Scientrometric Analysis Cognitive Biases Modification

in Accounting Information Systems Research

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Abstract: Recently, AIS researchers have begun to study cognitive bias, a topic that has been studied in psychologist-minded behavior of using the system. This has led to an unusual collection of papers with conflicting ideas, methodologies, and language. Our scientometric study provides the first comprehensive overview of AIS cognitive bias research. Through a systematic literature scan of the top 15 AIS sources over a 20-year period, we identified 102 papers related to cognitive bias. Our content analysis further revealed a significant increase in interest in cognitive bias research in AIS disciplines over the time period studied. However, there is an uneven distribution of this research across different AIS domains and industry settings. Although AIS has benefited from the study of perception and decision biases, there is still untapped potential in studying social biases, memory, and interest. Our work highlights gaps in AIS-related bias research and the need for more consistent bias identification and measurement practices. We are committed to conducting further research to promote the growth of cumulative knowledge in this area

INTRODUCTION

Accounting information systems research focuses on the human decision-making process (Goes, 2013). The study of technology acceptance explains and predicts the choices made by users regarding the adoption and usage of information systems (Davis, 1989; Venkatesh et al., 2003; 2012). Decision Support Systems and IT Outsourcing (Dibbern et al., 2004; Gonzalez et al., 2006; Lacity et al., 2010) also extensively examine decision-making. These fields make use of psychological theories. Davis's Technology Acceptance Model (1989) and its various versions are influenced by Fishbein and Ajzen's Reasoned Action Theory (1975). The success of each of these streams of accounting information systems research demonstrates the importance of applying psychological understanding to comprehend information systems phenomena (Goes, 2013). In all of these cases, psychological understanding has aided information systems researchers in advancing the field and offering practical guidance.

Information systems research in accounting has lately focused on cognitive biases in psychology study on human decision-making. Cognitive biases are systematic human decision-making mistakes caused by heuristics (Wilkinson and Klaes, 2012). Simon (1990, p.11) defines heuristics as "methods for arriving at satisfactory solutions with simple calculations." Rules of thumb are heuristics. Cognitive biases cause genuinely illogical judgements to have inferior results for decision makers and anyone impacted by them (Wilkinson and Klaes, 2012). These cognitive biases, along with other psychological theories and concepts, can greatly enhance and complement research on accounting information systems. In areas such as crowdsourcing, collective intelligence, electronic marketplaces, personalization, and recommendation systems, accounting information systems play a crucial role in providing more information and facilitating

interactive decision-making. This setting raises behavioural issues including privacy, trust, and security, which may be susceptible to cognitive biases (Goes, 2013). The first research shows the direct utility of cognitive bias insights in information systems (Arnott, 2006; Kim and Kankanhalli, 2009). Finally, accounting information systems experts' apparent interest in cognitive biases suggests that this issue is becoming a welcome novelty (Browne and Parsons, 2012).

Cognitive biases have been studied for approximately 40 years (Tversky and Kahneman, 1974), but accounting information systems research is still scarce. Thus, the result supports Browne and Parsons (2012)' need for greater research. Research on bias in information systems is limited and inconsistent in terms of language and methodology (e.g. Mann et al., 2008). This project aims to carry out the first comprehensive evaluation of cognitive biases in research on accounting information systems.

SCIENTROMETRIC ANALYSIS

According to the study's analysis of individual cognitive biases, framing (n = 14) and anchoring (n = 10) were the most commonly studied biases. Additionally, the research has focused on several other biases, including negativity bias (n=7), sunk cost bias (n=7), confirmation bias (n=5), and halo effect (n=4). Only one publication examined a significant number of cognitive biases, such as cultural prejudice and the exponential estimating fallacy. This matrix displays the biases found within each category and topic of research in Accounting Information Systems. Figure 1 highlights the uneven distribution of research on cognitive biases. The usage and perception bias (n=27), decision bias (n=16), and stability bias (n=14) have been regularly studied.

	ICT business model firms	Software development	Application System	System Information Management	Use of Information Systems	Economic Impact	Meta-Research	∑ (bias)
Bias Perception	0	2	2	6	24	0	1	35
Bias Perception	0	2	3	2	4	0	0	11
Bias Reminder	0	0	0	1	0	0	0	1
Decision Bias	0	2	1	5	16	0	0	24
Action-Orientation Bias	0	0	2	4	2	0	0	8
Bias Stability	0	4	1	3	12	0	0	20
Social Bias	0	0	0	3	6	0	0	9
Attention Bias	0	0	0	1	1	0	0	2
∑ (Research Area)	0	10	9	25	65	0	1	∑=110

Figure 1. Matrix of Results in Research Field of AIS.

The study found that the majority of bias was examined in a general context, rather than focusing on a specific industry (n = 38). When biases were studied within a specific industry, the most researched sectors were retail (n = 33) and information (e.g. software, publishing, broadcasting, telecommunications) (n = 14). On the other hand, industries such as arts and entertainment (n = 2), real estate (n = 1), manufacturing (n = 1), and health care and social assistance (n = 1) have received less attention until recently. Additionally, there are certain industry sectors where no research on cognitive biases has been found. In terms of the combination of bias categories and industry context, researchers noted a similar pattern. For instance, there is extensive research on the combination of retail trade bias and perception (n = 18), while there is limited research on the combination of retail trade bias and memory (n = 2).

RESULTS AND DISCUSSION

The research involved in this scientometric analysis focused on examining cognitive bias in accounting information systems. The researchers will present their findings, discuss the latest research on

cognitive bias in accounting information systems, and propose areas for future research. The results of the scientometric analysis provided valuable insights. Firstly, it revealed a steady increase in the study of cognitive bias in accounting information systems over the past 20 years. Additionally, the analysis showed that cognitive biases were the main focus of most papers. This surge in publications and attention to cognitive bias as a primary research topic indicates that it is becoming a popular and respected subject in the field of accounting information systems. However, most articles primarily explain cognitive bias rather than offering strategies for avoiding or utilizing it. This suggests that the study of cognitive bias in accounting information systems is still in its early stages. Scholars argue that understanding a phenomenon within a specific area of inquiry is often the first step towards progress in that field.

Most publications primarily focused on individual analysis, as predicted. Early cognitive bias research, such as Tversky and Kahneman (1973), initially explored bias at the individual decision-making level before delving into more complex group-related phenomena like herd behavior (Scharfstein and Stein, 1990). In the researcher's scientific analysis articles, e-commerce stands out as one of the most significant study settings, reflecting the findings of individual-level research. Researchers in the field of e-commerce often examine individual decision-making (Smith and Brynjolfsson, 2001; Corbitt et al., 2003; Cowart and Goldsmith, 2007). With the increasing influence of social networks (Wilcox and Stephen, 2013) and the resulting collective decision-making (Kempe et al., 2003; Kim and Srivastava, 2007), it becomes crucial to consider cognitive biases in future studies. When it comes to collective decision-making processes, such as those observed in online communities, studying social biases like value bias and cultural prejudice could prove fascinating. Moreover, it would be worthwhile to investigate whether cognitive biases identified in individual decision-making can be applied to collective decision-making.

In terms of the theoretical foundations discussed in the studies reviewed, the researcher noted that many authors present a solid rationale for exploring cognitive biases in their respective investigations, such as prospect theory. However, there were also numerous articles where this was not the case, lacking a proper theoretical basis altogether. Therefore, researchers strongly recommend that future studies on cognitive biases in Accounting Information Systems incorporate a robust theoretical foundation and provide clear argumentation and discussion.

The researchers conducted a scientometric analysis and found that 41 articles used quantitative and objective methods to measure bias. Since cognitive biases cannot be directly observed, it is important to compare biased decisions against objective baselines for conclusive evidence. However, this does not mean that qualitative or quantitative methods like interviews or secondary data analysis are inappropriate. The choice of method should depend on the research question. Researchers suggest considering the methodological peculiarities of bias-related research when selecting methods for future studies. The rest of the paper focuses on the Accounting Information Systems research field and discusses current and potential bias-related research, highlighting opportunities for future studies.

When examining AIS research fields, we can categorize them into three main groups: (1) e-commerce (B2C), (2) technology adoption and post-adoption research, and (3) decision support systems and the use of recommendation systems. Surprisingly, these three groups alone accounted for half of the 84 bias-related articles identified by the researchers. As a result, the researchers dedicated a considerable amount of discussion to this particular area of research.

The e-commerce cluster comprised 23 articles that focused on online reviews, product choice, pricing, confidence in online buying, and customer retention. In these articles, perceptual bias and framing were identified as the most common forms of prejudice. To advance framing research, we propose the use of multiple approaches for operationalizing framing, such as text, frames, or other web design elements like size, color, and presentation style (dynamic vs. static). The prominence of website items could also be considered. Despite extensive research on these characteristics, much of it does not take into account cognitive biases or non-rational decision-making (Li et al., 2012; Lee et al., 2012b). However, by recognizing the presence of cognitive biases in such studies, we may gain valuable insights for AIS and HCI research.

The second cluster in the field of research on the use of Accounting Information Systems includes 10 articles. These articles focus on bias within the context of technology adoption, such as sunk cost bias as discussed by Polites and Karahanna in 2012, and post-adoption theory, including status quo bias as explored by Hong et al. in 2011. Although adoption is a well-established area within Accounting Information Systems, with recognized models like UTAUT and UTAUT2 (Venkatesh et al., 2003; Venkatesh et al., 2012), it

would be beneficial to explicitly consider the role of cognitive biases. Current models already incorporate bias-related concepts like "habit" (e.g., as seen in status quo bias) (Venkatesh et al., 2012), but delving deeper into cognitive biases could enhance our understanding of adoption behavior among Accounting Information System users and further develop existing adoption and post-adoption theories. Additionally, it may enable more accurate predictions about the likelihood of nonrational adoption decisions influenced by cognitive biases. Another area that has received limited attention in terms of bias is research on software selection (e.g., Benlian, 2011; Benlian and Hess, 2011).

The third cluster of articles in the use of Accounting Information Systems (9 articles) addresses the challenges of using decision support systems (e.g. Kahai et al., 1998) and recommendation systems (e.g. Pathak et al., 2010). For instance, Pathak et al. (2010) explores the impact of novelty and suggests that future research could explore different types of recommendation approaches, such as content-based or a combination of content-based and collaborative filtering methods. Researchers also propose investigating this perceptual bias in conjunction with framing effects. This would reveal the circumstances in which the impact of novelty on recommendations is most influential, or conversely, when it is diminished. Including these aspects could enhance research on recommendation systems, as bias is often not explicitly considered (e.g. Benlian et al., 2012a). In summary, it is evident that the field of using Accounting Information Systems already contains significant contributions on the subject of irrational decision-making. However, there are also research gaps to be identified. The category of memory bias, as well as category bias, has not been examined at all in the use of Accounting Information Systems. Nevertheless, it would be interesting to explore how previous decisions can bias new ones, or in other words, how reference point dependency bias (McFarland and Ross, 1987) affects user behavior.

A closer look at the field of Accounting Information Systems management research shows that, similar to the use of Accounting Information Systems, there are three areas that have been dealt with more intensely with regard to cognitive biases: IT outsourcing (Ramachandran and Gopal, 2010; Vetter et al., 2010; Vetter et al., 2011a), escalation of Accounting Information Systems projects (Keil et al., 1994; Boonthanom, 2003), and the security of Accounting Information Systems projects. As companies increasingly rely on Accounting Information Systems, the importance of strong security cannot be overstated (Campbell et al., 2003; Cavusoglu et al., 2004). Therefore, it is crucial to explore the field of Accounting Information System security. Conducting further studies on bias could greatly enhance a company's ability to make informed judgments regarding their system's security. Surprisingly, there have been no studies on bias in areas such as software assessment, knowledge management, and selection choices. Addressing this research gap would be valuable in the field of Accounting Information Systems management. For instance, investigating decision biases like control illusions (Langer, 1975), choice support biases (Brehm, 1956), and probability abandonment (Sunstein, 2002) could yield intriguing insights into selection choices.

The articles in the field of software development research cover various aspects of the software development cycle (Laudon and Laudon, 2013). One article focuses on requirements elicitation (Jayanth et al., 2011), two articles discuss software design (Rafaeli and Raban, 2003 ; Arnott, 2006), and one article discusses quality management (Calikli et al., 2012). Additionally, two articles discuss the general management of software development projects (Keil et al., 2000; Lee et al., 2012a). However, none of the identified articles examine cognitive biases in the actual implementation stage. Researchers argue that exploring cognitive biases in this area is valuable because, even in structured software development processes, individual developers still have significant decision-making responsibilities.

In the realm of cognitive bias research, there is a prevalent focus on articles that analyze the functionality and system architecture of decision support systems within the field of application systems (e.g. George et al., 2000). While it is crucial to examine the function of decision support systems in this area of study, investigating other enterprise application systems and consumer application systems could yield significant potential for further research on biases. For instance, explicit consideration of the effects of grazing among customers could enhance the functionality and performance of a customer relationship management (CRM) system. Likewise, social network operators on the consumer side of application systems

could enhance member satisfaction by incorporating social biases into the design and functionality of their services.

The lack of research findings in literature searches conducted by researchers is similar to the scarcity of publications on business models for ICT companies, which is a new field in Accounting Information Systems (Veit et al., 2014). However, experts suggest that cognitive biases in this field should be investigated. Bias can occur when developing an ICT business model, as entrepreneurs identify market opportunities, establish revenue models, and implement ICT business concepts. Further research should examine the effectiveness of checklists proposed by Kahneman et al. (2011) in detecting potential biases in decision-making related to ICT entrepreneurship.

Furthermore, it is worth noting that there is a lack of research on cognitive biases in the economic impact of Accounting Information Systems. This could be attributed to the fact that most studies in this field do not focus on individual cognitive and decision-making processes (e.g. Kraemer and Dedrick, 1998). Nevertheless, researchers argue that it would be valuable to explore biases in this context as well. Specifically, group social biases, such as herd behavior, can have an impact on the economic consequences of Accounting Information Systems, as demonstrated by the virulence observed in online social communities (Chen et al., 2010).

The main motivation for conducting this scientometric analysis was the lack of sufficient meta-research on cognitive biases in Accounting Information Systems. The results of the study support the existence of this research gap and provide further evidence to emphasize the importance and necessity of conducting a literature review on cognitive biases in Accounting Information Systems to derive implications for specific research topics.

In summary, our analysis suggests that there are several key areas of focus in research on cognitive biases in Accounting Information Systems. These include the use and management of Accounting Information Systems, with particular emphasis on the retail trade and information sectors. However, there are also other important areas that have received less attention, such as the business models of ICT companies and the economic impact of Accounting Information Systems. Moving forward, there are several avenues for future research in this field. Firstly, researchers could delve deeper into individual Accounting Information Systems and explore their purpose and the specific cognitive biases that are examined within this domain. By doing so, they can uncover the implications of these biases for the field and refute any potential implications of unexplored biases. Additionally, investigating other types of biases could also contribute to the advancement of this field. To guide future studies, researchers can refer to the results matrix provided in Figure 1, as well as the aforementioned opportunities for further research. These resources can serve as a valuable starting point for future investigations.

CONCLUSION

Firstly, the researcher in this study solely concentrates on the highest-rated publications in Accounting Information Systems (AIS) research, overlooking other AIS journals or conferences that may contain relevant articles on cognitive biases (e.g., Benlian et al., 2012b). While the researchers acknowledge this focus as an acceptable limitation, they recommend that future literature reviews should encompass a wider range of AIS journals and conference proceedings to validate their findings.

Secondly, in terms of factor bias in the researchers' scientometric analysis, a uniform and comprehensive typology could not be found. As a result, the researchers decided to incorporate existing typologies in order to achieve a more thorough categorization of bias. However, the researchers acknowledge the limitations of this approach and suggest that future studies on cognitive biases should prioritize the development and validation of an integrated typology.

Thirdly, it is important to note that certain categories of categorization schemes employed for data analysis, such as position bias in papers and impact bias, involve some level of interpretation. However, it is worth mentioning that the researchers have achieved a high level of agreement (96%) in their coding process and have continuously sought validation from experts. As a result, the researchers are confident that their

findings are as objective as can be. Nonetheless, it would be beneficial for future literature reviews on cognitive biases to also validate the categories utilized in the researchers' analyses.

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