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Factors driving memory fallibility: A conceptual framework for accounting and finance studies

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ABSTRACT

The purpose of this paper is twofold. First, it identifies the theoretical and methodological strengths and limitations of the previous literature on the effect of memory on judgements and decision-making in an accounting and finance context. Second, it proposes a framework that integrates memory functions with factors that may cause biases and errors in judgement and decision-making processes. This framework may be useful for future accounting and finance research aiming to reveal the fundamental causes for cognitive biases and errors in information processing, rather than considering the human brain as ‘black box’.

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1. Introduction

Accounting information plays a pivotal role in capital markets because the annual report and other forms of accounting disclosures summarise the economic consequences of a company's business activities. However, accounting information is not objective, neutral and value-free, because human judgements and decision-making (JDM) affect all stages from the preparation to the application and interpretation of accounting information (Hellmann, 2016).

Indeed, JDM in accounting and finance are influenced by numerous variables such as person variables, task variables and environmental variables (Bonner, 2007, p. 54). Person variables include characteristics of the decision maker such as the cultural background and abilities, or the cognitive processes used while a judgement or decision is being made. In this context, memory processes are an integral part of JDM (Birnberg and Shields, 1984; Kida et al., 1998; Grossman and Welker, 2011). Research into memory processes is necessary because both new information encoding and past information retrieval is influenced by the human memory system and may be affected by cognitive

constraints. These refer to those physiological factors limiting individuals' information processing quality or capacities such as encoding biases and false memory (Hogarth, 1991; Peng and Xiong, 2006; Birnberg, 2011).

The influence of memory processes on JDM is long-established in accounting and finance research. Early scholars such as Birnberg and Shields (1984) have made significant contributions by outlining internal cognitive processes such as attention and their influence on accounting JDM. However, they failed to specify the potential effects of particular cognitive constraints on JDM. Other researchers such as Hogarth (1991) and Ho and Roger (1993) outlined the causes of biases and errors about JDM. However, they did not specify any relationship between the underlying cognitive processes and the biases and errors. Therefore, the purpose of this paper is twofold. First, to identify the theoretical and methodological strengths and limitations of the previous literature on the effect of memory on JDM in an accounting and finance context. Second, to propose a framework that integrates memory functions with factors that may cause biases and errors in JDM processes.

The framework formulated in this paper outlines memory processes with particular reference to financial accounting, auditing, and finance. It also provides a comprehensive understanding of the different cognitive constraints that decision makers may experience in various memory processing stages and the potential effect that these may have on JDM. Finally, it emphasises the effect of natural cognitive causes on decision makers' JDM by referring to findings from cognitive psychology.

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2. Role of memory in judgements

Early work by scholars such as [Birnberg and Shields \(1984\)](#) formulated a decision-making framework that aims to explain the effect of internal cognitive processes on accounting JDM. This framework extends previous decision-making models (e.g., [Mock and Vasarhelyi, 1978](#); [Hilton, 1980](#)) by outlining the relationship between several cognitive activities. [Birnberg and Shields's \(1984\)](#) framework consists of three stages, sensory memory¹ (SM), short-term memory (STM) and long-term memory (LTM). According to this framework, information cues are initially perceived by sense perception organs (visual or auditory organs, such as eyes or ears), which can store information over a period ranging from milliseconds to several seconds. In the next stage, perceived information is encoded and temporarily stored in STM. After a rehearsal or further encoding, the information stored in STM may be transferred to LTM. Information stored in LTM can be retrieved when needed, even after several days or decades.

[Birnberg and Shields \(1984\)](#) have provided a succinct model for understanding the basic cognitive activities of information processing. However, their framework regards memory processes as highly efficient and does not account for the occurrence of any biases or errors that may distort information processing. Indeed, the literature shows that JDM processes are affected by a range of different cognitive and physiological constraints ([Chewning, 1990](#); [Spilker and Prawitt, 1997](#); [Arnold et al., 2000](#); [Hirshleifer and Teoh, 2003](#)). For example, [Hirshleifer and Teoh \(2003\)](#) have provided evidence that humans have limited attention and can only process a limited amount of information simultaneously; STM can only hold five to nine items or four chunks ([Miller, 1956](#); [Cowan, 2001](#)). This is especially relevant to the accounting and finance fields, where individuals are usually exposed to information overload and time pressure ([Libby and Trotman, 1993](#); [Choo, 1995](#); [Glover, 1997](#); [Braun, 2000](#)). It is common and necessary to rely on LTM of previously examined information when making judgements ([Libby and Trotman, 1993](#); [Bonner, 2007](#), p. 108, [Hastie and Dawes, 2010](#)).

Ultimately, [Birnberg and Shields \(1984\)](#) made a significant contribution by emphasising the effect of internal cognitive processes on judgements. However, distortions may occur in information processing which may result in forgetting or retrieval of false memories. As such, it is important to extend their model, explaining when and why distortions may occur, as well as the possible consequences of these distortions for JDM in accounting and finance. Accordingly, our framework outlined in [Fig. 1](#) depicts the relationship between memory and JDM, with a particular focus on those biases and errors that have been identified in accounting and finance studies.

Our framework consists of two levels, namely the relationship between judgements and memory, and the causes of memory biases and errors. The framework distinguishes between judgements with memory retrieval (referred to as memory-based judgements) and judgements without memory retrieval (called on-line judgements). These are influenced by three dependent memory functions, namely information encoding (processing raw information in working memory), information storage (retaining the processed information in LTM) and memory retrieval (retrieving information from LTM).

Although the process of on-line judgement making is not influenced by memory storage and retrieval, it is not completely isolated from other memory functions as it involves information processing in the working memory that may subsequently affect memory storage and retrieval ([Hastie and Park, 1986](#)). Hence, the framework outlined in [Fig. 1](#) depicts two pathways for

future JDM studies. Specifically, on-line judgements are influenced by information encoding functions (illustrated as *Pathway A*). Memory-based judgements are the collaborative products of all three memory functions, as the information that is ready for retrieval needs to be sequentially processed in information encoding and memory storage (depicted as *Pathway B*).

3. Causes of biases and errors

3.1. Information encoding

Information encoding is the first function of the memory process, one that allows individuals to encode and manipulate the perceived raw information (i.e. SM) together with information stored in STM. Information encoding is necessary for subsequent memory storage and memory retrieval, as this memory function gives individuals the capacity to convert information into a format that can be stored in LTM. Several causes of biases and errors in information processing may occur due to cognitive constraints and limited processing capacity. The six factors identified below are carefully selected from a much broader list of factors that may cause biases during the information encoding stage. These factors are intended to increase the awareness of preparers of accounting information and how certain actions during the information encoding stage are likely to impact information storage and retrieval resulting in biased judgements and decisions.

3.1.1. Selective attention

Selective attention is a significant factor that may lead to biases and errors in an individual's information encoding process because decision makers have a limited processing capacity. This means that they have to allocate their finite processing capacity (i.e., their attention) to limited and selected tasks to maintain an effective and efficient problem-solving capacity ([Weber and Johnson, 2009](#)). This phenomenon has been confirmed in the literature as a universal and compulsory mechanism in information processing ([Tversky and Kahneman, 1973](#); [Birnberg and Shields, 1984](#); [Hirshleifer and Teoh, 2003](#)).

Previous research has suggested that selectively allocated attention, known as conscious attention,² is a scarce cognitive resource for decision makers, due to their limited processing capacity ([Simon, 1978](#)). [Kahneman \(2002\)](#) has stated that how to allocate this scarce cognitive resource wisely is important for JDM studies. This is because of conscious attention, which requires effort, focuses on particular tasks or memories to the exclusion of other tasks. Without sufficient attention allocated to certain tasks (e.g., too many distractions), shallow encoding or forgetting may occur and degrade the memory retrieval capacity.

There is an increasing recognition that accounting information preparers should not simply provide information, but should also consider the accounting information users' attention and processing capacity ([Braun, 2000](#); [Hirshleifer and Teoh, 2003](#)). For example, [Hirshleifer and Teoh \(2003\)](#) have noted that instead of assuming investors are fully rational, researchers should consider investors' limited attention and processing capacity when examining their JDM. Their findings suggest that limited attention may affect investors' cognitive resource allocation, resulting in selective attention to certain accounting information.

¹ Also known as attention.

² Conscious (voluntary) attention is opposite to unconscious (involuntary) attention. [Kahneman \(1973\)](#) emphasised the limited capacity and selective aspect of attention. He also separated attention into two categories based on its purpose: momentary task intention (conscious or voluntary attention) or more enduring disposition (unconscious or involuntary attention), such as the orienting response to novel stimuli.

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