Behavioral Economics in Information Systems Research: A Persuasion Context Analysis

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Abstract: In recent years, there has been growth in information systems (IS) research applying psychological theories focusing on peoples' perception towards use of technology and how technology can motivate positive change. Behavioral economics–grounded in cognitive and psychological principles–on the other hand studies irrationalities in peoples' behavior from an economics perspective and is a field that has lately been starting to gain credence in IS literature. This study's aim is to establish the depth of behavioral economics studies in IS research by reviewing the basket of eight journals using the persuasive systems design model as an analytical tool. From this extant literature, similarities and complementary properties with other disciplines can be integrated, and improved methods of understanding users and their actions can be used for better prevention and intervention techniques especially in the domains of health IS and sustainability or Green IS.

1 INTRODUCTION

To economists and management scientists, consumers want to maximize utility and if they are presented with clear and simple choices that they understand, they will do so. Whereas to behavioral scientists, the real world is so complicated that the theory of utility maximization has little relevance to real choices and even in relatively simple situations, people do not behave in the way predicted by direct application of the utility theory (Simon 1959). This stream of research formed the beginnings of behavioral decision research. The 1970s heralded the emergence of behavioral economics with works from (Tversky and Kahneman, 1974) and (Kahneman and Tversky, 1979) prospect theory dealing with decision-making under risk and how differences in formulating a choice of problems cause significant changes in people's preferences. For more details on the emergence of behavioral economics see (Angner and Loewenstein, 2007), for example.

Behavioral economics examines conditions that influence the consumption of commodities and combines psychology and economics to investigate how individuals actually behave as opposed to how they behave if they were being perfectly rational (as

in the sense of maximizing their utility) (Prince et al. 2013; Thorgeirsson and Kawachi 2013). Behavioral economics is organized around experimental findings that suggest inadequacies of standard economic theory and is focused on individual choice, the motives underlying that choice and also knowing more about a subject's situation at the time of making a choice (Pesendorfer 2006).

The present study focuses on analyzing behavioral economics in information systems (IS) research by utilizing persuasion context analysis as described in (Oinas-Kukkonen and Harjumaa, 2009). Applying behavioral economics in studying technology use and adoption provides a potential strategy for better understanding users and the factors that lead to the non-adoption or intended use of IS. Behavioral economic principles can also aid in developing techniques for improved presentation, delivery, and organization of information or services. Therefore, behavioral economics methods have enormous potential to inform and complement information systems (IS) research and as noted in Goes (2013) there has not been extensive research in the IS field utilizing behavioral economics methods.

The objective of the present review is, thus, to examine by applying context analysis (Oinas-Kukkonen and Harjumaa, 2009), behavioral economics research in IS that address how cognitive

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limitations influence decision-making. The rest of the paper is structured as follows: the following section introduces the theoretical background on behavioral economics and persuasive systems design. Section 3 describes the review process, which is followed by the results. The paper then concludes with a discussion summarizing the results, limitations, directions for future work, and conclusions.

2 THEORETICAL BACKGROUND

2.1 Persuasive Systems Design

Computers were initially created to perform simple tasks like calculating, storing and data retrieval, but they have now adopted increasingly persuasive roles as they have shifted to our everyday lives (Fogg, 2003). Computers are now viewed as interactive persuasive systems that motivate and influence users and can facilitate behavior change (Fogg, 2003; Oinas-Kukkonen and Harjumaa, 2009).

The aim of persuasive communication is to voluntarily change one's attitude and/or behavior without deception or coercion. The PSD model presents seven postulates to be taken into account when developing persuasive systems. These postulates address accessibility and reach, ease of use, making and enforcing of commitments, attitudes and persuasion strategies, sequential nature of persuasion, the ideal moments for initiating persuasive features and openness (Oinas-Kukkonen and Harjumaa, 2009).

Inherent in these postulates are social psychological theories on attitude change, influence, learning and among others that help to explain human behavior in different circumstances. Examples of such theories include the theory of planned behavior (TPB) (Ajzen 1991), which explains how an individual's attitude and subjective norms about a behavior is determined by behavioral intentions and perception with which the behavior can be performed. The elaboration likelihood model (ELM) (Petty and Cacioppo 1986) a theory of attitude change that describes direct and indirect routes to information processing and persuasion. Bandura's (1989) social learning and social cognitive theories which provide a framework for understanding, predicting and changing human behavior. According to theories, people learn new behaviors by studying, observing and then replicating the actions of others. Lastly, Cialdini's

(2007) studies on influence which show how formulating requests in certain ways can trigger automatic compliance response from individuals.

Following the postulates, the context for persuasion is considered. The *persuasion context analysis* comprises of recognizing the intent, the event, and the strategy (Oinas-Kukkonen & Harjumaa, 2009). The intent includes the initiator for the development of a system and its purpose. The event consists of the context of use, the user, and the technology. The use context refers to characteristics of the problem domain in question, the user context includes the differences and characteristics among users, and the technology context refers to the type or technical specifications of a system. Finally, the strategy addresses the analysis of persuasive message being conveyed and the route, whether direct or indirect or both (Petty and Cacioppo, 1986), that is used to influence the user (Oinas-Kukkonen and Harjumaa, 2009).

In most studies on persuasive systems and success factors for IS, the context and the effect it can have on a user's decision-making is rarely addressed. Success is also usually measured in terms of changing users' behaviors in ways predetermined by developers or providers of the system (Brynjarsdottir et al. 2012). In persuasive technology, information is usually provided for people to better understand either certain problems. However, there has been research that point to potential disadvantages of using information-centric approaches to motivate behavior (Lee et al., 2011). The emphasis on providing information rests on the assumption that people are rational actors striving to enhance activity based on what they know and the information that is available (Brynjarsdottir et al., 2012). But, people have been shown to be predictably irrational with such behavior being "*neither random nor senseless. They are systematic, and since we repeat them again and again, predictable*" (Ariely 2008).

2.2 Behavioral Economics

Behavioral economics departs from the standard economic model in acknowledging three human behavioral traits: 1) bounded rationality – human beings have limited information processing capabilities and because of this, they adopt rules of thumb to aid in problem-solving. 2) Bounded willpower – accounts for the fact that people do not always make choices that are in their best long-term interest, due to a lack of self-control, and 3) bounded selfishness – relaxes the assumption that people are motivated by pure self-interest and their actions also

include altruistic and spiteful behaviors (Thorgeirsson & Kawachi, 2013). Within these three behavioral traits, there are psychological principles that explain why people act in certain ways. For example, one's estimates and judgments being biased towards some initial anchor value, preference of the status quo as opposed to changing routines, interventions that help participants pre-commit to future healthy behavior and so forth (Thaler & Sunstein 2008; Thorgeirsson & Kawachi 2013).

Most behavioral economics research mainly focuses on interventions for healthier living (Prince et al. 2013; Michie & Williams 2003), strategies for reducing unwanted behaviors (Lunze & Paasche-Orlow 2013), environmental sustainability and improving governmental and institutional policies that benefit society (Siva 2010; Avineri 2012). Prince et al. (2013), for example, propose improvements to better understand the role of protective behavioral strategies in reducing the use of alcohol, explain why there have been inconsistencies in previous studies, and what can be done to enhance future studies. Michie and Williams (2003) discuss the factors that lead to work-related psychological ill health, comparing between different professions and proposing solutions to these problems mainly involving training and more involvement in decision making.

Siva (2010) applies lessons in behavioral economics to improve pay-for-performance programs. The reasons why such programs are flawed and how people respond to incentives are addressed in the article. Lunze and Paasche-Orlow (2013) discuss the pros and cons and ethical concerns on the use of incentives in behavioral economics to promote healthy behavior and reduce health costs. Lunze & Paasche-Orlow (2013), acknowledge the need for safeguards in the programs to monitor their associated risks and promoting fairness in offering the incentives for them to be beneficial. Avineri (2012), links travel behavior to psychological theories and shows how individuals' choices in different contexts deviate from the predictions of rational behavior.

As the role of information technology (IT) in people's daily decision-making and experiences has increased, new opportunities to assist people in making self-beneficial choices have arisen (Lee et al. 2011). The persuasive element in behavioral economics lies in the presentation of choices in a way that leverages people's decision processes; thus, encouraging them to make self-beneficial choices (Lee et al. 2011). For example, Crowley et al. (2011) apply behavioral economics in developing sensor-based interactive systems to initiate change in

residential energy consumption. They argue that even though the success of most of the sensor-based power meters and other related residential monitoring devices depends on users responding to the data they generate with appropriate changes in their consumption behavior, most of these devices have not been developed with the end-user in mind. Therefore, a more human-centered process that integrates behavioral insights to determine the effectiveness of sensor-based interactive systems and of interfaces based on cognitive, social and affective frames is proposed (Crowley et al. 2011).

3 REVIEW PROCESS

A structured literature review is a focused approach to identify relevant articles. Structured reviews provide means to identify and categorize most of the existing literature concerned with the research question(s). The reasons for conducting a review include, but are not limited to summarizing the existing facts about use of technology, creating a firm foundation for advancing knowledge, identifying gaps in current works in order to suggest areas for further analysis, and providing a framework for suitably positioning research interests (Webster and Watson 2002; Kitchenham 2004). Our objective, is to use the PSD model (Oinas-Kukkonen and Harjumaa 2009) to examine behavioral economics research in IS. This would enable us to identify any recurring and emerging themes and identify gaps in the literature.

3.1 Need for a Review of Behavioral Economics in IS

Webster and Watson (2002) state that a literature review process stems from scholars need to report progress in a particular stream of research and from those who have completed a review prior to starting a project and have developed theoretical models from the review. Additionally, there are reviews on mature topics and those on emerging issues that would benefit from exposure to new theoretical foundations (Webster and Watson 2002). Behavioral economics has lately been gaining attention in the IS field, and although it is a relatively new field, it has been widely studied in economics and mostly health and environmental conservation-related topics.

Vassileva (2012), in her overview of the growth of web-based social applications and the approaches they use to motivate user participation, states that most of these applications employ simple

approaches that have been successful in engaging users. Although, these approaches only ensure that users act accordingly, but are unable to guide the social system(s) towards a desirable overall behavior. For this reason, several future trends related to the application of social psychology, behavioral economics and their convergence with other disciplines are suggested in the design of reward and incentive mechanisms for particular types of communities, persuasive and other user-adaptive systems (Vassileva, 2012).

Therefore, there is a great opportunity to combine behavioral economics and IS as these two disciplines both seek to enhance the understanding of the user. Both disciplines emphasize how context and cognitive effects influence decision-making–the IS field is mostly about information processing for decision-making (Goes, 2013). Subsequently, we have examined articles from the top IS journals and have not found a comprehensive review that addresses the research question below regarding the integration of behavioral economic in IS.

The main research question that guided our research is:

RQ: How can behavioral economics enhance understanding of users and their interactions with information systems?

3.2 Electronic Search

For the present review, a literature search was conducted for the years between 2006 and 2014. The keywords used were behavior(u)ral economics, prospect theory, mental accounting, cognitive bias, choice architecture, nudge, persuasive systems design, persuasive technology, behavior(u)r change, attitudes, and persuasion. This was to ensure that we got a wide variety of article applying behavioral economics principles and persuasive techniques.

The above keywords were used to search the metadata related to the top eight IS journals (MIS Quarterly, European Journal of Information Systems (EJIS), Information Systems Journal (ISJ), Information Systems Research (ISRe), Journal of Information Technology (JIT), Journal of Management Information Systems (JMIS), Journal of Strategic Information Systems (JSIS), Journal of the Association for Information Systems (JAIS)) in Wiley, INFORMS PubsOnline, EBSCOhost, ScienceDirect, Taylor Francis Online, and ProQuest ABI/INFORM.

The search string resulted in 919 articles and after excluding editorials, book reviews and commentaries, and reviewing the abstracts, 63

articles remained, these were further reduced to 15 (Figure 1) based on the eligibility criteria below.

3.3 Eligibility Criteria

Inclusion and exclusion criteria were used to select articles from the original search to be used in answering our research question. Studies were selected, if they: had behavioral economics in the abstract, b) were full research papers (and not editorials, commentaries), c) described the persuasive/cognitive stimuli applied, d) investigated the relation between the stimuli and (behavioral) outcome. Articles were excluded, if they: a) only discussed system implementation; b) were about either general systems development or systems development to meet organizational/individual needs without a behavioral outcome; c) only discussed systems benefit(s) to an organization; or d) were purely on research methodology or systematic reviews not related to the topic.

3.4 Data Extraction and Synthesis

The first author coded all the articles using predefined criteria (devised by both authors) and any uncertainty about a particular article was discussed prior to its inclusion or exclusion based on the eligibility criteria.

Each selected publication was examined for the following elements: Objective of the study and corresponding research question(s); study environment and participants; themes emerging from the study; and, the relevance of the studies' results. This was then followed by a synthesis of the emergent themes and categorization of the articles according to the cognitive/persuasive stimuli studied. To integrate the search results and our conceptualization of behavioral economic studies in IS we applied context analysis as defined by Oinas-Kukkonen and Harjumaa (2009) to categorize articles (Tables 1-3) according to the objectives, the cognitive principle(s) studied, the user and technology contexts, and contribution of the study. This categorization is suitable because of the level of abstraction it enables in identifying the effects of the measures used in the reviewed studies.

4 RESULTS

Analysis of these papers was based on the aforementioned objectives and the results reveal a difference in coverage of behavioral economics in

the major IS journals. A majority of the articles were from EJIS and ISRe. All but one of the journals produced original results with data, and only two of the articles (Goh and Bockstedt 2012; Adomavicius et al. 2013) from ISRe contained behavioral economics as a keyword in their abstracts. While the following analysis is based on the 15 articles that we have labeled–according to the persuasion context analysis–as investigating a behavioral economic principle, it is important to note that certain articles (Tsai et al. 2010; Goh and Bockstedt 2012; Adomavicius et al. 2013; Wu and Gaytán 2013; Park et al. 2013; Chiu et al. 2014; Legoux et al. 2014) much more strongly considered decision-making and the valuation of presented choices than others (e.g., Blanco et al. 2010; Lee and Benbasat 2011).

Some articles, while explicitly focused on investigating users' valuation of choices, additionally engaged with goals and design issues that may not fall under the realm of behavioral economics (Lankton and Luft, 2008; Angst and Agarwal 2009; Blanco et al. 2010)
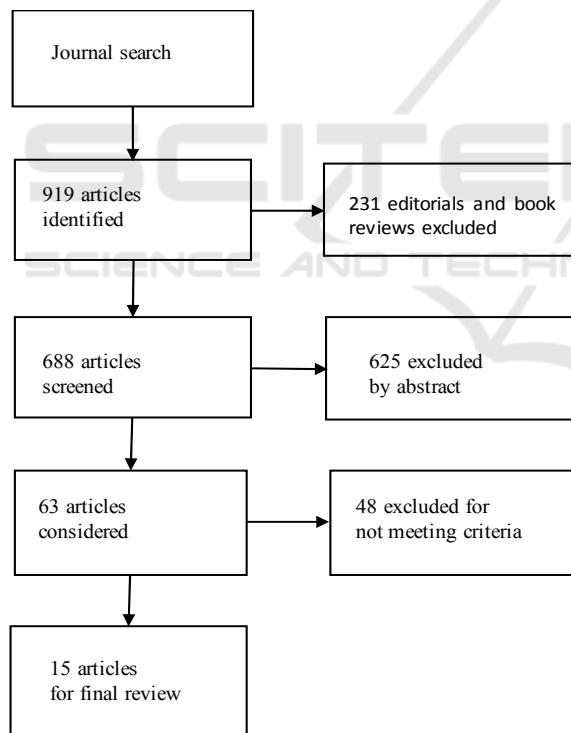

Figure 1: Literature search and selection process.

Accordingly, our classification of each of these articles as investigating a behavioral economics principle should be considered with this caution in mind. As further noted in (Avineri, 2012), it is important to acknowledge that behavioral economics is not a homogenous field that can straightforwardly be demarcated and there are opposing views as to what counts as behavioral economics. A related discussion can be found in a Q & A with R. Thaler on what it really means to be a "Nudge" (Ubel 2015). The characteristics of the studies based on the principle examined are presented in Tables 1-3.

Analysis of the persuasion context requires an understanding of the occurrences in information processing as the context assists in learning and better understanding user behavior.

4.1 The Intent

Determining the intent involves defining the purpose of an interactive system. Intentions can arise from the creators of interactive systems, those who give access to the system, and the individuals using the systems (Fogg, 2003; Oinas-Kukkonen & Harjumaa, 2009). In the case of the current study, the intent is derived from both the objectives of the reviewed studies, the systems being studied, and their purpose. Most of the studies were either Web or mobile-based and involved either experimentation (Goh and Bockstedt 2012; Wu and Gaytán 2013) or surveys (Tsai et al. 2010; Park et al. 2013) Six of the studies investigated various aspects of user behavior in online stores. Chiu, Wang et al. (2014) use prospect theory (Kahneman and Tversky, 1979) to highlight decision-making under risk and why people continue to buy from an online store. Prospect theory is used to explain decision-making from a value maximizing perspective and how, when one makes a decision, s/he does not take into account the decision's effect on their consumption (Chiu et al. 2014).

Blanco et al. (2010) develop mock-ups based on e-commerce practices to investigate the ideal combination of presenting visual and textual information and how various combinations of these affect consumers' cognitive states. Wu and Gaytán (2013) discuss a risk-based conceptual framework to help understand the role of seller reviews and product prices on buyers' willingness to pay. Adomavicius et al. (2013) investigate the influence of recommender systems' ratings on consumers' preferences by exploring anchoring, timing, system reliability and granularity issues that are related to their impact. Goh and Bockstedt (2013) apply behavioral economic principles to examine seller's design choices and how these influence consumer behavior.

Lankton and Luft (2008) apply behavioral economic theories to study IT investment valuation and predict the differences between intuitive judgment and real options prescriptions. Ma et al.'s (2014) study integrate gambling theory, the

availability heuristic, and repeated behavior into a framework that explains online gambling over time. The rest of the studies examine various aspects of human behavior in different environments. These include, the role price and context play in mobile service adoption (Blechar, Constantiou et al. 2006) and the role consumer trust in online merchants plays in purchase decisions (Liu and Goodhue 2012).

4.2 The Event

The event consists of the use, user and technology contexts. These are the issues arising from the problem domain, individual differences in people that influence their information processing, and the technologies or strategies employed in computer-human and computer-mediated interaction (Oinas-Kukkonen and Harjumaa, 2009). The use context was not discussed in detail in any of the studies. This is because they primarily concentrated on investigating some aspect of user behavior related to valuation of choices and/or presentation of information, and proposing solutions and directions for future research without going into details on the actual use of the systems and/or features investigated. As noted in Lehto and Oinas-Kukkonen (2011) a high abstraction level in systems descriptions makes it difficult to understand the actual interactions taking place through the system and the extent to which any potential outcome(s) are due to the system's intent.

The tested hypotheses and conducted experiments in the studies provided a clearer picture of the results' relevance and their practical and theoretical implications. For example, Chiu et al.'s (2014) study extended prospect theory and provided additional theoretical reasons why consumers become more risk-seeking or less risk averse in different circumstances. One of the practical implications of their study was a suggestion of how online sellers could attract potential buyers and turn infrequent buyers into frequent ones. This was through delivering guarantees on issues such as security, inspiring customers and keepings customers informed (Chiu et al., 2014).

The studies analyzed were about, 1) Web-based environments which analyzed aspects of user behavior (e.g. Chiu et al., 2014; Adomavicius et al., 2013; Ma et al., 2014), 2) ways of improving user interactions or understanding user actions online (Legoux et al. 2014), 3) mobile-based services (Blechar et al. 2006), and 4) the decision to use certain systems (Constantiou et al. 2014). Although these studies reported the technology context, as

their focus was mostly on studying users' actions, they did not provide a detailed description of the technologies investigated.

4.3 The Strategy

Analysis of the strategy involves identifying the route of message delivery–the underlying theories applied in the studies to reach an intended audience, the medium used, and the persuasion elements that are conveyed in a message. A majority of the studies investigated were not inherently persuasive, therefore, the route used was either not described or clearly discernable. Only in Angst and Agarwal (2009) is there a mention of the route as the study, investigating privacy concerns, is explicitly about direct and indirect routes to persuasion. The study highlights under which circumstances either or both routes could be used. Unlike previous studies on the ELM where the main focus was on attitude/opinion change, Angst and Agarwal (2009) investigate a choice process that could be cognitively taxing.

The message refers to the techniques used to influence or alter users' actions and in our study, these are the principles (see Tables 1-3) applied in or emerging from the reviewed articles. These included how people react to information and/or choices depending on how they are presented (framing) (e.g., Goh and Bockstedt 2012), relying only on information that confirms an initial assumption while discounting opposing information (confirmation bias) (e.g., Park et al., 2013), how loss is more significant than an equivalent gain (loss aversion) (e.g., Chiu et al. 2014), relying on one piece of information (an anchor value) when making decisions (anchoring) (e.g., Adomavicius et al. 2013), and application of persuasive principles (explained by information processing-related theories such as the ELM in investigating choice decisions) in Websites to influence users (Angst and Agarwal 2009).

5 DISCUSSION

5.1 Contribution and Implications

It is important to understand how different contextual issues affect users' decision-making, decision-making that may not always follow a systematic pattern. Behavioral economics recognizes that people are influenced by who they communicate with, their reactions are shaped by predictable mental cues (heuristics), people are strongly

influenced by others' actions, relevant innovations draws our attention, people's acts are often subconsciously influenced, people seem to be consistent with their public promises and often have an urge to reciprocate acts of kindness (Thaler and Sunstein, 2008; Ariely, 2008; Dolan et al. 2010; Thorgeirsson and Kawachi, 2013).

Behavioral economics has the potential to be an important enabler of sustained behavior change, especially in technology-mediated environments. Behavioral economics also offers means to obtain a deeper understanding of how IS and the design of IS can influence users. Primarily because effective persuasive communication is about correctly interpreting the purpose of an IS–the intent.

This communication can be disrupted the noise sometimes created by people's cognitive biases related to their judgment and decision-making (Ariely 2008). As such, the educational approach and the assumption that people are rational actors prevalent in persuasive systems design and most IS-related theories such as the technology acceptance model (TAM) (Markus and Tanis 2000; DiSalvo et al. 2010; Lee et al. 2011; Brynjarsdottir et al. 2012) is not the most effective approach to driving (behavior) change. Rather, an understanding of people's regular biases can be more useful for stimulating change (e.g., Blechar et al., 2006; Adomavicius et al., 2013; Goh and Bockstedt, 2013; Ma et al., 2014).

Related to this, we asked one major question in this paper: "How can behavioral economics enhance understanding of users and their interactions with information systems?" To examine behavioral economics research specific to IS, we turned to the major IS journals. We were particularly interested in studies investigating various behavioral economic principles related to valuation, the effects of cognitive stimuli on choices, and how these relate to and can be explained by persuasion context analysis.

The choice of the eight IS journals was because the major contributions in a particular field are likely to be in the leading journals (Webster and Watson, 2002) and studies accepted in these fora are usually concise and comprehensive, detailing all the relevant aspects of the particular field studied. Although, Webster and Watson (2002) also suggest searching for articles elsewhere after the initial search in the major journals. In this study, we limited the search to only the basket of eight. We also concentrated on the major journals because we were interested in those studies focusing on the IS community and thus excluded from review behavioral economics studies meant for other audiences such as psychology and marketing. Consequently, this review can be

considered as the first attempt in synthesizing behavioral economics studies in IS research. Furthermore, we have also discussed the limitations of IS and looked at ways behavioral economics with its focus on judgment and decision-making can help address some of these limitations.

In terms of coverage, the findings suggest that 1) there is great potential in enhancing research in the two fields especially as one entails incorporation of cognitive, emotional and environmental principles in decision-making and the other is about information processing for decision-making. 2) There has been an increase in the studies integrating the application of behavioral economic principles in IS, the majority of which have focused on online retail stores and recommender systems. 3) Considering some of the limitations of IS, behavioral economics in its grounding on cognitive theories as shown in the reviewed studies, offers possibilities to enhance both IS design and implementation and PSD and 4) the decision-making process is not consistent. The study of behavioral economics principles in most cases should involve field and/or experimental tests to determine the underlying theoretical relationships in order to enhance the clarity of the studies and the principles applied.

In the previous section, we have positioned the behavioral economics literature based on context analysis and although there were similarities in approach as mentioned above, the studies analyzed were not about behavior change, which is a key concept in persuasive systems research. Inherently, they do involve change, but the coverage of the change and the actual aspect changing is limited. Additionally, most of the studies do not factor in differing user characteristics and how these differences may lead to varied responses to stimuli. Therefore, in context analysis, as viewed from the persuasive systems domain, not all factors could be applied which has implications for the findings.

In behavioral economics, the behavioral assumption is that people often act irrationally (Ariely 2008) and not all their actions can be reasonable and/or according to predefined criteria– there is always a need to understand the audience and the context in which information is received. The prevailing environment and one's emotional state affects decision-making. Thus, behavioral economics investigates the scope of decisions regarding finances, health, and dietary choices that people make (Ariely 2008). The persuasive element involves presenting these choices in a way that leverages people's decision making and persuades them to make self-beneficial decisions (Lee et al. 2011). The psychological barriers that prevent

desired behaviors should be understood and this knowledge incorporated into decision-making and systems design. As Wu & Du (2012) have stated, in order to better understand system-use behavior, especially in behavioral economics research, researchers need to enhance their conceptualization and measures of system usage which also factor in the information quality and complexity of the IS environment.

5.2 Limitations and Future Research

For this study, we concentrated only on articles from the major IS journals and as comprehensive as these are, they may not present all the relevant information that has been conducted. Especially when one considers that behavioral economics is a relatively new field and IS research is itself multidisciplinary so there may be other relevant studies outside the IS realm. For example, examining articles from well-known conference and workshop proceedings. Secondly, our search was meant to produce a large number of articles for review. But by including additional terms in the search string (e.g., known behavioral economic principles (cognitive biases prevalent in judgement and decision-making) such as framing, priming, incentives etc.) and searching

in other online libraries and databases, a highly-focused pool of potential articles for review could have been found. Lastly, in persuasion context analysis since the articles did not prescribe to persuasive systems design, interpretive categorization, which may be subjective, was used.

Further research to extend the scope of the search is planned and specifically to investigate how behavioral economic principles can be integrated in both IS research and more concentrated persuasive systems design. As most of the studies included in the current review have focused on examining aspects of human behavior, a potential avenue for future research would be to implement some of the principles in actual systems design and study the subsequent effects. For example, how varying the allocation and rate of rewards combined with social support in incentive schemes could influence goal achievement.

Furthermore, the reviewed studies are very diverse in nature. Some studies focused on behavioral IS and others on the economics of IS. Future research could examine whether there are any differences in adopting behavioral economics between different fields of research and the implication(s) this has for the findings.

Table 1: Characteristics of studies related to framing.

Study	Objective	User context	Technology context	Contribution
Blanco et al., 2010	Examine how product presentation affects recall and perceptions on quality (framing)	Graduate and Postgraduate students (N=108)	Mock websites based on e-commerce practices	Confirmation of the importance of product presentation online, consumer characteristics, and how people perceive and process product information
Goh & Bockstedt, 2013	Measure whether framing influences consumers' value of customizable bundle offers from online stores (framing)	Behavioral experiments (N=454)	Online streaming and movie rentals	The technology-driven context of a purchase decision can have significant effects on consumer choices and economic outcomes.
Tsai et al., 2011	Investigate whether prominence of privacy information influences incorporation of privacy considerations in online purchasing decisions. (Salience, framing, and priming)	Online responses to a concerns survey and a shopping experiment (N=238)	Shopping search engine interface, Privacy Finder	New insight into consumers' valuations of personal data and evidence that privacy information affects online shopping decision-making.
Angst & Agarwal 2009	Investigate whether persuasion can change attitudes and opt-in intentions toward electronic health records even in the presence of significant privacy concerns. (Persuasion and framing)	Participants (attendees to a conference and online survey) (N=366)	Electronic health records	Even when people have high concerns for privacy, their attitudes can be positively altered with appropriate message framing. These results as well as other theoretical and practical implications are discussed.

Table 2: Characteristics of studies related to risk aversion and confirmation bias.

Study	Objective	User context	Technology context	Contribution
Chiu et al., 2014	Understand reasons for customers' repeat purchase in online retail stores and the effect perceived risk would have. (Risk aversion)	Customers of Yahoo! Kimo in Taiwan (N=782)	Yahoo! Kimo - online shopping store	The moderating effect of perceived risk, extends prospect theory and provides additional theoretical reasons for risk seeking and risk averseness in consumers.
Wu & Gaytan, 2013	Apply the buyers' risk perspective to reconcile and explain seemingly conflicting results in previous literature. (Risk aversion and framing)	Undergraduates students (N=78)	eBay auction site (empirical study)	Customers have different risk preferences and thus select sellers with different risk profiles to match their risk appetites.
Park et al., 2013	Explore the extent investors are subject to confirmation bias in the context of exposure to information on message boards. (Confirmation bias)	Investors in South Korea (N=502)	Stock message boards	Confirmation bias plays a great role in investment decision-making in numerous contexts e.g., project management.
Legoux al., 2014)	Investigate how experts' investment decisions are affected by cognitive biases. (Confirmation bias)	Participants from a financial institution (N=100)	N/A	Prediction accuracy about market reactions to IT investments was hampered by confirmation biases.

Table 3: Characteristics of studies related to other biases.

Study	Objective	User context	Technology context	Contribution
(Adomavicius et al., 2013)	Explore how preferences at the time of consumption are influenced by recommender systems' predictions. (Anchoring effects)	Participants N = 216	Recommender systems	Viewers' preference ratings are malleable and can be significantly influenced by the recommendation received.
(Liu & Goodhue, 2012)	Explain the role of potential users' trust in creating intention to revisit a website (Bounded Rationality)	Undergraduate MIS students (N=314)	Website which redirects to 12 other websites	Consumer trust in e-vendor plays a major role in purchasing services
(Blechar et al., 2006)	Explore the influence of reference situations and reference pricing on mobile service users' behavior. (Reference pricing and Reference situation)	Students and employees in the public sector (N=74)	Mobile services	The benefits of approaching mobile service adoption and use research in a holistic manner and the importance of considering the reference point on mobile usage behaviors.
(Ma, Kim et al. 2014)	Develop and test a model of online gambling that simultaneously takes into account cumulative and recent outcomes, and prior use. (Availability heuristic)	Actual users of a gambling website (N=22, 304)	Bwin Interactive Entertainment (Internet gambling)	Integration of gambling theory, the availability heuristic, and repeated behavior into a framework that explains online gambling over time.

Table 3: Characteristics of studies related to other biases (cont.).

Study	Objective	User context	Technology context	Contribution
(Constantiou et al., 2014)	Investigate cognitive processes involved in the decision to use location based services (LBS) and how they influence information retrieval behaviors. (Cognitive processes in decision-making)	Young smartphone users (N=66)	Location-based services in the German telecommunications market	A new conceptual framework to investigate LBS use and complement existing models in user behavior research.
(Lee, Benbasat 2011)	Extend the effort-accuracy perspective of understanding users' recommendation agents' (RA) acceptance by including trade-off difficulty. (Cognitive aspects of decision-making)	Students at a large North American university (N= 100)	Web-based recommendation agents	Explains role of preference elicitation methods (PEMs) in assisting users with trade-off difficulty across different decision contexts Perceived effort compared to previous research no longer has a significant influence in the loss condition.
(Lankton & Luft 2008)	Provide theory-based predictions of how consistency between intuition and normative real options value varies for deferral and growth investment options under differing conditions. (Intuitive judgment and regret theory)	MBA students from a Midwestern public university in the United States (N=70)	N/A	Techniques by which organizations can limit unwanted effects of regret and overaggressive competitive behavior.

6 CONCLUSIONS

The current study attempted to understand the integration of behavioral economics in IS research by reviewing the major IS journals. The study chose a wide perspective in its search for articles that was intended to capture a broad spectrum of articles that covered the application of behavioral economics and integrated persuasive systems design to some extent. This explains why our eligibility criteria consisted of issues pertaining to the user and their use (their actions, intentions) of technology. The research was also driven by the need for a more profound understanding of the different principles of behavioral economics and their application. By understanding the extant literature in the field, similarities and complementary properties with other disciplines can be integrated, and in the case of IS, improved methods of understanding users and their actions can be used for better prevention and intervention techniques especially in the domains of health and sustainability. Behavioral economics with its focus on understanding why sub-optimal choices are made offers great opportunities in IS research by highlighting these issues and how to counter them, which can inform systems design.

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