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Gustavo Montesdioca
Universidade Federal do Rio Grande do Sul, gustavo.percio@ufrgs.br

Antonio Carlos Gastaud Maçada
Universidade Federal do Rio Grande do Sul, acgmacada@ea.ufrgs.br

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Research-in-Progress

Gustavo Zimmermann Montesdioca
Federal University of Rio Grande do Sul
gustavo.percio@ufrgs.br

Antonio Carlos Gastaud Maçada
Federal University of Rio Grande do Sul
acgmacada@ea.ufrgs.br

Abstract

People use information systems to seek information. Transformative technologies have increased the number of information sources and amount of time people consume interacting with them. However, life is overloaded with unpredictable and uncontrolled information sources, generating anxiety, stress, and uncertainty. While the Management Information Systems field is concerned with understanding how to increase adoption of information systems that represent formal information sources, transformative technologies are selected by users and used to perform work tasks. Given this scenario, we present a new approach to investigate user behavior in this information context. The objective of this research in progress is to investigate information stimulus event, which influences human information behavior in the context of the large number of information sources. We hope to provide a new model to assist the academic community, practitioners, and society to understand this phenomenon, as well as to improve IS design and help individuals to advance their experience and interaction with IS.

Key words: Information Stimulus Event, Human Information Behavior, Information Load.

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Introduction

People use information systems to seek information. Transformative technologies are social media, mobile, analytics, and embedded devices (Fitzgerald et al., 2013) that generate information stimulus event. These technologies have increased the number of information sources and the amount of time people consume interacting with them. However, life is overloaded with unpredictable and uncontrolled information sources, generating anxiety, stress, uncertainty, and physical illness such as cardiovascular disease and susceptibility to infectious diseases (Keith et al., 2014). Adults in the United States are exposed to approximately 74Gb (gigabytes) of data per day, including information sources such as newspapers, apps, magazines, television, books, and websites (Short, 2013; CNN, 2015). Information load increases life complexity due to distractions that affect attention and concentration on the task to be performed (Goleman, 2013). Meanwhile, the Management Information Systems (MIS) field is concerned with understanding how to increase the adoption of IS that represent formal information sources given the scenario in which transformative technologies are brought by users to the organization.

Gibson (1960) defines information stimuli as suggestions, clues, signs, indicators, messages, and events that convey information to the human cognitive system. He sustains that stimuli carry environmental information about objects, places, events, people, and human actions that stimulate perception and human sense. Stein et al. (2015) investigate IT use patterns based on IT stimulus events that elicit emotions, resulting in adaptation behavior strategies in response to the different types of stimuli. We believe that the evolution of technology has generated different classes of information stimuli events enabled by transformative technologies that elicit information behavior. We argue that information stimulus event is observed in terms of information load, information diversity, information asymmetry and their influence on human information behavior regarding IS adoption.

The study of Human Information Behavior (HIB) emerged in the early twentieth century, addressing the information sources used to meet the need for information, information seeking, and information use behavior (Case, 2012). Research in the MIS field has seldom employed HIB concepts to its studies as little attention is given to the study of information phenomena itself (McKinney and Yoos, 2010; Detlor, 2003). The concept of information has great importance as a dependent variable in evaluating the effectiveness of IS used in firms (Carter et al, 2015). As the number of transformative technologies increased inside the organization, the same happened with the number of information sources that influence human behavior, impacting the quality of strategic decision making (Kaplan, 2008).

Given this scenario, the objective of this research in progress is to investigate information stimulus event, which influences human information behavior in the context of the large number of information sources, introduced to the individual's life by transformative technologies. We believe this research will increase the understanding of the information stimulus event that influences influence technology usage, as well as that of IS adoption phenomena. Few studies have investigated IS adoption by analyzing the influence of information behavior. Our study applies HIB concepts to understand the need for information, information seeking, and use of information that drive behavior. The HIB field aims to improve IS design to enhance user experience in relation to information use (Case, 2012). We believe our model can benefit organizations when taking design decisions, driving IS adoption, and improving user task performance. Two research questions guide this research:

1. How does information stimulus event influence human information behavior?
2. How does information stimulus event influence IS adoption?

We began our investigation on previous literature and developed the research model based on the literature review. We present the planned research method and expected results in the final remarks.

Theoretical Development

Theoretical development encompassed three phases following Webster and Watson's (2002) methodology from the literature review. First, we identified the main contributions for transformative technologies, information stimulus event, and HIB in top IS journals referenced as the MIS basket of eight journals (AIS, 2016), in addition to the MIS Quarterly Executive, Harvard Business Review, and MIT Sloan Management Review. Second, we revised the references used in preparing the articles identified in the first phase (go backward). Finally, we analyzed later articles that cited works identified in the first phase (go forward), selecting those with consistent contributions for this research.

Transformative Technologies

Transformative technologies are the engine of digital transformation and represent the context of this research. Organizations driving digital transformation develop new digital products and services that impact human beings with different forms of information ubiquitously present in everyday life.

Fitzgerald et al. (2013) consider that transformative technologies such as social media, mobile devices, analytics, and embedded devices (internet of things - IoT) drive digital transformation, demanding new mindset and organizational abilities. The authors define digital transformation as the use of new technologies to enable major business improvements, such as enhancing customer experience, streamlining operations, and creating new business models. The speed with which transformative technology appears on the market requires processes to establish a different level of relationship with customers, employees, and stakeholders in order to increase firm performance, since everything is becoming connected in the digital environment. In this scenario, it is crucial to the organization's survival to respond quickly to significant changes in the business. Digital transformation allows for improvement of the customer experience and direct engagement with stakeholders, enhancing operations and developing new lines of business. However, few organizations have the managerial and technological capacity to make significant gains with transformative technologies due to organizational behaviors that need to be changed so as to be successful, starting at the executive and strategic level. The main organizational barriers are workers' attitudes, legacy technology, innovation fatigue, and politics. These barriers need to be broken to enable the organization to perform digital transformation in an environment where information overload; limitations in human capacity for technological implementation; and the need to balance convenience, speed, and superficiality of digital tools with the rational processes of the human mind represent the main challenges to overcome (Fitzgerald et al., 2013).

This scenario represents a major challenge to organizations as transformative technologies are present inside them, generating spurious information with random correlation among work priorities and personal life, which make work more complex (The Economist, 2015). Users need to deal with the variability and ambiguity of information generated by the transformative technology they are bringing to or adopting at the company, which generates signals and stimuli hard to control. Information overload leads to anxiety, stress, and uncertainty (Keith et al., 2014) and can impact strategic decision making (Kaplan, 2008) in a way that a deeper understanding of information stimulus event is required.

Information Stimulus Event

Information stimulus event is addressed in different ways in MIS and social psychology literature. Kimbrough and Moore (1992) describe information event as a series of processes performed to allow information flow for work execution. The authors describe information event activities as retrieving documents, making decisions, and sending notifications. Miller (1956) evaluates human information transmission capacity using different stimuli. A stimulus has an amount of information sent to a person who then provides a response with another amount of information. The correlation between stimulus-response is the amount of information transmitted. This amount varies asymptotically according to the dimensions and directions related to the stimulus, in addition to the variation according to memory use strategy (Miller, 1956). Gibson (1960) defines information stimulus as suggestions, clues, signs, indicators, messages, and events that convey information to the human cognitive system. He sustains that stimuli carry environmental information about objects, places, events, people, and human actions that stimulate perception and human sense. Gianni et al. (2015) consider that the stimulus model consists of

information flow enabled by signals, states, and events induced by environmental stimuli and rules for detecting these signals.

Zhang (2013) discusses IT stimulus as an affective antecedent triggered by psychological elements. The author defines affective antecedent stimulus as an event in which a person reacts or responds, characterized by elements that contain affective information and may originate in their own IT or environmental context, as the ecosystem of IT use. He categorizes types of stimuli as the object itself and the use of the object, for example, computer as object and computer use as behavior. These categories emerge from the finding that affective concepts tend to be associated with an object (the object-based stimulus) or behavior (stimulus based on behavior). Beaudry and Pinsonneault (2010) address users' responses to IT events through the coping model of user adaptation, which proposes that users respond with an adaptation strategy after appraisal of the disruptive IT event that occurs in their environment. The authors define adaptation as "cognitive and behavioral efforts exerted by users to manage specific consequences associated with a significant IT event that occurs in their work environment" (p. 496). The IT event refers to both new IT implementations and the changes made to existing IT, perceived as significant enough to stimulate an individual's responses. User adaptation behavior occurs at different times after awareness of the IT event, acting before, during, and after implementation of the technology disruption. The authors report that there is information asymmetry that leads the individual to adopt adaptive strategies at different times and use different strategies. Users first assess whether the IT event is an opportunity, threat, or a combination of opportunity/threat, and then determine their level of control over the situation, reacting with an adaptation process centered either on emotions when they realize low-level control or on the problem when they realize high-level control over the IT event (Beaudry and Pinsonneault, 2010).

Stein et al. (2015) aim to understand how IT events and emotional factors influence IT use behavior. They analyze which IT stimuli events provoke emotions and the influence of these emotions on IT use patterns. The authors propose a model to appraise affective responses, adaptation strategies, and IT use patterns to IT events. A stimulus event is an event in which the person performs an assessment, responding with different emotions according to the evaluation. The emotional response can be provided according to four classes of emotions: 1) loss, anger, dissatisfaction (initiated by appraisals of threat and low control); 2) deterrence, anxiety, fear (activated by appraisals of threat and high control); 3) achievement, satisfaction, pleasure (triggered by appraisals of opportunity and low control); and 4) challenge, excitement, hope (sparked by appraisals of opportunity and high control) (Stein et al., 2015).

Following the definitions identified in the extant literature, *we define information stimulus event as information generated by transformative technology that elicits the human cognitive system and influences human behavior*. The human cognitive system perceives and conceives information, and emotions may bring uncertainty mainly through high information load, diversity, and asymmetry, resulting in different human information behavior.

Human Information Behavior

HIB studies were initially developed in library and information science (Case, 2012). Wilson (1999) conceptualizes HIB as the totality of human behavior in relation to information sources and channels, including both active and passive information seeking and use. HIB is the activities that a social actor performs to identify their information needs, the ways they seek information, and use information, involving the transfer, exchange, and processing of information. Information need is a psychological, cognitive, and affective state influenced by the context, the environment, and the individual's situation, which occurs from the social actor's perceived need. This situation requires the use of formal and informal sources that result in the success or failure of satisfaction of the perceived need. Success leads to sharing information and exchanging behaviors with other people, while failure triggers new iteration of information need, seeking, and use (Wilson, 1999). Courtright (2007) uses the terminology *information need*, *seeking*, and *use* for broad behavior, which can start either intentionally and directly or passively and indirectly, triggered by internal or external stimuli. *Context* and *situation* have distinct characteristics in HIB literature. The author describes *context* as a framework for information practices where the individual interacts with information resources and influences information behavior. *Situation* is part of the context and represents a dynamic interaction in which interpretative processes are deployed, ratified, changed, and solidified, where a particular set of circumstances leads to HIB (Courtright, 2007).

Situations of certainty and uncertainty may occur in the same context of interaction with information resources.

HIB represents an iterative cycle of information need, information seeking, and information use. The iterative cycle begins with the perception of a problem by the individual and occurs in three stages (Choo, 1998). The first stage is the information need in which individuals realize discrete issues within an environment. The size of the discrete issue determines the gap of knowledge and the type of information that the individual should seek to solve the problem. Information seeking is the second stage in which the person uses IS to get information to solve the issue. IS produce an information product that determines the effectiveness of the system, depending on its utility to solve the issue. IS are useful if they produce valuable information. The third stage encompasses information use, where the individual uses the information obtained from the sources consulted, changing the problem status. A new iteration of need, seeking, and use begins if the problem is not solved or if an adequate level of knowledge in the individual's mind that satisfies the information need is not reached, which depends on their internal cognitive structure and emotional disposition. These two components influence the iterative cycle and how the social actors perceive problems and react to the information presented (Detlor, 2003). Context is another variable that influences the cycle of information need-seeking-use. While identifying information need, environmental variables can influence perception of information gap by social or workgroups in which the individual participates. Information seeking can be impacted by these groups' social characteristics, and information use is subject to the influence of social norms.

Nomological Network and Relationships

Figure 1 presents the proposed nomological network and hypotheses among the variables. We will analyze information use behavior in the organizational context, involving formal information sources and transformative technologies, which represent informal information sources. This setting leads to a high number of information stimuli events represented by information load, information asymmetry, and information diversity and impacts HIB.

Fitzgerald et al. (2013) describe information overload as a challenge organizations need to handle to promote digital transformation. Miller (1956) demonstrates that people can process a limited amount of information before losing the capacity to transmit information they are receiving from information sources. Campbell (1988) also identifies information load as a characteristic of task complexity that impacts user behavior toward work. Information load represents a problem when it overcomes human cognitive capacity by increasing the number of stimuli the individual can handle (Miller, 1956; Campbell, 1988). In this scenario, we postulate that:

H1: Information load in the context of transformative technologies impacts human information behavior.

Stein et al. (2015) relate IT stimuli events with emotional responses, resulting in adaptation behavior that can vary according to the level of control the individual perceives in the specific situation. Beaudry and Pinsonneault (2010) report that information asymmetry occurs among users during IT events as each user takes individual behavior, leading to information asymmetry. Both emotions and information asymmetry happen in contexts of uncertainty, affecting user behavior. We hypothesize that:

H1a: Information load in the context of transformative technologies impacts information asymmetry.

Information asymmetry is the difference of information between the principal and agent that puts principal in a disadvantaged position due to hidden information (Akerlof, 1970). Information asymmetry is linked to perceived uncertainty that affects user behavior toward decision making (Pavlou et al., 2007). It is also the difference of awareness of an IT event during a certain time (Beaudry and Pinsonneault, 2010). When a new information stimulus happens, user adaptation behavior starts with user awareness of the consequences of the information stimulus event. Users adopt transformative technologies without complete knowledge of the intentions and resultant behavior fostered by them and with a low level of awareness of the impact an information stimulus event has on information behavior. We hypothesize that:

H2: Information asymmetry in the context of transformative technologies impacts human information behavior.

Information diversity represents the number of alternative information options users may or may not process in a given context (Campbell, 1988). It is defined as the number of dimensions of unrelated variables in the information set. As the number of cues increases, typically beyond approximately 10 items of information, decision-making performance starts to fall (Iselin, 1989). HIB is triggered when the individual becomes aware of an information gap related to a problem, driving the information behavior cycle. Given this context, we posit that:

H3: Information diversity in the context of transformative technologies impacts human information behavior.

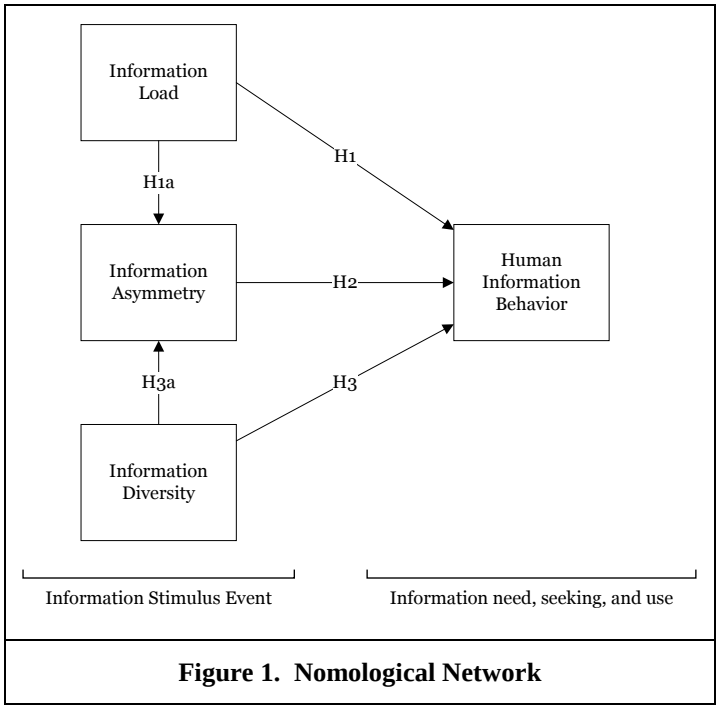

Figure 1. Nomological Network

The last hypothesis proposes the relationship between information diversity and information asymmetry. As the individual faces many stimuli, more cognitive processes elicit uncertainty (Iselin, 1989; Beaudry and Pinsonneault, 2010). A rich information context is characterized by a large number of information sources provided by different technologies. Since information diversity changes user behavior with the increase of unrelated variables, we propose that:

H3a: Information diversity in the context of transformative technologies impacts human information behavior.

Methodology

This study will combine mixed methods of qualitative and quantitative research methodology (Venkatesh et al., 2013). We plan to conduct a field study to investigate the influence of information stimulus event on HIB. Field study requires unrestricted access to various stakeholders inside organizations (Stein et al., 2015). For the initial approach, we plan to select companies with intensive information use and that allow users to bring their own devices (i.e., transformative technologies) to the organizational environment. After collecting and analyzing the necessary evidence to support the model relationship, a survey will be performed using a quantitative approach to verify the consistence and reliability of the present model.

Conclusion

The initial research aims to investigate the influence of information stimulus event on HIB and its impact on IS adoption. We will develop new concepts to study user behavior and provide elements to understand the impact of transformative technologies on organizational settings. The preliminary research model was

developed based on the literature review with three antecedents (information load, information asymmetry, and information diversity) and the hypotheses were proposed to link the variables to the model.

The traditional theories may not support the investigation of current IS phenomena due to various contexts of technology use in everyday life (Constantiou et al., 2014). We will develop a new approach to research such phenomena using information and behavioral elements in hopes of providing a better explanation for technology use and adoption, investigating human information behavior in the context of the large number of information sources. We expect to provide a new model to the literature and a practice to help the academic community, the organization, and society to understand such phenomena, as well as to improve IS design and help individuals to advance their experience and interaction with IS.

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