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Two minds and double entries: an application of cognitive psychology to corporate reporting

Avani Sebastian
School of Accountancy, University of the Witwatersrand, Johannesburg, South Africa

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Abstract

Purpose – An understanding of the role of decision-making has been emphasised since the seminal works on human information processing and professional judgements by accountants. The interest in these topics has been reignited by the increasing digitisation of the financial reporting and auditing processes. Whilst the behavioural research on accounting is well-established, the application of seminal works in cognitive psychology and behavioural finance is lacking, especially from recent research endeavours. The purpose of this paper is to provide a synthesis of theories relating to accounting behavioural research by evaluating them against the theories of cognitive psychology.

Design/methodology/approach – Using theory synthesis, this research draws seemingly isolated strands of research into a coherent framework, underpinned by cognitive psychology.

Findings – Evidence from accounting and auditing behavioural research is largely consistent with the psychology and finance research on cognitive limitations and errors. There remains a lacuna in accounting behavioural research on debiasing techniques. Such research, if underpinned by a single, cohesive theoretical framework, is likely to have practical relevance.

Research limitations/implications – The current research has theoretical implications for the accounting decision-making and uncertainty research. Areas for future research, based on identified gaps in the current accounting behavioural research, are also proposed.

Keywords Corporate reporting practice, Uncertainty expressions, Cognitive psychology, Automatic system, Reactive system

Paper type Conceptual paper

Introduction

Homo economicus, or *the economic man*, is a term that was created by Mill (1836) to describe a hypothetical person who always makes intelligent, rational decisions after analysing all available, relevant information. Thaler and Sunstein (2009) liken *homo economicus* to Captain Spock, a fictional character from the *Star Trek* series of films. Captain Spock is intelligent, logical and calm. He is portrayed with a stoic demeanour and is rarely emotionally moved (Selley, 1986). He always makes decisions in a deliberate and calculated manner. He uses the "reflective mind" for all his decisions and actions. Thaler and Sunstein (2009) explain that the decision-making processes of human beings is less like Captain Spock and more like Homer Simpson, a fictional character from an animated situational comedy, *The Simpsons*. Homer Simpson makes emotional, uncalculated decisions, often reacting instinctively when a more methodical approach is necessary (Branch *et al.*, 2013). Homer Simpson's reactions rely on the "automatic mind".

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The reflective and automatic minds are both required for humans to survive. However, humans sometimes use the automatic mind to perform tasks that should be performed by the reflective mind. It is for this reason that reverence for the economic man appears to have waned in the decades after his initial creation. For example, Seldon (1912) believed that the behaviour of financial market participants varies according to their mental attitude. This notion was extended in the seminal works of Tversky and Kahneman (1974, 1986) who integrated concepts from psychological research into finance and economics. Notably, the authors demonstrated the effect of cognitive errors and emotional biases on judgement in situations of uncertainty. Since then, uncertainty has been a pivotal notion in the behavioural finance and economics research.

The way in which the human mind processes information and reacts to uncertainty is explored in the cognitive psychology literature. Cognitive psychology, one of the five pillars [1] of psychology, deals with the mental processes involved in perception, memorising and reasoning. It is the study of how individuals perceive their world and how their thinking occurs (Solso *et al.*, 2005). In particular, the dual-process theory of reasoning (Kahneman and Tversky, 1982; Chaiken and Trope, 1999; Stanovich and West, 2000) distinguishes between the automatic and reflective ways of thinking. Humans can think either instinctively, or in a deliberate, calculated manner. Where the mind needs to process large amounts of information or complex information, the latter approach to decision-making is usually appropriate. However, in some instances, despite the circumstances requiring this calculated approach to problem solving, humans make decisions in a more instinctive manner.

Table 1 summarises the key features of the automatic and reflective ways of thinking. The application of financial reporting and auditing standards requires the calculated, deliberate approach to thinking. Yet, practitioners of accounting are human and subject to cognitive limitations.

This research focusses on the use of both systems of thinking in the application of financial reporting and audit standards. By its nature, research of the practice of corporate reporting is multi-disciplinary. Strands of existing literature apply behavioural and decision-making theory to corporate reporting by testing whether "factors", "judgement" or "cultural influences" account for differences in the way the standards are interpreted and applied. There is a need for a single framework that can be consistently applied to the various strands of research on the effect of the human mind on the interpretation and application of accounting and auditing standards. Based on the seminal works of researchers in cognitive psychology, this research provides a conceptual model for understanding how cognitive errors and emotional biases are likely to affect the preparation of and disclosure in financial reports. Behavioural finance researchers seek to improve investment decision-making by understanding the implications of cognitive errors made by investors. Similarly, this research is predicated on the notion that the application of reporting and auditing standards can be improved if there is an awareness of cognitive limitations of users in this context.

The aim of this research is therefore to propose a parsimonious model for future behavioural research in accounting and auditing. To this end, theory synthesis (Jaakkola,

Automatic mind	Reflective mind
Fast	Slow
Reactive	Calculated
Effortless	Effortful
Associative	Deductive
Pre-learned	Rule-following

Table 1.
Two "minds"

Source: Author's compilation from Thaler and Sunstein (2009)

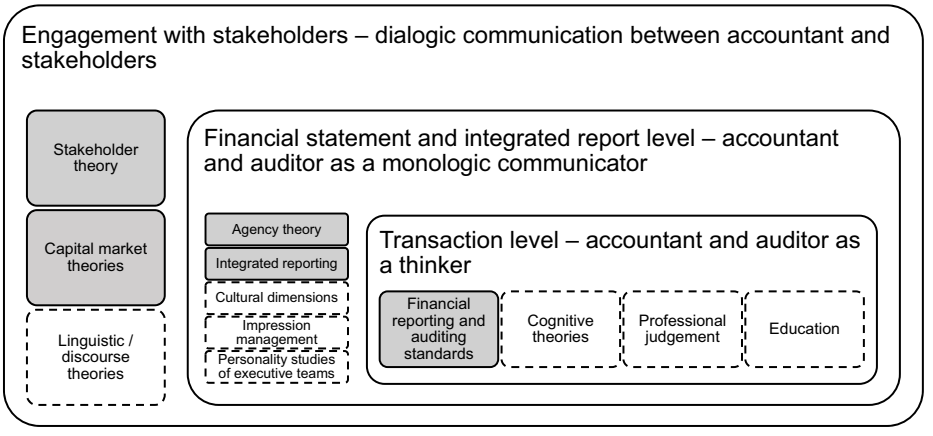
2020) is used. The aim of theory synthesis is to integrate seemingly distinct streams of literature in a manner that provides a new framework which can be used to scaffold future research (Jaakkola, 2020). In this study, theory synthesis is used to combine and contrast the theories used in the existing accounting, auditing and behavioural research with the existing cognitive psychology literature that has been used in economics and finance.

Theories from the communication studies literature have been used to analyse the output produced by accountants and auditors. Merkl-Davies and Brennan (2017) view accountants as communicators of information to investors, amongst others. The authors categorise this communication as being monologic (one-way communication, as in the publication of financial statements) or dialogic (two-way communication, where accountants and the firm's stakeholders meet to gain an understanding of the economic events in the firm). This view of the corporate reporting professional as a communicator was recently used in Jugnandan and Willows (2021). The authors investigated the use of impression management in corporate communication such as regulatory announcements to integrated reports.

In this research, we use the representation of the accountant as a communicator to show the dominant theories of research on each respective stage in the reporting process. These traditional frameworks are presented in shaded squares at each level of communication. Non-traditional focus areas are framed by dotted lines.

The diagram shows the recording of economic transactions [2] in a broad socio-economic context. An intention of this research is therefore to encourage academics to view practitioners as decision-makers in the real world, influenced by personal and context-specific factors (Merkl-Davies and Brennan, 2011). It must be noted that the dominant theories and frameworks depicted are not exclusive to each level of reporting.

It is apparent from Figure 1 that there are numerous theoretical frameworks that may be employed to understand and enhance the practice of corporate reporting. Many of these do not come from the cognitive psychology literature. However, at the lowest level of granularity, it is the cognition involved in the recording of economic transactions that has implications for all further levels of communication. The focus of this paper is on the cognitive theories in the transactional and the financial statement level of reporting, where we explore the cognitive processes in context.



Source: Author's compilation

Figure 1.
Dimensions of financial reporting and relevant research

Through a review of the existing seminal works, the rest of this section shows how the heuristics (Tversky and Kahneman, 1986) and cognitive load are relevant to various strands of existing corporate reporting and auditing literature. In accordance with a systematic process of theory synthesis, the rest of the research is structured as follows. Theoretical underpinnings of cognitive psychology and corporate reporting literature are described and relationships between them are explained. The theories and relationships are shown diagrammatically in a framework. Finally, areas for practitioner-focussed research are identified.

Uncertainty

Tversky (1974) acknowledges that uncertainty is inherent in all aspects of human life. Humans make decisions, based on their individual estimates of the probability of future events. It is in situations of uncertainty that the human mind is likely to resort to heuristics. These heuristics can lead to cognitive errors and emotional biases. When Kahneman and Tversky (1979) developed Prospect Theory, they incorporated the effects of uncertainty on investor behaviour. They explained that investors simplify complex decisions by using mental short-cuts or heuristics.

The corporate reporting research acknowledges the ubiquitous nature of uncertainty. Despite the existence of International Financial Reporting Standards and International Auditing Standards (hereafter referred to as "the Standards") to guide the preparation of financial information and facilitate comparability across companies, the process of preparation of financial information is a complex one. The complexity arises partly as a result of uncertainty expressions in the international guidelines for preparation and review of the financial statements (Chand *et al.*, 2012; Perera *et al.*, 2020; Zhang *et al.*, 2019), and partly, as a result of the cognitive load that is required in the interpretation and application of the standards to a range of transactions and circumstances.

Principle-based standards require more sophisticated professional judgement. The principle-based approach to the reporting standards was supported by the International Accounting Standards Board as a more desirable alternative to creating an exhaustive set of rules (Leone, 2011). This approach was consistent with frameworks developed on principles rather than rules (ICAS, 2012). Zhang *et al.* (2019) acknowledge that the "preparers and auditors would need the courage to exercise and defend their judgements" as there could be a range of acceptable "judgement-based" accounting values.

Cognitive load

The concept of cognitive load is explored in the seminal work of Kahneman (1973), with the formulation of the capacity model. According to this model, individuals have a limited attention capacity, thereby limiting the mental tasks that can be performed simultaneously. Furthermore, the mental capacity required for tasks varies depending on their complexity. Tasks such as mental arithmetic require more mental capacity than tasks performed in response to familiar external stimuli. Kahneman (1973) also describes attention as being selective and highly responsive to tasks that are perceived as difficult by the individual. This perception of difficulty or mental resource requirements is shaped by past experience as well as residual mental capacity, after attending to other tasks.

Tasks which are performed under time pressure require considerable mental capacity. Young, Goodie, Hall and Wu (2012) studied the effects of time pressure on the decision-making abilities of participants in the context of prospect theory. The researchers found that time pressure leads to increased risk attractiveness and reduced probability discriminability. Phillips-Wren and Adya (2020) propose that time pressure is negatively associated with

decision quality. The time pressures associated with the preparation, review and compilation of financial information may therefore increase proclivity for bias. This is especially relevant in an increasingly digital information environment. Electronic results are expected to be quickly on hand to be relevant to decision-makers (Arnold, 2018).

When attention capacity is reached, the quality of task performance is compromised, and individuals resort to mental shortcuts or heuristics to complete their tasks. The activities involved in the financial reporting and auditing process place demands on the mental capacity of practitioners. In recent research on the complexity of the process of gathering, processing and presenting accounting information, Sacer *et al.* (2016) explain that the preparer is expected to understand the consequences of the various alternatives provided by the standards and to identify the need for their own judgements to be reassessed in response to changes in circumstances. Any assumptions that information producers accurately engage in this extent of analysis are challenged by Tversky and Kahneman (1974) who find that even statistically sophisticated researchers employ intuitive judgements that are prone to irrational bias. By their nature, individuals tend to use limited heuristics to simplify the tasks of applying probabilities of alternative outcomes and understanding the consequences of these outcomes.

Accounting research has used the Brunswik's Lens Model as a conceptual framework to view the way in which decisions are made by accountants. This model was developed by the psychologist, Egon Brunswick in 1956. The pivotal notion of Brunswick's theories was that cues about the environment are reduced to a single perception to reduce complexity. This may lead to inaccurate perceptions of current circumstances, especially if the focus is on inconsequential cues about the environment.

Uncertainty and cognitive load as a catalyst for inconsistencies in the application of reporting standards

According to the conceptual framework, high quality financial reports should be relevant, understandable, timely, comparable, verifiable and faithfully represent the economic position of the company. The framework further explains the processes involved in applying these qualitative characteristics. Firstly, preparers should identify an economic phenomenon that would be useful to the company's stakeholders. Secondly, the relevant details of the phenomenon should be separated from detail that would not impact decision-making. Thereafter, the preparer should determine whether the relevant information is available. If it is available, then the preparer must determine whether it can be represented faithfully (IASB, 2018). Finally, the transaction/s must be recorded. Although these processes happen quickly in practice (or they are required to happen quickly), they can place strain on the cognitive capacity of the preparer and reviewers due to real-world complexities.

When applying financial reporting standards, uncertainty can arise from the complexities involved in applying these standards to a plethora of scenarios. In seminal research on information in capital markets, Fama and Laffer (1971) assume that any producer of information knows the probability distributions of changes in shareholder value associated with different levels of expenditure. Stiglitz (1985) explains that problems with the gathering and transferring of information are exacerbated by the limited capabilities of the human mind, making communication of information costly and imperfect. Similarly, Einhorn (1976) described accounting tasks as unstructured, with missing and/or unreliable information. Van Zyl and De Villiers (2011) find that even students perceive the field of work as strenuous and are therefore reluctant to study accounting.

Individuals are more likely to resort to these mental shortcuts for judgements in situations of uncertainty. Zhang *et al.* (2019) raise concerns about the pervasive use of

uncertainty expressions by standard setters and users of accounting information. The researchers emphasise the need for solutions to the fundamental concerns arising from the use of uncertainty expressions. Perera *et al.* (2020) suggest the use of decision aids, such as additional worked examples in the International Financial Reporting Standards (IFRS), and flag this as an area for exploration in future research.

The well-established research on judgement and decision-making in the use of accounting standards is further evidence of inherent uncertainty. In seminal research relating to human information processing, Libby and Lipe's (1992) proposed models relied extensively on the works on uncertainty from Tversky and Kahneman. Biases, such as representativeness and anchoring (Tversky and Kahneman, 1974), form the basis of their conceptual model. The researchers modelled abilities and deficiencies in performance as a function of ability, knowledge, environment and motivation. The deficiencies in performance were driven by limitations in cognitive processing and concomitant use of heuristics. The authors further explain that individuals develop various interchangeable techniques to complete a task. Similarly, Tversky and Kahneman (1974) refer to mental shortcuts or heuristics.

Related research on judgement decision-making amongst management accountants also incorporated psychology theory to understand the subjectivity involved in the analysis of internal performance data. For example, Farrell *et al.* (2007) find that management accountants tend to misjudge relationships between profitability and possible business drivers. Tversky and Kahneman (1974) propose the representativeness heuristic as a potential cause for misjudgements of such cause-and-effect relationships.

Recently, increased capabilities of accounting and auditing software has renewed the focus on the literature on judgement decision-making in accounting (Arnold, 2018; Gunz and Thorne, 2020). Prior research (Kachelmeier and Messier, 1990; Ashton, 1992) explored the potential for technology to the cognitive errors made by individuals with regards to probability estimation. It is this probability estimation that is a central theme of the seminal work on judgement under uncertainty (Tversky and Kahneman, 1974). Tversky and Kahneman explain that these judgements rely on information that may not be valid in all circumstances. Kachelmeier and Messier (1990) found that subjects using software decision aids tended to work backwards, based on estimates that were provided by the software, so that their ultimate estimate would still match their initial intuition. This type of cognitive process is akin to the availability bias, discussed in Tversky and Kahneman (1974). As accounting software becomes increasingly sophisticated, it can process information to make more complex decisions which would have otherwise been reserved for the professional judgement of preparers (Gunz and Thorne, 2020). However, Benford and Hunton (2000) suggest that cognitive decision-making models in accounting have not adequately addressed the impact of accounting software.

The pervasiveness of judgement in the application of IFRS is affirmed by Hodgdon *et al.* (2013). The authors list areas that require judgement in the application of IFRS, including the classification of transactions, the estimation of amounts to record and the determination of materiality. In support, Sacer *et al.* (2016) show that reported values of intangible assets can be significantly different due to the inherent subjectivity in the judgements of, amongst others, the useful economic life, the distinction of research from development and the separation of upgrades from costs. Lai *et al.* (2017) describe the determination of materiality as "demanding" as it requires the preparers to sift through information and apply their judgement on the significance thereof. Furthermore, preparers and auditors need to use their professional judgements in considering quantitative as well as qualitative issues.

Mokoaleli-Mokoteli and Taffler (2009) confirm this idea as they showed that individuals involved in more complex work are more likely to be prone to cognitive biases.

The interpretation of uncertainty expressions that are pervasive in reporting standards can also lead to increased proclivity to heuristics. Whilst there may be debate about the extent and influence of the use of uncertainty expressions in accounting standards, there is a general acknowledgement that these expressions do exist (Chand *et al.*, 2012; Perera *et al.*, 2020; Zhang *et al.*, 2019). Chand *et al.* (2012) describe "uncertainty expressions" in IFRS such as "probable", "significant influence", "control" and "substantial". These uncertainty expressions have received recent research attention in Zhang *et al.* (2019). The authors explain that the expressions, "possible" and "uncertain" are often used in both IFRS and international accounting standards (IAS) pronouncements and are interpreted differently, based on the directionality effect. "Possible" is interpreted to mean that an event may occur while "uncertain" is interpreted to mean that an event may not occur. The researchers also emphasise the standard-setters' use of the expressions as they find that the IFRS and IAS use around forty different uncertainty expressions that cover a variety of areas of financial reporting. Chand *et al.* (2012) find that the interpretation of uncertainty expressions in IFRS varies amongst respondents. This is especially relevant to the interpretation of probability of inflows or outflows of economic benefit that is required for the recognition of assets or liabilities. However, the research fails to attribute the difference in interpretation to identified cultural differences in conservatism and secrecy, as the direction of the relationships are not as hypothesised.

Further examples of uncertainty expressions are quoted as "very likely" and "highly probable" in Heath and Tversky (1991). Whilst these authors did not use the context of accounting standards, there are similarities. For example, the definition of an asset requires users to assess whether economic benefits are expected. Kolesnik *et al.* (2019) found that individuals interpret "expected" as "highly probable". Considering the findings from Heath and Tversky (1991) that individuals tend to exhibit substantial over-confidence in their estimations of high probability outcomes, it is possible that preparers of financial information apply their judgement incorrectly or at least, inconsistently.

Heuristics

Heuristics are mental shortcuts or rules of thumb that the human mind resorts to in situations of uncertainty and high cognitive load. These heuristics result in behavioural biases and are classified as either cognitive or emotional. Cognitive biases are the result of an inappropriate application of heuristics in the decision-making process. Emotions affect economic behaviour as they may enable the making of a decision when an individual's rational deliberation is inadequate in a given circumstance (Elster, 1998). This is because emotion can limit the amount of information that has to be considered before a decision is made (De Sousa, 1990). It follows then that emotions may be instrumental in financial decisions involving a large or complex range of options, which is likely in the process of the preparation and consumption of information.

In research on the functioning of cognitive processing systems, Tversky (1974) acknowledges that whilst heuristics can sometimes lead to irrational bias, they are a thrifty yet effective way of making estimations for the purposes of decision-making. Extending this research on decision-making, Kahneman and Tversky (1979) developed prospect theory. They showed that individuals assess equal gains and losses in an inconsistent manner as they displayed a disproportionate aversion to losses. Their incorporation of probabilities into situations was inconsistent with Bayes' Law and expected utility, as they tend to over-weight events with low probabilities. This use of heuristics was shown to be more likely in situations of uncertainty, where a subjective assessment of quantities is required

(Tversky and Kahneman, 1986). Kahneman (2011) explains two mental systems which are useful in different situations. System 1 works automatically and effortlessly to make quick judgements based on familiar patterns. This is the system that is required to ensure safety when, say, a person jumps out of the way of a moving object. It handles automatic skills rapidly and/or involuntarily and is quick and efficient. System 2 takes more effort as it requires intense focus and functions methodologically. The intricate interaction between these systems may not always result in optimal decision-making, especially if quick judgements are made in instances that require more focussed and methodical thinking. In this research, we refer to these two systems as the "two minds".

The related literature on bounded rationality (Simon, 1990) shows the decision-making implications of the limitations of the cognitive abilities of the mind. Heuristics and biases are therefore present in intuitive judgement of probabilities. Such situations arise frequently in financial markets. For example, a subjective assessment is required to determine the likelihood of a company's share price exceeding that of its competitors. There is also subjectivity involved in, say, determining the fair value of an asset.

Having established the inherent uncertainty in the preparation and audit of financial statements, the rest of this paper presents the case for specific bias in these contexts. The cognitive psychology research shows that proclivity to bias can be increased through a combination of genetics, cognitive load and environment. In support of the former, Cesarini *et al.* (2009) find that genetic differences explain between 16% and 34% of the variation in over-confidence in individuals. In support of the latter, Malmendier *et al.* (2011) find that executives who lived through the Great Depression are more likely to be conservative and therefore, rely excessively on internal financing instead of debt. Similarly, military service has been shown to induce higher risk appetites, even in financial decisions. Therefore, the remainder of this paper focusses on the shaping of bias in the specific contexts in which accountants and auditors apply their technical skills and experience.

Over-confidence

In the cognitive psychology literature, over-confidence is described as an unjustified belief in one's own predictive abilities. This trait often implies an unrealistic optimism about future events in one's life. Over-confidence results in predictions that do not conform to Bayes Law and narrow confidence intervals (Kahneman and Tversky, 1973). Although Ehrlinger *et al.* (2016) acknowledge that little is known about what encourages overconfidence, the authors find that proclivity towards over-confidence is enhanced in those who have a fixed mindset or view intellectual capacity as predetermined.

Shefrin (2008) finds that people tend to exhibit over-confidence when the issues at hand are difficult. In doing so, they over-emphasise the information they have. This tendency may be particularly relevant in the preparation of financial information which requires the understanding of complex transactions. Arnold (2018) considers the impact of over-confidence in the context of the digitisation of auditing processes. Using the Theory of Technology Dominance, the author explains that the use of audit technologies can sometimes lead to users' over-reliance on the technology, especially if the issues at hand result in high cognitive load. It seems that both Shefrin (2008) and Arnold (2018) have identified the link between shortcuts (mental or technological), overconfidence and complexity.

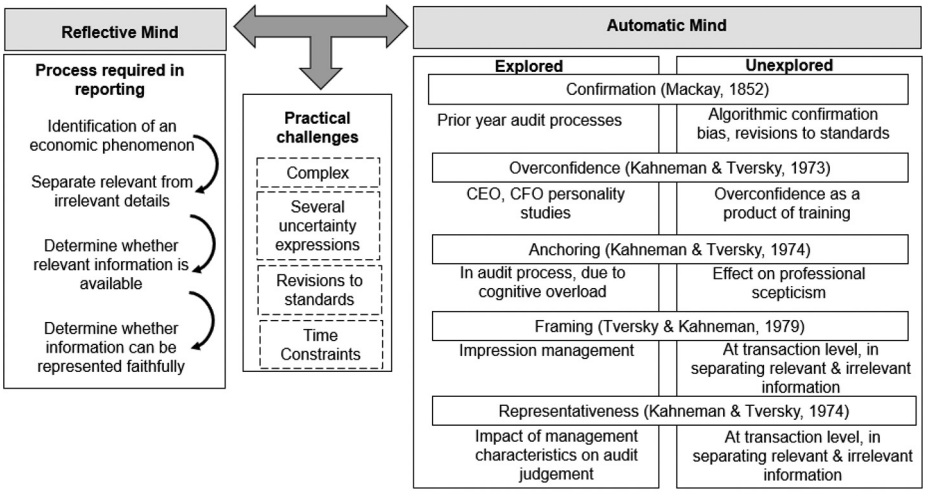
At a financial statement reporting level, the impact on reporting practices of over-confidence of executive management has been extensively researched. In a study that included impression management, Marquez-Illescas, Zhou (2019) find that narcissism has a significant impact on financial statement disclosures. Qualitative disclosures tend to be more optimistic when chief executive officers (CEO's) are more narcissistic. Similarly,

Malmendier, Zheng (2022) focus on over-confidence amongst executive managers. They find that over-confident CEO's tend to make more risky financing decisions. Ham *et al.* (2017) find that narcissistic executives are more likely to engage in earnings management and have less regard for internal controls. It appears that the research on the impact of over-confidence tends to focus on executive managers in general. In addition, these research efforts are directed at the financial statement and stakeholder engagement level of reporting.

There appears to be minimal focus on the impact of over-confidence at the transactional level of reporting. Singhvi *et al.* (2021) have contributed to filling this gap in the research even though the focus of their study was on the mindset of auditors rather than the effect of over-confidence. The authors suggest that a fixed mindset is actually developed in the traditional accounting student through their education and training processes. The authors posit that the preoccupation with academic achievement in the initial years of accounting education unintentionally de-emphasises the need for further research as a means of broadening the student's knowledge-base and highlighting aspects of the business world that would not otherwise be learnt. This creates a false sense of self-attribution. In considering how the training of the accountant and auditor shapes their proclivity to over-confidence, the authors have contributed to the research on cognitive processes in the practice of the disciplines. There is scope for research that is intentionally focussed on the impact of accounting education and training on proclivity to bias. This is indicated in Figure 2 in the Theory Synthesis section of this paper.

Confirmation

Nickerson (1998) explains that confirmation bias refers to seeking or over-weighting the importance of evidence that confirms existing beliefs and under-emphasising the implications of evidence that contradicts existing beliefs. The author cites the words of Mackay (1852, p. 552); individuals "torture facts into their service" so that they can confirm their existing suppositions. Confirmation bias is likely to impact the preparation and verification of financial information, due to the nature of the verification process. Prior



Source: Author's compilation

Figure 2.
Synthesis

research has shown that auditors' reliance on prior information in repeat engagements increases their proclivity to confirmation bias. Auditors must either confirm whether given information is materially correct or not. The experimental research of Ashton and Ashton (1988) provided evidence as they found that auditors are likely to revise their beliefs when presented with updated information.

However, Arnold (2018) criticises auditing systems that enforce rigid audit process that were used in prior years. The author elaborates that these restrictive practices may constrain auditor judgement and discourage the tailoring of audits to specific clients. Consider the hypothetical case of an auditor whose work or whose team's work from a prior period is used as a basis for the current engagement. Thurstone (1924) explains that having a personal interest at stake in a situation (in this case, the credibility of the work of the auditor or their team) increases the proclivity to confirmation (and other) bias.

Evidence of confirmation bias in the application of IFRS for SMEs was found by Perera *et al.* (2020). The authors acknowledge that while professional accountants may pride themselves on the level of professional care with which they perform their duties, they are still susceptible to bias in cognitive processing. They found that when accountants are expected to apply a different set of guidance to the ones to which they are accustomed, they are likely to base their judgements on aspects of the prior guidance. Their research focussed on accountants in small businesses using their knowledge of IFRS instead of the more appropriate IFRS for SME's, because they had been taught the former. The researchers note the lack of research of the bias effect of prior knowledge and beliefs in the application of IFRS. Given the number of revisions to accounting standards, the proclivity to confirmation bias amongst accountants is an area that requires further research attention.

The increasing digitization of audit and accounting also highlights the need for further research on confirmation bias. Confirmation bias can be unintentionally incorporated in the algorithms of machines that have been programmed to deal with data-intensive audit processes (Kokina and Davenport, 2017). In these cases, the technology can shield users from information that conflicts with their initially held view. This links to the anchoring and availability heuristic.

Anchoring

Anchoring refers to a heuristic in which individuals start their estimations at an initial point from prior experience. They then make adjustments based on the availability of information (Tversky and Kahneman, 1974). This bias is closely linked to confirmation bias. Considering the cognitive effort involved in the preparation of accounting information, Libby and Lipe (1992) explain that auditors need to rely partly on memory of prior evidence as well as their knowledge of auditing to evaluate the implications of current evidence. These cognitive processes of retrieval may increase proclivity to the availability bias.

Considering the preparation of financial information, Rose *et al.* (2020) engaged with senior auditors from the Big Four audit firms. They found that the generation of many possible explanations about potential misstatements increased cognitive load to the extent that the auditors resorted to anchoring on client explanations. This anchoring detracted from the professional scepticism that auditors are expected to exercise to effectively discharge their responsibilities. Similarly, Church and Schneider (1993) found that auditors tend to anchor on suggestions from their superiors. The experimental research showed that the auditors generated fewer additional hypotheses when they had received ideas from their superiors. Whilst there may be arguments that this phenomena is not isolated to audit firms, we suggest that it is likely to be exaggerated in firms with as distinct a hierarchy as audit firms (Pierce and Sweeney, 2005). These findings support the theories of cognitive load, as it

appears that when auditors experience cognitive overload, they resort to heuristics as a mental shortcut. These heuristics can hinder the effectiveness of audit procedures.

Framing

Using prospect theory, Tversky and Kahneman (1979) explain framing as the phenomenon where individuals make different decisions on the same issue, depending on the way in which the issue is presented. Ashton and Ashton (1995) focussed on the framing bias of management in interpreting internally generated information. Managers may make decisions based on the way in which internal information is provided at the expense of the detail of the content. Similarly, Chang *et al.* (2002) find that the actions of company managers vary according to the way accounting information is framed. The authors suggest that accounting professionals should be aware of possible framing effects and internal reporting systems should be designed to manage the bias. The research may have focussed largely on internal accounting information because the use of largely standardised formats for company financial statements may minimise users' proclivity to framing. However, the prevalence of uncertainty expressions and other complexities in the financial reporting standards may increase proclivity to the framing bias in the contextual application thereof. The recent research on the effects of framing of accounting information focusses largely on producers of internal, management accounting information. For example, Enslin *et al.* (2022) hypothesised that, due to the fact-seeking personalities of management accountants in general, they have difficulty in making decisions in situations of uncertainty. This is noteworthy, as it considers uncertainty intolerance as a catalyst for bias.

The effects of the framing bias is used extensively in the research on impression management. By combining theories of social psychology with the cognitive theories, accounting researchers have shown the extent of use of impression management in financial reports, especially where qualitative disclosures are required (Merkl-Davies *et al.*, 2011). More recently, there is a growing strand of research on impression management in sustainability reports, which are not subject to international reporting standards [see, for example, Kanbaty, Hellman and He (2020)]. Further research on impression management in mandatory and non-mandatory reports could show the mediating (or non-mediating effect) of standardisation on bias.

The research endeavours on impression management are most prevalent at the financial statement reporting level. Research which focusses on the transactional level can be furthered by linking framing to the bias of representativeness, where errors in judgement are made because of the influence of details that are irrelevant to the issue at hand. This bias is discussed in detail in the following section.

Representativeness

Tversky and Kahneman's seminal 1974 work introduced the bias of representatives. Representativeness bias refers to the misjudgement of probabilities in the human mind. This error in judgement arises when individuals over-weight the possibility that an observation originates from a specific population, based on characteristics that are perceived to be common between the observation and the population. In doing so, they neglect the incorporation of the prior probability or base rate frequency. In the context of the halo effect, Harvin and Killey (2021) explain that auditors may be influenced by the personal reputation of a CEO. As a result, their professional scepticism is dampened, and they are less likely to question information that the CEO provides.

According to Thorndike (1920), the halo effect refers to the tendency to allow the assessment of one of an individual's characteristics to influence the assessment of other,

unrelated characteristics of the person. Using halo theory, the authors explain that auditors will be influenced by CEO characteristics that are not relevant to their technical and managerial skills, for example, the CEO's donations to charities. This misjudgement can have a negative impact on the auditor's strategic risk assessment during the planning stage of the audit. Representative bias also explains these errors in judgement. Tversky and Kahneman (1974) show how individuals ignore prior probabilities when they are given additional, uninformative information. When judging the likelihood that a person belonged to a specific profession (Tversky and Kahneman use engineer or lawyer), individuals were influenced by the description of personality characteristics that had no relevance to the likelihood of belonging to a particular profession. Nevertheless, Harvin and Killey (2021, p. 501) call for research to further explore ways in which these biases can be minimised so that auditors are equally alert to the possibility of misstatement, irrespective of the "superstar" status of the CEO.

Areas for future research

Thus far, this research has discussed somewhat isolated theories that underpin the accounting and auditing behavioural research. Simultaneously, these theories were compared to the cognitive psychology literature that has been used extensively in the behavioural economics and finance research. The tension between the automatic and reflective mind, triggered by practical challenges of applying reporting standards is presented in Figure 2. Potential areas for further research are developed in the figure, based on the synthesised literature.

It is evident that research using non-dominant theoretical frameworks (Figure 1 of this paper) has focussed on financial communication at the financial statement level. There is therefore potential for research on the effects of cognitive limitations and the use of heuristics at the very first stage of the reporting process – the transaction level.

The field of cognitive psychology is vast. Therefore, a focus on the heuristics which are used when making judgements amidst uncertainty can guide future corporate reporting research, especially at the transaction level. Possible areas for future research endeavours are discussed in the section on Heuristics and highlighted in Figure 2 as "Unexplored".

A benefit of cognitive psychology is that it has tended to use a scientific approach, through the use of experiments (Solso *et al.*, 2005). Research in cognitive psychology has had such empirical foundations that it now shares theoretical underpinnings with cognitive science. For example, magnetic-resonance spectroscopy has been used to identify mental tasks that increase cognitive strain (and therefore increase the proclivity to the use of heuristics) by measuring biochemical changes in the brain (Wiehler *et al.*, 2022).

Another benefit is that an understanding of cognitive processes allows individuals to improve cognitive abilities such as memory and reasoning. For example, Leron and Hazzan (2006) apply principles of cognitive psychology to the process of learning mathematics. They find that students' natural tendency to substitute easier scenarios (automatic system) for a given complex scenario (reflective system) occurred even when students had the knowledge to produce correct answers. The authors suggest that students should have "stopped to think more" (Leron and Hazzan, 2006, p. 121) or invoked the reflective system.

Conclusion

This research juxtaposed human fallibility with the rigours involved in producing high quality corporate reports. Practitioners must make complex decisions in an environment in which they are sometimes unable to think deeply about every transaction that they record. Therefore, they default to heuristics that can compromise the quality of their reports. The

cognitive psychology research shows that the awareness of limitations and heuristics in mental processes of practitioners can lead to an improvement in the application of the relevant standards.

Ultimately, it is research that suggests debiasing strategies that will contribute to enhanced consistency in the application of reporting standards. To this end, we require research that seeks to provide an understanding of the contexts in which proclivity to bias is increased. These contexts may be based on the nature of the standards as a whole or they may be based on the application of specific standards. For example, proclivity to bias (such as overconfidence) may be increased due to the inherent nature of the process of training accountants. Also, representativeness bias may affect the accountant's judgement as they decide whether information is relevant to a transaction. It is the cognitive psychology literature, particularly on heuristics and bias, that provides insights on decision-making and the effects of contexts and circumstance on thought processes and behaviour of individuals (who are corporate reporting practitioners).

Therefore, future research on the thought processes involved in the application of reporting standards and the contexts of practitioners would be well-served by the theories developed and tested in the cognitive psychology literature.

Notes

1. The five pillars of psychology are biological, cognitive, developmental, social and personality and mental and physical health.
2. The economic transactions referred to in this paper are those that form the basis of reports to external stakeholders, distinct from management accounting transactions, for internal reporting.

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Corresponding author

Avani Sebastian can be contacted at: avani.sebastian@wits.ac.za

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