

A research framework on the judgement and decision-making of investors using sustainability reports

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Abstract

Purpose – In general, archival studies suggest that integrated reporting quality (IRQ) is associated with an improved information environment, while experimental evidence suggests that individual investors do not benefit from integrated reporting. This study aims to propose a framework that bridges the mixed findings between the archival and experimental literature on the benefits of integrated reporting.

Design/methodology/approach – The authors extend the [Maines and McDaniel's \(2000\)](#) decision-making framework, which is influential in experimental accounting research, to integrated reporting. The authors' extension of the framework provides a systematic approach to thinking about the key features of integrated reporting that need to be operationalised in an experimental design. The framework explains how the dimensions of performance signals (placement, labelling and linkage) and the dimensions of cognitive costs (isolation, aggregation, display proximity and task proximity) affect users' acquisition, evaluation and weighting of information contained in financial statements when making investment decisions. The authors translate the principles of the Integrated Reporting Framework ("the Framework") into these dimensions of performance signals and cognitive costs.

Findings – The authors' review of the archival literature indicates that IRQ is typically measured using a proxy that captures multiple characteristics of integrated reporting as outlined in the Framework. In contrast, in experimental research, integrated reporting is typically operationalised based on a single characteristic, namely, whether sustainability information is presented in a separate report or a single report with financial information. Given that archival data on sustainability reports prepared in accordance with the IFRS Sustainability Disclosure Standards (SDS) and the European Sustainability Reporting Standards (ESRS) is limited, experimental research can provide empirical evidence on the efficacy of these standards in achieving their stated objectives. The authors' extended judgement and decision-making framework opens various ideas for future research.

Originality/value – Because many foundational characteristics of integrated reporting are incorporated into the IFRS SDS and the ESRS, the authors use integrated reporting in developing a framework that could guide future research.

Keywords Cognitive effort, Decision-making, Information processing, Integrated reporting, Investors, Presentation format, Sustainability reporting

Paper type Conceptual paper



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1. Introduction

The growing archival literature on the capital market benefits associated with integrated reporting generally finds positive capital market consequences associated with integrated reporting (Lee and Yeo, 2016; Barth *et al.*, 2017; Bernardi and Stark, 2018; Caglio *et al.*, 2020; Zhou *et al.*, 2017; Barth *et al.*, 2025) [1]. In contrast, experimental studies on integrated reporting provide less convincing evidence of the benefits for individual investors (Bucaro *et al.*, 2020; Haji *et al.*, 2021; Reimsbach *et al.*, 2018). We provide a framework that addresses the mixed evidence between archival and experimental research.

Integrated reports are prepared following the International Integrated Reporting Framework (“the Framework”) of the International Integrated Reporting Council (“IIRC”), a principles-based framework outlining the guiding principles for preparing an integrated report, as well as the content elements to be included in such a report. The principle of information connectivity is central to integrated reporting. The Framework describes connectivity as the ability of an integrated report to show “a holistic picture of the combination, interrelatedness and dependencies between the factors that affect the organization’s ability to create value over time” (IIRC, 2021). Simply combining standalone financial and sustainability reports in a single report will not meet the connectivity principle.

The empirical evidence on integrated reporting is relevant because, globally, interest in sustainability reporting has increased with two new standard-setting initiatives established in the past five years. Firstly, the International Sustainability Standards Board (ISSB) was established by the International Financial Reporting Standards Foundation (IFRSF) in November 2021 to develop IFRS Sustainability Disclosure Standards (SDS). The Value Reporting Foundation, consisting of the IIRC and the Sustainability Accounting Standards Board (SASB), was consolidated into the ISSB in August 2022. The ISSB functions as a sister body to the International Accounting Standards Board (IASB), which issues IFRS Accounting Standards. In June 2023, the ISSB issued its first two standards. Secondly, in June 2020, the European Commission (EC) mandated the European Financial Reporting Advisory Group (EFRAG) to develop the first set of European Sustainability Reporting Standards (ESRS), which were subsequently adopted by the EC in 2023.

Similar to the Framework, the connectivity of financial and sustainability information is a foundational concept of both the IFRS SDS and ESRS. For example, paragraph 21 of IFRS S1, *General Requirements for Disclosure of Sustainability-related Financial Information*, requires a firm to provide information in a manner that enables users of corporate reports to understand “the connections between disclosures provided by the entity across its sustainability-related financial disclosures and other general purpose financial reports published by the entity—such as its related financial statements”. Similarly, paragraph 118 of ESRS 1, *General Requirements*, requires that a firm provide information that “enables users of its sustainability statement to understand the connections between different pieces of information in the statement and the connections between the information in the sustainability statement and other information that the undertaking discloses in other parts of its corporate reporting”.

Both standard setters also established separate committees to inform their standard-setting activities related to integrated reporting principles. In June 2022, the EFRAG Financial Reporting Board (EFRAG FRB) approved the formation of an advisory panel on the connectivity between financial reporting and sustainability reporting (EFRAG CAP) to support the research activities and advise the EFRAG Financial Reporting Technical Expert Group (FR TEG) on the project. In February 2024, the “Connectivity Principles Issues Paper” was released, based on discussions from the joint public meeting of the EFRAG FR TEG and Sustainability Reporting Technical Expert Group held in December 2023. In November 2022, the IFRSF announced a new advisory group, the Integrated Reporting and

Connectivity Council (IRCC), to advise the IFRSF and its two standard-setting bodies on how the reporting requirements of the respective boards could be integrated and how the boards could apply principles and concepts from the Framework to their standard-setting projects.

Given the limited archival data available on sustainability reports prepared using the IFRS SDS and ESRS, researchers have turned to alternative settings and methods to address questions about the usefulness of sustainability reports and the characteristics that enhance their usefulness. In this regard, a substantial body of literature has developed on the benefits associated with integrated reporting. Given the overlap in frameworks and standards, the existing empirical evidence on integrated reporting provides provisional insights into the potential consequences of sustainability reports that firms may issue in the future using the standards of the ISSB and the EFRAG.

Archival studies on integrated reporting are primarily based on data from South Africa, as integrated reporting is mandatory in that country according to the Listings Requirements of the Johannesburg Stock Exchange (JSE). These studies provide evidence that integrated report quality (IRQ) is associated with capital market benefits for firms, such as higher firm value, higher share liquidity, lower cost of capital, lower analyst earnings forecast errors and lower stock price synchronicity (Lee and Yeo, 2016; Barth *et al.*, 2017; Bernardi and Stark, 2018; Caglio *et al.*, 2020; Zhou *et al.*, 2017; Barth *et al.*, 2025). Collectively, these studies suggest that integrated reporting is associated with an improved information environment.

Regarding the experimental literature, our discussion focuses on three studies that investigate the benefits of integrated reporting to individual investors. Bucaro *et al.* (2020, p. 665) conclude that their empirical evidence “contributes to practice by highlighting a potential unintended consequence of issuing integrated versus separate CSR reports: that investors incorporate CSR information less when it is integrated with financial information versus separately reported”.

Haji *et al.* (2021, p. 3629) argue that their evidence indicates that “the incremental effects of CSR information is contingent on how investors receive this form of information, such that CSR information has a greater impact on investors’ judgements when provided in a separate report relative to when integrated into a financial report”. Reimsbach *et al.* (2018, p. 576) argue that the presentation format effects in their study question “the feasibility of the objectives of integrated reporting advocated by the IIRC”, namely, “that the integrated reporting format is expected to better satisfy investors’ information needs and enhance the value relevance of sustainability information”.

We propose that the mixed findings between the archival and experimental literature may be due to differences in the operationalisation of integrated reporting in the respective literature. In archival studies, IRQ is typically measured using a proxy that captures multiple characteristics of integrated reporting, as envisaged by the Framework. In contrast, integrated reporting is operationalised in experimental research based on a single characteristic of integrated reporting, namely whether sustainability information is presented in a separate report or a single report with financial information. While abstraction from reality is an inherent feature of experimental design, too much abstraction limits the validity of inferences derived from such studies.

To guide a more comprehensive operationalisation of integrated reporting in experimental research, we extend Maines and McDaniel’s (2000) decision-making framework, which is influential in experimental accounting research, to integrated reporting. Our extension of their framework provides a systematic approach to thinking about the key features of integrated reporting that need to be operationalised in an experimental design. The framework explains how the information dimensions of performance signals (placement,

labelling and linkage) and the dimensions of cognitive costs (isolation, aggregation, display proximity and task proximity) affect users' acquisition, evaluation and weighting of information contained in financial statements when making investment decisions. We translate these dimensions into the principles of the Framework.

Our study contributes to the literature on sustainability reporting by developing a framework for judgement and decision-making research in this emerging area. Given that archival data on sustainability reports prepared in accordance with the IFRS SDS and the ESRS are limited, experimental research will continue to be influential in providing empirical evidence on the efficacy of these standards in achieving their stated objectives. Careful operationalisation of the core concepts of these standards in experimental studies is essential to ensure future research is informative to standard setters. Since many of the foundational characteristics of integrated reporting are incorporated into the IFRS SDS and the ESRS, we use integrated reporting in developing a framework that could guide future research.

The remainder of this study is organised as follows: Section 2 contains the literature review; Section 3 develops the framework; Section 4 provides suggestions for future research, and Section 5 summarises and concludes.

2. Relevant literature

In this section, we provide an overview of the literature on the benefits associated with integrated reporting, referencing both archival and experimental studies.

2.1 Archival studies – research design considerations

A substantial body of archival literature examines the benefits associated with integrated reporting. The findings of these studies should be considered in the context of their operationalisation of integrated reporting. We provide a summary of the proxies used in [Table 1](#). These proxies use different approaches to measure integrated reporting, such as relying on expert evaluations of reports ([Barth et al., 2017](#); [Wang et al., 2024](#)), researcher-constructed disclosure indexes ([Lee and Yeo, 2016](#); [Zhou et al, 2017](#); [Pavlopoulos et al., 2019](#)) and textual analysis ([Barth et al., 2017](#); [Caglio et al., 2020](#)).

The proxies of [Barth et al. \(2017\)](#), [Lee and Yeo \(2016\)](#), [Pavlopoulos et al. \(2019\)](#) and [Zhou et al. \(2017\)](#) are attempts to operationalise IRQ in terms of the guiding principles and content elements of the Framework. While [Barth et al.'s \(2017\)](#) and [Wang et al's., \(2024\)](#) proxies, based on reporting awards, have the benefit of independent expert evaluation, it uses proprietary data, which limits its use in other studies. [Lee and Yeo \(2016\)](#), [Pavlopoulos et al. \(2019\)](#) and [Zhou et al. \(2017\)](#) address this issue by using researcher-constructed disclosure proxies that other researchers can use. A downside of these proxies is that they rely on coding by the researchers, who may not be experts at evaluating the quality of integrated reports. In addition, these self-developed disclosure indexes measure the presence or absence of specific content elements and may not accurately capture the guiding principles of the Framework (e.g. connectivity).

More recently, [Barth et al. \(2025\)](#) and [Caglio et al. \(2020\)](#) use textual analysis of integrated reports to measure their quality. Such an approach does not rely on proprietary data or researcher-constructed indexes and evaluations of integrated reports, thereby overcoming the shortcomings of some of the earlier proxies used in the literature. A crucial question, however, is the construct validity of these text-based measures in assessing IRQ. [Caglio et al. \(2020\)](#) argue that their textual attributes are linked to principles of the Framework, e.g. length is related to conciseness, readability relates to the Framework's preference for the use of plain language and tone relates to the neutral presentation of

Table 1. Integrated reporting proxies in archival studies

Article	Integrated reporting proxy
Baboukardos and Rimmel (2016)	The authors conduct a pre- vs. post-analysis of the mandatory implementation of integrated reporting in South Africa. The authors do not examine the quality of integrated reports
Barth et al. (2017)	Integrated report quality (IRQ) is constructed from proprietary data on the scores underlying the annual EY Excellence in Integrated Reporting Awards. Expert readers of corporate reports rated the integrated reports, and this measure is not simply a disclosure index that captures the presence or absence of particular items. The proxy incorporates 12 components measuring various aspects of the Framework, namely (1) strategic focus and future orientation, (2) connectivity of information, (3) stakeholder relationships, (4) materiality, (5) conciseness, (6) organizational overview and external environment, (7) governance, (8) business model, (9) risks and opportunities, (10) performance, (11) basis of preparation and presentation and (12) other
Barth et al. (2025)	IRQ is measured as the average percentile ranks across seven textual attributes of integrated reports, namely disclosure length, readability, boilerplate language, redundant language, specific language, language that is sticky over time and hard information
Bernardi and Stark (2018)	The authors conduct a pre- vs. post-analysis of the mandatory implementation of integrated reporting in South Africa. The authors do not examine the quality of integrated reports
Caglio et al. (2020)	Three key textual characteristics underpinning integrated report disclosure quality, namely the reading difficulty, length and tone (i.e. whether the language of the disclosure is biased towards optimism and certainty). These characteristics denote the amount (length) and style (readability and tone) of an integrated report
Hsiao et al. (2022)	The authors examine the adoption of integrated reporting, rather than its quality
Lee and Yeo (2016)	A self-constructed integrated report disclosure score measuring the eight content elements in the Integrated Reporting Framework ("the Framework"), namely (1) Organizational overview and external environment; (2) Governance; (3) Business model; (4) Risks and opportunities; (5) Strategy and resource allocation; (6) Performance; (7) Outlook; and (8) Basis of preparation and presentation. Each content element contains five questions, resulting in a maximum score of 200
Obeng et al. (2021)	Same as Serafeim (2015) .
Pavlopoulos et al. (2019)	A self-constructed integrated report disclosure score that captures a firm's degree of compliance with integrated reporting disclosures on nine categories in terms of the King III Code on Corporate Governance, namely (1) ethical leadership and corporate citizenship, (2) boards and directors, (3) audit committees, (4) governance of risk, (5) governance of information

(continued)

Table 1. Continued

Article	Integrated reporting proxy
Serafeim (2015)	<p>technology, (6) compliance with laws, codes, rules and standards, (7) internal audit, (8) governing shareholder relationship and (9) integrated reporting and disclosure. The disclosure index consists of 28 items</p> <p>The “Corporate Governance: Vision and Strategy” (CGVS) data item from the Asset4 database, which measures “a company’s management commitment and effectiveness towards the creation of an overarching vision and strategy integrating financial and extra-financial aspects. It reflects a company’s capacity to convincingly show and communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes”. De Villiers, Venter, and Hsiao (2017b, p. 948) argue that this proxy “seems to measure the level of ‘integrated thinking’ in a firm (performance), rather than the quality of its integrated reports (disclosure)</p>
Wang et al. (2024)	<p>Strategic report disclosure quality is constructed from proprietary data from PwC (UK), which has been identifying trends, variations and excellence in the reporting quality of FTSE 350 entities since 2003. The proxy incorporates seven components measuring various aspects of the Strategic Reporting Guidance, namely (1) strategy and objectives, (2) business model, (3) principle risks and uncertainties, (4) performance and position, (5) environmental, employee, social, community and human rights matters, (6) information connectivity and (7) forward-looking orientation</p>
Zhou et al. (2017)	<p>A self-constructed integrated report disclosure score measuring compliance with the Framework across eight dimensions, namely (1) organisational overview and operating context, (2) governance, (3) opportunities and risks, (4) strategy and resource allocation plans, (5) business model, (6) performance and outcomes, (7) future outlook and (8) other. The maximum score is 31</p>

Source(s): Table by authors

information. [Barth et al. \(2025\)](#) provide further evidence on construct validity and conclude that their analysis “reveals a high correlation between the EY scores and our text-based measures, which provides external validity to our measures” and provides support for the use of their text-based measure “as a measure of IRQ, and more generally, sustainability information, particularly in large samples where expert ratings are not available”.

Another challenge facing archival researchers is to ensure that the effects they document reflect IRQ and not general information quality. Some studies include control variables in their estimation equations to address this concern. For example, [Barth et al. \(2017, 2025\)](#) include controls for the issuance of a standalone sustainability report as well as accounting quality and overall disclosure quality. [Caglio et al. \(2020\)](#) and [Zhou et al. \(2017\)](#) include controls for the issuance of a standalone sustainability report and financial reporting quality. Thus, to the extent that these and other controls capture the overall information quality of a firm, the evidence generally shows that integrated reports are associated with benefits incremental to those associated with the existing reporting environment.

2.2 Archival studies – overview

Studies using data outside of South Africa include [Serafeim \(2015\)](#), [Pavlopoulos et al. \(2019\)](#), [Obeng et al. \(2021\)](#) and [Hsiao et al. \(2022\)](#). [Serafeim \(2015\)](#) reports a positive association between the US firms that adopt principles of integrated reporting and long-term investors, suggesting that firms that use integrated reporting attract more long-term investors than firms that do not use it. Based on an international sample, [Pavlopoulos et al. \(2019\)](#) provide evidence that IRQ is positively associated with firms’ market value, for firms sourced from the IIRC website between 2011 and 2015, thereby including both voluntary and mandatory adopters. Their findings further suggest that higher quality integrated reports are associated with higher value relevance of the book value of equity and earnings for larger firms. Their results indicate that the association between high earnings quality and IRQ is more pronounced in settings where integrated reporting is mandatory.

[Obeng et al., 2021](#) examine whether integrated reporting is associated with lower agency costs. Based on a sample of voluntary adopters across 35 countries, they report that firms that use integrated reporting extensively have lower agency costs and lower annual average changes in agency costs. The negative association between integrated reporting and agency costs is more pronounced in stakeholder-oriented countries. In addition, the effectiveness of integrated reporting is more pronounced for diversified firms that tend to experience more agency problems than less complex firms. Their results suggest that managers are more disciplined in firms that use integrated reporting.

[Hsiao et al. \(2022\)](#) investigate whether the voluntary adoption of the Framework has an impact on the capital market. They find that adopting integrated reporting voluntarily is not associated with analyst forecast errors, analyst forecast dispersion, cost of equity and firm value. This evidence questions the usefulness of integrated reports to capital markets, but should be considered in the context of research design decisions. A key feature of [Hsiao et al. \(2022\)](#) is that it investigates the adoption of integrated reporting, rather than its quality. In addition, their analysis investigates the capital market benefits one year after the first year a firm discloses that it has adopted the Framework. As [Hsiao et al. \(2022\)](#) note, the quality of integrated reports may improve over time as firms incorporate new reporting practices into their operations. Hence, investigating the association between IRQ and capital market benefits over a more extended period in voluntary settings may yield further insights into the benefits of integrated reporting.

Archival studies using the South African setting where integrated reporting is mandatory suggest that integrated reporting is associated with market-related outcomes. [Baboukardos](#)

and Rimmel (2016) note an increase in the earnings valuation coefficient after the mandatory adoption of integrated reporting, focusing on early data from 2008 to 2013. Their results suggest that the degree of integration of information included in the integrated report is useful to users of these reports, and their findings support the IIRC's claim that integrated reporting can assist in assessing future financial performance. They also report a decrease in the value relevance of the book value of equity, which they attribute to the possibility that unrecognised liabilities are revealed by integrated reporting, compared to the recognised liabilities in the financial statements (Baboukardos and Rimmel, 2016). In another early study using data from 2008 to 2012, Bernardi and Stark (2018) find a significant improvement in analyst forecast accuracy after the mandatory introduction of integrated reporting. Their evidence suggests that integrated reporting facilitates improved connectivity between environmental and financial performance.

Lee and Yeo (2016) examine the association between IRQ and firm value for South African firms, using Tobin's Q as a proxy for firm value. They indicate a positive association between IRQ and firm value. The increased valuation effect is more pronounced for complex firms and firms with higher financing needs. Their evidence suggests that integrated reporting reduces information asymmetry between a firm's management and the providers of financial capital (Lee and Yeo, 2016). In another early study, Zhou *et al.* (2017) investigate data from just before the implementation of the Framework (2009) to a period just after implementation in South Africa in 2012. They document that analysts' forecast errors are lower when IRQ is higher. However, no clear association between IRQ and analyst forecast dispersion exists. In addition, their results suggest a negative association between IRQ and the implied cost of equity capital for firms with a weak information environment.

Barth *et al.* (2017) investigate whether economic benefits arose from integrated reporting for large, listed South African firms during the period 2011–2014. Their findings show that IRQ is positively associated with firm value (measured by Tobin's Q). They further deconstruct firm value into stock liquidity, expected future cash flow and cost of capital. Their findings suggest that stock liquidity and expected future cash flows are primarily responsible for the association between IRQ and firm value (Barth *et al.*, 2017).

Caglio *et al.* (2020) examine the economic benefits associated with three textual attributes of integrated reporting (length, readability and tone) and the external assurance of the integrated report for South African firms from 2011 to 2016. They find that readability is associated with higher market valuation, while conciseness is associated with higher stock liquidity. In addition, they document that assurance moderates the negative associations between low-quality textual attributes and economic consequences, thereby acting as a credibility-enhancing mechanism for financial analysts.

Barth *et al.* (2025) find that measures of IRQ based on seven textual attributes of integrated reports are negatively related to stock price synchronicity, an inverse measure of firm-specific information reflected in share prices. In addition, they document that content related to the three most common integrated report content categories (governance, performance and risks and opportunities) is negatively associated with synchronicity. Similar results are reported for content related to all integrated report capitals except manufactured capital. Furthermore, the results suggest that sustainability information has a stronger negative association with synchronicity than financial information. Finally, the authors report that proprietary costs stemming from product market competition attenuate the negative association between IRQ and synchronicity, suggesting that the informativeness of integrated reports varies with a firm's competitive environment.

Although not directly about integrated reporting, in a related study, Wang *et al.* (2024) investigate the capital market benefits of preparing reports in terms of the Strategic Reporting

Guidance (“the Guidance”) in the UK. There is significant similarity between the Framework and the Guidance. Consequently, this evidence also provides insights into the potential consequences of sustainability reports that firms may issue in the future using the standards of the ISSB and the EFRAG. Wang *et al.* (2024) find that higher strategic report disclosure quality is associated with higher liquidity, lower cost of capital and more accurate, less dispersed analysts’ forecasts. Considering components of their disclosure quality score, they find that connectivity and forward-looking orientation are also associated with these benefits.

The evidence from the studies cited above, using different quality measurements, generally suggests that the quality of integrated reports is associated with firms’ information environment. However, these studies do not address how integrated reporting affects individual users’ judgement and decision-making, which we discuss in the next section.

2.3 Experimental studies

Up to this point, our literature review has focused on the economic benefits of integrated reporting drawing on archival research methods. Although archival research examines the average market outcomes associated with integrated reporting, these methods cannot infer how and to what extent it affects individual investors’ decision-making (De Villiers *et al.*, 2017a, 2017b). These questions need to be evaluated using behavioural research methods, in particular, experiments. We focus on three experimental studies in this section that have operationalised integrated reporting (Bucaro *et al.*, 2020; Haji *et al.*, 2021; Reimsbach *et al.*, 2018).

Before discussing the three studies, we provide background on the participants in the experiments. Bucaro *et al.* (2020) and Haji *et al.* (2021) recruited participants from Amazon Mechanical Turk. The average age of the participants in Bucaro *et al.*'s (2020) primary experiment is 33 years, 59.2% are male, 88.3% have some college education, 76.5% have some experience with evaluating stocks; 56.6% have invested in a firm’s stock; and 69.9% plan to invest in a firm’s stock within the next five years. All participants in Haji *et al.* (2021) are aged 25 or above, 65% are male, 88% stated that they have more than 5 years of professional working experience; 98% (65%) have read financial (sustainability) reports at least once in the past. Hence, both these studies provide evidence on the decisions of non-professional investors. By contrast, Reimsbach *et al.* (2018) provide evidence on the decisions of professional analysts and fund managers, i.e. professional investors, recruited through various professional social networks and the mailing list of an investors’ association. Participants’ mean age was 40.2 years, and the mean time in their professional role was 11.8 years, 12.5% had a PhD and 24% were Chartered Financial Analysts.

All three experimental studies operationalise integrated reporting similarly by including sustainability information with financial information in a single report as opposed to separate reports. Bucaro *et al.* (2020) based their predictions on cognitive psychology, positing that users of reports tend to use a unidimensional perspective to process information unless inconsistent information causes them to switch to a multidimensional perspective (Spalding and Murphy, 1996; Hamilton and Winchel, 2019). Consequently, Bucaro *et al.* (2020) argue that when sustainability and financial performance are presented in separate reports, the two reports trigger a multidimensional perspective on financial and social responsibility. However, when financial information and sustainability information are presented in a single report, the social responsibility dimension is not sufficient to activate a multidimensional perspective. Hence, Bucaro *et al.* (2020) predict that sustainability information will have a greater influence on investors’ judgements when it is presented in a separate report rather than in a single report. Their findings indicate that when negative CSR measures are presented in a separate report as opposed to a single report, non-professional investors take more cognisance of the sustainability information in their investment decisions. This leads

Bucaro *et al.* (2020:668) to conclude that “issuing a single report containing both CSR and financial information may have unintended consequences” and that “companies that wish to highlight CSR performance may benefit from issuing separate CSR reports rather than integrating CSR measures with financial reports” (Bucaro *et al.*, 2020:668). Similarly, Haji *et al.* (2021) provide evidence that negative CSR performance disclosures presented in separate financial and sustainability reports have a greater impact on firm value estimations of non-professional investors than when the CSR performance disclosures are contained in a single report. However, positive CSR performance disclosures yielded comparable firm value estimates irrespective of the presentation format.

Reimsbach *et al.* (2018) examine how integrated reporting and the voluntary external assurance of sustainability information interact and influence the information processing abilities of professional investors. They find that although combining sustainability and financial information in a single report increases potential access to sustainability information, the format does not enhance the acquisition of sustainability information. In addition, they document that the reporting format interacts with voluntary assurance of sustainability information. When sustainability information is not assured, the single report format has a positive impact on professional investors’ evaluation of a firm’s sustainability performance, as evidenced by a higher weighting of this information and higher investment-related judgements. The authors attribute this finding to a halo effect emanating from the assurance report on financial information contained in the integrated report, creating an overall impression of assurance even if the sustainability information is not assured.

Bucaro *et al.* (2020), Haji *et al.* (2021) and Reimsbach *et al.* (2018) use the term “integrated” to describe their single report treatment. However, a single report that includes both financial and sustainability information is not necessarily an integrated report if it does not address the interconnectivity and interdependencies of the financial and sustainability information. A distinction between the archival and experimental literature is that archival researchers use proxies that measure a broader set of integrated report characteristics (refer to Table 1). In contrast, the three experimental studies operationalise only one feature of integrated reporting, namely whether financial and sustainability information are included in a single report or separate reports. Consequently, it is not clear whether the experimental evidence extends to sustainability information that is integrated with financial information in the manner intended by the Framework. In addition, as Bucaro *et al.* (2020:668) point out, their results are “conditional upon investors viewing the CSR information”. If financially material sustainability information is presented in a separate report, some investors may not view the sustainability information, as they need to purposefully search for the relevant information in another report. Hence, when sustainability information is presented in a separate report, investors must incur processing costs to know that the disclosures exist.

Given the mixed evidence in the archival and experimental findings on the benefits of integrated reporting, we develop an information processing framework for integrated reporting in the next section, drawing on the experimental literature on financial reporting, to guide the operationalisation of integrated financial and sustainability information in future experimental studies.

3. Framework

3.1 Background

Given the inherent uncertainty of future outcomes, investors prefer to focus on useful and relevant information (Jaiyeoba *et al.*, 2018). Traditionally, useful information has been provided to investors through financial reporting, supported by legislation, mandated by

reporting frameworks, underpinned by financial reporting standards and independent assurance.

Investors need to interpret useful and relevant information provided to the public through reporting. However, individual investors are also humans who have emotions and psychological biases which are unique to them and which form an integral part of how they analyse information and make investment decisions (Kahneman and Tversky, 1979; Jaiyeoba *et al.*, 2018). How and to what extent people use the available information to inform their decisions requires information processing, which is an area of human activity studied as a branch of cognitive psychology.

Individual investors' information processing is limited by time, resources and cognitive capacity (Blankespoor *et al.*, 2020; Libby and Lipe, 1992; Hirshleifer and Teoh, 2003; Kim, Li and Liu, 2019). From a user perspective, publicly available information is readily available, but not costless to process (Blankespoor *et al.*, 2020; Holm and Rikhardsson, 2008).

Blankespoor *et al.* (2020) provide a useful distinction between "public" and "private" information. Public information is simultaneously known to all investors at a negligible cost to process, while all other information is costly to know and thus "private". To allocate financial capital, investors must find different ways to gain access and process the private information they require. This comes at a cost to investors; alternatively, they can claim a risk premium in return for investing financial capital in a firm (Virlics, 2013; Serafeim, 2015). The relevance of information and how it is presented, such as its salience, location and the number of competing items, can affect users' attention – their cognitive effort (Orquin *et al.*, 2021). Information processing tasks vary according to the amount of attention required to perform the task adequately. Paying attention can range from little or no effort to mental accounting tasks, which require high levels of effort; the intensity and duration of attention are the drivers of effort. Complex decisions involve a variety of cognitive processes that are sensitive to effort (Libby and Lipe, 1992).

Humans have limited cognitive processing capacity, resulting in information processing costs (Libby and Lipe, 1992). Attention is a scarce resource that demands time, which has a monetary cost (Van Knippenberg *et al.*, 2015; Gödker and Mertins, 2018). This, in turn, has the effect that individual investors do not use or process all the publicly available information, which then constrains their decision-making (Libby and Lipe, 1992; Hirshleifer and Teoh, 2003; Kunz and Staehle, 2020). As a result of the limitations of their processing capacity, people tend to use information in the format it is presented to them rather than modifying it appropriately to their needs (Kahneman and Tversky, 1979). Behavioural accounting research suggests that investors tend to fixate on certain aspects of the information presented to them; however, accounting is a complex and rich information environment in which cognitive processing and attention are crucial for good decision-making (Clor-Proell *et al.*, 2016). While using information without modification reduces processing costs, fixating on specific information can induce errors (Hodder, Hopkins and Wood, 2008).

Maines and McDaniel (2000) developed a framework based on the psychology literature to ascertain whether the presentation format of financial information influences the weight that non-professional investors attach to the information in making a performance assessment judgement. Maines and McDaniel's (2000) framework breaks down the decision-making process into three parts, namely acquisition, evaluation and weighting of information. The framework is influential in experimental accounting research (Clor-Proell *et al.*, 2014; Lachmann *et al.*, 2015; Gödker and Mertins, 2018; Reimsbach *et al.*, 2018).

The acquisition of information entails acquiring, storing and recalling (Maines and McDaniel, 2000; Yao *et al.*, 2024). During the acquisition phase, investors search for relevant

information to store for later recall; in doing so, they need to distinguish between relevant and irrelevant information. Evaluation is the interpretation of acquired information in a manner that enables its use (Maines and McDaniel, 2000; Hirshleifer and Teoh, 2003; Gödker and Mertins, 2018). Information weighting refers to considering the perceived relevance and reliability of the acquired information for an investment-related decision (Maines and McDaniel, 2000; Gödker and Mertins, 2018; Reimsbach *et al.*, 2018). Since evaluation and weighting are more complex than the acquisition of available information, they require more cognitive effort (time and attention).

Blankespoor *et al.* (2019) present a conceptualisation of disclosure processing costs. They identify three steps to processing a disclosure for use in a trading decision, namely (1) awareness (learning that the disclosure exists); (2) acquisition (obtaining the report and extracting the disclosure); and (3) integration (analysing the implications of the disclosure for firm value). “Awareness” is related to the acquisition phase in the Maines and McDaniel’s (2000) framework, while “acquisition” refers to aspects of the acquisition and evaluation phases. “Integration” overlaps with the weighting phase. Each of the steps in the Blankespoor *et al.* (2019) conceptualisation has an associated cost. Awareness costs are “the costs necessary to improve one’s probability of knowing that a particular disclosure exists” (Blankespoor *et al.*, 2020, 5). Acquisition costs are “the costs necessary to extract and quantify a disclosure signal so it is ready for use in a valuation model” (Blankespoor *et al.*, 2020, 5). Integration costs “include the costs necessary to combine and refine acquired signals into a valuation estimate or investment decision” (Blankespoor *et al.*, 2020, 6). Integration costs include determining which disclosures are value relevant, the expected relations between each disclosure and firm value, and the appropriate weights to place on each disclosure (Blankespoor *et al.*, 2020). The cost of processing involves an explicit economic cost and an opportunity cost. Processing the relevant firm disclosure requires resources, which could have been used on other activities or to process something else, which is identified as the opportunity cost of processing. Table 2 provides a summary of the overlap between the Maines and McDaniel (2000) and Blankespoor *et al.* (2019) frameworks.

Using the principles of sequential information processing, Maines and McDaniel (2000) argue that the format in which comprehensive income is presented does not affect the acquisition and evaluation stages of information processing of non-professional investors but does influence the weighting stage. They argue that sequential information processing results in non-professional investors acquiring and evaluating the presented information regardless of the format in which it is presented. Their results support their argument, suggesting that format influences the weighting of information more than it affects the acquisition and evaluation. However, later studies suggest that the acquisition and evaluation of information may be affected by the characteristics of the presentation (Kunz and Staehle, 2020).

Hodge *et al.* (2004) investigated search technology, specifically the eXtensible Business Reporting Language (XBRL), that enhances the directed search capabilities of users. They document that labelling pieces of financial data with a unique identification tag enhances the ability of non-professional investors to acquire information. An experiment by Lachmann *et al.* (2011) shows that making credit risk changes more salient increases the likelihood that non-professional investors acquire the information.

The characteristics (dimensions) of information presentation can potentially influence the way people classify information. Classification can, in turn, affect the perceived importance that investors attach to information for decision-making. These dimensions of information presentation can aid users in information processing by reducing the cognitive effort (in terms of time and attention) required to process the information (Maines and McDaniel, 2000; Arnold *et al.*, 2012; Clor-Proell *et al.*, 2014). Conversely,

Table 2. Comparison between [Maines and McDaniel \(2000\)](#) and [Blankespoor et al. \(2019\)](#)

Maines and McDaniel (2000)	Blankespoor et al. (2019)
<i>Acquisition</i> Search for relevant information to store for later recall; distinguish between relevant and irrelevant information	<i>Awareness</i> Learning that the disclosure exists
<i>Evaluation</i> Interpretation of acquired information in a manner that enables its use	<i>Acquisition</i> Obtaining the report and extracting and quantifying a disclosure signal so it is ready for use in a valuation model
<i>Weighting</i> Considering the perceived relevance and reliability of the acquired information for an investment-related decision	<i>Integration</i> Analysing the implications of the disclosure for firm value. Combine and refine acquired signals into a valuation estimate or investment decision. Determining which disclosures are value relevant, the expected relations between each disclosure and firm value and the appropriate weights to place on each disclosure

Source(s): Table by authors

these dimensions could complicate information processing if they increase cognitive effort (time and attention). [Maines and McDaniel \(2000\)](#) use five dimensions of information presentation in their study. They divide the five dimensions into two categories: performance signals and cognitive costs. Their framework has subsequently been expanded by [Hodge et al. \(2010\)](#) to include display proximity and task proximity. This framework is summarised in [Figure 1](#). In the discussion that follows, we examine each of the elements of the extended information-processing framework and their relationship to integrated reporting.

3.1.1 Dimensions of performance signals. The dimensions of performance signals provide the users of financial statements with cues that the information is relevant to assessing firm performance. The three dimensions identified by [Maines and McDaniel \(2000\)](#) are placement, labelling and linkage.

3.1.1.1 Placement. [Maines and McDaniel \(2000\)](#) use placement to refer to whether comprehensive income appears in a performance statement (statement of comprehensive income) or a non-performance statement (statement of shareholders' equity). [Libby and Emett \(2014\)](#) use the location of information to differentiate between information recognised in the financial statements as opposed to information disclosed in the notes to the financial statements.

In the context of reporting financial and sustainability information, placement refers to whether information is displayed in a single report or separate financial and sustainability reports. In the experiments by [Bucaro et al. \(2020\)](#), [Haji et al. \(2021\)](#) and [Reimsbach et al. \(2018\)](#), placement was the treatment used because they did not consider other features of integrated reporting, such as the connectivity of the information [2].

Presenting financial and sustainability information in one single report arguably makes it easier for investors to find relevant information, thereby reducing the awareness costs to process the information. Presenting financial and sustainability information in a single report also makes it easier for investors to extract sustainability information relevant to an investment decision, thereby reducing acquisition costs. Placement in a single report could also reduce the integration costs of sustainability information compared to presentation in a

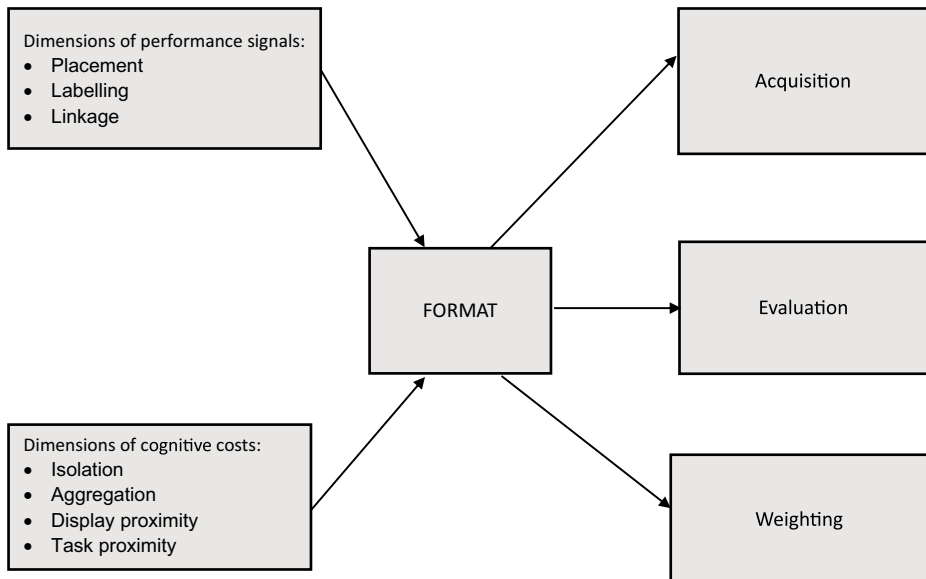


Figure 1. Expanded information processing framework
Source: Figure by authors

separate report, as it signals to the users of the information that managers consider sustainability-related matters to be integral to a firm’s performance.

3.1.1.2 Labelling. [Maines and McDaniel \(2000\)](#) use labelling as an indication of the characteristics of firm performance. In their case, unrecognised gains and losses are labelled as comprehensive income, suggesting it is relevant to assess firm performance. [Clor-Proell et al. \(2014\)](#) associate labelling with the saliency of information. Explicitly labelling information to indicate that it relates to firm performance can increase the importance of the information for the decision-making process ([Maines and McDaniel, 2000](#); [Clor-Proell et al., 2014](#)). Labelling aids investors in classifying information and, in doing so, communicates the relevance of the information concerned to the investors ([Maines and McDaniel, 2000](#); [Hodge et al., 2004](#); [Galley et al., 2015](#)).

In the context of reporting financial and sustainability information, labelling conveys whether the sustainability information is financially material and, thereby, communicating information about a firm’s performance ([Hodge et al., 2004](#); [Lachmann et al., 2011](#); [Kunz and Staehle, 2020](#); [Yao et al., 2024](#)). The SASB prescribes the disclosure of financially-material sustainability metrics, which are standardised qualitative and quantitative metrics for each of the 77 industry-based SASB standards, to convey the importance of sustainability information to investors. Including a financially-material label with sustainability information conveys the message that management deems the information relevant to investors’ decision-making, thereby increasing the salience of the information for investors. Thus, labelling reduces integration costs for investors. Given that acquisition is a prerequisite to integration, it also suggests that labelling could reduce acquisition costs.

3.1.1.3 Linkage. [Maines and McDaniel \(2000\)](#) use the term linkage to focus on the relationship between financial statement items. Specifically, items are linked if they are

presented together, and their aggregated total is presented in the financial statements. [Libby and Emmett \(2014\)](#) use labels and subtotals in financial statements to differentiate between recognised and disclosed information, thereby linking the information to aspects of firm performance deemed relevant for the investment decision.

In an experimental setting, using causal reasoning theory, [Koonce et al. \(2019\)](#) examine whether the proximity of economically related (linked) disaggregated information in the statement of financial position influences investors' and lenders' judgements. The findings suggest that the close physical proximity of linked information, presented in a disaggregated (gross amounts) manner, makes it easier for investors to infer causal relationships between the statement of financial position items. This format enables users to simultaneously perceive the effect of the related hedged item and the hedging instrument, and to determine the nature of the relationship between the items ([Koonce et al., 2019](#)).

Unlike the requirements for financial reporting, the SASB standards require a qualitative description, enabling sustainability information to be linked with a firm's future performance. Connecting sustainability information with the firm's future financial performance increases the saliency of the sustainability information for investment decision-making ([Wang et al., 2024](#)). This supports the guiding principles of connectivity, materiality and reliability and completeness of information as outlined in the Framework. Hence, linked information could increase the saliency of the information. As such, linking could reduce the acquisition and integration costs of sustainability information, as linking communicates relevance of the information to assessing firm performance.

3.1.2 Dimensions of cognitive costs. [Maines and McDaniel \(2000\)](#) added two cognitive costs dimensions, namely isolation and aggregation, to the already identified performance dimensions of placement, labelling and linkage. They suggest that as a result of processing costs (cognitive effort and working memory), these dimensions can influence the weighting of information during the decision-making process. Presenting non-diagnostic (irrelevant) information along with diagnostic (relevant) information reduces the weight attached to the diagnostic information because of the processing costs associated with the non-diagnostic information ([Maines and McDaniel, 2000](#); [Gödker and Mertins, 2018](#)). This refers to the extent to which relevant information is isolated. [Hodge et al. \(2010\)](#) added proximity as another dimension.

3.1.2.1 Isolation. [Maines and McDaniel \(2000\)](#) use isolation to indicate whether comprehensive income is the only type of information presented in the financial statement. When comprehensive income is presented in a statement of shareholders' equity, it competes for attention with common equity and other equity reserve information. Investors expend additional cognitive effort to simultaneously process all the information presented to identify the relevant information for their decision. More irrelevant information, therefore, results in a lower degree of isolation of relevant information, which increases the cognitive effort needed by individuals to extract the information relevant to the decision ([Lachmann et al., 2015](#)).

In the context of reporting financial and sustainability information, presenting sustainability information that is not financially material will reduce the saliency of the material (relevant) information, increasing the acquisition costs of relevant information.

3.1.2.2 Aggregation (disaggregation). [Maines and McDaniel \(2000\)](#) are interested in whether the presentation format of comprehensive income can ease the cognitive load required to process the information for decision-making purposes. Two of their presentation formats (SFAS No. 130) present gross changes in comprehensive income on the face of the statement, thereby providing the users with disaggregated information. Whereas SFAS No. 115 only provides the net changes in comprehensive income on the face of the statement, the gross changes are available but disclosed elsewhere in the financial statements and in footnotes.

Processing the information in the footnotes requires more cognitive effort to disaggregate and understand the details. [Maines and McDaniel's \(2000\)](#) findings suggest that disaggregating the changes in comprehensive income eases the cognitive effort investors expend to weight the information. [Clor-Proell et al. \(2014\)](#) find that increasing the salience (disaggregation) of fair value gains reported in the income statement enhances the ability of non-professional investors to weight the differences in subjectivity with which the firm measures those gains. By implication financial and sustainability information cannot be aggregated, but sustainability information with the same unit of measurement could be. Aggregating items with similar valuation implications could reduce acquisition and integration costs for investors as it reduces the number of items investors need to process. Aggregating items with dissimilar valuation implications increases processing costs. Hence, aggregation remains an important consideration in an integrated report.

3.1.2.3 Proximity. In addition to isolation and aggregation, [Hodge et al. \(2010\)](#) add proximity, which refers to how closely (in relation to one another) two related pieces of information, both relevant to a decision, are presented. [Reimsbach et al. \(2018\)](#) use [Maines and McDaniel's \(2000\)](#) framework, as previously extended by [Hodge et al. \(2010\)](#), to further expand the proximity dimension by focusing on the proximity compatibility principle. Proximity compatibility refers to the association between cognitive processing (effort and memory) and the visual presentation (presentation/disclosure) of information during decision-making ([Reimsbach et al., 2018](#)). Proximity entails both display proximity and task proximity.

3.1.2.3.1 Display proximity. Display proximity refers to the distance between the displayed information and whether the user of the report can perceive different but related information simultaneously. [Hodge et al. \(2010\)](#) link display proximity and the cognitive cost dimensions of isolation and aggregation (cognitive cost category) suggested by [Maines and McDaniel \(2000\)](#). Given limited processing power (attention) and working memory, it is challenging for users to acquire multiple parts of the information simultaneously, especially if the information is displayed in different locations (low display proximity). High display proximity is associated with lower cognitive costs to acquire information.

Display proximity is distinct from placement, which we discussed earlier. Placement refers to whether information is presented in the same or different reports, providing a signal of firm performance. Display proximity refers to the physical proximity of related information and affects processing costs. Hence, presenting financially material sustainability information in a single report with financial information serves two objectives, namely decreasing display proximity, and signalling performance (see the discussion on "placement" above) ([Hodge et al., 2010](#); [Reimsbach et al., 2018](#)).

3.1.2.3.2 Task proximity. Task proximity relates to information settings that require a combination of multiple types of information relevant to the task of making a judgement or decision. Accounting is a complex informational environment. Investment decision-making involves considering various forms of information, both historical and forward-looking, to assess a firm's current and future performance ([Hodge et al., 2010](#); [Grigg and Griffin, 2014](#); [Reimsbach et al., 2018](#)). Decisions requiring high task proximity can be supported by high display proximity as presenting information relevant to the task in close proximity reduces the cognitive costs of processing the information ([Hodge et al., 2010](#); [Reimsbach et al., 2018](#)). Hence, the focus here is on task complexity and the overall information needs of the user to make the decision.

3.2 *An adapted information processing framework for integrated reporting*

In summary, the format in which information is presented can affect all three stages of the information-processing framework, regardless of the investor's sophistication. The format

dimensions play a role in conveying the specific characteristics of the applicable information and affect the ease with which the information can be processed.

The seven guiding principles of the Framework guide the presentation format of an integrated report. The guiding principles of the Framework intend to reduce noise in an integrated report, enabling users to focus their limited attention on information relevant to their task. By *placing* information in an integrated report rather than in separate stand-alone reports, management conveys to the users that the sustainability information, in combination with financial information, is relevant to the short-, medium- and long-term value creation of the firm. *Labelling* sustainability information as financially material conveys to the users of the integrated report that management deems the sustainability information relevant to users' decisions. Qualitatively *linking* material sustainability information with the firm's financial performance through a narrative explanation in the integrated report conveys the relevance of the information for projecting future performance for investment purposes. By incorporating only material sustainability information in an integrated report, and excluding irrelevant information, management *isolates* the material information, making it easier for investors to consider it in their decision-making. *Aggregation* remains an important consideration in an integrated report. Appropriate aggregation, i.e. combining items with similar valuation implications, could assist investors in processing the information.

Therefore, placement, linkage, labelling, isolation and aggregation support the guiding principles of the Framework, including strategic focus and future orientation, connectivity, conciseness and materiality. Through these format dimensions, the saliency of the information in the integrated report is increased. Salient information presented with high display proximity could reduce the cognitive effort needed by individual investors to acquire, evaluate and weight the information for investment decision purposes. We adapt the information-processing framework of [Maines and McDaniel \(2000\)](#), extended by [Reimsbach et al. \(2018\)](#), into an integrated reporting information-processing framework, as set out in [Figure 2](#).

Our framework has implications for experimental research on integrated reporting and, more broadly, sustainability reporting. In operationalising "integrated reporting" or connected financial and sustainability information, manipulating only one format dimension, e.g. placement, may not sufficiently capture the concept of integrated reporting. An advantage of experimental design is that it demonstrates causation as opposed to the archival literature, where drawing causal inferences is often impossible due to endogeneity concerns. While it may be impractical to manipulate all the format dimensions in an experiment, researchers must ensure that their inferences relate to the specific manipulations they have made. For example, if placement is the only format dimension manipulated in an experiment, researchers can make inferences about this dimension, but not broader inferences on the efficacy of integrated reporting. In the next section, we provide more concrete examples of ideas for future research.

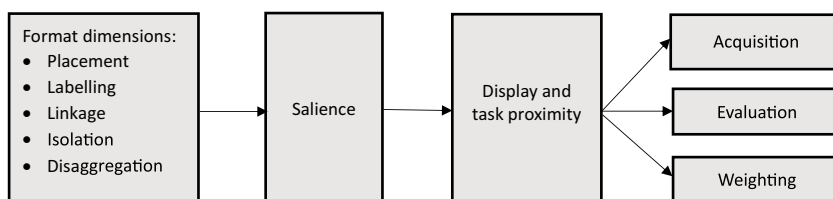


Figure 2. Adapted integrated information processing framework

Source: Figure by authors

4. Future research

In this section, we outline how our expanded framework can be applied in future studies. We begin by discussing how it may impact the inferences of [Bucaro et al. \(2020\)](#), [Haji et al. \(2021\)](#) and [Reimsbach et al. \(2018\)](#).

[Bucaro et al. \(2020\)](#) base their predictions on cognitive psychology, suggesting that individuals tend to use a unidimensional perspective in processing information unless inconsistent information causes them to switch to a multidimensional perspective ([Spalding and Murphy, 1996](#); [Hamilton and Winchel, 2019](#)). Consequently, [Bucaro et al. \(2020\)](#) argue that when sustainability and financial performance are presented in separate reports, the two reports trigger a multidimensional financial and social responsibility perspective. However, when financial and sustainability information is presented in a single report, the social responsibility dimension is insufficient to activate a multidimensional perspective. As such, [Bucaro et al. \(2020\)](#) predict and find that sustainability information has a greater influence on investors' judgements when presented in a separate report relative to a single report. They further predict and find that investors' responses to CSR measures will be less affected by placement when investors are explicitly prompted towards an opposing dimensional perspective. In this regard, participants are asked to either place 12 fruit items into four categories (a multidimensional prompt) or to place the same 12 fruit items into two categories (unidimensional prompt). However, some format dimensions could potentially trigger a multidimensional perspective without relying on external cues unrelated to reporting. Specifically, when the dimensions of labelling and linkage are used in conjunction with placement, it may prompt a multidimensional perspective by sending a signal to users of integrated reports that the sustainability information is relevant to their investment decision. Therefore, replicating [Bucaro et al. \(2020\)](#) to test this prediction empirically may improve our understanding of whether the labelling and linkage format dimensions attenuate the unidimensionality observed by [Bucaro et al. \(2020\)](#).

[Haji et al. \(2021\)](#) argue, similar to [Bucaro et al. \(2020\)](#), that categories trigger people to adopt unidimensional or multidimensional perspectives ([Medin et al., 1987](#); [Spalding and Murphy, 1996](#)). A unidimensional perspective results in people treating items of the same category as identical, although they are different ([Spalding and Murphy, 1996](#)). People switch to a multidimensional perspective when additional conceptual knowledge makes differences in categories salient ([Medin et al., 1987](#); [Ahn and Medin, 1992](#)). [Haji et al. \(2021\)](#) argue and find that when investors value a firm, a single report format triggers a unidimensional perspective that predominantly activates a focus on financial information, while separate reports cause investors to adopt a multidimensional perspective, focussing on both financial and sustainability information. We argue that placing sustainability information in a single report with financial information increases its salience for the valuation task as it signals that it is relevant to assessing firm performance. While this may trigger a unidimensional perspective, other format dimensions, such as labelling and linkage, may mitigate the risk.

[Reimsbach et al. \(2018\)](#) predict that professional investors who receive sustainability information in a single report are more likely to acquire sustainability information than investors who receive separate financial and sustainability reports. Approximately one-quarter of the participants who received separate reports did not access the stand-alone sustainability report. To examine the acquisition of sustainability information, participants were asked to answer the following true or false post-experimental questions:

- Beta (the hypothetical firm) provided ESG key performance indicators in tabular form;
- in 2012, the overall amount of CO₂ emissions decreased; and
- in 2012, about one-third of Beta's senior management was female.

The results indicate no statistically significant differences between the separate and single conditions for two of the three measures of sustainability information acquisition. Acquisition levels of the CO₂-related question are higher in the single treatments than in the separate treatments, with this difference being marginally statistically significant. Based on this evidence, [Reimsbach et al. \(2018, p. 570\)](#) conclude that “[a]lthough the integration of sustainability and financial information generally increased potential access to sustainability information, this did not lead to improved acquisition of sustainability information in our setting”. Regarding the effect of the placement treatment on participants’ perceptions of sustainability performance (evaluation), the weighting of sustainability information in making an investment decision and the investment attractiveness, the results indicate that participants evaluated sustainability performance higher in the single report conditions than in the separate report conditions, with no differences in the weighting of information and the attractiveness of the investment across the two treatments.

We offer a few observations on [Reimsbach et al. \(2018\)](#) that could guide future research. Firstly, [Reimsbach et al. \(2018\)](#) evidence is based on professional investors. Access to sustainability information is a prerequisite for its acquisition. Future studies could provide evidence on whether the placement of sustainability information in a single or separate report affects the accessibility of sustainability information to non-professional investors. Secondly, [Reimsbach et al. \(2018\)](#) tested acquisition by asking three questions, two of which related to ESG metrics. In total, the experimental material contained 15 ESG metrics. Researchers need to select ESG metrics that have clear financial implications and are directly relevant to the investment decision. Participants may not be able to acquire specific metrics because participants deem them irrelevant to the investment decision. Participants may also fail to acquire relevant metrics due to disclosure overload, i.e. excessive noise in the experimental material. In this regard, researchers should consider the implications of the format dimension of isolation for the experimental design. Future studies could investigate whether relevant and material ESG metrics are acquired, evaluated and weighted by investors and whether this is affected by the degree of isolation of these metrics among other immaterial metrics. Such evidence could directly speak to the concern of disclosure overload.

Both [Reimsbach et al. \(2018\)](#) and [Haji et al. \(2021\)](#) provide evidence on how investors perceive assurance across single and separate reports conditions. In [Reimsbach et al. \(2018\)](#), one of their treatments is whether sustainability information is externally assured. They find that when sustainability information is not assured, participants rate sustainability performance higher, place greater weight on sustainability information when making an investment decision and rate the attractiveness of the investment higher when the sustainability information is presented in a single report, as opposed to a separate report. They attribute this to participants misattributing the assurance of financial information in the single report to also apply to sustainability information. In [Haji et al. \(2021\)](#) the sustainability information was not assured across all treatments. They find that more participants were more likely to misclassify the sustainability information as assured in the single report treatments than in the separate report treatments. Misclassifying participants rated the credibility of sustainability information higher and provided higher firm value estimates compared to participants who correctly classified the assurance of sustainability information. These findings require further investigation. Specifically future studies could investigate mechanisms through which misclassification of the assurance of sustainability information in integrated sustainability reports could be mitigated. This is a relevant issue, as combining information with various levels of assurance in the same report will become more prevalent.

5. Summary and conclusion

The purpose of this study is to propose a framework that can be used in experimental research to operationalise the characteristics of an integrated report to address the mixed

findings between the archival and experimental literature. In archival studies, IRQ is typically measured using a proxy that captures multiple characteristics of integrated reporting, as envisaged by the Framework. In contrast, integrated reporting is operationalised in experimental research based on a single characteristic of integrated reporting, namely whether sustainability information is presented in a separate report or a single report with financial information. While abstraction from reality is an inherent feature of experimental design, too much abstraction limits the validity of inferences derived from such studies. Our framework provides researchers with a classification of the format dimensions of integrated reporting. This could assist researchers in designing experiments to provide evidence beyond the placement format dimension.

We extend the [Maines and McDaniel \(2000\)](#) information processing process by aligning the characteristics of integrated reporting with the format dimensions of placement, linkage, labelling, isolation and aggregation. These characteristics should enhance the salience of the financial and sustainability information. Presenting information in a manner consistent with the Framework could enhance the ability of individual investors to acquire, evaluate and weight information to make an investment decision.

Our study contributes to the literature on sustainability reporting by developing a framework for judgement and decision-making research in this emerging area. Experimental research will continue to be influential in providing empirical evidence on the efficacy of IFRS SDS and the ESRS in achieving their stated objectives. Careful operationalisation of the core concepts of these standards in experimental studies is essential to ensure future research is informative to these standard setters. In addition, we urge experimental researchers to describe their inferences in a manner that is consistent with the format dimensions they have manipulated and not to integrated reporting broadly.

Notes

- [1.] While the archival literature generally supports capital market benefits associated with integrated reporting, it does not do so unanimously. For example, [Barth et al. \(2017\)](#) do not find evidence that integrated report quality is associated with cost of capital, while [Zhou et al. \(2017\)](#) find cost of capital benefits only for firms with a weak information environment. [Hsiao et al. \(2022\)](#) find that adopting integrated reporting voluntarily is not associated with analyst forecast errors, analyst forecast dispersion, cost of equity and firm value. We provide a detailed discussion on the archival literature in subsection 2.2.
- [2.] [Reimsbach et al. \(2018\)](#) acknowledge this, stating that their integration treatment falls short of the concept of integrated reporting, which, according to the IIRC guidelines, “ideally goes beyond combining the different types of information and also takes into account the connectivity and interdependencies” ([Reimsbach et al., 2018](#): 566).

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