadequacies of theory to explain the results of this thesis.

Whenever an experimental study is commissioned with inherent characteristics such as tight control and narrow focus, it is important to acknowledge different perspectives on the topic. In this case, cognitive processing of content can be examined through various methodologies. For example, the rhetoric literature treats derived meaning and learning as a function of experience between the reader and the writer of the text. Similar to the principal of perspective relevance, reading as a rhetorical act

stipulates that the rhetorical situation is a critical component of memory, and that memory may be equally a function of experience. Rhetorical situations include such elements as place, purpose, and motive on reader interaction with the text. Although this thesis was clearly not a rhetorical study, it is valuable to consider alternative perspectives to any study. In this case, consideration of rhetorical situation demonstrates the diversity of elements that could potentially influence the process of learning and serve as a reminder that this study was indeed rather controlled –as is the case with psychophysiological experiments in the realm of social science.

Future directions for research are several and diverse. A follow-up to this study could examine the same content structure with the addition of perspective relevant story topic. Eveland and Dunwoody found that memory is enhanced for perspective relevant material. The interaction between relevance, memory and content structure should be explored. Another rich avenue of research is the isolation and thorough examination of the observed fatigue effect – a rich avenue as evidence by the presentation at Dow. Is this a phenomenon consistent with varying content structure (such as the case with this study); and, if so, how does fatigue affect memory? The Limited Capacity Model of Mediated Message Processing suggests that memory could be sacrificed through such stress. Perhaps even more interesting would be introducing the variable of motivation. It seems that user motivation, relevance, learning ability and the observed fatigue effect would all be related. Research should examine these proposed relationships to see if they actually exist. The value to both the academic and practitioner realms would be substantial. Finally, another direction for research is examining content structure,



attention, and memory with the addition of message valence. Although this study was not well suited for the additional variable (as corporate news releases are rarely negative in valence), news stories and other mediated texts online do vary along valence. Regardless of which study and what direction is taken next, it is clear that this research study has not only provided some insights into the research question, but also illuminated numerous offshoot research opportunities.

This thesis was a first step in understanding how people process mediated news releases with different content structures. In response to the research question posed, *How does content structure of online news articles affect cognitive processing?*, it was found that hypermediated content structure (BSM) is as effective in communication and more efficient in cognitive processing than non-hypermediated (traditional) content structure - BSM requires less attention for the identical level of memory capacity. Additionally, through examination of mediated message processing in a new way (an extended time horizon), this thesis also stumbled upon a fatigue effect in processing after one minute of exposure. The knowledge that this study contributes to mediated message processing suggests that the environment is more complex than currently reflected in theory.

## APPENDIX A

### EXPERIMENT ORDERS

1. 2, 3, 6, 7, 10, 11
2. 10, 11, 8, 5, 4, 1
3. 6, 7, 4, 1, 12, 9
4. 5, 8, 9, 12, 3, 2
5. 1, 4, 11, 10, 5, 8
6. 9, 12, 3, 2, 7, 6

## APPENDIX B

FIGURE B1  
ARTICLE LEGEND

IDENTIFICATION	TOPIC	CONTENT STRUCTURE
1	New Hire Announcement	Traditional
2	New Hire Announcement	BSM
3	Dividend Release	Traditional
4	Dividend Release	BSM
5	Joint Venture	Traditional
6	Joint Venture	BSM
7	Scholarship Competition	Traditional
8	Scholarship Competition	BSM
9	New Product Roll-out	Traditional
10	New Product Roll-out	BSM
11	Contract Announcement	Traditional
12	Contract Announcement	BSM

## APPENDIX C

### RECOGNITION QUESTIONS

\*Question groups organized per article topic.

Topic: New Hire Announcement

Stimulus Identification: 1, 2

1. Which of the following is the **real title** of an article you just read?
    - A Edgenet announces new executive office of senior VP of finance and strategy; Barbara Finnesey to head post ✓
    - B Barbara Finnesey named to executive office of senior VP of finance and strategy
    - C Edgenet announces new executive office of senior VP of finance and strategy
    - D Barbara Finnesey returns to Edgenet as senior VP of finance and strategy
  
  2. Barbara Finnesey's return to Edgenet will mark her \_\_\_\_<sup>th</sup> year of service to the company.
    - A 8
    - B 11
    - C 14 ✓
    - D 17
  
  3. Barbara Finnesey's consulting company worked with all of the following organizations EXCEPT:
    - A Delphi
    - B Wells Fargo ✓
    - C IBM
    - D Georgia-Pacific
  
  4. About how many employees does Edgenet have?
    - A 10,000
    - B 20,000 ✓
    - C 30,000
    - D 40,000
-

Topic: Dividend Release  
Stimulus Identification: 3, 4

1. Which of the following is the **real title** of an article you just read?
    - A Annual dividend to be paid to Edgenet shareholders
    - B Edgenet announces annual dividend
    - C Quarterly dividend to be paid to Edgenet shareholders
    - D Edgenet approves quarterly dividend ✓
  
  2. How much was the dividend paid to Edgenet stockholders?
    - A 19 cents
    - B 25 cents
    - C 37 cents ✓
    - D 48 cents
  
  3. About how much were Edgenet's annual revenues last year?
    - A \$500 million
    - B \$1 billion
    - C \$1.5 billion
    - D \$2 billion ✓
  
  4. In an article you just read, "forward-looking statements" were defined as:
    - A future financial and operating results ✓
    - B future investing ventures
    - C future marketing and investing ventures
    - D future financial results
- 

Topic: Joint Venture  
Stimulus Identification: 5, 6

1. Which of the following is the **real title** of an article you just read?
  - A Edgenet announces strategic partnership with IBM
  - B Edgenet and IBM enter into strategic partnership to form joint venture ✓
  - C Joint venture announced; Edgenet and IBM form strategic partnership
  - D Edgenet to form joint venture with IBM
  
2. Where will Edgenet-IBM be located?
  - A Los Angeles
  - B Detroit
  - C New York
  - D Chicago ✓

3. Including this partnership with IBM, how many joint ventures has Edgenet been a part of?
    - A 1 ✓
    - B 2
    - C 3
    - D 4
  
  4. About how much are IBM's annual revenues?
    - A \$21 billion
    - B \$27 billion ✓
    - C \$32 billion
    - D \$36 billion
- 

Topic: Scholarship Competition

Stimulus Identification: 7, 8

1. Which of the following is the **real title** of an article you just read?
  - A Call for applicants: Edgenet's first ever excellence in engineering minority scholars program ✓
  - B Edgenet announces first ever excellence in engineering minority scholars program
  - C Edgenet's first ever excellence in engineering minority scholars program; Call for applicants
  - D Excellence in engineering minority scholars program; Call for applicants
  
2. To be eligible for the Excellence in Engineering Scholar Program, applicants must have an SAT score of \_\_\_\_\_ and a \_\_\_\_\_ GPA.
  - A 1200, 3.9
  - B 1200, 3.5 ✓
  - C 1400, 3.5
  - D 1400, 3.8
  
3. Who is Edgenet's Community Relations Manager?
  - A Sarah Endelmier
  - B Olivia Kaufman
  - C Terri McNeill
  - D Renee Vasquez ✓

4. Where are Edgenet's international headquarters?
- A Chicago ✓
  - B London
  - C New York
  - D Boston
- 

Topic: New Product Roll-out  
Stimulus Identification: 9, 10

1. Which of the following is the **real title** of an article you just read?
- A New product offering from Edgenet: First ever artificial intelligence incorporated into commercial security software
  - B First ever artificial intelligence incorporated into commercial security software in new product offering: SecuriTech ✓
  - C Announcing SecuriTech: next generation commercial security software
  - D Edgenet announces SecuriTech commercial security software; First ever to use artificial intelligence
2. SecuriTech was endorsed by an expert columnist; which publication did he write for?
- A CNET ✓
  - B Forbes
  - C Wired
  - D USA Today
3. Roughly how much does SecuriTech Software cost?
- A \$1 million
  - B \$1.2 million ✓
  - C \$1.8 million
  - D \$2.4 million
4. About how long has Edgenet's flagship software, M2O, been a market leader?
- A 10 years
  - B 15 years
  - C 20 years ✓
  - D 25 years
-

Topic: Contract Announcement  
Stimulus Identification: 11, 12

1. Which of the following is the **real title** of an article you just read?
    - A Edgenet wins \$58 million contract in Asia-Pacific Market with Stelleman-Guthmark
    - B Edgenet announced \$58 million contract in Asia-Pacific Market
    - C Edgenet awarded \$58 million contract with Stelleman-Guthmark for Asia-Pacific Market ✓
    - D Edgenet awarded \$58 million contract with Stelleman-Guthmark
  
  2. How many retail locations does Stelleman-Guthmark have?
    - A Over 500
    - B Over 750
    - C Over 1000 ✓
    - D Over 1250
  
  3. How many new engineers will Edgenet hire for their contract with Stelleman-Guthmark?
    - A 15 engineers
    - B 25 engineers
    - C 35 engineers
    - D 45 engineers ✓
  
  4. Which of the following companies is an Edgenet client?
    - A Hunter Douglas
    - B Home Depot ✓
    - C Siemens
    - D Lowe's
-



## APPENDIX D

### CUED RECALL TEST

Once participants had been exposed to the stimulus material, they were asked to respond to 6 questions by the computer program (MediaLab) in a randomized order. Participants had 120 seconds to populate the text box.

Topic: New Hire Announcement  
Stimulus Identification: 1, 2

You just read a story about EDGENET'S NEW HIRE, BARBARA FINNESEY. Please describe all details and information that you can remember from that article. When you've finished typing a response, you may press "esc" to continue.

Topic: Dividend Release  
Stimulus Identification: 3, 4

You just read a story about EDGENET'S DIVIDEND RELEASE. Please describe all details and information that you can remember from that article. When you've finished typing a response, you may press "esc" to continue.

Topic: Joint Venture  
Stimulus Identification: 5, 6

You just read a story about EDGENET'S JOINT VENTURE WITH IBM. Please describe all details and information that you can remember from that article. When you've finished typing a response, you may press "esc" to continue.

Topic: Scholarship Competition  
Stimulus Identification: 7, 8

You just read a story about EDGENET'S ENGINEER SCHOLAR PROGRAM. Please describe all details and information that you can remember from that article. When you've finished typing a response, you may press "esc" to continue.

Topic: New Product Roll-out  
Stimulus Identification: 9, 10

You just read a story about EDGENET'S NEW PRODUCT OFFERING, SECURITECH. Please describe all details and information that you can remember from that article. When you've finished typing a response, you may press "esc" to continue.

Topic: Contract Announcement  
Stimulus Identification: 11, 12

You just read a story about EDGENET'S CONTRACT WITH STELLEMAN-GUTHMARK. Please describe all details and information that you can remember from that article. When you've finished typing a response, you may press "esc" to continue.

## APPENDIX E

### STIMULUS MATERIAL

#### 1. NEW HIRE ANNOUNCEMENT – TRADITIONAL FORMAT

##### Edgenet Announces New Executive Office of Senior VP of Finance and Strategy; Barbara Finnesey to Head Post

CHICAGO, March 3, 2005 – Edgenet Corporation (NYSE: EGNT) today announced that Barbara Finnesey, former Chief Executive Officer of System Solutions LLC., will rejoin Edgenet as the Senior Vice President of Finance and Strategy, effective March 23, 2005. She will assume the additional title of Treasurer upon the retirement of Robert Ericson, 65, Edgenet’s Senior Treasurer and member of the Board of Directors.

Upon her arrival, Finnesey will report to Edgenet’s Chief Financial Officer, Fred Schlosser—a tenured officer of the organization and longtime friend. In her new role, Finnesey will be responsible for the company’s finances, treasury, strategic planning, and benefit investments departments as well as reforming practices and building new standards of excellence.

“Barb has always been an high performer and a true asset to the team,” said Schlosser. “Edgenet is ready for a true leader who knows the business of technology and solutions and has a strong dedication to innovation and progress.

Her return to Edgenet will mark Finnesey’s 14th year of service to the Edgenet and also a fundamental shift in the finance department’s traditional inward focus. Finnesey said, “I’ve learned more about business in the last six years than I ever thought possible. One thing I know for certain is that the environment and competition are key factors in Edgenet’s success. My charge to the entire organization is to be accountable for our actions, keep a steady eye on innovation, and extend our strong external focus.”

Beginning in early April, Finnesey will perform an informal audit of the finance department to develop progressive recommendations and enact numerous reform initiatives. This will be just one of many steps that are intended to enhance Edgenet’s operating efficiency and overall competitiveness.

Finnesey first joined Edgenet’s finance department in 1987 as a new hire fresh out of Carnegie Mellon’s renowned MBA program. From her initial post as a Financial Analyst, Finnesey quickly advanced through the ranks. By 1993, Finnesey organized global initiatives and shifts in practice while working directly under the Chief Financial Officer, Pedro Manchenez, who has since retired. Finnesey left Edgenet in 1999 to pursue her lifelong dream of running her own financial consulting firm. Through that venture in private consulting and management, she held such clientele as IBM, Delphi and Georgia-Pacific.

Edgenet is a renowned international technology innovator and solutions provider that employs over 20,000 workers from across cultures and spanning continents. Headquartered in Chicago, Edgenet has regional offices on each coast as well as a growing center of operations in the Asia-Pacific market.

- Read, then Click Continue –

2. NEW HIRE ANNOUNCEMENT – BSM FORMAT

[Edgenet Announces New Executive Office of Senior VP of Finance and Strategy; Barbara Finnesey to Head Post](#)

- Read, then Click IN-TEXT Link -

## NEW HIRE ANNOUNCEMENT – BSM FORMAT (CONT.)

CHICAGO, March 3, 2005 – Edgenet Corporation (NYSE: EGNT) today announced that [Barbara Finnesey](#), former Chief Executive Officer of System Solutions LLC., will rejoin Edgenet as the Senior Vice President of Finance and Strategy, effective March 23, 2005. She will assume the additional title of Treasurer upon the retirement of Robert Ericson, 65, Edgenet’s Senior Treasurer and member of the Board of Directors.

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- Read, then Click IN-TEXT Link, do NOT click Continue -

## NEW HIRE ANNOUNCEMENT – BSM FORMAT (CONT.)

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NEW HIRE ANNOUNCEMENT – BSM FORMAT (CONT.)

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- Read, then Click Continue -

### 3. DIVIDEND RELEASE – TRADITIONAL FORMAT

#### Edgenet Approves Quarterly Dividend

CHICAGO, February 25, 2005 – The Board of Directors for Edgenet Corporation (NYSE: EGNT) today declared a regular quarterly dividend of 37 cents per share on Edgenet outstanding common stock, scheduled to be paid on March 1, 2005, to shareholders of record at the close of business on February 28, 2005.

This dividend marks the 42nd consecutive dividend declared by Edgenet in its 11 years as a publicly held organization. The fourth quarter's dividend also marks the highest scheduled return paid to shareholders to date. Edgenet common stock price closed this afternoon at \$38.26 per share, a 15 percent increase from February 2004 and only \$.50 below the all-time high price of \$38.51 per share reached in the second quarter of 2000.

Fred Schlosser, Chief Financial Officer of Edgenet said, "The Board is very pleased with Edgenet's performance throughout fiscal year 2004. As a shareholder in Edgenet, as well as a host of other organizations, I think I speak for most Edgenet investors when I say that this organization is a sound investment –as evidence by our steadily growing stock price and consistent dividends."

Edgenet is a world-class provider of technology products and product development for business solutions. Edgenet is a \$1 billion business with over \$2 billion in annual revenues and has investors spanning the globe –including the company's placement in several successful mutual funds through Wachovia.

Except for historical information contained in this news release, other content may constitute "forward-looking statements," within the meaning of Section 27A of the Securities Act of 1993 and Section 21E of the Securities Exchange Act of 1934. These acts regard risks and uncertainties that could cause actual results to differ materially from those projected, anticipated or implied. These statements are based on management's current expectations and are subject to uncertainty and changes in circumstances.

Forward-looking statements may include statements addressing Edgenet's future financial and operating results. The following factors are a small example of variables that could cause actual results to differ materially from those described in any forward-looking statements: competitive pressures, loss of customer relationship, insolvencies and change in client mix. For more detailed information about these and other risk factors, refer to Edgenet's filings with the Securities and Exchange Commission, including its Annual Report on Form 10-k for fiscal 2004. Edgenet undertakes no obligation to release publicly or revise any forward-looking statements, whether as a result of new information or otherwise.

- Read, then Click Continue -



4. DIVIDEND RELEASE – BSM FORMAT

[EDGENET APPROVES QUARTERLY DIVIDEND](#)

- Read, then Click IN-TEXT Link -

## DIVIDEND RELEASE – BSM FORMAT (CONT.)

CHICAGO, February 25, 2005 – The Board of Directors for [Edgenet Corporation](#) (NYSE: EGNT) today declared a regular quarterly dividend of 37 cents per share on Edgenet outstanding common stock, scheduled to be paid on March 1, 2005, to shareholders of record at the close of business on February 28, 2005.

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## DIVIDEND RELEASE – BSM FORMAT (CONT.)

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- Read, then Click Continue -

## 5. JOINT VENTURE – TRADITIONAL FORMAT

### Edgenet and IBM Enter into Strategic Partnership to Form Joint Venture

CHICAGO, March 1, 2005 – Edgenet Corporation (NYSE: EGNT) and International Business Machines (NYSE: IBM) announced today a 10-year strategic alliance and joint venture that will bring together the two market leaders in technology business solutions and support. This deal will include a joint venture organization, tentatively branded Edgenet-IBM. The parent companies share equal ownership. Financial details of this partnership have not yet been disclosed.

The agreement will enable both Edgenet and IBM to work in seamless coordination to produce high quality, customized product offerings to clients with never before seen speed and agility. “This partnership with IBM will enable Edgenet to cut its delivery time in half and fully integrate our processes –something never before achievable,” said Sharon Rockchester, Chairman and Chief Executive officer of Edgenet. “Edgenet-IBM will cut preproduction lead time by six months and reduce costs by more than ten percent. We are delighted to welcome IBM, a tried and true global organization, into our family. This mutually beneficial alliance is a unique opportunity to link our brands, enhance revenues, and will serve as a bold step in the evolution of Edgenet.”

Edgenet-IBM will be located in metropolitan Chicago in order to take advantage of the central U.S. location and strong customer relationships within the region, including several distribution sites. Ralph Pinson, Edgenet’s Executive Vice President, has been appointed Chief Executive Officer of Edgenet-IBM. “We didn’t have to look far for the right person for the job,” said Sam Palmisano, IBM Chairman and Chief Executive Officer. “Ralph knows the technology solutions business and he knows IBM just as well as Edgenet. Sharon and I are supremely confident in our leadership choice for this joint venture and we have the full support of our respective boards. IBM is pleased to welcome Edgenet into our inner-network of business partners.”

“This will mark the first joint venture embarked upon by Edgenet,” said Chief Executive Officer Fred Schlosser. “It just made sense for Edgenet to join in this partnership with IBM since our entire product offering requires their systems for customization and client integration. In the last decade, since Edgenet first went public, our board of directors has strived to get our business closer to the customer and this alliance makes that a reality.”

IBM is the market leader in commercial computing solutions with annual revenues exceeding \$27 billion and a global network of allied organizations committed excellence and innovation. Edgenet is a world-class provider of technology, products and product development for business solutions and offers network-centric system solutions to its global commercial, government and personal customers.

- Read, then Click Continue -

6. JOINT VENTURE – BSM FORMAT

[Edgenet and IBM Enter into Strategic Partnership to Form Joint Venture](#)

- Read, then Click IN-TEXT Link -

## JOINT VENTURE – BSM FORMAT (CONT.)

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## JOINT VENTURE – BSM FORMAT (CONT.)

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## JOINT VENTURE – BSM FORMAT (CONT.)

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- Read, then Click Continue -

## 7. SCHOLARSHIP COMPETITION – TRADITIONAL FORMAT

### Call for Applicants: Edgenet’s First Ever Excellence in Engineering Minority Scholars Program

CHICAGO, March 7, 2005 – Edgenet Corporation (NYSE: EGNT) is proud to announce its first scholars program, which will award \$25,000 to five college-bound high school seniors intending to pursue a degree in engineering. The goal of Edgenet’s Excellence in Engineering Minority Scholar’s Program is to support local youth in their study of computer engineering and related disciplines.

“Edgenet is proud to offer this opportunity to some of our most talented future industry leaders right here within our community,” said Gail Sloss, Edgenet senior vice president. “Much of our organization is based upon creativity, innovation, and strong work ethic; we want to foster exactly these qualities in promising young adults.”

Five \$5,000 college scholarships, partnered with a summer internship at Edgenet, will be awarded in late April. To apply, candidates must submit a 1000 word essay response for two questions, “What interests you about computer engineering and why?” and “What place does creativity have in computer engineering?”

To be eligible for consideration, an applicant must be an Illinois resident and be currently enrolled in a Chicago public high school. Students should also have achieved a composite SAT score greater than 1,200 and have a minimum GPA of 3.5, however exceptions may be made at Edgenet’s discretion for especially promising applicants. Minority students will be given preference status, but all are encouraged to apply. Candidates must be able to demonstrate financial need.

The deadline to apply for Edgenet’s Excellence in Engineering Scholarship is fast approaching. To be considered, applications must be postmarked by April 1, 2005. Interested students are urged to apply for one of five awards based upon merit, service and interest in information technologies.

Students can obtain an information packet for Edgenet’s Excellence in Engineering Minority Scholars Program online at: [www.edgenet.com/engscholars](http://www.edgenet.com/engscholars). For additional information about the scholars program, contact Renee Vasquez, Edgenet Community Relations Manager, at (773) 843-8569 or via email at [renee.e.vasquez@edgenet.com](mailto:renee.e.vasquez@edgenet.com).

Edgenet is a technology and business solutions organization with satellite offices spanning the globe. With a true appreciation for creativity and diversity of both people and thought, Edgenet is dedicated to the success of current employees and future leaders. The Excellence in Engineering is just one of Edgenet’s many comprehensive programs designed to promote diversity and education in computer engineering.

- Read, then Click Continue -

8. SCHOLARSHIP COMPETITION – BSM FORMAT

[Call for Applicants: Edgenet's First Ever Excellence in Engineering Minority Scholars Program](#)

- Read, then Click IN-TEXT Link -

## SCHOLARSHIP COMPETITION – BSM FORMAT (CONT.)

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## SCHOLARSHIP COMPETITION – BSM FORMAT (CONT.)

The deadline to apply for Edgenet's Excellence in Engineering Scholarship is fast approaching. To be considered, applications must be postmarked by April 1, 2005. Interested students are urged to apply for one of five awards based upon merit, service and interest in information technologies.

Students can obtain an information packet for Edgenet's Excellence in Engineering Minority Scholars Program online at: [www.edgenet.com/engscholars](http://www.edgenet.com/engscholars). For additional information about the scholars program, contact Renee Vasquez, [Edgenet](http://www.edgenet.com) Community Relations Manager, at (773) 843-8569 or via email at [renee.e.vasquez@edgenet.com](mailto:renee.e.vasquez@edgenet.com).

- Read, then Click IN-TEXT Link -

SCHOLARSHIP COMPETITION – BSM FORMAT (CONT.)

IBM is the market leader in commercial computing solutions with annual revenues exceeding \$27 billion and a global network of allied organizations committed excellence and innovation.

Edgenet is a world-class provider of technology, products and product development for business solutions and offers network-centric system solutions to its global commercial, government and personal customers.

- Read, then Click Continue -

## 9. NEW PRODUCT ROLL-OUT – TRADITIONAL FORMAT

### First Ever Artificial Intelligence Incorporated into Commercial Security Software in New Product Offering: SecuriTech

CHICAGO, Feb. 25, 2005 – Edgenet Corporation (NYSE: EGNT) today announced a new offering, SecuriTech, in reaction to heightened demand for corporate information security. The first of its kind, SecuriTech software utilizes advanced artificial intelligence technology. This allows the system to adapt to a host of situations without instruction.

“The technology behind SecuriTech is a groundbreaking development within the knowledge management and security business. I’ve never seen anything like it before,” said George Hankinson, CNET columnist. “It’s beyond anything we’ve ever seen—from the design to the installation –it’s on par with having a personal bodyguard for your data.”

The key to the SecuriTech program is its unique ability not only to protect data and secure networks, but to function independently and designed to reason. Based on a given set of facts, SecuriTech can make judgments. As the customized program learns an organization’s operations, standards, and practices, it relieves technicians from spending countless hours guiding the program through a network, SecuriTech runs with supervision and never requires updating.

“This is truly a breakthrough in the technological application of artificial intelligence,” said Sharon Rockchester, Edgenet Chairwoman and Chief Executive Officer. “Edgenet’s been working with artificial intelligence in software platforms for decades, but we’ve never achieved anything as groundbreaking as SecuriTech. In comparison to other commercial security offerings in the marketplace, it’s like the difference between a cheap electronic dog bark unit to keep intruders at bay and an angry Great Dane behind the door.”

Through the final stages of prototype testing, SecuriTech by Edgenet will be ready for market deployment within the next 90 days. Several Fortune 100 companies have already begun the transition to this innovative and cutting edge program.

At a projected cost of over \$1.2 million including purchase, installation and training, each installation is custom with a lifetime guarantee for service and Industry experts say it’s well worth the cost. System capabilities include:

- Firewall protection comprised of millions of reasoned judgments about security needs while preserving accessibility.
- Site-based license with universal platform that is client-centric and not reliant on geographic location – a truly mobile information security guard.
- Intuitive interface with unrestricted access to administrative functions.

Edgenet is a global organization that provides specialized business solutions through consistent innovation and advanced technologies such as artificial intelligence. The company’s flagship software application for advanced architectural configuration and component-ordering technology is still, after over two decades, the market leader boasting international clientele.

- Read, then Click Continue -

10. NEW PRODUCT ROLL-OUT – BSM FORMAT

[First Ever Artificial Intelligence Incorporated into Commercial Security Software in New Product Offering: SecuriTech](#)

- Read, then Click IN-TEXT Link -



## NEW PRODUCT ROLL-OUT – BSM FORMAT (CONT.)

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## NEW PRODUCT ROLL-OUT – BSM FORMAT (CONT.)

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## NEW PRODUCT ROLL-OUT – BSM FORMAT (CONT.)

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- Read, then Click Continue -

## 11. CONTRACT ANNOUNCEMENT – TRADITIONAL FORMAT

### Edgenet Awarded \$58 Million Contract with Stelleman-Guthmark for Asia-Pacific Market

CHICAGO, March 4, 2005 – Edgenet Corporation (NYSE: EGNT) has been awarded an exclusive contract with Stelleman-Guthmark to outfit each of over 1000 retail locations with Edgenet’s proprietary software, M2O. The fixed-price contract, valued at over \$58 million, marks the largest undertaking by the technology solutions company to date. Preliminary software installation and customization is slated to begin in the latter half of 2005.

Within the terms of this contract, Edgenet will supply, service and provide lifetime support to all of Stelleman-Guthmark’s retail locations. As the world’s largest construction and development company, Stelleman-Guthmark will utilize M2O’s advanced application in both retail and industrial settings. In order to service this client with the same level of excellence it is renowned for, Edgenet will increase its presence in Stelleman-Guthmark’s home base with the Asia-Pacific region.

“This is a big step in the growth of Edgenet over the long-term and enhances our competitiveness within key developing markets,” said Sharon Rockchester, Edgenet Chairwoman and Chief Executive Officer. “Although over twice the size of any of our other customers in both manpower and volume, we’ve put in place several systems which will enable Edgenet to best serve Stelleman-Guthmark and actually enhance service to our other clients both domestic and international.”

As part of the fiercely competitive pitching process, Edgenet made clear their ability to do the job just as well as corporations headquartered in Asia-Pacific. The final contract with Stelleman-Guthmark requires Edgenet to double the current allocation of human resources to the Asia Pacific region. It will require approximately 45 new engineers and a management team of five to provide the agreed services. Candidates are being reviewed both domestically and within the new business region.

“We wanted the best outfit for the job –that was our primary objective and Edgenet surpassed our expectations in terms of customization and growth potential,” said Edward Derrick, Stelleman-Guthmark Chief Operating Officer. “We had bigger companies from within China offering us lower quotes and promising more flashy solutions, but it all came down to the world-class service and solid support that only Edgenet could provide us with.”

Edgenet is the market leader in customized ordering from large-scale industrial developments all the way to weekend home-improvement enthusiasts. The key to the M2O system is the intuitive user interface –a computer terminal typically housed in home improvement stores like Home Depot. Edgenet is proud to add Stelleman-Guthmark to its growing list of international clients.

- Read, then Click Continue -

12. CONTRACT ANNOUNCEMENT – BSM FORMAT

[Edgenet Awarded \\$58 Million Contract with Stelleman-Guthmark for Asia-Pacific Market](#)

- Read, then Click IN-TEXT Link -

## CONTRACT ANNOUNCEMENT – BSM FORMAT (CONT.)

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## CONTRACT ANNOUNCEMENT – BSM FORMAT (CONT.)

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CONTRACT ANNOUNCEMENT – BSM FORMAT (CONT.)

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- Read, then Click Continue -



## APPENDIX F

### SELECTED FORTUNE 100 ORGANIZATIONS

Abbott Laboratories

Amerisourcebergen

Bellsouth

Boeing

Citigroup

Conoco-Phillips

Delphi

Dow Chemical

Electronic Data Systems

ExxonMobil

Ford Motor Company

Georgia-Pacific

HP

International Business Machines

McKesson

Metlife

Microsoft

Northrop Grumman

Pfizer

Sears

United Technologies

Unitedhealth Group

Wachovia

Walmart

Wells Fargo

\*Selection randomized.

## APPENDIX G

### READABILITY FORMULAS

#### Flesch Reading Ease Score

- Rates text on a 100-point scale; the higher the score, the easier it is to understand the document.
- For most standard documents, aim for a score of approximately 60 to 70.

$$F(x) = 206.835 - (1.015 \times ASL) - (84.6 \times ASW)$$

- ASL = average sentence length (the number of words divided by the number of sentences)
- ASW = average number of syllables per word (the number of syllables divided by the number of words)

#### Flesch-Kincaid Grade Level Score

- Rates text on a U.S. grade-school level. For example, a score of 8.0 means that an eighth grader can understand the document. For most standard documents, aim for a score of approximately 7.0 to 8.0.

$$F(x) = (.39 \times ASL) + (11.8 \times ASW) - 15.59$$

- ASL = average sentence length (the number of words divided by the number of sentences)
- ASW = average number of syllables per word (the number of syllables divided by the number of words)

\*Content provided from Microsoft Word Help function, keyword: readability.

## APPENDIX H

FIGURE H1  
READABILITY STATISTICS

Article	Word count	Words/sentence	Characters/word	Passive %	Readability %
New Hire Announcement	449.0	22.7	5.4	0.0	24.9
Joint Venture	456.0	22.4	5.4	5.0	29.5
Dividend Release	408.0	26.9	5.5	13.0	17.6
New Product	419.0	20.1	5.9	0.0	17.3
Scholarship Competition	403.0	20.7	5.6	33.0	18.8
Contract Announcement	410.0	23.5	5.6	17.0	24.5
Stimulus Average	424.2	22.7	5.6	11.3	22.1
Content Analysis Statistics	463.0	23.9	5.5	13.7	21.7

## APPENDIX I

### EXPERIMENT PROTOCOL

NOTE: Please review the procedures for when the participant arrives –you will be running 2 other Media Lab files after the initial experiment.

### BEFORE PARTICIPANT ARRIVES

1. Make sure Coulbourn stack, VPM computer, and Media Lab computer are turned on. Power for the Coulbourn stack is located on the rear, lower left side of the base.
2. Prep sensors. This study collects **heart rate**.
3. For heart rate, you will need three standard (big) sensors.
4. The sensors will be placed on either side of the **forearm** (2 on left; 1 right). See diagram for exact placement.
5. Remember: USE ELECTRODE GEL (GREENISH).
6. Start the Media Lab computer program.
  - a. Under “**Run**” click on “**select and run an experiment**”
  - b. Select the folder named “**Writing**”
  - c. Click on the “**1 writing exp**” file with a cube icon next to it.
  - d. Enter the Subject ID and Condition for the participant you are running.  
Note: This is listed on the participant tracking form on the bulletin board.
7. Start the VPM data collection program. Make sure you are at the VPM prompt. If it’s not at the prompt, type “cd\vpmp” and hit enter.
  - a. At the VPM prompt type “**vpmp writing**” and hit enter.
  - b. Enter the specification file “**defwriting.vpmp**” and hit enter
  - c. Enter the participant ID Number
8. Take sensors into the participant room. Put consent form on clip board for participant to sign. Make sure computer monitor is ON.

ONCE PARTICIPANT ARRIVES:

1. Welcome the participant and give them the informed consent form to read and sign. Place signed form in consent form folder.
2. Prep participant for sensors and place sensors on participant. **See diagram.**
3. Plug sensors in.
4. Check heart rate waveform and make sure you are reliably picking up HR in the “last event” window of the VPM monitor. Normal HR = 600-1200.
5. Tell participant to read instructions and answer questions when they are presented.
6. Keep an eye on HR in VPM to make sure you get a good HR signal throughout study. Make sure VPM advances as it should. “Count” in VPM should reflect number of article; 6 total.
7. Once the participant has finished the first experiment, with the mouse in the researcher room “Run” another experiment file.
  - a. Under “**Run**” click on “**select and run an experiment**”
  - b. Select the folder named “**Writing**”
  - c. Click on the “**2 writing recall**” file with a cube icon next to it.
  - d. Enter the Subject ID and Condition for the participant you are running.  
Note : this is the same ID and Condition as the first experiment
8. When the second experiment is finished, repeat step #7 for the last Media Lab experiment: In the writing file, select and run “**3 writing recog**”
9. After participant completes all 3 experiments, disconnect sensors, thank and dismiss participant.
10. Clean the sensors and get ready for the next experiment.

## APPENDIX J

### RECRUITMENT SCRIPT

Hello, my name is Becky Marxer. I would like to invite you to participate in a study that is being conducted in the PRIME Lab in the Journalism School; 178 Gannett Hall. The purpose of the study is to learn more about how people respond to online media. The study will take about one hour of your time. This study also involves the collection of physiological data. The procedure will involve placing some sensors on the surface of your skin on your palm, collarbone, cheek and forehead. This procedure is painless but if you believe it may make you uncomfortable, please do not sign up to participate. In exchange for your participation you will receive 3 extra credit in this class. If you do not wish to participate, you will be given other opportunities to earn equivalent extra credit without participating in research. I am now going to pass around a sign up sheet. Please neatly print your name, email address and phone number on the line next to the time you wish to participate. You will receive either a phone call or email reminding you of your time on the evening before you are scheduled to participate.

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## VITA

Rebecca Ann Marxer was born January 17, 1982, in St. Louis Missouri to parents Gail Ellen Mohrmann and Frederick George Marxer. After living a mild mannered childhood and teenage years, she ventured to the Missouri School of Journalism –the alma mater of her grandmother, Josephine Sloss. After receiving her Bachelor of Journalism in Advertising (2004), she ventured on to an accelerated graduate program and earned her Master of Arts in Strategic Communication (2005).

She has been well prepared, with over 20 years of education and guidance, to experience a truly rewarding life. Coming full circle to her kindergarten class's prophesy (Rebecca was voted most likely to become the first woman president) she fully intends to rule the world.