

An Empirical Analysis of the Effects of Integrated Reporting on Sustainability Management

Exploring the Link between Climate Change Reporting and Management Performance

Dissertation

zur Erlangung des Grades

Doktor der Wirtschaftswissenschaft (Dr. rer. pol.)

der Juristischen und Wirtschaftswissenschaftlichen Fakultät
der Martin-Luther-Universität Halle-Wittenberg

vorgelegt von

M.Sc. Linda Kannenberg

Halle (Saale),
Februar 2019

Erster Gutachter: Prof. Dr. Philipp Schreck

Zweiter Gutachter: Prof. Dr. Edeltraud Günther

Verteidigungsdatum: 11. November 2019

Abstract

Integrated Reporting (IR) is a fairly new form of corporate reporting that intends to consolidate financial and sustainability reporting. Its transformative qualities concerning informational structures as well as communication and decision-making processes have the potential to influence a firm's environmental, social and governance (ESG) performance. The simultaneous portrayal of sustainability concerns alongside financial considerations might lead to socially and ecologically advantageous company decisions, based on the fundamental change of the organization's beliefs, norms and values. To investigate this effect, this study analyzed whether the extent and quality of climate change-related IR have an influence on the climate change mitigation performance of a company. Extent and quality of reporting were measured by means of self-developed completeness and connectivity scores, whereas the CDP's 'climate score' was used as a measure of performance.

Results derived by means of multiple regression analysis of 235 company-year-observations, however, provided only partial support to the notion that connectivity is positively associated with climate change management performance. This effect was present only when performance was measured in terms of greenhouse gas (GHG) emissions, but not with the more comprehensive score by the Carbon Disclosure Project (CDP). In addition, this result appears independent of report type. Despite the fact that integrated reports are generally more complete and exhibit more information connections than sustainability reports, the regression analyses' results revealed no superior impact of IR on performance as compared to sustainability or hybrid reports. Hence, IR contributes to the development of a more sophisticated ESG information environment, but its alleged transformative qualities do not go beyond the mere change in processes and organizational sub-systems, let alone provoke a change in actual performance.

Acknowledgements

The novelty of this dissertation's topic – integrated reporting – provided various challenges throughout the research as well as uncertainty regarding the significance of its outcomes. My doctoral supervisor, Prof. Dr. Philipp Schreck, pointed out these challenges without discouraging me to pursue the topic and helped me in every step of the way. I am very grateful for his continuous support, valuable advice and for giving me the opportunity to work at his chair for business ethics and management accounting (bema) at the Martin Luther University Halle-Wittenberg. The mutual encouragement between all members of the bema team has helped me overcome many technical and motivational obstacles. This particularly applies to Simon, my favorite “colega” of all times, because we approached even the greatest setbacks with much humor and pragmatism.

I am also incredibly thankful for the opportunity to participate in the doctoral program “Ethics and Responsible Leadership in Business” by the Wittenberg Center for Global Ethics (WCGE). Without the financial support of the Karl Schlecht Stiftung the realization of this research study would not have been possible. I am greatly appreciative of the stipend and relating academic program. Practical projects alongside theoretical courses on business ethics and its philosophical foundations deepened my understanding of today's moral, social, and ecological challenges, and fueled my ambition to find feasible solutions for such in my professional as well as private life. Moreover, the new gained network of colleagues, friends and role models at the WCGE has offered much inspiration and provided the necessary drive to finalize my doctoral thesis. Particularly the remarkable discipline as well as motivational support of Katharina and Julia have helped me in the final stages of this thesis.

By nature, writing a doctoral thesis is a very lonesome and frustrating task, but I was lucky enough to have some great colleagues, friends and family members that have made the process a little less lonesome and frustrating. I am deeply grateful to have such supportive parents that have always encouraged me to follow my academic, professional or personal goals. Especially the uplifting words and caring actions of my mother helped me out of quite a few motivational slumps. Furthermore, I owe great thanks to Robert who has not only endured my occasional bad temper, proof-read my dissertation, but also reminded me to take some time off work every once in a while, in order to restore my energy, focus and motivation.

Contents

1. Bridging Financial and Sustainability Reporting.....	1
1.1. The Assumed Need for Integrated Reporting	1
1.2. Potential Benefits and Pitfalls	2
1.3. Research Aim and Approach	4
2. Emergence of Sustainability and IR	7
2.1. Rising Interest in Corporate ESG Performance	7
2.2. National ESG Reporting Regulation.....	8
2.2.1. Australia	8
2.2.2. Canada	9
2.2.3. South Africa	9
2.2.4. United Kingdom	10
2.2.5. United States.....	10
2.3. Emergence and Key Concepts of IR	11
2.4. Different Types of IR.....	13
3. Reviewed Determinants and Implications of IR.....	15
3.1. Literature Review Method	15
3.2. Determinants of IR.....	18
3.2.1. Overview and Prevalent Research Approaches.....	18
3.2.2. Country Level Determinants	25
3.2.3. Industry Level Determinants	28
3.2.4. Organizational Level Determinants.....	29
3.3. Implications of IR	32
3.3.1. Overview and Prevalent Research Approaches.....	32
3.3.2. Internal Implications.....	36
3.3.2.1. <i>Non-financial Information</i>	36
3.3.2.2. <i>Processes</i>	38
3.3.2.3. <i>Strategy</i>	40
3.3.3. External Implications	42
3.3.3.1. <i>Societal Relations</i>	45
3.3.3.2. <i>Financial Markets-Related</i>	46
3.3.4. Direct Implications	47
3.3.4.1. <i>Financial Implications</i>	49
3.3.4.2. <i>Implications on ESG Performance</i>	49

3.4.	Discussion of Reviewed Literature	50
3.4.1.	Inconclusive Evidence on IR Benefits	52
3.4.2.	Research Potential of IR, ESG Performance and Connectivity	53
4.	Empirical Analysis of IR Effects	56
4.1.	Sample Selection	56
4.1.1.	Industries	56
4.1.2.	Countries	57
4.1.3.	Reports.....	59
4.1.3.1.	<i>Integrated Reports</i>	60
4.1.3.2.	<i>Sustainability Reports</i>	60
4.1.3.3.	<i>Hybrid Reports</i>	61
4.2.	Variables	62
4.2.1.	Dependent Variable: Climate Change Management Performance.....	62
4.2.2.	Independent Variable: Completeness	64
4.2.3.	Independent Variable: Connectivity.....	66
4.2.4.	Control Variables	71
4.3.	Hypotheses Development	74
4.3.1.	Organizational Change through IR.....	75
4.3.2.	The Link between Performance and Reporting Completeness and Connectivity .	77
4.3.3.	Interaction Effects	79
4.4.	Estimation Model and Statistical Method	80
4.5.	Scoring Procedure	88
4.5.1.	Stepwise Scoring Procedure	88
4.5.2.	Data Extraction Form	89
4.5.3.	Inter-rater Reliability	90
4.6.	Sample Description	92
4.6.1.	Industry and Country Distribution.....	92
4.6.2.	Summary of Climate Change Performance.....	93
4.6.3.	Summary of Completeness and Connectivity Score	97
4.6.4.	Bivariate Analysis	99
4.6.5.	Information Properties of Completeness and Connectivity Score	101
4.6.5.1.	<i>Completeness Score</i>	102
4.6.5.2.	<i>Connectivity Score</i>	102
4.7.	Regression Analysis	106
4.7.1.	Results and Discussion.....	106

4.7.1.1.	<i>Relation between Reporting Completeness, Connectivity and Performance ..</i>	106
4.7.1.1.	<i>The Role of Report Type</i>	110
4.7.1.2.	<i>Influence of Controls and Preliminary Summary</i>	111
4.7.2.	<i>Robustness of the Model</i>	112
5.	<i>Discussion</i>	117
5.1.	<i>Connections Reduce Emissions</i>	117
5.2.	<i>Connectivity Beyond IR.....</i>	118
5.3.	<i>Negligence of Strategic Considerations</i>	120
5.4.	<i>The Role of Regulation, Industry Affiliation and Standards</i>	120
5.5.	<i>The IR – Performance Link.....</i>	121
6.	<i>Conclusion and Limitations</i>	123
7.	<i>Implications and Further Research</i>	125
8.	<i>References.....</i>	127

List of Tables

Table 1: Differences in IR Approaches.....	13
Table 2: Cited Publications per Level of Analysis, Year and VHB-Jourqual3 Rank.....	16
Table 3: Country, Industry and Organizational Level Determinants.....	19
Table 4: Internal Implications of IR.....	33
Table 5: External Implications of IR.....	43
Table 6: Relation between IR and Financial and ESG Performance.....	48
Table 7: Summary of Results.....	51
Table 8: Sampled Reports.....	61
Table 9: Key Topics.....	63
Table 10: Key Words.....	65
Table 11: CDP Categories and Scores.....	69
Table 12: Variable Definitions.....	74
Table 13: Assumptions of the Classical Linear Regression Model.....	83
Table 14: Stepwise Scoring Procedure.....	89
Table 15: Information in Data Extraction Form.....	90
Table 16: Summary Statistics and ANOVA.....	94
Table 17: Pairwise Comparisons.....	96
Table 18: Summary Statistics for Connect and Complete.....	98
Table 19: Pairwise Correlation Matrix.....	100
Table 20: Pairwise Correlation Matrix (Cramer's V).....	100
Table 21: Completeness Score per Complete Topic and Type.....	102
Table 22: Regression Results for CCPerf.....	108
Table 23: Regression Results for Logem.....	114
Table A1: Abstract Data Extraction Form.....	144
Table A2: Data Code Names.....	145
Table A3: Coding Choices.....	146

List of Figures

Figure 1: Reference Frame.....17

Figure 2: Organizational Model.....75

Figure 3: Amount of Reports by Type and Country92

Figure 4: Amount of Reports by Type and Industry92

Figure 5: Amount of Key Words103

Figure 6: Combinations of Key Words (Connections)104

Figure 7: Summarized Types of Connections105

List of Abbreviations

ACCA	Association of Chartered Certified Accountants
ANOVA	Analysis of Variance
A4S	Accounting for Sustainability
C	Capital
CDP	Carbon Disclosure Project
CE	Content Element
CERES	Coalition for Environmentally Responsible Economies
CIMA	Chartered Institute of Management Accountants
CSR	Corporate Social Responsibility
EMAS	EU Eco-Management and Audit Scheme
EPA	Environmental Protection Agency
EPI	Environmental Performance Index
ESG	Environmental Social Governance
ETS	Emission Trading Scheme
EU	European Union
GHG	Greenhouse Gas
GP	Guiding Principle
GRI	Global Reporting Initiative
HDI	Human Development Index
HR	Hybrid Report(ing)
IASB	International Accounting Standards Board
IR	Integrated Report(ing)
IIRC	International Integrated Reporting Council
JSE	Johannesburg Stock Exchange
Kt	Kilo tons
kWh	Kilowatt hour
MoU	Memorandum of Understanding
NGER	National Greenhouse and Energy Reporting
NGO	Nongovernmental Organization
OLS	Ordinary Least Squares
PP	Pilot Program
R	Rand
SASB	Sustainability Accounting Standards Board
SD	Standard Deviation
SE	Standard Error
SEC	U.S. Securities and Exchange Commission
SR	Sustainability Report(ing)
TJ	Terajoule
UK	United Kingdom
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VHB	Verband der Hochschullehrer für Betriebswirtschaft
VIF	Variance Inflation Factor
WWF	World Wildlife Fund

1. Bridging Financial and Sustainability Reporting

Corporate boardrooms, government agendas, civil society, business schools and media reports – the debate surrounding a corporation’s responsibilities gains momentum as human rights violations along supply chains are revealed and planetary boundaries, such as the loss of biodiversity, are reached. The extent of these responsibilities is naturally growing along with the size, power and complexity of the increasingly globalized value chains of companies. Apart from numerous social issues that can arise along these intricate supply chains, a corporation’s environmental responsibility also revolves around pollution and, more specifically, its contribution to global climate change in the form of carbon emissions (CO₂ emissions). Claiming these responsibilities – either stemming from the intrinsic ambition to align societal with strategic goals or an extrinsic motivation to satisfy the interests of investors, consumers, pressure groups or regulators – requires a more effective management of such social and environmental issues.

1.1. The Assumed Need for Integrated Reporting

Sustainability accounting and reporting attempts to align the allocation of capital and corporate actions with financial stability and sustainability principles at the same time. Burritt and Schaltegger (2010) argue that it supports such a holistic management twofold. Firstly, a set of internal and integrative management control systems assist managers in decisions involving financial alongside non-financial information. In that vein, sustainability accounting has the potential to improve economic and environmental performance, as compliance with environmental regulation is monitored and data for internal decision-making as well as external reporting are provided to drive steady improvement (Henri & Journeault, 2010). The authors further suggest that such an improvement requires performance indicators that include environmental aspects, the establishment of goals for environmental expenditures and investments, and linking the achievement of sustainability targets to rewards.

Secondly, sustainability reporting also meets the informational needs of various stakeholders (Burritt & Schaltegger, 2010) that are interested in the non-financial performance of companies. A dwindling public trust in markets and corporations since the 2008 financial crisis and subsequent global recession add to the demand of various stakeholders for improved transparency (Krzus, 2011). Only around 20% of a company’s market value can be attributed to physical and financial assets nowadays, whereas 80% account for non-financial, intangible assets (Sullivan & Sullivan, 2000). Short-term-oriented financial accounts do not accurately reflect this ratio and neglect the influence of social and environmental risks on long-term financial success (Stubbs, Higgins, Milne, & Hems, 2014). Even

though sustainability reports include these longer-term considerations and corporate (ir)responsibilities against the backdrop of global concerns, they are mainly voluntary and provide a plethora of environmental, social and governance (ESG) information without deriving strategic or financial implications for the business (Eccles & Serafeim, 2015).¹

ESG data are rarely connected to the business model and released later than financial data that are audited at a higher level of assurance, limiting their usefulness for investors (Serafeim, 2015).² The inadequate integration of financial and non-financial information in conventional sustainability reports (Velte & Stawinoga, 2017b), combined with their alleged failure to effectively engage with investors, led to the emergence of the consolidating IR approach (Rowbottom & Locke, 2013). Rather than treating financial and sustainability reporting separately, IR intends to connect financial and ESG information in a single business narrative (GRI, 2015; IIRC, 2013c). It thereby intends to offer a solution to the above-mentioned issues with conventional sustainability reporting.

1.2. Potential Benefits and Pitfalls

Whether this new reporting strategy is able to live up to its promises, is widely debated. Proponents argue that the establishment of linkages between strategy, financial performance and the economic, social and environmental contexts comes along with distinct advantages: it fosters the development of advanced measurement methodologies, promotes internal collaboration and supports external engagement (Eccles & Krzus, 2010). The resulting clarity about reciprocal effects between different performance indicators could improve internal management processes, decision-making and societal relations, thus leading to process efficiencies, improved risk management, and other advantages (e.g., Adams, 2015; Eccles & Armbrester, 2011).

Moreover, the focus on investors and their informational needs in assessing a firm's prospects might lead to capital market benefits for the company, such as lowered cost of capital (Zhou, Simnett, & Green, 2017). Some advocates of the new voluntary reporting format even suggest that the linkages and added metrics cause a profound change towards more environmentally and socially responsible business practices by reconceptualizing the interpretative scheme of managers (e.g., Adams, 2016; Maniora, 2015; Simnett & Huggins, 2015; Stubbs & Higgins, 2014). For instance, an increase in the quantification of non-financial information and its inclusion in management and board reporting

¹ The terms *ESG information* and *non-financial information* are used interchangeably in this study. When referring to *sustainability* this concerns the social and environmental only, the financial dimension of corporate performance is discussed separately.

² Parts of this paragraph as well as full paragraphs in chapter 3 were published as "Integrated reporting: boon or bane? A review of empirical research on its determinants and implications", by L. Kannenberg and P. Schreck, 2018, *Journal of Business Economic*, 27, p. 1-53.

could improve its consideration in decision-making and possibly lead to environmentally and socially superior outcomes. Maniora (2015) even suggests that the integration of ESG issues into the core business model causes an internalization of ethical norms, which could foster more ethical management. Different interpretations of information possibly reshape organizational structures at the core, affecting individuals, but also the whole organisation (Levy, 1986). This effect of new information enabling managers to develop a holistic view of the company (Mio, Marco, & Pauluzzo, 2016) and possibly influencing their decisions is also termed “integrated thinking” (e.g., Vesty, Dellaport, Oliver, & Brooks, 2016).

Despite these alleged benefits, IR is not without critics. For example, practitioners find the lack of clarity in the guidelines of the main governing body of IR, the International Integrated Reporting Council (IIRC), such as regarding the concept and process of integrated thinking or the capital framework, especially challenging (Cheng, Green, Conradie, Konishi, & Romi, 2014). In addition, data in an IR format are difficult to verify as compared to other standards, such as the Global Reporting Initiative (GRI), International Financial Reporting Standards (IFRS) or the EUs Eco-Management and Audit Scheme (EMAS). Apart from a hindered verification, the lack of prescribed indicators also compromises the comparability among different integrated reports (Günther, Herrmann, & Lange, 2017).

However, opponents mainly criticize the dominance of the business case logic over environmental and social issues (e.g., Cheng, et al., 2014; Flower, 2015; Thomson, 2015; Villiers, Rinaldi, & Unerman, 2018; van Bommel, 2014).³ They fear a setback of sustainability reporting achievements, as the IIRC recommends to include only those social and environmental concerns in the report that are material to the organization’s ability to create value for its shareholders (IIRC, 2013b; IIRC and SASB, 2013). Such conflicting views characterize the fierce debate on whether IR is a threat to the progress in accounting for non-financial business impacts (e.g., Villiers et al., 2018), or, quite contrary, whether it advances sustainable and economically viable business efforts (e.g., Eccles & Krzus, 2010; Maniora, 2015).

Whether IR is beneficial or not ultimately remains an empirical question. Consequently, the last decade has observed an upsurge in empirical studies on the consequences of IR. Although several earlier literature reviews have provided important insights into the practice of IR, they offer an incomplete account of its empirical consequences. Perego, Kennedy & Whiteman (2016) for example, discuss the academic literature on IR, but with a specific focus on conceptual arguments. Others

³ Flower (2014) attributes this dominance to the presence of participating corporations and accountancy professionals in the IIRC council.

analyze the reception and methodological foundations of IR research (Dumay, Bernardi, Guthrie, & Demartini, 2016; Villiers & Hsiao, 2016). Quite recently, Velte and Stawinoga (2017b) reviewed the empirical literature on the drivers and the financial performance effects of IR.

These reviews have proven useful in clarifying the foundations of IR, and in summarizing work on the effects of IR on the reporting firms' financial performance. However, the mechanisms through which IR may unfold its effects on financial and, even more importantly, on ESG performance still remain to be investigated. We may know *that* IR affects performance (Maniora, 2015), but we do not fully understand *how* these effects emerge. A thorough understanding of such effects is important for an assessment of whether IR, as a new concept of corporate reporting, changes internal processes, external stakeholder relations and, ultimately, performance as claimed by its proponents. As more and more companies are investing a lot of money in the implementation of IR, there is a need for evidence on its expected benefits regarding more informed decisions. At the same time, social and environmental accounting scholars place great hopes in the new reporting format, as it puts into practice the long-standing call for an integration of financial and non-financial information in corporate reporting.

1.3. Research Aim and Approach

The main argument under investigation is the above-mentioned claim that linkages between financial and non-financial information cause a profound change towards more environmentally and socially responsible business practices. Consequently, the purpose of this research study is to analyze whether such linkages effectuated by IR, improve the ESG performance of companies given the heightened awareness of managers of their decision's social and environmental impacts. More specifically, the focus is placed on climate change reporting and performance, because there are a number of confounding factors influencing a company's overall ESG performance.⁴ These confounding factors offer alternative explanations for changes in ESG performance. Hence, by concentrating on climate change reporting and performance, more accurate results concerning specific effect mechanisms and relations might be derived. The study attempts to shed light on these effect mechanisms by asking: *Does the extent and quality of climate change-related integrated reporting have an effect on the climate change mitigation performance of a company?*

⁴ The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (UNFCCC, 1992, p. 7).

For that reason, a company's climate change management performance is related to two self-developed scores measuring the extent and quality of climate change-related disclosures.⁵ A completeness score checks the extent to which the respective company discloses information on six key topics in climate change management. Quality is measured against the backdrop of IR as the focal object of investigation. In that vein, quality equates with the number of connections in a given company report, because connectivity is one of the key principles of IR. Hence, a connectivity score measures the degree to which IR links different types of climate change-relevant information in a respective report.

The study will proceed as follows. Chapter two describes key concepts and the main forms of IR, reasons for its emergence, and related institutional and regulatory approaches. National ESG reporting regulations of those countries under investigation are also laid out, in order to equip the reader with an overview of the legislative status quo. In chapter three, the empirical literature on drivers as well as the implications of IR is reviewed. An increasing number of companies start to adopt the new reporting practice, partly because of institutional pressures and partly because of strategic reasons (e.g., Higgins, Stubbs, & Love, 2014). A preliminary review of these determinants helps the reader to develop a holistic understanding of the reasons for adopting IR, before presenting its implications. These internal and external implications might act as mediators in the direct relationship between the reporting approach and ESG and financial performance.

Based on these preliminary findings in chapter three, chapter four describes the methodological approach and findings of the empirical study on the IR - performance link. First, the sample selection is specified as well as the variables under investigation in sections 4.1. and 4.2. In that vein, the total sample consists of 235 company-year-observations in high-polluting industries and across seven countries. Apart from integrated reports, sustainability and annual reports were also analyzed, in order to shed light on the potential value added by IR as compared to the other two reporting formats.

Data on both independent variables were collected through content analyses of corporate reports. Hence, a detailed description of the scoring procedure is presented in section 4.5. In addition, the development of the estimation model that was used for regression analyses is outlined in-depth in section 4.4. The underlying hypotheses and theoretical arguments that motivated this research and offer possible explanations for the hypothesized cause-and-effect relationship are portrayed in section 4.3. Descriptive results on the study's dependent and independent variables are presented in section 4.6., whereas findings from the regression analysis are reported in 4.7.

⁵ The climate change management performance is measured as the company's awareness of climate change-related issues, relating management methods and progress made (CDP, 2017a).

Chapter five then critically discusses these findings against the background of those effects hypothesized in section 4.3. A summary of results and relating limitations of this study are presented in chapter six. The research study concludes with some practical implications for reporting practitioners and regulators, and offers some future avenues for additional research on IR.

2. Emergence of Sustainability and IR

Before outlining the emergence, key concepts and different types of IR, the following paragraphs provide a general overview of significant regulatory developments in financial and sustainability reporting first. After informing the reader about the early appearances of IR and describing its key concepts, an overview of these different types of integrated reports is also provided.

2.1. Rising Interest in Corporate ESG Performance

Sustainability reporting stems from an increasing awareness of social and environmental responsibility in the 1960s and 70s in all spheres of society, especially in the US and Europe (Ioannou & Serafeim, 2011). A first set of environmental reporting guidelines was introduced by the US-based Coalition for Environmentally Responsible Economies (CERES), which was formed as a response to the 1989 oil spill of the Exxon Valdez (Smith III, 1993). In 1997, CERES and the United Nations Environment Programme (UNEP) launched the GRI. With the original goal to develop reporting guidelines that account for the triple bottom line of a company's performance, the GRI is now the de facto international reporting standard for ESG matters (Ioannou & Serafeim, 2011).⁶

Whereas around 1,000 companies had published a sustainability report at the turn of the century, this figure rose to over 19,000 in 2019 (Corporate Register, 2019) and highlights the perceived relevance of ESG data for investors.⁷ The growing complexities of global value chains in an increasingly intertwined economic system has caused numerous problems (e.g., "tax havens", dependence on imports, corruption). It also made existing challenges (e.g., climate change, human exploitation for cheap goods) more apparent and tangible to a better-informed group of society, particularly consumers. This further fueled the rising interest in an organization's ESG performance as well as mitigation and risk management processes apart from its financial bottom line from a wide variety of stakeholders. At the same time, investors and information intermediaries began to include ESG information in their performance valuation models and thus became one of the largest reader groups of sustainability reports and related ESG information (Ioannou & Serafeim, 2011). Especially industry sectors with high environmental and social impacts, such as the oil and gas, and the mining sector, typically have high reporting rates and increasingly acknowledge climate change-related risks (KPMG, 2017).

⁶ The term triple bottom line refers to an accounting framework that considers a firm's social and environmental alongside a financial bottom line (Elkington, 2018).

⁷ In a similar vein, a recent KPMG survey revealed that 78% of the Global Fortune 2015 companies have published a sustainability report in 2017 (KPMG, 2017).

As a direct consequence, governments have slowly started to mandate the inclusion of ESG information in corporate reporting, either through laws or stock exchange listing requirements (e.g., India, Brazil, Denmark and China). France became the first country to introduce mandatory climate reporting requirements for financial institutions in 2016. The 2014 EU Directive (2014/95/EU) by the European Parliament is one of the most important developments in this regard, as it had to be translated into national legislation until the end of 2016. Under this Directive around 6,000 large companies with more than 500 employees are required to disclose material non-financial information on social and environmental matters for financial years commencing in 2017 (European Commission, 2017). By 2018, all member states had communicated full transposition of the measures into their national law (European Commission, 2017). The most important national reporting regulations and requirements for the sampled companies in the underlying study are laid out in the following paragraphs.⁸

2.2. National ESG Reporting Regulation

To ensure the validity of the study's results, the sampled companies are based in countries that exhibit a homogeneity with regard to certain reporting characteristics as outlined in chapter four. As a result, the final sample consists of companies based in Australia, Canada, South Africa, New Zealand, Ireland, the UK and the US. However, given the insignificantly small number of Irish and New Zealand companies in the sample, specific reporting regulations for these countries are not outlined. Despite the fact that national as well as supra-national governments worldwide are increasingly mandating private and public-sector entities to disclose information on their social and environmental impact, those countries included in the sample already exhibit comparably advanced legislation in that regard, as discussed in the following paragraphs.

2.2.1. Australia

There are two important ESG disclosure requirements in Australia. Under the Corporations Act 2001, companies have to provide information on the performance or breaches of environmental laws and standards (Parliament of Australia, 2010). The National Greenhouse and Energy Reporting Act 2007 (NGER) on the other hand represents a reporting framework on Greenhouse Gas (GHG) emissions, projects and energy use and production (Australian Government, 2018). Those companies that emit 25 kt or more of GHG emissions (scope 1 and 2) or produce 100 TJ or more of energy have to register

⁸ The mentioned laws and guidelines do not represent an exhaustive list, but the most important regulations. There might be other national as well as supra-national regulations regarding the disclosure of non-financial information, such as in line with the EU Emissions Trading Scheme or the Carbon Reduction Commitment (Guthrie, Manes-Rossi and Orelli, 2017).

for the scheme and digitally submit a separate energy and emissions report (Australian Government, 2018).

2.2.2. Canada

According to the Chartered Professional Accountants Canada (2017), Canadian securities law generally requires companies to disclose information that is material to investor decision-making, including material environmental and social issues, in their security filings. They assert that disclosures may be required concerning risks, environmental trends and uncertainties or environmental liabilities. Given its pervasive impact, climate change is therefore an area of significant interest to investors. The Canadian Securities Administrators provide guidance on existing disclosure requirements and, more specifically, on how companies should identify material environmental information (Chartered Professional Accountants Canada, 2017). In 2017, 84% of the Canadian N100 companies have published a sustainability report (KPMG, 2017).⁹

2.2.3. South Africa

The South African government had explicitly attended to IR by 1994 (Dumay et al., 2016). A committee led by high court Judge Mervyn King, now chairman of the IIRC, developed the first King Code of Corporate Governance Principles ('King I') (Rowbottom & Locke, 2013). In 2010, IR became obligatory for companies listed on the Johannesburg Stock Exchange (JSE) through the King III principles on an apply or explain basis (The South African Institute of Chartered Accountants, 2012) which raises the question of whether it is truly mandatory.¹⁰ In 2016 the Committee on Corporate Governance in South Africa issued a draft King IV Report. The King reports prescribe the provision of a corporate governance framework alongside sustainability issues which have an impact on the business and its financial performance (The South African Institute of Chartered Accountants, 2012). These aspects should be interwoven with financial reporting and discuss the company's impact on the broader environment and affected stakeholders as well as their strategies for mitigating any negative effects (The South African Institute of Chartered Accountants, 2012).

⁹ The KPMG Survey of Corporate Responsibility Reporting refers to the N100 as the largest 4,900 companies by revenue in 49 countries (KPMG, 2017).

¹⁰ In this approach the reporting principles have to be adopted, otherwise reasons for its omission have to be provided (The South African Institute of Chartered Accountants, 2012).

2.2.4. United Kingdom

Social cuts, deregulation and measures of privatization under the administration of Margaret Thatcher in the 1980s led UK businesses to take measures into their own hands regarding corporate social responsibility (CSR) and sustainability reporting (Steurer, 2010). Even nowadays the governmental approach to CSR disclosure in the UK is primarily characterized by partnerships and multi-stakeholder dialogues (Lenssen, Albareda, Tencati, Lozano, & Perrini, 2006). The Companies Act from 2006 requires listed companies to include information on their business risks, performance, and workplace, social and environmental issues in their annual reports (The UK Statutory Office, 2013).

Amendments made in 2013 further require the preparation of a separate strategic report alongside the annual directors' report. Here, the organization has to report on primary risks and challenges, human rights issues, gender representation across the company and their GHG emissions to monitor and thus reduce their GHG outputs (GRI, 2013; The UK Statutory Office, 2013).

In addition, the Climate Change Act of 2008 mandates the inclusion of GHG emission figures in company reports and as part of their annual financial reporting (Tang & Demeritt, 2018). It refers to the legally binding long-term contract for reducing all six GHG emissions under the Kyoto Protocol (The UK Statutory Office, 2013).

2.2.5. United States

US companies are also subject to several disclosure requirements in their annual reports in line with the S-K regulation – a regulation under the US Securities Act of 1933 (U.S. Securities and Exchange Commission, 2017). It requires the disclosure of environmental matters, such as environmental control expenditures and legal proceedings on environmental issues, as part of the US Securities Act of 1933 (Feller, 1995). Legal proceedings might regard potential monetary sanctions by governmental authorities, risk factors and physical impacts of climate change (Feller, 1995).

As of 2009 the GHG Mandatory Reporting Rule also requires suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions in the US, to submit annual reports to the Environmental Protection Agency (EPA) (United States Environmental Protection Agency, 2018). The collection of comprehensive, nationwide emissions data is intended to provide a better understanding of the sources of GHG emissions and to guide development of policies and programs to reduce emissions (United States Environmental Protection Agency, 2018).

In that vein, the U.S. Securities and Exchange Commission (SEC) issued a concept release in 2016, seeking public comments on 340 topics regarding disclosure requirements, including climate change and resource scarcity (Husch Blackwell, 2016). The US law firm Husch Blackwell (2016) states that these comments provide relevant feedback on the importance of ESG issues for investment and voting decisions.

2.3. Emergence and Key Concepts of IR

Despite a handful of integrated reports by “early movers” at the beginning of the 2000s, such as the Danish health care giant Novo Nordisk, it was not until 2004 that guidance on *Connected Reporting* of social, economic and environmental impacts was offered by the foundation of the Prince’s Accounting for Sustainability (A4S) Project in the UK (Eccles & Krzus, 2010). Another six years later the official governing body for IR, the Integrated Reporting Committee, which transitioned into the UK-based not-for-profit IIRC in 2011, was jointly formed by the GRI and the Prince’s A4S Project (Villiers et al., 2018).

The IIRC is a coalition of accounting experts, standard setters, companies, NGOs, investors, regulators and academics. The network was established with the aim of developing a common reporting framework which would help integrate existing reporting approaches and offer clear guidance to firms interested in IR (IIRC, 2019). After the release of a prototype framework, the IIRC conducted a two-year pilot program with more than 100 firms globally in 2011. The final principles-based IR framework was published in December 2013 and still represents the most important guiding document for about 1,600 companies that have published an integrated report according to the IIRC (Markham, 2018).

According to the framework, companies should follow seven guiding principles in its preparation and include eight content elements that are linked to each other. The majority of these content elements, such as *Governance* and *Strategy and Resource Allocation* or guiding principles, such as *Materiality* and *Reliability and Completeness* are common components and principles that define the content of sustainability reports in general (GRI, 2017). The guiding principle *Connectivity of Information* and content elements such as *Business Model*, however, are mostly unique to the IR approach. They recommend the establishment of connections between financial and non-financial information wherever possible as well as the depiction of the value creation process and business model of the company (IIRC, 2013c).

According to the IIRC (2013c), the company can create or destroy value for itself (e.g., through financial returns for investors) or society at large (e.g., through job creation). Such impacts are

expressed through increases, decreases or transformations of different forms of capitals (i.e. financial, natural, human, manufactured, intellectual, social and relationship capital) caused by the firm's activities and outputs (IIRC, 2013c). The IIRC (2013a) highlights that there is no reasonable way of measuring uni-dimensionally the organization's stocks or impacts with respect to all six capitals and interactions because of a missing common measurement unit.

Other approaches to IR, such as the US-based *One report* approach (Eccles & Krzus, 2010) subsist alongside the IIRC's definition, especially among US companies (e.g., Southwest Airlines). The IIRC and its framework are endorsed by the South African government as well as major accounting firms (e.g., Deloitte, 2011; E&Y, 2014; KPMG, 2015; PWC, 2015), professional accounting organizations (e.g., ACCA, 2017; CIMA, 2014) and standard setters (e.g., GRI, 2017; IIRC & IFRS Foundation, 2014). Endorsements were formulized through several Memoranda of Understanding (MoU) between the IIRC and most of the above-mentioned parties.

Whereas a more integrated form of corporate reporting has long been anticipated by sustainability reporting advocates (Pounder, 2011), financial reporting representatives also acknowledge the added value of integrated reporting alongside financial reports. However, the International Accounting Standards Board (IASB) highlights the need for it to remain a voluntary practice (International Financial Reporting Standards Foundation, 2016). The IASB is responsible for developing the International Financial Reporting Standards, a set of rules intended to harmonize the preparation of accounts and financial statements internationally. Although these have already replaced many different national accounting standards, the novel IR approach might further challenge report preparers as it adds to the number of standards to be considered. Günther et al. (2017) identified that practitioners fear the disclosure of ESG performance indicators alongside financial ones, as the former ones might have not reached the same degree of maturity as financial key performance indicators (KPIs) yet. They suggest that this might lead to the usage of IR internally, instead of external integrated reports.

The reconciliation of different standards and formats as well as parties involved in the development and proliferation of the reporting approach might represent just as big of a challenge as bringing together different target groups that require varying information through an integrated report (Rowbottom & Locke, 2013). Despite the above-mentioned collaborations, differences remain between the IIRC, the South African or the One Report approaches. Companies increasingly consolidate their financial and non-financial information in internal and external reporting without even calling it integrated or adhering exclusively to the IIRC framework (Rodríguez, Correa, & Larrinaga, 2016). This leads to a great diversity in the nature, extent and motivation of the reporting

approach (Rowbottom & Locke, 2013). Hence, any study on IR needs to clarify which particular approach it refers to, although often the different approaches are not sufficiently held apart (Baboukardos & Rimmel, 2016; Günther & Schmiedchen, 2013). The following section provides an overview of these different approaches.

2.4. Different Types of IR

Despite the fact that the term *integrated reporting* is used to refer to a certain kind of corporate reporting, it actually reflects a variety of particular reporting approaches. These approaches share the aim of integrating financial and non-financial information, but important differences remain between them.

In line with the suggestion of Dumay, Bernardi, Guthrie and Demartini (2016), four IR approaches can be distinguished: *King Report on Governance for South Africa*, *One Report*, *IIRC pre-2013 guidelines* and *IIRC 2013 guidelines*. As summarized in Table 1, major differences exist between the reporting approaches in terms of their governance focus, level of integration and the target group. This section provides a short overview on these approaches and the differences between them.

Table 1

Differences in IR Approaches

Approach	Governance focus	Level of integration	Target group
IIRC pre-2013 guidelines (IIRC, 2011)	No emphasis of governance-related issues	Demonstrate interactions between financial and CSR-related information in a single document	Primarily investors, but also other stakeholders
IIRC 2013 guidelines (IIRC, 2013c)	No emphasis of governance-related issues	Demonstrate interactions between financial and CSR-related information either in a standalone report or be included as a distinguishable, prominent and accessible part of another report	Primarily investors, but also other stakeholders
One Report (Eccles & Krzus, 2010)	No emphasis of governance-related issues	Recommends a single document which includes financial and non-financial information and their impact on each other	All stakeholders

King III Report on Governance for South Africa 2009 (The South African Institute of Chartered Accountants, 2012)	Prescribes the provision of a corporate governance framework alongside sustainability issues which have an impact on the business and its financial performance	South African companies under King III are able to attach their CSR reports to their financial statements (Zhou et al., 2017)	All stakeholders
--	---	---	------------------

Note. Adapted from Dumay, J., Bernardi, C., Guthrie, J., & Demartini, P. (2016). Integrated Reporting: A structured literature review. *Accounting Forum*, (40): 166-185.

Whereas One Report and the IIRC’s guidelines do not emphasize governance-related issues as much, King III prescribes the provision of a corporate governance framework alongside sustainability issues which have an impact on the business and its financial performance (Dumay et al., 2016).

In line with the previously mentioned lack of specifications on the level of *Integration*, Zhou et al. (2017) observed that South African companies under King III are able to attach their CSR reports to their financial statements and call it IR. Those adopting the IIRC’s guidelines, on the other hand, need to demonstrate interactions between financial and CSR-related information in a single document. As the name suggests, One Report similarly recommends a single document which includes financial and non-financial information and their impact on each other.

The target group of integrated reports under King III and One Report are all stakeholders (Dumay et al., 2016). Whereas the IIRC pre-2013 guidelines also regarded investors and other stakeholders as the intended audience (IIRC, 2011), this has changed in the final IIRC framework of 2013 by stating that “the primary purpose of an integrated report is to explain to providers of financial capital how an organisation creates value over time” (IIRC, 2013c, p. 4). Allegations that IR pushes sustainability considerations into the market place and privileges market concerns forms the basis of IR criticism (e.g., van Bommel, 2014).

Günther, Herrmann and Lange (2017) found that five years after the publication of the first and only framework on the key concepts, building blocks and „how-tos“ of IR by the IIRC, the speed with which companies pick up the reporting format seems to be decreasing. The researchers have discovered that a lack of urgency and appreciation for the relevance of non-financial KPIs for controlling purposes act as confounding factors in the decision to adopt IR.

Other factors that determine this decision to adopt IR and empirical evidence of its implications is examined by means of a comprehensive literature review in the following sections.

3. Reviewed Determinants and Implications of IR

A review of literature on the determinants and implications of IR lays the foundation for an in-depth analysis of its impact on ESG performance in two respects. First, it sheds light on the reasons for adopting IR in section 3.2. By providing an overview of empirical studies on country-, industry- and organizational-specific determinants, the different strategic considerations as well as institutional pressures regarding the decision to engage in IR become apparent.

Second, the review presents all researched internal and external implications of IR for the organization in sections 3.3.1. and 3.3.2. Whereas internal implications have a direct effect on the company's information management, processes and strategy, external implications indirectly influence the organization, for example through its stakeholder relations. The systematic depiction of these implications outlines those potential effects of IR that might act as mediators in the direct relationship between the reporting approach and ESG performance. It further equips the reader with all relevant empirical insights on whether the expected benefits of IR could be confirmed or rejected. Section 3.3.4. then presents the sparse amount of research studies on the direct relation between IR and financial as well as ESG performance indicators.

Lastly, section 3.4. discusses the review's findings and its implications for the subsequent empirical study in chapter 4. The following paragraphs specify the methodological approach according to Denyer and Tranfield's (2011) proposal of a systematic review.

3.1. Literature Review Method

Systematic reviews are a distinct type of reviews that differ from quantitative meta-analyses or purely narrative reviews. Denyer and Tranfield (2011) stress the importance of rigor and reliability in a systematic review process. The authors suggest that it should provide high quality evidence that is designed to inform decision-making in evidence-based practices. They identify four core principles for locating, selecting and synthesizing evidence on the respective subject matter. In this vein, reviews should be *transparent*, *inclusive*, *explanatory*, and *heuristic*. The following paragraphs elaborate on how the underlying review meets each of these criteria.

The first principle requires transparency regarding the construction of the sample of studies. Relevant empirical studies have been identified by searching the international databases EBSCO, SSRN, Google Scholar and Science Direct. The search comprised one of the following keywords that had to be included in the title: "integrated reporting", "integrated report", "integrated thinking", or "International Integrated Reporting Council". The focus was placed on empirical studies with either

a worldwide (e.g., Jensen & Berg, 2012) or country-specific (e.g., Haji & Anifowose, 2016) sample of IR adopters. These studies include single (e.g., Beck, Dumay, & Frost, 2015) or multiple case (e.g., Adams, Potter, Singh, & York, 2016) company observations, questionnaires (e.g., Steyn, 2014) and interviews with preparers or readers of integrated reports (e.g., Burke & Clark, 2016). The recency of the concept and sparse amount of empirical data guarantees the timeliness of studies that are not older than six years. The initial sample includes 22 studies on the determinants as well as 57 studies on the implications of IR.

This sample was further reduced by following the principle of inclusivity and identifying relevant studies based on a fit-for-purpose criterion (Denyer & Tranfield, 2011). Specifically, and in line with this review’s focus on determinants and implications of IR, studies on other aspects of IR were excluded. For example, research on the preparation of an integrated report, challenges of IR, or an analysis of the IIRC framework and its differences with other frameworks, are not relevant.

Only those articles published in a journal rated in VHB-JOURQUAL3, a journal ranking list compiled by the German Academic Association for Business Research (VHB), have been examined to warrant a high quality of reviewed articles. In addition to studies from peer-reviewed journals, working papers that were published during the last three years were also included. High-quality working papers are generally published within a time-frame of three years, which is why older papers have not been considered.

Eventually, the sample includes ten studies on the determinants and 36 studies on the implications of IR, of which two and six are working papers respectively. Table 2 presents the distribution of these studies across the levels of analysis in this review, publication year and journal rank.

Table 2

Cited Publications per Level of Analysis, Year and VHB-JOURQUAL3 Rank

Year	Determinants				Implications			Total
	Country	Industry	Organization	Internal	External	Direct		
2017			2xWP	1xA; 2xB; 1xC, 1xWP	1xA; 1xB; 1xC; 2xWP	1xA; 2xWP	15	
2016	1xB; 1xC	1xB; 1xC	1xB; 1xC	3xB; 3xC; 1xWP	2xB; 2xC; 1xWP	2xC; 1xWP	21	
2015	1xC	1xC	1xC	3xB; 3xC	2xB; 2xC	2xB	15	
2014		1xB	1xB	3xB; 2xC	2xC		9	
2013	2xB	1xB	2xB; 1xC	1xC			7	
2012	1xB						1	
Total	6	5	9	24	16	8	68	

The subsequent analysis, especially the summary tables, address the third core principle identified by Denyer and Tranfield (2011). They represent an explanatory and interpretive synthesis that goes beyond a mere description of evidence. In that vein, after screening all relevant studies and their findings that were collected in a data extraction form in Microsoft Excel, different categories of determinants and implications to which each study could be assigned were inductively developed. That way, the studies' results are systematically organized to illustrate differences and connections between the reviewed studies, and to facilitate generalizations and conclusions. As a result of this systematic literature review and based on the inductive development of respective categories, figure 1 was drawn to offer the frame of reference of the review.

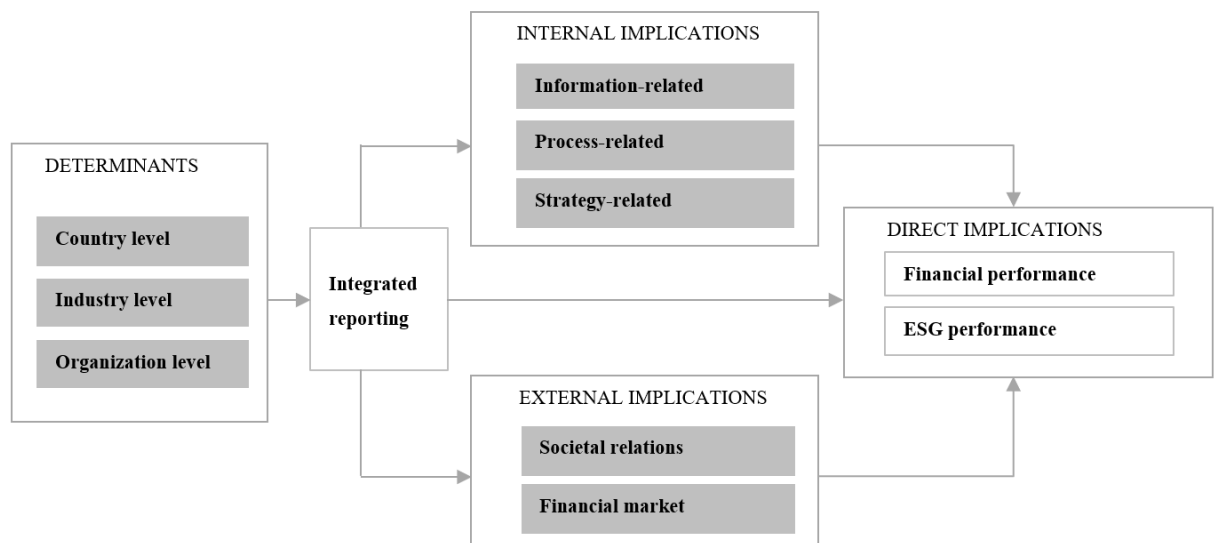


Figure 1. Reference Frame. Own model.

The first part of the review discusses studies on the determinants that influence the adoption of IR. Next, company as well as stakeholder-related implications of IR are presented. Empirical evidence on these implications allows for a more profound understanding of how exactly IR may affect a company's ESG and financial performance. Internal implications are either information-, process- or strategy-related, whereas external implications can refer to societal relationships or financial markets. Lastly, the direct relation between IR and the organization's financial and ESG performance is investigated.

Apart from the depiction of different determinants and implications by category, each study's method, dependent variable and theoretical approach is also specified. Many of the studies reviewed below simply observe whether or not a given company publishes an integrated report (e.g., Vaz, Fernandez-Feijoo, and Ruiz, 2016). The authors either checked by themselves whether an integrated report was

present, or they coded companies based on reporting databases such as the GRI Sustainability Disclosure Database. When studies go beyond the absent/present dichotomy, they assess the quality of integrated reports through content analysis with self-developed indices, or through ratings provided by investment and accounting firms (i.e. RobecoSAM, Ernst & Young) (e.g., Arguelles, Balatbat, and Green, 2017). Such indices and ratings are partly based on the content elements and guiding principles defined by the IIRC. As IR is obligatory for companies listed on the JSE and recommended by regulation in South Africa and Australia, those are the most popular countries from which company reports are sampled. A variety of theoretical approaches inform the reviewed studies with legitimacy theory being a very prominent one (e.g., Lai, Melloni, and Stacchezzini, 2016). By assuming that voluntary disclosures intend to demonstrate the company's alignment with societal values and expectations (Preston & Post, 1981; Suchman, 1995), legitimacy theory offers great potential in explaining the relation between a company's disclosure strategy and factors such as the information presentation within the report or capital market implications.

Finally, in line with Denyer and Tranfield's (2011) last principle, the concluding section of the review chapter summarizes the findings and identifies gaps that have motivated the research aim and method of the subsequent empirical study. Relevant insights for regulators are also outlined.

3.2. Determinants of IR

Determinants are categorized according to their level of analysis, based on whether they regard country-specific, industry-specific or organizational aspects. Country level characteristics such as cultural values, national laws and economic conditions have an effect on a company's corporate culture, governance structures and, ultimately, the extent and quality of its disclosures. Industry level factors, especially industry affiliation, are also likely to explain the uptake of IR. For example, certain industries are pressured to disclose more information than others. Organizational characteristics such as profitability or size also influence the decision to adopt IR within the company. Accordingly, profitable and large firms are more likely to engage in IR than less profitable or smaller ones, because they have the necessary financial and human resources.

3.2.1. Overview and Prevalent Research Approaches

Table 3 presents an overview of studies on the determinants of IR, their results, method, theoretical approach as well as operationalization of the presence and quality of IR.

Table 3

Country, Industry and Organizational Level Determinants

Level	Determinant	(Result) Reference	Method/ Sample/ Year(s)	Dependent variable/ Operationalization	Theoretical approach
Country level	Level of power distance, uncertainty avoidance & long- vs. short-term orientation in national culture	(0) García-Sánchez, Rodríguez-Ariza, and Frías-Aceituno (2013)	Archival/ 1590 companies worldwide/ 2008-2015	Presence (1) or absence (0) of IR	Stakeholder theory
	Level of collectivism in national culture	(+) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	Level of femininity in national culture	(+) García-Sánchez, Rodríguez-Ariza, and Frías-Aceituno (2013)	Archival/ 1590 companies worldwide/ 2008-2013	Presence (1) or absence (0) of IR	Stakeholder theory
		(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	Prevalence of secular-rational values	(+) Jensen and Berg (2012)	Archival/ 204 companies worldwide/ 2009	Presence (1) or absence (0) of IR, example companies in Eccles & Krzus (2010)	Institutional theory
	Level of national corporate responsibility	(+) Jensen and Berg (2012)			
	Region	(0) Lai, Melloni, and Stacchezzini (2016)	Archival/ 52 IIRC pilot program (PP) members & 52 non-IR reporters/ 2009-2011	Presence (1) or absence (0) of IR	Legitimacy theory
		(+) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory

	(-) Sierra-García, Zorio-Grima, and García-Benau (2015)	Archival/ 7344 company-year observations from GRI database/ 2009-2011	Presence (1) or absence (0) of IR	Not specified
Level of economic development	(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	(+) Jensen and Berg (2012)	Archival/ 204 companies worldwide/ 2009	Presence (1) or absence (0) of IR, example companies in Eccles and Krzus (2010)	Institutional theory
Civil law political system	(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	(+) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013b)	Archival/ 750 companies worldwide/ 2008-2010	Presence (1) or absence (0) of IR	Institutional theory
Degree of market coordination	(+) Jensen and Berg (2012)	Archival/ 204 companies worldwide/ 2009	Presence (1) or absence (0) of IR, example companies in Eccles and Krzus (2010)	Institutional theory
	(+) Jensen and Berg (2012)			
Strength of investor protection laws	(-) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	(+) Jensen and Berg (2012)			
Degree of ownership dispersion	(+) Jensen and Berg (2012)	Archival/ 204 companies worldwide/ 2011	Presence (1) or absence (0) of IR, example companies in Eccles and Krzus (2010)	Institutional theory
Share of private expenditures for tertiary education	(+) Jensen and Berg (2012)			

	Trade union density	(+) Jensen and Berg (2012)			
	Strength of employment protection laws	(-) Jensen and Berg (2012)			
Industry level		(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
		(+) Lai, Melloni, and Stacchezzini (2016)	Archival/ 52 IIRC pilot program members & 52 non-IR reporters/ 2009-2011	Presence (1) or absence (0) of IR	Legitimacy theory
	Industry-affiliation	(0) Frias-Aceituno, Rodríguez-Ariza, and García-Sánchez (2014)	Archival/ 1590 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Agency theory, Signalling theory, Theory of political costs
		(-) Sierra-García, Zorio-Grima, and García-Benau (2015)	Archival/ 7344 observations from GRI database/ 2009-2011	Presence (1) or absence (0) of IR	Institutional theory
		(+) García-Sánchez, Rodríguez-Ariza, and Frías-Aceituno (2013)	Archival/ 1590 companies worldwide/ 2008-2011	Presence (1) or absence (0) of IR	Stakeholder theory
	Monopoly position	(-) Frias-Aceituno, Rodríguez-Ariza, and García-Sánchez (2014)	Archival/ 1590 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Agency theory, Signaling theory, Theory of political costs
	Presence of GRI industry supplement	(+) Sierra-García, Zorio-Grima, and García-Benau (2015)	Archival/ 7344 observations from GRI database/ 2009-2011	Presence (1) or absence (0) of IR	Institutional theory
Organizational level	Profitability	(0) Lai, Melloni, and Stacchezzini (2016)	Archival/ 52 IIRC pilot program members & 52 non-IR reporters/ 2009-2011	Presence (1) or absence (0) of IR	Legitimacy theory
		(+) Frias-Aceituno, Rodríguez-Ariza, and García-	Archival/ 1590 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Agency theory, Signalling theory, Theory of political costs

	Sánchez (2014)			
	(+) García-Sánchez, Rodríguez-Ariza, and Frías-Aceituno (2013)	Archival/ 1590 companies worldwide/ 2008-2011	Presence (1) or absence (0) of IR	Stakeholder theory
	(0) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013a)	Archival/ 568 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Stakeholder theory, Agency theory
	(+) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013b)	Archival/ 750 companies worldwide/ 2008-2010	Presence (1) or absence (0) of IR	Institutional theory
	(+) Arguelles, Balatbat, and Green (2017)	Archival/ 960 company-year observations worldwide/ 2011-2013	Self-developed score for level of integration based on Asset4 proxies for IIRC CE and capitals	Signalling theory
	(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	(0) Lai, Melloni, and Stacchezzini (2016)	Archival/ 52 IIRC pilot program members & 52 non-IR reporters/ 2009-2011	Presence (1) or absence (0) of IR	Legitimacy theory
Firm size	(+) Sierra-García, Zorio-Grima, and García-Benau (2015)	Archival/ 7344 observations from GRI database/ 2009-2011	Presence (1) or absence (0) of IR	Institutional theory
	(+) Arguelles, Balatbat, and Green (2017)	Archival/ 960 company-year observations worldwide/ 2011-2013	Self-developed score for level of integration based on Asset4 proxies for IIRC CE and C	Signalling theory
	(+) Frías-Aceituno, Rodríguez-Ariza, and García-	Archival/ 1590 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Agency theory, Signalling theory, Theory of political costs

	Sánchez (2014)			
	(+) García-Sánchez, Rodríguez-Ariza, and Frías-Aceituno (2013)	Archival/ 1590 companies worldwide/ 2008-2011	Presence (1) or absence (0) of IR	Stakeholder theory
	(+) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013a)	Archival/ 568 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Stakeholder theory, Agency theory
ESG disclosure score	(+) Lai, Melloni, and Stacchezzini (2016)	Archival/ 52 IIRC pilot program members & 52 non-IR reporters/ 2009-2011	Presence (1) or absence (0) of IR	Legitimacy theory
Board diversity (foreign background & women)	(+) Frías-Aceituno et al. (2013a)			
Board size	(-) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013a)	Archival/ 568 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Stakeholder theory, Agency theory
Board independence	(0) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2014)	Archival/ 1590 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Agency theory, Signalling theory, Theory of political costs
Business growth opportunities (market to book value ratio of corporate assets, business activity etc.)	(+) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013a)	Archival/ 568 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Stakeholder theory, Agency theory
	(-) García-Sánchez, Rodríguez-Ariza, and Frías-	Archival/ 1590 companies worldwide/ 2008-2011	Presence (1) or absence (0) of IR	Stakeholder theory

	Aceituno (2013)			
Stock exchange listing	(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
Leverage	(0) Lai, Melloni, and Stacchezzini (2016)	Archival/ 52 IIRC pilot program members & 52 non-IR reporters/ 2009-2011	Presence (1) or absence (0) of IR	Legitimacy theory
Number of analyst following	(+) Wachira, Berndt, and Martinez (2017)	Archival/ 174 SA companies/ 2014	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
CSR report assurance	(0) Vaz, Fernandez-Feijoo, and Ruiz (2016)	Archival/ 1449 companies from GRI database/ 2012	Presence (1) or absence (0) of IR	Institutional theory, Stakeholder theory
	(+) Sierra-García, Zorio-Grima, and García-Benau (2015)	Archival/ 7344 observations from GRI database/ 2009-2012	Presence (1) or absence (0) of IR	Institutional theory
	(0) García-Sánchez, Rodríguez-Ariza, and Frías-Aceituno (2013)	Archival/ 1590 companies worldwide/ 2008-2011	Presence (1) or absence (0) of IR	Stakeholder theory
	(0) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013b)	Archival/ 750 companies worldwide/ 2008-2010	Presence (1) or absence (0) of IR	Institutional theory
	(0) Frías-Aceituno, Rodríguez-Ariza, and García-Sánchez (2013a)	Archival/ 568 companies worldwide/ 2008-2010	Issuance of only financial statement (0), CSR report (1) or IR (2)	Stakeholder theory, Agency theory

Note. Study results presented in column “Result (Reference)” either identified no link or relationship (0) between IR and the respective dimension of implication, an existing or positive relationship (+) or a negative (-) relationship. The IIRC’s Guiding Principles are abbreviated with GP, Content Elements with CE, Capitals with C and Pilot Program with PP.

Applying the previously specified quality criteria to the selection of studies on the determinants of IR yielded archival research studies only. These studies’ samples either consist of those companies that participated in the IIRC pilot program (e.g., Lai et al., 2016), or those that are listed in the IIRC or

GRI reports databases (e.g., Vaz et al., 2016). Some studies even base their analysis on larger, worldwide samples (e.g., Frías-Aceituno et al., 2013a). Studies that investigate factors that promote the implementation of IR mostly use a binary dependent variable (e.g., Vaz, Fernandez-Feijoo, and Ruiz, 2016). That is, they simply observe the presence or absence of an integrated report in a company and assign values 1 or 0 respectively. Frías-Aceituno et al. (2013a; 2013b) further discriminated between the issuance of only a financial statement, a CSR report or an integrated report to allow for a more differentiated analysis.

Most studies on the determinants of IR are informed by either socio-political theories (e.g., Lai, Melloni, and Stacchezzini, 2016), or draw upon the economics-based voluntary disclosure assumptions (e.g., Frias-Aceituno, Rodríguez-Ariza, and Garcia-Sánchez, 2014). Socio-political theories, such as legitimacy, stakeholder or political economy theory, predict a positive relationship between disclosure and performance with the central premise that organizations will disclose more when information is favorable rather than unfavorable to them (Dye, 1985; Verrecchia, 1983). Economics-based theories, such as agency, signaling or proprietary cost theory, support the notion that the extent of disclosure is a result of pressure on weak environmental or social behavior resulting in a negative relation between the level of disclosure and performance (Gray, Kouhy, & Lavers, 1995; Patten, 2002). Hence, both strands of theory offer differing explanations for the relation between ESG disclosure and performance. These can be transferred to IR, providing reasons for how and why ESG performance influences the extent and quality of integrated reports, as discussed by means of empirical evidence in the next sections.

3.2.2. Country Level Determinants

There are several factors on the country level that influence a firm's propensity to engage in IR. Stakeholder theory offers a theoretical perspective for the analysis of these factors by assuming an implicit contract between society and the company. Here, the company uses up natural and other forms of resources to create wealth for a diverse set of stakeholder groups (e.g., in the form of goods and services or job generation) (Hess, 2008). Based on this contract, the company's success depends upon the effective management of its various stakeholder groups that have a legitimate interest in corporate activities (Donaldson & Preston, 1995). Gray, Kouhy and Lavers (1995) highlight that legitimacy and stakeholder theory are overlapping perspectives that inform political economy theory. In a similar vein, political economy theory assumes that there exists an implicit social contract between organizations and those affected by its actions (Ramanathan, 1976), which is why they voluntarily release information in order to maintain their position in society (Williams, 1999).

Against the background of these theories, IR might serve as a tool to inform a diverse set of stakeholders about social and environmental matters. As their expectations of corporate behavior strongly depend on a variety of norms and values inherent in local culture (Carroll, 1979), such cultural conditions might influence the decision of whether or not to adopt IR (García-Sánchez et al., 2013).

An investigation by García-Sánchez et al. (2013) on the influence of a country's cultural system based on Hofstede's (1980) classification of different cultural dimensions showed that neither the level of power distance, uncertainty avoidance nor long- vs short-term orientation had an influence on the uptake of IR.¹¹ However, a high level of collectivism and femininity in the underlying cultural system increased the probability of the company publishing an integrated report.¹² Hofstede's dimension of individualism/collectivism expresses the prevalence of individual versus group values. As the company is influenced by a stronger commitment to society in collectivist countries, it is also more willing to disclose information about its impact on this society (Vaz et al., 2016). García-Sánchez et al. (2013) suggest that companies in female-oriented countries are more likely to publish an integrated report based on their long-term goal of improving the overall quality of life compared to male-oriented countries that are more assertive and focused on material success.¹³

In addition, the prevalence of secular-rational values (e.g., an interest in politics) as opposed to traditional values (e.g., based on religion or national pride) also influences the adoption of IR positively (Jensen & Berg, 2012). This might be due to secular-rational societies exhibiting a greater sense of responsibility (Inglehart, 2011). In this vein, an investigation of the impact of national corporate responsibility found a positive relationship (Jensen & Berg, 2012).¹⁴ Three studies have investigated the relation between a company's geographical region and IR and identified a negative (Sierra-García et al., 2015), positive (Vaz et al., 2016) and no relation (Lai et al., 2016). These dissimilar results might be explained by the different samples of IR adopters. Whereas Sierra-García et al. (2015) included 7344 company-year observations from six regions around the world in their sample, Lai et al. (2016) compared 52 IIRC pilot program members to 52 companies that did not

¹¹ Power distance indicates the acceptance of unequal power distribution by less powerful members. Uncertainty avoidance describes societal members are (un)comfortable with uncertainty, whereas long- vs. short-term orientation expresses the encouragement of societal change or a preference for time-honored traditions (Hofstede, 1980).

¹² Collectivist countries include Indonesia, China or Mexico; Individualistic countries are Germany, the U.S. or Australia (Hofstede, 1980).

¹³ Masculine countries are Japan, Hungary and Mexico; Feminist countries include Sweden, Chile or South Korea (Hofstede, 1980).

¹⁴ The score is based on an international assessment of the state of corporate responsibility by Account Ability, the Environmental Performance Index (EPI) by Yale University and Human Development Index (HDI) by the UNDP (Hofstede, 1980).

publish an integrated report. Although the latter sample is much smaller, it is more representative than the former one which is based on a self-declaration of IR by companies without ensuring minimum requirements for the level of integration of the report.

Apart from national culture affecting stakeholder expectations and ultimately the decision to adopt IR, other national factors (e.g., degree of market coordination or ownership dispersion) might also have an effect on this decision. As organizations and their adoption of instruments and structures are strongly influenced by their institutional context (Meyer & Rowan, 1977), the spread of IR might be attributed to institutional pressure through legislation, stakeholder expectations or competition (Walgenbach & Beck, 2003). For example, legal reporting specifications that prioritize share- over stakeholder concerns represent such institutional aspects that have an influence on the decision to engage in IR. Institutional theory seeks to explain conformity and standardization among companies through the broader political and social structures within which organizations exist (DiMaggio & Powell, 1983).

The level of economic development, for instance, affects the capacity for innovation within companies. In this respect, companies from countries with higher economic development are more likely to adopt new management instruments, such as IR, than less developed countries. While Jensen and Berg (2012) found evidence for this association, a more recent study could not identify this effect (Vaz et al., 2016).

Another factor that has been analyzed is the political system of the country in which a company is based. Here, researchers often distinguish between common law and code or civil law countries (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1996). Accordingly, common law countries are characterized by a weak political influence and a focus on company revenues as well as shareholder needs (La Porta et al., 1996). In contrast, code or civil law countries are characterized by a high degree of governmental intervention and stakeholder-orientation. Probably based on the fact that companies in civil law political systems are more sensitive to stakeholder interests, two out of three studies found a positive relation between such a system and the adoption of IR (Frías-Aceituno et al., 2013b; Jensen & Berg, 2012). Although the study by Jensen and Berg (2012) investigated the difference between traditional sustainability and IR, they also found that 70% of investigated integrated reports originated from a civil law country.

Jensen and Berg (2012) further identified six other institutional country level characteristics that could explain the decision to engage in IR. Firstly, the authors argue that a high degree of market coordination constitutes a stronger dependence of companies on a number of stakeholders rather than banks. The UK or the US are such market-based economies. Companies in countries with a lower

degree of market coordination, such as Germany and Japan, are more dependent on bank capital and need to provide banks with direct access to financial data. While bank-based economies might reduce the need for external communication in the form of IR, powerful stakeholder groups in market-based economies require ESG alongside financial information (Jensen & Berg, 2012). This might increase the probability of a company publishing an integrated report.

Secondly, countries with strong investor protection laws exert pressure on companies to meet shareholder needs, possibly driving the adoption of IR (Jensen & Berg, 2012). A high degree of ownership dispersion as compared to ownership concentration illustrates a third institutional condition that favors the publication of an integrated report. Jensen and Berg (2012) argue that in a situation of ownership concentration a few dominating owners, such as in family-controlled companies, usually get the information directly from the company and are not dependent on published information. According to the authors, higher ownership dispersion therefore favors the publication of an integrated report, because of a general demand for information.

Fourthly, companies with a higher share of private expenditure for tertiary education are more likely to adopt innovative management techniques sooner than others and therefore publish an integrated report (Jensen & Berg, 2012). Jensen and Berg (2012) interpret the involvement in tertiary education, such as through corporate universities, as a strong interest in new research findings and management know-how. In their view, the degree of employee involvement in employment-related company decisions reflects a corporate culture and value system that takes into account other interests than those of shareholders. Thus, the fifth factor, a higher density of trade unions, increases the probability of engaging in IR (Jensen & Berg, 2012). Lastly, they also found that this probability is lower in countries with weaker employment protection laws, contrary to the authors' expectations.

3.2.3. Industry Level Determinants

On the industry level, three factors encouraging the uptake of IR have been investigated so far: a company's specific industry, the presence of a GRI industry supplement, and a company's monopoly position.

Firstly, industry affiliation seems to affect the adoption of IR insofar as certain industries are more exposed to public scrutiny than others (Cho, Freedman, & Patten, 2012; Cho & Patten, 2007). Companies in environmentally sensitive industries, such as the chemicals or energy sector, are expected to suffer from more stakeholder and regulatory pressure than those with lower environmental impacts, such as the service sector (Bowen, 2000). Such pressure heightens the demand for disclosure on corporate ESG performance. The previously mentioned institutional context

does not only regard country-specific factors, but also industry-related structures and norms with which an organization has to conform in order to maintain legitimacy and survive. Hence, companies within the same industry might adopt similar norms and behaviors, such as the publication of an integrated report under what is called institutional mimetic isomorphism (DiMaggio & Powell, 1983). Two studies found such an industry effect (García-Sánchez et al., 2013; Lai et al., 2016). In that vein, Lai et al. (2016) discovered that those industries classified as *basic materials*, *industrials* and *financials* are more likely to adopt IR than others.

Secondly, Sierra-García et al. (2015) found a positive relation between the presence of a GRI industry supplement and the adoption of IR. The GRI publishes sector supplements with sector-specific issues that are not covered in the general reporting guidelines, such as for the *mining and metals*, *oil and gas* or *financial services* sector (GRI, 2016). In line with the previously mentioned exposure to public scrutiny by certain industries, the fact that an industry needs supplementary advice on their social and environmental issues might imply they are operating in a critical industry and therefore engage in more extensive external reporting.

Thirdly, Frias-Aceituno et al. (2014) found a negative relation between a company's monopoly position and the adoption of IR. The notion that firms in less competitive industries have higher proprietary costs and therefore disclose less information to protect the abnormal profits derived from this position (e.g., Botosan & Stanford, 2005) seems to hold true.¹⁵ As competition increases, however, they disclose more information to reduce information asymmetries (Bilson, Birt, Smith, & Whaley, 2006). On the contrary, the argument that increased competition yields less corporate disclosure as it could harm the competitive position of the company (e.g., Verrecchia, 1983; Wagenhofer, 1990) is not supported (Frias-Aceituno et al., 2014).

3.2.4. Organizational Level Determinants

Profitability might be a determinant of IR on the organizational level, since more profitable firms can devote more resources to the production of information and disclosure of such (Frías-Aceituno et al., 2013a). Slack resources theory suggests that those firms with higher financial returns have more discretionary resources available for CSR- or disclosure-related activities (Miles & Covin, 2000). Four studies found such a positive relation between profitability and IR (Arguelles et al., 2017; Frias-Aceituno et al., 2014; García-Sánchez et al., 2013; Frías-Aceituno et al., 2013b), whereas two did not find a significant relation at all (Frías-Aceituno et al., 2013a; Lai et al., 2016). Five studies further

¹⁵ Verrecchia (1983) equates proprietary costs with disclosure-related costs beyond the preparation and dissemination of information. In that regard, proprietary costs also include costs associated with the publication of information that is potentially damaging to the organization.

detected a positive relation between the adoption of IR and firm size (Arguelles et al., 2017; Frias-Aceituno et al., 2014; García-Sánchez et al., 2013; Frías-Aceituno et al., 2013b; Sierra-García et al., 2015). Firm size plays a role when deciding on the amount of ESG information to disclose. Larger firms tend to interact more with society, attract greater political and external pressure and therefore engage in more extensive voluntary disclosure (Brown & Deegan, 1998). Only two studies (Lai et al., 2016; Vaz et al., 2016) identified firm size as insignificant in the decision to adopt IR.

The relation between a company's ESG performance and disclosure is a prominent topic for research. In line with voluntary disclosure theory that predicts a positive relation (e.g., Dye, 1985; Verrecchia, 1983), a company's Bloomberg ESG disclosure rating score is also positively related to IR (Lai et al., 2016). Such a behavior can be explained through the following three assumptions. Firstly, increased transparency conveys a signal to the market and reduces information asymmetries for relevant stakeholders (e.g., Baiman & Verrecchia, 1996). In line with signaling theory it is generally advantageous for the firm to reduce the information asymmetry component of the cost of capital through extensive disclosure. The decreased information risk for investors when forecasting future payoffs lowers the company's costs of capital and therefore increases the value of the firm (Healy & Palepu, 2001).

Secondly, the principal-agent relationship is marked by an imbalance of power as managers have incentives to strategically release or withhold information (Heckerman, 1975). Agency theory encourages the disclosure of information as it reduces the agency costs arising from conflicts of interest between managers and external stakeholders, and enables them to supervise managerial actions (Jensen & Meckling, 1976).¹⁶

Thirdly, in line with the theory of proprietary costs, a company with a superior social performance can differentiate itself from the competition through the communication of this performance in a sustainability report. Such a competitive advantage will lower the cost of equity capital (Dhaliwal, Li, Tsang, & Yang, 2011), companies face lower capital constraints and have a better access to finance as a result (Cheng, Ioannou & Serafeim, 2014). However, the disclosure of proprietary information can also act as a competitive disadvantage (Verrecchia, 1983). Such a competitive disadvantage might occur when rivals prejudice the company's future market position, or if the disclosure increases the chance of attacks and sanctions of regulators or activist groups (Li, Richardson, & Thornton, 1997). By analyzing 11,187 firm-year observations across 60 countries from 2006 to 2010, Ott, Schiemann

¹⁶ Jensen and Meckling (1976) define agency costs as (1) the monitoring expenditures by the principal, such as through the control of budget restrictions, compensation policies or operating rules, (2) the bonding expenditures by the agent and (3) the residual loss as dollar equivalent of the divergence between the welfare reduction of the principal and the agent's decisions.

and Günther (2017) found that proprietary costs arising from a highly competitive environment limit the willingness of managers to disclose details on the performance data and value creation.

Regarding IR, Frías-Aceituno et al. (2013a) identified a positive relation between board diversity, size and the probability to engage in the reporting format.¹⁷ They argue that a larger and more diverse board of directors enhances its overall expertise, which positively influences the breadth and integration of corporate information. The authors further found that a greater independence of the board does not drive IR.¹⁸ An independent board is of key importance to control management actions and ensure the fulfillment of shareholder interests. If the information through integrated reports is somehow disadvantageous to shareholders, it might not be disclosed. Vaz et al. (2016) found that stock exchange listing is not related to the adoption of IR. Similarly, the argument that firms with higher leverage might want to engage in IR, in order to meet the informational needs of lending institutions according to legitimacy theory, could also not be supported (Lai et al., 2016).

Ambiguous results were reached with regard to the firm's growth opportunities measured as market to book value. Higher market to book values require a more extensive disclosure in order to reduce information asymmetry (Frías-Aceituno et al., 2013a). Frías-Aceituno et al. (2013a) found a positive relationship, suggesting that business expansion goes hand in hand with improved accountability demanded by investors or politicians. When the researchers repeated the same study with a sample three times larger, they found no significant relation (Frías-Aceituno et al., 2014). García-Sánchez et al. (2013) even found a negative relation. Despite the fact that the researchers look at reports from a longer period (i.e. 2008-2011 as compared to 2008-2010), they base their dependent value (the presence of IR) solely on the report database provided by the GRI in which companies self-declare whether they engage in IR or not. Frías-Aceituno et al. (2014; 2013a), on the other hand, examined whether the company issued only a financial statement, CSR report or integrated report by hand. Lastly, studies examining the link between the assurance of the company's CSR report and the introduction of IR yielded no clear results. Only one out of five studies found a positive link (Sierra-García et al., 2015).

¹⁷ Board diversity is expressed as the disparity of characteristics of its members, i.e. presence of foreigners, gender diversity.

¹⁸ The percentage of non-executive directors on the board is used as a proxy to determine the independence of the board.

3.3. Implications of IR

3.3.1. Overview and Prevalent Research Approaches

Next to identifying the determinants of IR, the review's main purpose is to identify the implications that IR has on the reporting firm and its stakeholders. In line with this purpose, the following section discusses various empirical studies on such implications. A thorough understanding of the internal and external implications of IR is important for an evaluation of the overall consequences of IR in terms of a company's financial and sustainability performance. This is because such internal and external implications mediate any potential link between IR and company performance. For instance, the enhanced collaboration between departments might foster integrated thinking and the inclusion of non-financial information in managerial decision-making. This could have strategic implications within and outside the organization and further affect its financial or ESG performance.

The previous sections mainly draw upon either socio-political or economics-based voluntary disclosure theory to explain how IR is affected by country, industry and organizational determinants. Empirical research on its implications, however, generally assumes a reversed causation. Instead of performance having an influence on disclosure, IR as a novel disclosure format might also influence performance through changes in processes or strategy. These assumptions are based on practice theory (Schatzki, 2005), Sztompka's (1999) theory of trust in relationships and Laughlin's (1991) model of organizational change. These theories are described in more detail in the following sections and are of great relevance for the underlying hypotheses in section 4.3.

Based on a review of 36 empirical studies, a total of 24 implications of IR were identified. Internal and external implications are grouped into five sub-categories: non-financial information, processes, and strategy-related internal implications; and societal relations and market-related external implications. Direct relations are investigated with regard to market value, stock liquidity, share price, earnings valuation coefficient, economic performance as well as ESG performance score. These categories may not be exhaustive, but they represent the most frequently investigated implications of IR. Table 4 presents an overview of studies on internal implications, their theoretical underpinnings and the methodological approaches used in each study.

Table 4

Internal Implications of IR

Dimension	Implication	(Result) Reference	Method/ Sample/ Year(s)	Independent variable/ Operationalization	Theoretical approach
Non-financial information	Connections between financial and non-financial information	(0) Haji and Anifowose (2016)	Archival/ Reports of 82 South African (SA) companies /2011-2013	Self-developed index with 52 items based on IIRC GP, IRC's SA GP and CE, King III recommendations and E&Y IR awards; weighted and un-weighted scoring method	Legitimacy theory
		(0) Veltri and Silvestri (2015)	Case study/ South African university/ 2013	IR quality based on IIRC CE	Stakeholder theory
		(+) Carels, Maroun and Padia (2013)	Archival/ Reports of 15 SA companies/ 2008-2012	Self-developed matrix with 21 axial codes based on report sections and 5 content codes based on GRI G3	Agency theory
		(+) Cortesi and Venay (2017)	Archival/ Reports of 636 companies worldwide/ 2003-2016	Presence (1) or absence (0) of IR	Not specified
	Data quality	(+) Burke and Clark (2016)	Archival/ 19 panel interviews at IR symposium/ 2014	Questions on future, preparation, legal and ethical implications and assurance of IR, and market for ESG information	Not specified
		Amount of non-financial information	(+) Setia, Abhayawansa, Joshi and Huynh (2015)	Archival/ Reports of 25 SA companies/ 2009-2012	Self-developed index with 37 items based on four IIRC capitals, Presence (1) or absence (0)
	(+) Carels, Maroun and Padia (2013)		Archival / Reports of 15 SA companies/ 2008-2012	Self-developed matrix with 21 axial codes based on report sections and 5 content codes based on GRI G3	Agency theory
	Level of assurance	(+) Haji and Anifowose (2016)	Archival/ Reports of 82 SA companies /2011 - 2013	Self-developed index with 52 items based on IIRC GP, IRC's SA GP and CE, King III recommendations and E&Y IR awards; weighted and un-weighted scoring method	Legitimacy theory

Processes	Collaboration across departments (basis of integrated thinking)	(+) Burke and Clark (2016)	Archival/ 19 panel interviews at IR symposium/ 2014	Questions on future, preparation, legal and ethical implications and assurance of IR, and market for ESG information	Not specified
		(0) Perego, Kennedy and Whiteman (2016)	Interviews/ 3 international IR experts & practitioners/ 2014	Questions on personal experience with IR, current state and future of IR and role of academia	Not specified
		(+) Beck, Dumay and Frost (2015)	Case study (2 interviews & archival)/ Australian company/ 2009-2013	Questions on the role and audiences of reporting, its determinants, external guidelines, internal reporting systems and processes, assurance and prospects	Legitimacy theory
		(+) Stubbs and Higgins (2014)	Interviews/ 23 managers in 15 Australian firms/ 2012	Questions on internal reporting processes and mechanisms	Laughlin's (1991) model of organizational change
		(+) Mio, Marco and Pauluzzo (2016)	Case study (10 interviews, field observations & archival) / Italian company/ 2014/2015	Questions on Management Control Systems and internal integrated report	Not specified
	Risk management	(+) Moloi (2015)	Archival/ Reports of Top 20 JSE listed companies/ 2013	Presence (1) or absence (0) of IR	Not specified
		(+) Steyn (2014)	Survey/ 50 SA managers responsible for IR/ 2013/2013	Questions on benefits and implementation challenges of IR and reasons for its production	Legitimacy theory, Stakeholder theory
	Effect on decision-making	(+) Barth, Cahan, Chen and Venter (2017)	Archival/ Reports of 100 SA companies/ 2011-2013	E&Y Excellence in IR awards mean score of three adjudicator's scores annually ranked into deciles	Agency theory
		(0) Chen, Jermias and Nazari (2016)	Experiment/ 154 US managers/	IR as one of six different reporting frameworks	Legitimacy theory
		(+) Adams (2017)	Interviews/ 7 SA and 9 Australian board chairs and non-executive directors/ 2015	Questions on role sustainability reporting and IR in creating value for companies	Llewellyn's level three and four theorising

	(+) Venter, Stiglingh and Smit (2017)	Archival/ Reports of 45 SA companies/ 2013	Integrated thinking based on Asset4 data (Corporate Governance: Vision and Strategy)	Theory of proprietary costs
	(0) Steyn (2014)	Survey/ 50 SA managers responsible for IR/ 2013/2013	Questions on benefits and implementation challenges of IR and reasons for its production	Legitimacy theory, Stakeholder theory
	(+) Lodhia (2015)	Case study (4 interviews & archival)/ Australian company/ 2008-2013	Questions on understanding of IR, transition to IR, motives, benefits, success factors and challenges of IR	Practice theory
Strategy	(+) Adams (2017)	Interviews/ 7 SA and 9 Australian board chairs and non-executive directors/ 2015	Questions on role sustainability reporting and IR in creating value for companies	Llewellyn's level three and four theorising
	(0) Haji and Anifowose (2016)	Archival/ Reports of 82 SA companies /2011-2013	Self-developed index with 52 items based on IIRC GP, IRC's SA GP and CE, King III recommendations and E&Y IR awards; weighted and un-weighted scoring method	Legitimacy theory
	(0) van Bommel (2014)	Interviews/ 62 Dutch professionals with IR knowledge/ 2011/2012	Questions on understanding, opinion, goal, problems of IR, stakeholders involved and conflicts during IR emergence	Thevenot's (2006) <i>Sociology of worth</i> framework
	(-) Lai, Melloni and Stacchezzini (2016)	Archival/ Reports of 54 companies worldwide/ 2011-2013	Publication of IIRC Best Practice Report	Impression Management Framework
	(+) Adams (2016)	Case study (archival)/ Reports of 4 multinational companies / 2009-2013	Participation in IIRC PP	Stewardship theory, Institutional theory
	(+) Beck et al. (2015)	Case study (2 interviews & archival)/ Australian company/ 2009-2013	Questions on the role and audiences of reporting, its determinants, external guidelines, internal reporting systems and processes, assurance and prospects	Legitimacy theory

	(-) Maniora (2015)	Archival/200-300 companies worldwide/ 2002-2011	ESG integration effect based on Asset4 data (e.g., public commitment to ESG integration into strategy, monitoring & engagement)	Not specified
	(+) Churet and Eccles (2014)	Archival/ 2,000 companies worldwide/ 2011/2012	RobecoSAM assessment of IR quality	Not specified
Potential for organizational change	(0) Chaidali and Jones (2017)	Interviews/ 15 senior managers/ 2014	Questions on role of sustainability in IR; credibility and benefits of IR	Theory of trust in social relationships
	(0) Stubbs and Higgins (2014)	Interviews/ 23 managers in 15 Australian firms/ 2012	Questions based on internal reporting processes and mechanisms	Laughlin (1991) model of organizational change
	(0) Stubbs, Higgins, Milne and Hems (2014)	Interviews/ 23 managers in 15 Australian firms/ 2012	Questions on understanding, emergence, differentiation of IR, internal processes and structures driving IR	Institutional theory
	(0) Steyn (2014)	Survey/ 50 SA managers responsible for IR/ 2013/2013	Questions on benefits and implementation challenges of IR and reasons for its production	Legitimacy theory, Stakeholder theory

Note. Study results presented in column “Result (Reference)” either identified no link or relationship (0) between IR and the respective dimension of implication, an existing or even positive relationship (+) or a negative (-) relationship. The IIRC’s Guiding Principles are abbreviated with GP, Content Elements with CE, Capitals with C and Pilot Program with PP.

3.3.2. Internal Implications

3.3.2.1. Non-financial Information

The first sub-category of internal implications refers to the quality and kind of non-financial information that a company reports. More specifically, the studies included in the review investigate four different implications: explicit connections between financial and non-financial data in the report, data quality, data quantity, and the level of assurance.

An integrated report intends to illustrate the relationship between the firm’s most material financial and non-financial information and metrics as explicitly as possible. In the process of compiling and organizing the necessary information, new connections and even cause-and-effect relationships

between ESG and financial outcomes are established (Eccles & Krzus, 2010). For example, integrated reports may quantify the positive impact of GHG emission reductions on operating profit.¹⁹ However, only one out of three studies on connectivity detected such connections between financial and non-financial information in integrated reports (Carels et al., 2013). In contrast, two other studies identified a general lack of disclosures on such interdependencies and potential trade-offs between those factors that play a role in the organizational value creation process. Haji and Anifowose (2016) concluded that instead of depicting contextualized, company-specific connections between financial and non-financial measures, integrated reports are mostly generic and aimed at acquiring organizational legitimacy.

However, the potential lack of useful indicators for these contextualized connections might foster the development of improved measurement methodologies and new metrics, such as the measurement of physical processes like water consumption (Eccles & Krzus, 2010). This overall improvement of the quality of data could occur in the form of an increase in non-financial information or in the quantification of non-financial information (Eccles & Krzus, 2010).²⁰ Given that the study was conducted by the primary governing body of IR, the research results may be subject to bias. In their analysis of 19 panel interviews Burke and Clark (2016) also concluded that an enhanced data quality was generally regarded as an implication of IR. Whereas their study is based on perceptual survey and interview data, Cortesi & Venay (2017) came to the same result by an archival analysis of reports of 636 companies.

Two studies further detected an increase in the quantity of non-financial information, such as human, natural, and intellectual capital (Carels et al., 2013; Setia et al., 2015). The IIRC framework (just like the GRI guidelines) includes the guiding principle *reliability*, which may be enhanced by independent, external assurance that ensures the quality of the information provided.

Given the investor focus of IR with potentially more quantitative information, a final data-related implication concerns the application of existing CSR assurance standards, because there is no specific assurance benchmark for IR yet (Velte & Stawinoga, 2017a). Research investigating the level of assurance of integrated reports delivers positive results in this regard (Haji & Anifowose, 2016).

¹⁹ SAP's (2016) Integrated Performance Analysis is a prominent example for such a depiction of cause-and effect relationships, i.e. that a one percent reduction in GHG emissions would have a positive impact of four million Euro on operating profit.

²⁰ The IIRC and their communications service provider Black Sun Plc received 66 valid questionnaires and conducted 29 subsequent telephone interviews to gather more detailed information about the surveyed responses.

Despite these alleged improvements, several researchers criticize the lack of assurance standard considerations for integrated reports in the IIRC's reporting framework (e.g., Adams, 2015). A sustainability report that uses the GRI framework, for example, can only be called *in accordance* with GRI when information on all indicators is provided or a valid reason for not reporting has been given. The IIRC does not have such an assurance requirement for materiality. Adams (2015) exemplifies her concerns with the integrated report of the energy and chemical company Sasol which was ranked fifth in the *E&Y 2013 Excellence in Integrated Reporting Awards*. The fact that the company did not mention concerns about the carbon bubble and the risk of devaluation through the inability of extracting carbon, questions the credibility of such a highly ranked report. The IIRC shares these concerns (IIRC, 2015) and works on the possibility of obtaining an integrated audit and assurance statement.

3.3.2.2. Processes

The next sub-category includes three internal implications that refer to various managerial processes within an organization: inter-departmental cooperation, risk management, and decision-making processes.

As explained in more detail above, the identification of cause-and-effect relationships between financial and non-financial information comes along with specific and new requirements. For instance, it requires the compilation of information from multiple sources, the development of innovative metrics, and new ways of compiling such information in an integrated report. These processes presuppose a high degree of internal collaboration and communication (Eccles & Krzus, 2010). The enhanced cooperation may, in turn, be of great benefit to the company because it helps to overcome departmental silos between different teams of different departments, including finance, sustainability management and investor relations (e.g., Simnett & Huggins, 2015). Correspondingly, 79% of 66 surveyed businesses regarded an increased collaborative thinking about goals and targets of the board, strategy departments and executives as a benefit of the IR process (IIRC & Black Sun Plc, 2014). Four out of five studies found empirical evidence on such an increase in collaborative thinking through interviews with Australian managers (Beck et al., 2015; Stubbs & Higgins, 2014), a case study of an Italian organization (Mio et al., 2016) or at a conference on IR (Burke & Clark, 2016). In contrast, three interviews with international IR experts by Perego et al. (2016) did not yield comparable evidence.

The most important benefit of increased interdepartmental cooperation has been argued to be integrated thinking (e.g., Krzus, 2011; Vesty et al., 2016). Integrated thinking and IR seem to have a

kind of a “chicken and egg relationship” (Piermattei, Livia & Venturini, Tommaso, 2016). Whereas some scholars regard IR as the reporting extension of integrated thinking (e.g., Al-Htaybat & Alberti-Alhtaybat, 2018), others suggest IR leads to integrated thinking (e.g., Guthrie et al., 2017). Especially the IR principle of *connectivity* reflects the integrated thinking concept (Mio et al., 2016), whereby one leads to the other: “The more that integrated thinking is embedded into an organization’s activities, the more naturally will the connectivity of information flow into management reporting, analysis and decision-making, and subsequently into the integrated report.” (IIRC, 2013c, p. 2). Tweedie and Martinov-Bennie (2015) describe two dimensions of integrated thinking. In the first one an increased understanding and dialogue arises across organizational units. The cooperation between the accounting team and scientific experts in different departments when reporting on natural capital creates such a dialogue and facilitates integrated thinking. The second dimension regards the understanding of interactions between the organization and its external stakeholders with regard to their needs and interests. The fairly unambiguous results from the above-mentioned studies (e.g., Beck et al., 2015; Burke & Clark, 2016) indicate that such an enhanced cooperation and interaction is actually taking place, which lends support to the integrated thinking notion.

A second potential process-related implication is a more effective identification of risks and opportunities (e.g., Eccles & Armbrester, 2011) as noted by 79% of the surveyed 66 businesses (IIRC & Black Sun Plc, 2014). The identification, assessment and prioritization of those aspects that “materially affect the organization’s ability to create value” (IIRC, 2013c) mainly takes place at the procedural level, making it a process-related implication. Such an enhanced risk management in relation with IR was detected by two studies based on survey (Steyn, 2014) as well as archival data (Moloi, 2015).

Finally, a holistic understanding about the organization’s strategy and performance, and changes in management information have been argued to facilitate better informed decisions, for instance with regard to resource allocation, cost savings or the assessment of priorities and product offers (IIRC, 2015). Based on interview data, Lodhia (2015) and Adams (2017) concluded that IR practitioners were indeed able to make more informed decisions. By drawing upon practice theory, Lodhia (2015) examined the recognition and role of IR in embedding ESG issues in the organizational structure of an Australian bank. Practice theory generally describes how social beings shape the world in which they live. Schatzki (2005) highlights that practices are non-individualist, meaning that it is people’s actions that form them. He defines these practices as “organized human activities” (ibid:472) which also include management practices. According to the author, the organization of a practice is composed an open-end set of individual actions that shape its rules and understandings and which then become objects of belief and know-how of the participants of this organization. Hence, IR as a

managerial practice that is implemented within the organization is formed by the entanglement of its institutional and social structures as well as individual actions, beyond the mere combination of ESG and economic information in a report (Lodhia, 2015).

In their analysis of 100 integrated reports by South African companies over the course of three years, Barth et al. (2017) also inferred that IR improves managerial decision-making through a better utilization of assets. Steyn (2014) who collected survey data from 50 South African managers concluded that better resource allocation decisions and cost reductions were not indicated as an outcome of IR. In a similar vein, Chen et al. (2016) found that integrated information does not have an effect on managers' willingness to invest in a CSR project.

Several researchers even suggest that IR bears the potential of inducing more socially and environmentally responsible decisions as it aligns notions of profit maximization with ESG issues (e.g., Adams, 2015). This assertion is challenged by the fact that decisions often require trade-offs, such as when a reduction in carbon emissions can show positive investment returns, but hurts short-term cash flows and dividends (Krzus, 2011). Strictly seen, the IIRC's interpretation of value as value for investors as opposed to value for society (e.g., Flower, 2015) could favor economic interests. Whether economic considerations take precedence over social and environmental concerns on single occasions is case-dependent and cannot be generalized. However, researchers also investigated potential strategic implications of IR as described in the following section.

3.3.2.3. Strategy

Strategy-related implications form the third category of effects within the organization. It includes three specific implications: accountability, the integration of sustainability issues into strategy, and organizational change.

To begin with, it has been argued that IR may foster an organization's accountability (IIRC, 2013b). Assuming and explaining the responsibility for one's actions directly happens at the process level, but is reinforced and influenced by the organizational culture (Sinclair, 1995). The degree to which an organization accepts social and environmental accountability thus depends on its culture and its fundamental structures, making it a strategy-related implication. Following the above-mentioned argument that IR bears the potential of inducing more socially and environmentally responsible decisions (e.g., Adams, 2015), this would require a greater accountability for the natural environment and civil society in the first place. By contrast, the previously mentioned allegations of IR privileging providers of financial capital over other stakeholders, and organizational over social and

environmental sustainability (e.g., Tweedie & Martinov-Bennie, 2015), would assume a lowered accountability in this regard.

Three of the sampled studies are concerned with the relation between IR and an organization's social and environmental accountability. However, only one of them has identified a positive effect from adopting integrated reports. Adams (2017) interviewed 16 South African and Australian board chairs and non-executive directors and identified a high level of awareness of ESG issues and the role their businesses plays in addressing these issues, especially in South African companies. Two other studies, however, found that integrated reports are hardly used as an organizational accountability tool that balances positive and negative trends (Haji & Anifowose, 2016; van Bommel, 2014). Rather, the primary function of integrated reports seems to lie in the enhancement of a company's legitimacy (Haji & Anifowose, 2016).

A key objective of IR is "linking the organization's strategy and business model with changes in its external environment, such as increases or decreases in the pace of technological change, evolving societal expectations, and resource shortages as planetary limits are approached" (IIRC, 2013c, p. 16). In line with a potential heightened accountability, this would result in the integration of social and environmental issues into the organizational strategy (e.g., Eccles & Krzus, 2010; IIRC, 2015; IIRC & Black Sun Plc, 2014). Embedding social investment activities (Adams et al., 2016) or ESG KPIs into corporate strategy exemplifies this integration (IIRC, 2015). Mio et al. (2016) point out that the IIRC's principles can be fruitfully applied to internal management control systems in that regard.

Three of the five studies that investigated this potential implication found that IR leads to a more extensive integration of sustainability issues in a company's strategy. Based on the analysis of companies' social investment disclosures, Adams et al. (2016) conclude that IR has an impact on how disclosures are linked to strategy. Beck et al. (2015) find that IR can enhance managers' willingness to include non-financial considerations into their strategic portfolio; and Churet and Eccles (2014) tested the relation between IR and the quality of ESG management.

Whereas these three studies derived their conclusions from interviews, the quantitative study of Maniora (2015) examined the impact of IR on the integration of ESG issues into the business model. She found that the new reporting approach only effectuated such an integration when compared to no ESG reporting at all or ESG reporting in annual reports. Compared to standalone sustainability reporting, IR was negatively associated with ESG integration. Similarly, Lai et al. (2016) concluded that IR does not favor the management of sustainability issues by analyzing reports and corporate information of 54 companies.

The potential for organizational change of IR is a third strategy-related implication, which partly also follows from the previous two. Information connections and increasing collaboration at the procedural level have been argued to drive morphogenetic organizational change by re-conceptualizing the interpretive scheme of managers (e.g., Stubbs & Higgins, 2014). This results in a heightened accountability for social and environmental issues, which could in turn lead to the integration of these issues in strategic decisions. Different interpretations of information possibly reshape organizational structures at the core, affecting individuals, but also the whole organization (Levy, 1986), which is why it is categorized as a strategic implication. Two of the studies included drew on Laughlin's (1991) model of organizational change to explain these changing beliefs, values and paradigms (Stubbs & Higgins, 2014; Guthrie et al., 2017). Accordingly, organizational change occurs through first and second order changes. First order, morphostatic changes in organizational structure, decision processes and communication systems (i.e. design architecture) are an effect of environmental disturbances, but do not "drastically affect the central core of the organisation" (Laughlin, 1991, p. 218). IR might be regarded as such an environmental disturbance. Second order, morphogenetic change permeates the organization's DNA through changing the interpretive scheme of managers and therefore their norms, values and paradigms (Laughlin, 1991). Studies on sustainability reporting in general have identified such changing organizational paradigms or an improvement of the overall quality of CSR policies based on the linkages between internal and external organizational reporting paradigms (e.g., Herremans & Nazari, 2016).

Despite evidence for some of the previously mentioned process- and strategy-related organizational changes, there is no evidence of change taking place at the organization's core (Chaidali & Jones, 2017; Higgins et al., 2014; Steyn, 2014; Stubbs & Higgins, 2014). By looking at Sztompka's (1999) social theory of trust in relationships, Chaidali and Jones (2017) identified that a general lack of credibility of IR and guidance by the IIRC could be to blame for not bringing about organizational change. Sztompka (1999) assumes that it may be quite challenging to establish trust in a new concept such as IR, as it needs to be considered as trustworthy by report preparers through reputation, performance and appearance. In that vein, IR is regarded as an expert system that fails to facilitate report preparers' trust in the idea that it is relevant to provide stakeholders with the necessary information (Chaidali & Jones, 2017).

3.3.3. External Implications

In addition to internal implications, external ones may indirectly influence a company's financial and ESG performance. For example, a secured legitimacy and intensive stakeholder engagement have been shown to come along with positive reputational effects, which in turn positively affect a

company's financial performance (Roberts & Dowling, 2002). As summarized in table 5, two societal-related and five financial markets-related implications are discussed.

Table 5

External Implications of IR

Dimension	Implication	(Result) Reference	Method/ Sample/ Year(s)	Independent variable/ Operationalization	Theoretical approach
Societal relations	Stakeholder engagement	(+) Burke and Clark (2016)	Archival/ 19 panel interviews at IR symposium/ 2014	Questions on future, preparation, legal and ethical implications and assurance of IR, and market for ESG information	Not specified
		(+) Beck, Dumay and Frost (2015)	Case study (2 interviews & archival)/ Australian company/ 2009-2013	Questions on the role and audiences of reporting, its determinants, external guidelines, internal reporting systems and processes, assurance and prospects	Legitimacy theory
		(+) Mio, Marco, and Pauluzzo (2016)	Case study (10 interviews, field observations & archival) / Italian company/ 2014/2015	Questions on management control systems and internal integrated report	Not specified
		(0) Veltri and Silvestri (2015)	Case study/ South African university/ 2013	IR quality based on IIRC CE	Stakeholder theory
		(+) Lodhia (2015)	Case study (2 interviews & archival)/ Australian company/ 2008-2013	Questions on understanding of IR, transition to IR, motives, benefits, success factors and challenges of IR	Practice theory
		(+) Steyn (2014)	Survey 50 SA managers responsible for IR/ 2013/2013	Questions on benefits and implementation challenges of IR and reasons for its production	Legitimacy theory, Stakeholder theory

	(+) Haji and Anifowose (2016)	Archival/ Reports of 82 SA companies /2011-2013	Self-developed index with 52 items based on IIRC GP, IRC's SA GP and CE, King III recommendations and E&Y IR awards; weighted and un-weighted scoring method	Legitimacy theory
Effect on legitimacy	(+) Beck, Dumay and Frost (2015)	Case study (2 interviews & archival)/ Australian company/ 2009-2013	Questions on the role and audiences of reporting, its determinants, external guidelines, internal reporting systems and processes, assurance and prospects	Legitimacy theory
	(+) Steyn (2014)	Survey/ 50 SA managers responsible for IR/ 2013/2013	Questions on benefits and implementation challenges of IR and reasons for its production	Legitimacy theory, Stakeholder theory
	(+) Lodhia (2015)	Case study (2 interviews & archival)/ Australian company/ 2008-2013	Questions on understanding of IR, transition to IR, motives, benefits, success factors and challenges of IR	Practice theory
Information asymmetry	(-) García-Sánchez and Noguera-Gámez (2017)	Archival/ 995 companies worldwide/ 2009-2013	Presence (1) or absence (0) of IR	Information asymmetry theory
	(0) Barth et al., (2017)	Archival/ 100 SA companies/ 2011-2013	E&Y Excellence in IR awards mean score of three adjudicator's scores annually ranked into deciles	Agency theory
Lowered cost of capital	(0) Martinez (2016)	Archival/ 96 pair of treated and control companies in IIRC database/ 2011-2015	Dichotomous variable that takes the value of 1 for treated firms and 0 for control firms	Agency theory, Voluntary disclosure theory
Financial market	(-) Zhou, Simnett and Green (2017)	Archival/ 443 company-year observations SA/ 2009-2012	Self-developed matrix with 31 items across 8 dimensions based on IIRC framework; Presence (1) or absence (0)	Voluntary disclosure theory

	(0) Steyn (2014)	Survey/ 50 SA managers responsible for IR/ 2013/2013	Questions on benefits and implementation challenges of IR and reasons for its production	Legitimacy theory, Stakeholder theory
Analyst forecast accuracy	(+) Zhou, Simnett and Green (2017)	Archival/ 443 company-year observations SA/ 2009-2012	Self-developed matrix with 31 items across 8 dimensions based on IIRC framework; Presence (1) or absence (0)	Voluntary disclosure theory
	(+) Bernardi and Stark (2015)	Archival/ 200 company-year observations SA/ 2008-2012	Differentiation between pre-IR and post-IR era	Not specified
Incorporation of non-financial information/ integrated reports in investment decisions	(+) Slack & Tsalavoutas, (2017)	Interviews/ 22 UK fund managers and equity analysts/ 2015	Questions on usefulness and diffusion of IR	Diffusion theory
	(-) Bucaro, Jackson and Lill (2017)	Experiment/ 213 non-expert participants assuming role of investors	Simultaneous (IR) or separate (SR) information presentation	Not specified
Long-term investor base	(+) Serafeim (2015)	Archival/ 1114 US companies/ 2002-2010	Asset4 score for level of integration (0-100)	Not specified
	(+) Knauer and Serafeim (2014)	Case study/ 1 Irish pharmaceutical company/ 2014	Presence of IR	Not specified

Note. Study results presented in column “Result (Reference)” either identified no link or relationship (0) between IR and the respective dimension of implication, an existing or positive relationship (+) or a negative (-) relationship. The IIRC’s Guiding Principles are abbreviated with GP, Content Elements with CE, Capitals with C and Pilot Program with PP.

3.3.3.1. Societal Relations

A key function of corporate reporting is to demonstrate the adequate management of a company’s assets and risks to external stakeholders (Eccles & Krzus, 2010). The previous section discussed the argument that the establishment of connections between different kinds of information requires a high degree of internal collaboration and communication. A similar argument applies to the engagement with external stakeholders, such as through consultations or surveys (e.g., Burke & Clark, 2016). Despite its focus on investors, the IIRC (2013c) suggests that “an integrated report should provide insight into the nature and quality of the organization’s relationships with its key stakeholders” (ibid: 5). Even though these key stakeholders have a direct and indirect influence on a firm’s reporting

behavior, the relation might also work the other way around in that a certain reporting behavior influences the firm's degree of engagement with its stakeholders.²¹

Five out of the six relevant studies identified an increased stakeholder engagement upon the introduction of IR. This result has been obtained through both interviews (Beck et al., 2015; Burke & Clark, 2016; Lodhia, 2015; Mio et al., 2016) and survey data (Steyn, 2014). Even though investors are the primary target group of integrated reports, other external stakeholders also benefit from these reports (Burke & Clark, 2016). Only one study found that companies are not engaging with their key stakeholders when defining and drafting the content of their integrated report (Veltri & Silvestri, 2015).

A second stakeholder-related implication of IR is the retention and enhancement of an organization's legitimacy and a reduction of reputational risk through increased transparency (Eccles & Armbrester, 2011). Organizations that lack legitimacy are vulnerable to criticism and unfulfilled stakeholder claims (Meyer & Rowan, 1977). The engagement with external stakeholders through IR can secure legitimacy through presenting the company in a meaningful, predictable and trustworthy way (Suchman, 1995). All four relevant studies have found evidence of secured legitimacy through the adoption of IR (Beck et al., 2015; Haji & Anifowose, 2016; Lodhia, 2015; Steyn, 2014). As an example, in a case study of an Australian bank, Beck et al. (2015) found that CSR and a subsequent IR led to a shift from legitimacy restoration to gaining strategic legitimacy in aligning disclosures with strategic goals.

3.3.3.2. Financial Markets-Related

IR could have a number of financial market-related implications. The review of the empirical literature identified five potential benefits of this novel reporting practice. Firstly, it is generally advantageous for the firm to reduce information asymmetries between the company and the market through extensive disclosures. This might reduce the information risk for investors when forecasting future returns, which also lowers the company's costs of capital (Healy & Palepu, 2001). A recent study by García-Sánchez and Noguera-Gámez (2017) lend support to this argument. Based on the observation of 995 companies over the course of five years, they found a negative relationship between information asymmetry and IR.

²¹ For instance, Günther et al. (2015) identified GHG politics acting as moderators of the relationship between the carbon disclosure and carbon performance. They further found that other stakeholders, such as the media, employees, and customers appear to be directly related to the carbon disclosure score.

In addition to the study by the IIRC and Black Sun Plc (2014) who found that only one out of 66 companies were able to lower their cost of capital, three academic studies also failed to detect a reduction in cost of capital upon the adoption of IR (Barth et al., 2017; Martinez, 2016; Steyn, 2014). One study even found a negative relationship between the level of alignment of integrated reports and the internal cost of capital (Zhou et al., 2017). This supports findings that the benefit of a reduction of internal cost of capital through company disclosures is less significant for those that have a larger analyst following, because financial analysts contribute substantially to the dissemination of information (Botosan, 1997).

Thirdly, voluntary disclosure theory suggests that firms might utilize IR to improve their information environment (Dye & Verrecchia, 1995), which enhances analysts' forecast accuracy by improving their understanding of the company's performance and future outlook (e.g., Beyer, Cohen, Lys, & Walther, 2010). Two studies investigated how analyst forecast accuracy changed upon the publication of an integrated report and both found a positive relationship (Bernardi & Stark, 2015; Zhou et al., 2017).

A fourth market-related implication concerns enhanced decision-making by the investment community, such as an increased integration of non-financial information into investment decisions upon the publication of IR. Slack and Tsalavoutas (2017) identified such an integration taking place through conducting interviews with UK fund managers. Those who are familiar with IR recognized its decision-usefulness based on the links between a company's value creation processes, strategy and associated key performance indicators. An experiment with 213 non-expert participants conducted by Bucaro et al. (2017), however, found that CSR measures are more likely to be incorporated into investors decision-making when presented separately as compared to integrated.

Fifthly, companies practicing IR have a more long-term-oriented investor base, representing the difference in percentage of shares held by dedicated and transient investors. Serafeim (2015) analyzed the degree of integration of ESG information in the financial reporting of 1,066 companies as well as the composition of their institutional investors between 2002 and 2010. Knauer and Serafeim (2014) also found evidence for such a long-term investor base by conducting a case study.

3.3.4. Direct Implications

After the preceding discussion of internal and external implications of IR, studies on the potential direct link between IR and a company's financial and ESG performance are investigated. Most of these studies focus on the financial implications measured by various market and book values, as depicted in the following table. All are based on the archival data analysis of 100 or more companies.

Table 6

Relation between IR and Financial and ESG Performance

Performance	Implication	(Result) Reference	Method/ Sample/ Year(s)	Independent variable/ Operationalization	Theoretical approach
Financial	Market value	(+) Barth et al., (2017)	Archival/ 100 SA companies/ 2011-2013	E&Y Excellence in IR awards mean score of three adjudicator's scores annually ranked into deciles	Agency theory
		(+) Cortesi and Venay (2017)	Archival/ 636 companies/ 2003-2016	Presence (1) or absence (0) of IR	Not specified
		(+) Martinez (2016)	Archival/ 96 pair of treated and control companies in IIRC database/ 2011-2015	Dichotomous variable that takes the value of 1 for treated firms and 0 for control firms	Agency theory, Voluntary disclosure theory
		(+) Lee and Yeo (2015)	Archival/ 822 company-year observations SA/ 2010-2013	Self-developed IR index based on IIRC CE; score from 0 (non-compliance with IR framework) to 5 (strong compliance)	Voluntary disclosure theory
	(+) Arguelles, Balatbat and Green (2017)	Archival/ 960 company-year observations worldwide/ 2011-2013	Self-developed score for level of integration based on Asset4 proxies for IIRC CE and C	Signalling theory	
	Stock liquidity	(+) Barth et al., (2017)	Archival/ 100 SA companies/ 2011-2013	E&Y Excellence in IR awards mean score of three adjudicator's scores annually ranked into deciles	Agency theory
		(+) Lee and Yeo (2015)	Archival/ 822 company-year observations SA/ 2010-2013	Self-developed IR index based on IIRC CE; score from 0 (non-compliance with IR framework) to 5 (strong compliance)	Voluntary disclosure theory
		(+) Rambe and Mangara (2016)	Archival/ Top 106 SA companies/ 2014	JSE IR Rating (0%-100%)	Not specified
	Earnings valuation coefficient	(+) Baboukardos and Rimmel (2016)	Archival/ 159 SA companies/ 2008-2013	Differentiation between pre-IR and post-IR era	Not specified

	Economic performance score (Sustainable growth & Return on investment)	(-) Maniora (2015)	Archival/ 200-300 companies worldwide/ 2002-2011	ESG integration effect based on Asset4 data (e.g., public commitment to ESG integration into strategy, monitoring & engagement)	Not specified
ESG	ESG performance score				

Note. Study results presented in column “Result (Reference)” either identified no relationship (0) between IR and the respective measure of performance, a positive (+) or negative (-) relationship. The IIRC’s Guiding Principles are abbreviated with GP, Content Elements with CE, Capitals with C and Pilot Program with PP.

3.3.4.1. Financial Implications

The direct relation between IR and financial performance has been investigated by changes in market value, stock liquidity, share price, return on equity and on investment. Five studies have found a positive relation between the publication of an integrated report and the firm’s market value (Arguelles et al., 2017; Lee & Yeo, 2015; Martinez, 2016; Cortesi & Venay, 2017; Barth et al., 2017). These unambiguous results stem from analyzing the return on assets (Arguelles et al., 2017; Barth et al., 2017), the market-to-book-ratio (Martinez, 2016) or the earnings per share ratio (Cortesi & Venay, 2017). Two studies further detected a positive relation between the reporting approach and stock liquidity (Lee & Yeo, 2015; Barth et al., 2017). Another one concluded that IR improves the value relevance of a firm’s accounting information, specifically the earnings valuation coefficient representing a book value of the company’s equity and earnings (Baboukardos & Rimmel, 2016). Rambe and Mangara (2016) found a positive correlation between the adoption of IR and the share price of the top 106 JSE listed companies.

3.3.4.2. Implications on ESG Performance

Building on the previously described argument that a connected or integrated consideration of information modifies managerial decisions, processes and strategic considerations with regard to ESG issues, Maniora (2015) presumed that changes in economic and ESG performance depend on the internal level of integration of ESG issues into the business model. As mentioned earlier, the researcher found that such an integration was taking place for companies with IR when compared to those with no ESG reporting at all or with ESG reporting in annual reports. Compared to those

organizations with a standalone sustainability reporting, IR was negatively associated with ESG integration (Maniora, 2015).

By using ASSET 4 data for her ESG and economic performance variables, she further concluded that IR is positively associated with economic as well as ESG performance, but only when the respective IR companies are matched with those that do not publish a sustainability report.²² In comparison with companies that publish a standalone sustainability report, IR is also negatively associated with economic as well as ESG performance (Maniora, 2015). These results suggest that the ethical implications of IR do not go further than those of other ESG disclosure approaches, as it seems to reduce the significance of non-financial information in connection with financial information.

3.4. Discussion of Reviewed Literature

The evidence reviewed from 36 studies suggests that IR has some positive implications, such as an improvement in data quantity and quality. It further seems to enhance collaboration on sustainability issues within the firm as well as its market value. In contrast, the review provided mainly inconclusive results on the determinants of IR and whether it advances financial or sustainability performance. Table 7 summarizes these results. The last column indicates whether the literature generally found no, weak or strong evidence as well as the hypothesized direction of the relationship. Mixed results indicate that there was no tendency towards a specific relationship at all. Weak evidence was found when only one study found the respective relationship and strong evidence is present when at least the majority of studies (e.g., two out of three) in the respective sub-category came to the same conclusions.

²² ASSET4 is an ESG information database by Thomson Reuters.

Table 7

Summary of results

	Level of analysis/ dimensions	Sub-categories	Evidence for relationship (Direction)
Determinants	Country level	Level of power distance, uncertainty avoidance & long- vs. short-term orientation in national culture	None (Positive)
		Level of collectivism in national culture	Mixed (Positive)
		Level of femininity in national culture	Mixed (Positive)
		Prevalence of secular-rational values	Weak (Positive)
		Level of national corporate responsibility	Weak (Positive)
		Region	Mixed (Positive)
		Level of economic development	Mixed (Positive)
		Political system	Strong (Positive)
		Degree of market coordination	Weak (Positive)
		Strength of investor protection laws	Mixed (Positive)
		Degree of ownership dispersion	Weak (Positive)
		Share of private expenditures for tertiary education	Weak (Positive)
		Trade union density	Weak (Positive)
	Strength of employment protection laws	None (Positive)	
	Industry level	Industry-affiliation	Mixed (Positive)
		Monopoly position	Weak (Negative)
		Presence of GRI industry supplement	Weak (Positive)
	Organization level	Profitability	Strong (Positive)
		Firm size	Strong (Positive)
		ESG disclosure score	Weak (Positive)
		Board diversity (foreign background & women)	Weak (Positive)
Board size		Weak (Positive)	
Board independence		None (Positive)	
Business growth opportunities (market to book value ratio of corporate assets, business activity etc.)		Mixed (Positive)	
Stock exchange listing		None (Positive)	
Leverage		None (Positive)	
Number of analyst following		Weak (Positive)	
CSR report assurance	None (Positive)		
Implications	Information-related <i>(internal)</i>	Connections between financial and non-financial information	Weak (Positive)
		Data quality	Strong (Positive)
		Amount of non-financial information	Strong (Positive)
		Level of assurance	Weak (Positive)
	Process-related <i>(internal)</i>	Collaboration across departments (basis of integrated thinking)	Strong (Positive)
		Risk management	Strong (Positive)
		Effect on decision-making	Strong (Positive)
	Strategy-related <i>(internal)</i>	Social and environmental accountability	Weak (Positive)
		Integration of sustainability issues in strategy	Mixed (Positive)
		Potential for organizational change	None (Positive)
	Societal relations <i>(external)</i>	Stakeholder engagement	Strong (Positive)
		Effect on legitimacy	Strong (Positive)
	Financial market- related <i>(external)</i>	Information asymmetry	Weak (Negative)
		Cost of capital	None (Negative)
		Analyst forecast accuracy	Strong (Positive)

	Incorporation of non-financial information/ integrated reports in investment decisions	Mixed (Positive)
	Long-term investor base	Strong (Positive)
Financial (<i>direct</i>)	Market value	Strong (Positive)
	Stock liquidity	Strong (Positive)
	Share price	Weak (Positive)
	Earnings valuation coefficient	Weak (Positive)
	Economic performance score	Weak (Positive)
ESG (<i>direct</i>)	ESG performance score	None (Positive)

3.4.1. Inconclusive Evidence on IR Benefits

To begin with, IR seems to improve the reporting companies' sustainability data. The reviewed studies provided fairly clear evidence on the effects that the adoption of IR as a new reporting approach has on the quality and quantity of the data compiled within the company. Those companies that publish integrated reports tend to rely on better and on more extensive sustainability data. This finding is remarkable as it supports the notion that the introduction of a new reporting tool, which is primarily designed to inform external stakeholders, has important consequences for internal management processes. The existence of such a relation between an external reporting tool and internal management processes is a prerequisite for the assumption that IR will affect how companies deal with sustainability internally (Adams, 2015; Eccles & Armbrester, 2011).

Quite surprisingly, however, no consistent evidence was found for one of the most important alleged benefits of IR: The connectivity of sustainability and financial data. So far, there is no empirical support for the assumption that the information compiled in integrated reports are more connected than those in conventional sustainability reports. This result may partly be due to methodological aspects, because the three studies under investigation use very different methodological approaches. For example, Carels et al. (2013) conducted an interpretative text analysis using the reports of 15 companies, whereas Veltri and Silvestri (2015) base their case study analysis on just one integrated report. Finally, Haji and Anifowose (2016) developed a sophisticated measure assessing the degree to which 82 integrated reports adhere to the IIRC framework. Two of the three studies conclude that the connectivity of information principle is not sufficiently implemented, but given the different research approaches, these studies are hard to compare. In light of the prominent role that connectivity plays in the IR framework, it is surprising how little research exists on that topic, and how inconclusive the existing studies' results are.

Despite the lack of evidence for higher levels of connectivity in integrated reports, the reviewed studies suggest that IR does have an effect on internal management processes. Notably, it leads to enhanced collaboration and improved risk assessment procedures. However, these results are mainly

based on interviews and surveys, and may therefore be prone to subjective response biases. Further qualitative and quantitative studies would thus be important to corroborate these preliminary findings.

Taken together, the review of the empirical literature suggests that IR is neither a threat to the progress in accounting for non-financial business impacts, as there is no worrying evidence for the systematic negligence of important sustainability issues (e.g., Villiers et al., 2018). Nor does IR seem to advance sustainable business efforts profoundly (e.g., Lai et al., 2016). Results rather lend support to an interpretation of sustainability reporting as a strategic tool. Such an interpretation has been championed by researchers of conventional sustainability reporting before. They argue that firms voluntarily disclose sustainability information mainly for strategic reasons, be it to signal their superior sustainability performance (e.g., Clarkson, Li, Richardson, & Vasvari, 2008; Schreck & Raithel, 2015), or to seek legitimacy in the market when it is threatened (e.g., Aerts & Cormier, 2009; Cho & Patten, 2007). This argument can be extended to the case of IR, because the reviewed evidence suggests that firms adopt this new reporting format when they can afford it and when there is something to gain from it.

More precisely, the analysis of determinants of IR revealed that the firms issuing integrated reports tend to be large, profitable companies that operate in highly competitive markets and countries with a strong economy and civil law political system. These companies have the resources as well as political, public and competitive pressure to engage in extensive reporting. IR, in turn, is a rational response to such pressures. For instance, results suggest that IR has positive effects on external stakeholder engagement (e.g., Burke & Clark, 2016), it helps enhance a company's legitimacy (e.g., Beck et al., 2015) and positively influences market valuation (e.g., Barth et al., 2017).

3.4.2. Research Potential of IR, ESG Performance and Connectivity

Only one study in the sample analyzed the link between the level of integration in integrated reports on ESG performance and detected a negative relation (Maniora, 2015). These findings suggest that IR prioritizes financial over non-financial information and that it does not necessarily drive a more holistic understanding and decision-making within the company. Maniora's (2015) results are an important step towards a deeper understanding of the ultimate consequences of IR, but whether it is a threat to or support for the advancement of sustainability still remains a remarkably under-researched topic. This is a key rationale behind this study that investigates the relationship between climate change reporting in IR and climate change management performance as a partial aspect of ESG performance.

In addition, the review clearly shows a general negligence and conceptual gap with regard to IR's core principle of *connectivity*. Although the establishment of connections between different kinds of financial and non-financial information is central to the concept of IR (IIRC, 2013c), the review suggests that there is almost no research on this very topic. As the quality of integrated reports generally increases over time (e.g., Haji & Anifowose, 2016), a more sophisticated measure of the level of integration might improve the operational foundations of future studies. When operationalizing IR, some of the reviewed studies simply use dummy variables to indicate whether the IIRC's guiding principles, content elements, and capitals are present or absent in an integrated report (Moloi, 2015). Lee and Yeo (2015) developed an index based on the IIRC's content elements and assigned scores ranging from 0 (non-compliance with IR framework) to 5 (strong compliance). The researchers claim to measure the quality of IR disclosures, yet their scoring criteria do not take into consideration whether or not the data are presented in connection to other pieces of information. Instead, their checklist-approach only shows to what extent integrated reports adhere to the IIRC framework.

The quality term, however, should go beyond such a checklist-approach and also tell how connected this information is reported. Based on this ambiguity in the operationalization of IR quantity and quality, for example regarding the level of connectivity, this study attempted to measure quantity in terms of a completeness score and quality by developing a connectivity score, as described in section 4.2.2. The connectivity score is characterized by those central aspects that constitute information connections as prescribed by the IIRC.

Measuring the level of connectivity in corporate reports based on this definition allows for conclusions on whether connectivity drives performance. In addition, a deeper investigation of the level of completeness might reveal potential shifts in reporting content that may come along with the adoption of IR. One of the critics' main concerns is that IR is too much financial markets-oriented and, hence, would lead to a negligence of information that may be important in terms of sustainability, but that has little financial impact for the company (e.g., Cheng et al., 2014; Flower, 2015; van Bommel, 2014). Although the review did not find any support for this potential drawback of IR, this is mainly because of a lack of empirical studies on the matter. Hence, the quantitative content analysis of integrated reports examined whether any disadvantageous shifts in content come along with the new reporting approach. Given the steadily rising number of reports issued according to the IIRC framework, the time is apt for such an analysis.

Apart from the concept of connectivity, a larger sample size would further improve the validity and representativeness of research results. By the time all relevant data for this study were collected, five

years have passed already since the publication of the IIRC framework – the most important guiding document for the preparation of IR. More companies have published integrated reports by now, which increases the overall sample size and thereby also the validity of results from a quantitative analysis.

4. Empirical Analysis of IR Effects

The focal point of this study lies on a positive analysis of the potential of IR to advance ESG management. In contrast, a normative approach would investigate value-based reasons of firms for considering their potential contribution to climate change as well as climate change-related consequences on their operations. Despite the fact that these normative considerations are highly relevant, because they ask whether companies *should take into account* their environmental and social impact in the first place (Schreck, 2009), the underlying study investigates whether these impacts are *actually taken into account*. Whereas both questions are equally important, the previously identified research gap regarding performance implications of IR, combined with the practical nature of IR, call for more empirical research on the topic. In this vein, market-related factors are presumed to be crucial drivers of climate change management efforts (e.g., Clarkson, Li, Richardson, & Vasvari, 2008). Market-based rationales behind effective ESG management generally and climate change management efforts specifically regard a reduction of operational (e.g., Kolk & Pinkse, 2004), strategic (e.g., Hoffman, 2005) or financing costs (e.g., Hart & Ahuja, 1996; Klassen & McLaughlin, 1996) as well as the strengthening of reputational effects (e.g., Russo & Fouts, 1997).

4.1. Sample Selection

Based on this economic-centered perspective, not all companies might be pursuing the same advancements in their climate change management. Larger companies in highly polluting industries might have stronger incentives to deal with these issues (Brown & Deegan, 1998), as discussed in the following paragraphs that describe the studied sample.

4.1.1. Industries

The focus on climate change management and disclosure suggests the inclusion of those companies in the sample that have a considerable effect on earth's environment. Hence, less carbon-intensive industries, such as the telecommunications or financial sector, are not included. The industry-specific scope 1 and 2 emissions of labor-intensive processes are generally lower than sectors that use heavy machinery or large amounts of energy in line with industrial processes (Lewandowski, 2017).²³ Heavy

²³ Whereas scope 1 emissions are directly coming from sources owned and controlled by companies, scope 2 emissions stem from the generation of purchased energy (WBCSD, 2004). Despite the fact that indirect scope 3 emissions occur outside of what is owned or controlled by the company, they can make up a large amount of its overall emissions for example through business travel. Scope 3 emissions account for 90% of total company emissions of fossil fuel producers, resulting from the downstream combustion of coal, oil, and gas for energy purposes. CDP (2017b). They are, however, not affected by regulatory constraints as much as scope 1 and 2 emissions and therefore not measured as thoroughly by companies (Lewandowski, 2017)

polluters on the other hand receive particular attention in the debate surrounding a company's responsibility regarding its environmental impact with public opinion on sectors such as mining and oil and gas being generally poor. These companies are a popular target for pressure groups and have more issues with maintaining their "license-to-operate". They have to justify their existence and document their performance through the disclosure of social and environmental information to a greater extent than, for instance, telecommunications companies (e.g., Guenther, Hoppe, & Poser, 2006; Halme & Huse, 1997; Jenkins & Yakovleva, 2006).

The World Commission on Environment and Development (1987) generally regarded sectors associated with metals, chemicals, utilities as well as pulp and paper as high-polluters. In his analysis of the effect of a company's carbon performance on its financial performance, Lewandowski (2017) evaluated data on the scope 1 and 2 CO₂ emissions of 1640 companies from 2003 to 2015. The researcher similarly identified the oil and gas, basic materials, industrials and utilities sector as carbon-intensive. These findings are in line with CDP information on the total amount of scope 1 and 2 emissions (CDP, 2017b) and the carbon intensity of certain sectors, for example when they are very energy-intensive (e.g., mining). In addition, their activities and products account for the largest amount of global industrial GHG emissions by far (91% in 2015) (CDP, 2017b). The core data set with climate change performance scores for each company by the CDP uses a categorization of *Industry Activity Groups* provided by the GRI. Based on the above-identified high-polluting sectors, the following activity groups are included in the sample: Chemicals, Construction Materials, Containers and Packaging, Electric Utilities and Independent Power Producers and Energy Traders, Forest and Paper Products, Gas Utilities, Mining (Coal, Iron, Aluminum, Other Metals, Precious Metals and Gems), Oil & Gas, Water Utilities.²⁴

4.1.2. Countries

The analysis of company reports that are subject to different institutional frameworks and reporting regulations in a given country should further presume a homogeneity of these regulations and relating enforcement systems to a certain extent.²⁵ Differences mainly stem from the underlying ownership and financing patterns in the particular economy (e.g., Leuz, 2010). In the discussion of ownership dispersion, investor protection and – more importantly for the underlying topic – reducing information asymmetries, the academic literature typically differentiates between *outsider* and

²⁴ For clarity reasons, industry labels are abbreviated in four cases (i.e., Electric Utilities, Mining - Iron, Aluminum, Mining - Other, Mining - Coal) in the proceeding sections.

²⁵ The detailed elements of reporting regulations can differ so much between one country and another given cultural, geographical and other drivers that it is beyond the scope of this study to account for each of these differences.

insider, or relationship-based systems (e.g., Allen & Gale, 2000). Outsider-focused systems are characterized by a high ownership dispersion in which a large number of shareholders own small percentages of shares or listed debt (Jensen & Berg, 2012). Insider economies on the other hand are characterized by smaller stock markets, higher ownership concentration and weak investor protection laws (Leuz, 2010). In addition, these insiders, such as family-controlled companies, usually get the information directly from the company and are not dependent on published information. Thus, companies in insider economies might disclose less information through external reporting.

The investigation of annual sustainability and, in particular, integrated reports should therefore concentrate on those companies in outsider-focused countries, as these engage in and are more contingent upon such disclosure to reduce information asymmetries. The resulting demand for detailed, audited, frequent and published accounting information (Nobes, 2011) enables investors to monitor their financial claims and further invest in public debt and equity markets (Leuz, 2010). Despite the fact that most countries fall somewhere between these two extremes, there is an observable tendency towards one system or another. Since investors represent the main target group of an integrated report – according to the IIRC – it makes sense to look at those reports of publicly traded companies in outsider countries. Here, they play a more important role than in countries with an insider focus that rely more on internal financing through banks and other financial intermediaries.

Apart from such a differentiation in ownership structure, this study should also consider differences between countries' reporting regulations²⁶ and financial market outcomes²⁷ as part of the institutional inside- or outside-oriented framework (Leuz, 2010). As integrated and annual reports that include financial information are analyzed – apart from sustainability reports – only those companies are considered that are subject to similar reporting regulations and enforcement mechanisms. Such mechanisms attempt to preserve the stability of the financial system and investors' confidence in financial markets (Leuz, 2010). The strength and enforcement of reporting regulation influences the extensiveness of disclosure of financial corporate information (Leuz, 2010). Annual and integrated reports connect financial with non-financial information. Therefore, similar institutional conditions and requirements for financial information assure a certain homogeneity in the sample. Leuz (2010)

²⁶ The author adopted variables describing a country's securities regulation from La Porta et al. (2006), namely disclosure requirements in securities offerings; the arithmetic mean of the liability standards for issuers, its directors, distributors, and accountants and a summary index of several sub-indices on public enforcement of securities regulation (e.g., supervisor characteristics index). He further included an aggregate measure of minority shareholder rights and three variables measuring the protection of outsiders against self-dealing by insiders (taken from Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2008).

²⁷ Leuz (2010) also used three financial development variables from Djankov et al. (2008), i.e., the ratio of stock market capitalization held by small shareholders to GDP, the ratio of the number of domestic firms listed in a given country to its population, and the ratio of equity issued by newly-listed firms in a given country to its GDP (ratios averaged from 1996 to 2000).

rightly noted that pure inside or outside system affiliation does not matter much when the respective legal structure that enforces this system is weak. He further highlighted the importance of the underlying market structure in the regulation, adoption and enforcement of corporate reporting. Although this comes as no surprise, he finds that country wealth is positively associated with the rule of law, supporting the notion that enforcement of securities regulation is stricter in wealthier countries.

Lastly, the author also included measures of the transparency of firms' reporting practices in his analysis and came up with three different groups of countries that are closely related in terms of region, economic development and legal origin (Leuz, 2010).²⁸ Whereas two country groups resemble insider economies with stronger and weaker legal enforcement systems, one represents outsiders with similar regulatory and transparency features. Based on these similarities identified by Leuz (2010), the underlying analysis includes corporate reports of companies headquartered in Australia, Canada, Hong Kong, Ireland, Israel, Malaysia, New Zealand, Singapore, South Africa, United Kingdom, and the United States.

The total sample consists of 94 companies and 235 company-year observations between 2013 and 2016. Earlier reports are not considered, because the IIRC framework was published in December 2013. Some integrated reports covering the 2013 performance have already applied the IIRC's final framework or the draft framework that was published in 2011 (e.g., Kumba Iron Ore Integrated Report, 2014). Reports covering the 2016 performance are not included given that their information does not have an effect on a firm's climate change management performance until the following year. Data on the dependent variable measuring this performance for the year 2017 are not yet available.

4.1.3. Reports

This study's primary research aim lies in the investigation of the potential effects of the adoption of IR. However, apart from the formalized publication of an integrated report, some scholars (e.g., Rodríguez et al., 2016) as well as practitioners noticed that firms are moving towards IR internally as well as externally without referring to this reporting as *integrated* explicitly (Günther et al., 2017).²⁹ Hence, firms publish annual or sustainability reports in a more or less integrated manner without calling them integrated reports. As an example, Johnson Matthey's "2015 Annual Reports and Accounts" publication has considered the IIRC framework in the preparation of its report. For that

²⁸ Leuz (2010) firstly included the CIFAR disclosure index, which measures the inclusion or omission of certain information items in firms' annual reports and, secondly, an updated version of the earnings management and opacity score from Leuz et al. (2003), which captures four different properties of reported earnings.

²⁹ Information based on two interviews with practitioners that want to be kept anonymous.

reason, the analysis is not limited to reports called *integrated*, but also covers annual and sustainability reports as outlined below. Thus, sustainability reports, annual reports that include ESG information as well as integrated reports represent the main unit of analysis. A comparative investigation of all three of these reports sheds light on the potential added value of the integrated format as compared to the other two reporting formats.

Reports were scanned for eligibility based on the availability of climate change performance scores – the underlying dependent variable – for the respective year. The scan yielded the following number of reports per type: 83 integrated, 66 sustainability and 86 hybrid reports, which are further described below.

4.1.3.1. Integrated Reports

The focus of the underlying study lies on integrated reports, their level of connectivity and whether this might have an effect on performance. For this reason, 83 eligible self-declared integrated reports are scored according to criteria developed in the following sections. If companies have published a sustainability or annual report alongside their integrated report, only the integrated report is scored since one of their main purposes is the connected depiction of information. The respective sustainability or annual reports are not analyzed in that case.

4.1.3.2. Sustainability Reports

Separate sustainability reports are often published alongside annual reports to depict the company's social and environmental performance. Such sustainability reports might also be called "Sustainability Reviews", "Corporate Social Responsibility" or "Corporate Citizenship" reports. 66 sustainability reports covering the reporting period 2013-2015 are included in the sample.

Given the case that a sustainability report was published alongside an integrated or hybrid report, it was not included in the sample. An investigation of the effects of these different disclosure formats yields biased results if they are not clearly defined and demarcated from each other. If decision-makers potentially consult both documents – sustainability and integrated reports – no causal inferences on the influence of either report on their decisions can be drawn. Hence, the analysis of sustainability reports for years in which no other relevant types of reports were published ensures that any changes in performance are attributable to that report.

4.1.3.3. Hybrid Reports

Annual reports with some sustainability information included are also scored. These are mostly called “annual reports”, but include a certain amount of sustainability information. This is why they are also regarded as a *hybrid* format for the purpose of this study. A few reports are even titled “Annual and sustainability report”, such as the 2015 PanAust report. They are investigated apart from integrated and sustainability reports based on the previously mentioned assumption that the trend of integrating financial and non-financial information has advanced alongside or irrespective of the IIRC framework.

Hybrid reports are only included in the sample if they fulfill one eligibility criterion to ensure their fit-for-purpose for the study’s research aim and design. In that vein, at least two pages containing some kind of sustainability information need to be included in the annual report for it to be considered a hybrid report. The number of pages that include sustainability information was checked in all annual reports during the initial scan of eligible reports. Two pages intuitively seem to provide a minimum threshold of opportunities to elaborate on the company’s ESG issues whether or not in an integrated manner.³⁰ Annual reports vary greatly in the amount of disclosed ESG information. Checking the amount of sustainability information in those reports guaranteed that they addressed at least some ESG aspects. The PDF files were searched with the terms “sustainability” or “environment” or “responsibility” to detect any paragraphs or whole pages that depict the ESG performance of a company in more detail. Hybrid reports need to include at least two consecutive or non-consecutive pages with some ESG information. The actual comprehensiveness of this information irrespective of the number of pages was determined by means of a completeness score that is further specified in section 4.2.2. The final sample included 86 hybrid reports.

Table 8 delineates these three report types as well as their respective quantity in the sample.

Table 8

Sampled Reports

Report type	Definition	Quantity
Integrated (<i>IR</i>)	Reports titled “integrated”	83
Sustainability (<i>SR</i>)	Reports that include the terms “sustainability”, “corporate citizenship” or “responsibility” in their title	66
Hybrid (<i>HR</i>)	Annual reports with at least two pages that include sustainability information	86
Total		235

³⁰ This number is based on an initial scan of 20 annual reports with the above-mentioned search terms that led to the conclusion that ESG information described on one page only was presented in a very superficial manner without going into detail on single ESG aspects. This started to change with two and more pages or paragraphs.

4.2. Variables

The investigation of the effects of the IR of climate change-related issues on a company's actual climate change management performance needs to consider a variety of aspects. Firstly, changes in the extent as well as quality of corporate reporting need to be operationalized and measured according to the underlying research aim. The first independent variable *Complete* illustrates how many and how sophisticated key climate change performance topics are covered.³¹ This by itself, however, says little about the actual quality in terms of integration of these disclosures. Hence, the second independent variable *Connect* measures this level of integration by representing the established connections between different pieces of information.

In a second step, these changes in reporting are analyzed in relation to the actual climate change performance of the respective company, treated as the dependent variable *CCPerf* in this study. Whereas data on the reporting extent and quality were manually collected, climate change performance scores were derived from the CDP database.

4.2.1. Dependent Variable: Climate Change Management Performance

Since 2010 the CDP (formerly Carbon Disclosure Project), a not-for-profit investor-initiative, assesses a company's progress towards environmental stewardship by awarding a holistic *climate score* ranging from 0 to 100%. The organization has the most comprehensive collection of self-reported environmental data in the world, accounting for over 20% of global anthropogenic emissions of the world's largest publicly listed companies. Companies are assessed across four consecutive levels of progress in environmental stewardship, namely disclosure, awareness, management and leadership. This way, not only the level of detail and comprehensiveness of the content are scored, but also the company's awareness of climate change issues, management methods and progress towards action taken on climate change (CDP, 2017a).

The score enjoys a high credibility among other popular sustainability ratings and rankings as found out by a survey conducted by Globescan and SustainAbility in 2012 with 850 sustainability professionals (Guenther et al., 2015). For example, the CDP requests information on the verification status of each completed questionnaire.³² Numerous research studies on carbon management have

³¹ Here sophistication refers to the inclusion of quantitative figures alongside qualitative or descriptive information to support depict a holistic picture of the company's performance, see e.g., Schreck & Raithel (2015).

³² In order to become an A-list company, the firm must verify at least 70% of scope 1 and scope 2 emissions with one of the approved verification standards by the CDP (CDP, 2017a).

used the CDP score already and have been published in high-ranking academic journals (e.g., Ioannou, Li, & Serafeim, 2016; Guenther et al., 2015).

The CDP score is based on the company’s response to the climate change information request by the CDP, which is usually provided in the second or third quarter of the year for the previous calendar year. The 2015 score therefore assesses the organization’s performance in 2014 and so forth. The number of points awarded for each of the four consecutive levels is divided by the maximum number that can be reached.³³ The fraction is then converted to a percentage and rounded to the nearest whole number. A minimum score of 75% and/or the presence of a minimum number of indicators on one level will be required in order to reach the next level. Table 9 presents an overview of the different levels and respective scores.

Table 9

*CDP Categories and Scores*³⁴

Performance level	Score	Grade
Disclosure	0-39%	D-
	40-74%	D
Awareness	0-39%	C-
	40-74%	C
Management	0-39%	B-
	40-74%	B
Leadership	0-39%	A-
	40-74%	A

All CDP questions are scored for the disclosure level, but some have no awareness, management or leadership level scoring associated with them, for instance when it does not concern any action by management or leadership. The number of points allocated for the *disclosure level* depends on both – the amount of data requested and its relative importance to the data users, mostly investors. Points on the *awareness level* measure the comprehensiveness of a company’s evaluation of how environmental issues generally and climate change aspects in particular intersect with other business functions and activities. Answers that provide evidence of actions associated with good

³³ The exact number of points reached by each company was not provided by the CDP, but only the final performance grade.

³⁴ This is the grading scheme currently used by the CDP. Before adjusting their methodology in 2015, there was also a grade ‘E’. However, given that the data only provides final grades, it was not possible to make adjustments accordingly.

environmental management (according to CDP and its partners) are further rewarded with points on the *management level*. Lastly, on the *leadership level*, points are allocated for actions that represent best practice as formulated by organizations working with CDP (e.g., CEO water mandate, CERES, WWF) (CDP, 2017a). The proceeding sections of this study refer to the numeric score as well as the grade equivalent of the CDP score.

4.2.2. Independent Variable: Completeness

Based on the pressure for disclosing climate change-relevant information as depicted in the previous chapter, the independent variable *Complete* describes how many of the fundamental topics are covered in the particular company report. In line with previous studies that catalogued these topics based on the GRI reporting guidelines to construct a quantitative disclosure index (e.g., Clarkson et al., 2008), the GRI's most recent G4 Guidelines were examined. Given the underlying emphasis on climate change management, the cataloging of key topics was extended to the CDP's comprehensive questionnaire for companies on their climate change performance. This scan of the GRI guidelines as well as the CDP's questionnaire yielded six key topics on which a company should provide climate change-related information.

Generally, the content analysis of social and environmental disclosures involves the construction of a classification scheme as well as a set of rules on what should be coded how (Milne & Adler, 1999). Milne and Adler (1999) suggest that this classification scheme or catalogue of topics should not include too many content categories as this might increase potential coding errors among the report raters and potentially impair data reliability. Section 4.5.3. discusses this inter-rater reliability in more detail.

All reporting standards and guidelines have placed a growing emphasis on the materiality aspect in voluntary disclosures. This means that reports should “be centered on matters that are really critical in order to achieve the organization’s goals and manage its impact on society” (GRI, 2015, p. 3). The sampled companies are all operating in carbon-intensive industries. Their carbon footprints, carbon reduction measures, targets and strategic interrelations are therefore material issues and should be transparently communicated to various stakeholders. Table 10 lists these topics and some exemplary indicators that might be included for each topic.

Table 10

Key Topics

	Key climate change-related topic	Example indicators
(1)	Strategic relevance (<i>Strategy</i>)	Climate change-related material issues Climate change-related company goals Integration of climate change-related issues into business strategy
(2)	Amount and coverage GHG emissions (<i>GHG</i>)	Amount CO ₂ & other GHG emissions (scope 1,2,3) GHG emission intensity
(3)	Energy consumption (<i>Energy</i>)	Energy consumption by type Energy intensity
(4)	Risks and opportunities (<i>Riskopp</i>)	Climate change-related risks and opportunities Related costs for management Climate change-related risk identification and management procedures
(5)	Targets (<i>Target</i>)	Emission reduction targets Renewable energy consumption targets Target achievement Monetary savings achieved through reductions
(6)	Emission reduction initiatives (<i>Emred</i>)	Emission reduction initiatives Methods to drive investments in reduction activities Expenditures/ investments in climate change-related activities

The *strategic relevance of climate change-related issues (1)* for companies in carbon-intensive sectors, such as oil and gas, is indisputable as mentioned above. External stakeholder pressure urges a firm to disclose carbon-related information to the public and elaborate on the *risks and opportunities (2)* related to climate change or GHG reduction targets in its strategic considerations. In line with the previous argument, companies should measure their *GHG emissions (3)* (scope 1, 2 and 3, if possible) and disclose these figures to the public. This might also be the case for the respective emission intensity – the emission rate of a given pollutant relative to the intensity of a specific activity or process. *Energy consumption (4)* similarly produces a large amount of GHG emissions depending on the energy source. Hence, consumption figures are also included in company reports.

The commitment to specific emission or energy *reduction targets (5)* and the communication of efforts made, progress achieved, and challenges faced is another key aspect in climate change-related company disclosures. Such targets demonstrate that the company accepts accountability for its environmental impact, usually through short-, mid- or long-term goals to mitigate this impact. These are generally accompanied by a description of certain *emission reduction initiatives (6)*. Such initiatives or activities might concern investments at the core business, such as more efficient production plants, or other business functions, such as a change in business travel policies.

To measure the level of completeness of a company's climate change reporting, the study employs a quantitative content analysis of integrated and sustainability reports as well as those annual reports that include sustainability information. Each of the six key topics on climate change-related information was assigned the value 0 if no information was found, 1 if some and mostly textual information was provided and 2 if an extensive amount of information on the topic was disclosed, such as through detailed textual information or textual information combined with quantitative data. Assigning higher weights to more detailed and quantitative rather than general and purely qualitative disclosures is justified by a higher potential verifiability (e.g., Al-Tuwaijri, Christensen, & Hughes, 2004). This way, the completeness score constitutes a well-founded representation of the extent to which climate change-related information is depicted and allowed for a reasonable differentiation of reporting levels in order to maximize validity. With a total of six key topics and three scoring values to be awarded, the coder has a total of 729 coding possibilities. This comparably small number of coding choices potentially favors the reliability of the analysis because there are fewer possibilities for several coders to disagree.³⁵ Section 4.5. describes the scoring approach and relating concerns of replicability in more detail.

4.2.3. Independent Variable: Connectivity

The connectivity score *Connect* measures the extent to which IR follows one of its main purposes, namely to connect different types of information. The main guidance document for the preparation of an integrated report – the IIRC framework – defines a number of guiding principles and content elements. However, the core idea of an integrated report is to depict how an organization creates value over time through connecting different types of information (IIRC, 2013c), hence the equalization of IR quality with connectivity. This focus on connectivity justifies the underlying research aim of identifying a relationship between IR and climate change management performance, which is further described in section 4.3.

As discussed in section 3.4.2. previous studies on IR claim to measure the quality of disclosures, yet their scoring criteria does not take into consideration whether or not the data are presented in connection to other pieces of information. Instead, their checklist-approach only shows to what extent integrated reports adhere to the IIRC framework, or, more specifically, whether the IIRC's guiding principles, content elements, and capitals are present or absent in an integrated report (e.g., Moloi, 2015, Lee & Yeo, 2015).

³⁵ A number of studies on sustainability reporting uses more categories. Gray et al. (1995) for example differentiated between 21 theme categories and Hackston & Milne (1996) between 73 final options.

This study applies a connectivity measure that goes beyond such a checklist-approach and counts the actual number of connections. The IIRC definition of connectivity is used as a basis for establishing criteria on what counts as a connection. Accordingly, “An integrated report should 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, 2013c, p. 5).

The seven key forms of information connections, according to the IIRC, are made between:

1. the framework’s content elements;³⁶
2. the past, present and future, to analyze current capabilities and the quality of management;
3. the capitals, to show trade-offs and interdependencies between them;
4. financial and other information, such as cost reductions that come along with energy efficiency measures;
5. quantitative and qualitative information, such as KPIs as part of narrative explanations;
6. management and board information, and information reported externally, with emphasis on the consistency between such information;
7. information in the integrated report, in the organization’s other communications and information from other sources (IIRC, 2013c).³⁷

The last two of these seven types of connections are difficult to operationalize. For example, the large sample size makes it impossible to gain access to internal management reports alongside external integrated reports of the same companies. Hence, checking for the consistency and connections of information between these two types of communication, as outlined in type six, is not feasible.

Since the focus of this study lies on those pieces of information that illustrate the company’s performance regarding climate change, this further narrows down the above-listed types of connections. For example, financial implications, such as cost reductions are only considered regarding climate change-relevant implications or initiatives. In addition, not all connections between different content elements are considered, but only those that include information on climate change and the company’s climate change management.

In that vein, an initial amount of ten integrated reports has been analyzed on the basis of the remaining five types of connections as defined by the IIRC and with a focus on climate change-related

³⁶ The content elements are *Organizational overview and external environment, Governance, Business model, Risks and opportunities, Strategy and resource allocation, Performance, Outlook, Basis of preparation and presentation, General reporting guidance* (IIRC, 2013c).

³⁷ This refers to the consistency between these sources of information as well as the combined consideration of them (IIRC, 2013c).

information. Every connection that corresponds to at least one of the above-mentioned types one to five *and* covers information on one of the key topics in climate change-related disclosure defined in the previous section is counted. Afterwards, a closer examination of this initial list of connections led to the inductive development of a set of three criteria, by looking for patterns and overlaps in those connections. Accordingly, a connection is characterized by:

1. The depiction of the company's actions with regard to climate change-related risks and opportunities or costs related to them.³⁸
2. The temporal development and organizational allocation (by geographic location or business unit) of climate change-relevant KPIs.³⁹
3. The depiction of climate change-relevant connections between different types of capitals (i.e. manufactured, intellectual, human, financial, natural, social and relationship) and reasons for changes in those capitals.⁴⁰

The first criterion mainly corresponds with the first and fifth connection type as prescribed by the IIRC. For instance, it represents a connection between the content elements Performance and Risks and Opportunities (i.e. connection type one) and potentially brings together qualitative with quantitative figures when costs are related to carbon mechanisms (i.e. connection type five).

The second criterion is directly related to the second connection type – the temporal development of relevant KPIs depicts “the past, present and future” (IIRC, 2013c, p. 17). All five types of connections defined by the IIRC were found in the third criterion. For example, a change in GHG emissions due to certain emission reduction activities corresponds to type two, four and five. The combined depiction of production outputs, GHG emissions or energy figures in the company's business model is in line with connection type one as well as three. Thus, these three criteria consider the IIRC's definition of connectivity as well as its feasibility and suitability for the underlying study. They contribute to the provision of a holistic and reciprocal picture of how climate change-relevant aspects affect a firm's ability to create value over time on the one hand, and how the firm itself contributes to climate change on the other.

³⁸ Regulatory national or supra-national standards, such as carbon market schemes, are regarded as a risk by most companies, which is why these carbon mechanisms as well as other compliance regulations have been included in the analysis.

³⁹ Referring to the climate change-related key topics, these KPIs are GHG emission and energy consumption figures.

⁴⁰ This criterion inherently includes the IIRC's requirement of connecting different types of capitals, and financial with other types of information and different content elements. Changes in capitals, such as costs (i.e. financial capital) or GHG emissions (i.e. natural capital) are also considered as connections.

Each connection that fulfills at least one of the above-mentioned three criteria is counted. It is also possible that multiple criteria are fulfilled at a time, for example the temporal development of GHG emissions with regard to a specific emission reduction initiative fulfills criterion two and three. Instead of referring to the respective criteria, specific key words are assigned to each connection, to further specify the nature of connections in more detail. By drawing on the climate change-related key topics, which are listed in section 4.2.2., and an initial analysis of connections in the first twenty reports, a list of 12 key words was developed inductively.

One connection according to the set of criteria can represent a combination of two to four key words within one sentence or paragraph. For example, in line with the third criterion, the depiction of a GHG emission figure (i.e. natural capital) alongside figures on financial or human capital within the business model, is counted as one connection between the key words “GHG emissions” and “Business model” (e.g., Kumba Iron Ore, 2016, p. 13). Table 11 provides a list of key words and their definitions. In addition, an exemplary connection from the reports that have been analyzed is presented as well as which one of the above-mentioned six criteria it fulfills.

Table 11

Key Words

Key word	Definition	Exemplary connection & fulfilled criterion
Business model	Overview of inputs, activities, outputs and outcomes according to the IIRC.	GHG emissions: Depiction of GHG emissions figure in business model illustration (e.g., Kumba Iron Ore, 2014, p. 13). Fulfilled criterion: #3
Business unit	Specific production site, company division or business segment.	Energy consumption: Total energy consumption by division (e.g., Sibanye Gold, 2014, p. 56). Fulfilled criterion: #2
Carbon mechanism	National or international, market- or technological mechanism regarding carbon management, such as Clean Development Mechanism (or other mechanisms suggested in Kyoto Protocol), Carbon taxes, Carbon credits, ETS, Carbon Capture and Storage, Carbon Funds.	Costs: The costs assigned to paying a carbon tax (e.g., Arcelor Mittal, 2016, p. 58). Fulfilled criterion: #1
Compliance	Climate change-related governmental investigations, allegations, fees, for example regarding allocation of <i>Atmospheric Emission Licenses</i> in South Africa.	Energy consumption: Comparing energy consumption figures to national energy reduction policies (e.g., Eldorado Gold, 2016, p. 35). Fulfilled criterion: #1

Costs	Total costs for a specific initiative or the reduction of costs (i.e. cost savings).	Carbon mechanism: Costs that incur through purchasing carbon credits or with regard to other carbon mechanisms (e.g., SSE, 2014, p. 51). Fulfilled criterion: #1
Energy consumption	Figures on the consumption of energy and electricity, or changes in these figures. Self-produced and consumed energy from renewable energy sources. Electricity is just one form of energy, whereas energy consumption might also include the use of petroleum or biomass for industrial and transport applications.	Temporal development: Annual figures on energy consumption for the past five years (e.g., Anglo Gold Ashanti, 2016, p. 110). Fulfilled criterion: #2
GHG emissions	Figures on the emittance of any one of the GHG emissions. These are “gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.” (UNFCCC, 1992, p. 7), namely water vapor, carbon dioxide, methane, nitrous oxide and ozone.	Initiative: Amount of GHG emissions saved due to a certain company initiative (e.g., Sappi, 2013, p. 43). Fulfilled criterion: #3
Initiative	Any measure or activity by the company aimed at reducing the amount of GHG emissions or its energy consumption (e.g., energy efficiency upgrades).	Investment: Investment costs to implement or build energy- or carbon reduction initiatives (e.g., Impala Platinum Holdings, 2015, p. 13). Fulfilled criterion: #3
Opportunity	Climate change-related opportunity, for example revenue recycling opportunities through <i>Integrated Electricity Demand Management</i> .	Revenue: Potential market size of a new technology related to the effects of climate change (in billion dollars) (e.g., Johnson Matthey, 2014, p. 18). Fulfilled criterion: #1
Revenue	Amount of money a company receives during a specific period.	GHG emissions: Change in GHG emissions per 1 million revenue (e.g., Nampak, 2014, p. 9). Fulfilled criterion: #3
Risk	Climate change-related risks, such as extreme weather events or patterns.	Initiative: Description of company initiative that has been implemented to counteract a certain risk (e.g., Harmony Gold Mining, 2015, p. 107). Fulfilled criterion: #1
Temporal development	Temporal trends of GHG emissions or energy consumption figures, for example annually.	GHG emissions: Annual figures on GHG emissions for the past four years (e.g., DCC, 2015, p. 69). Fulfilled criterion: #2

Reports were searched using seven terms relating to the above-mentioned key topics.⁴¹ Only those connections are counted that include at least one quantitative figure, or very elaborate information on an aspect for which the provision of quantitative information is impossible, given the nature of the information. This is in line with the “0-1-2 scoring approach” applied for the completeness score as described in the previous section. If all key words represent mostly textual information, the connection is not counted. However, if at least one of the key words includes an extensive amount of information on the topic such as through detailed textual information or textual information combined with quantitative data, then the connection is awarded with one point.

In this vein, the number of actual connections is higher for those reports that provide more connections with other types of qualitative or quantitative information, such as financial figures or regulatory developments. The total number of connections represents the connectivity score. The connectivity score reflects the overall level of connectivity of the report based on the IIRC’s connectivity principle and with a focus on climate change-related information.

Whereas the completeness score *Complete* assesses the extent and sophistication of the disclosed climate change management performance information, the connectivity score *Connect* measures the amount of connections of this information. Whether or not the extent of and connectivity in information affects a firm’s climate change mitigation performance is analyzed by relating *Complete* and *Connect* to *CCPerf*.

4.2.4. Control Variables

Based on prior literature, nine variables are further included in the analysis as controls for other factors that might be correlated with the independent variables *Complete*, *Connect* and determine the dependent variable *CCPerf*. It is assumed, however, that there are certainly other aspects that have such an influence, but could not be taken into consideration in the analysis for technical reasons, such as data availability.

The natural logarithm of total assets (*Logassets*) was used as a proxy for firm size (e.g., Barth et al., 2017; Lai et al., 2016). As larger firms tend to interact more with society, they attract greater political and external pressure and thus engage more extensively in voluntary disclosure (Brown & Deegan, 1998). Five out of seven reviewed studies in chapter 3.2. found a positive relation between firm size and the decision to adopt IR (Arguelles et al., 2017; Frias-Aceituno et al., 2014; Frías-Aceituno et al.,

⁴¹ Search terms in text were „climate“, „emission“, „green“, „carbon“, „energy“, „target“, „environment“.

2013a; García-Sánchez et al., 2013; Sierra-García et al., 2015). In this vein, larger firms might also disclose more information on relevant climate change topics, resulting in a higher completeness score.

Two measures for profitability have been included: return on assets (*ROA*) (e.g., Maniora, 2015; Lai et al., 2016) and the ratio of the company's operating cash flow to its net sales (*Logsales*) (e.g., Barth et al., 2017). The cash flow/sales ratio reflects the company's ability to turn sales into cash, whereas the ROA shows how efficient assets are utilized to generate earnings.⁴² As more profitable firms have more discretionary resources available for CSR- or disclosure-related activities (Miles & Covin, 2000), they might also publish more complete or connected reports.

In addition, it is controlled for the effect of leverage (*Loglev*), defined as the ratio of total debt and common equity.⁴³ A high leverage impedes potential investments to improve ESG performance (Maniora, 2015), which could also have an effect on the quality of ESG or IR. Precalculated figures on the sampled companies' return on assets, sales and leverage and were derived from Wharton Research Data Services.

Following Hung and Subramanyam (2007), companies show improvements in the quality of accounting practices and techniques after the adoption of IFRS. For that reason, Maniora (2015) included a control for following the IFRS, suggesting that its financial focus might prevent managers from integrating ESG issues into reporting and business considerations. The researcher failed to detect a significant relation. In addition, whether or not a company follows the IFRS guidelines is mandated on the national level, so any likely effect of the IFRS is included in the dummy variable *Country*. *Country* defines in which country the respective company is based.

Referring to the GRI guidelines as a basis for the report's preparation might have a positive influence on connectivity. Such an increase in *Connect* might be particularly visible in the application of the 4th version of the guidelines. Here, the GRI explicitly refers to the principle of integration and the linkages between sustainability and IR (GRI, 2015). The dummy *GRI* equals 1 if the G4 guidelines were referenced, and 2 if the 3rd version of the guidelines has been used in the preparation of the report. The value 3 was assigned, if the company mentions the GRI guidelines without specific reference to the version, which might imply a comparably loose application that is not *in accordance with GRI*. The value 0 was assigned if the report did not mention the GRI at all.⁴⁴

⁴² The ROA is calculated as: $(\text{Net Income} - \text{Bottom Line} + ((\text{Interest Expense on Debt} - \text{Interest Capitalized}) * (1 - \text{Tax Rate}))) / \text{Average of Last Year's and Current Year's Total Assets} * 100$

⁴³ Calculated as $(\text{Long Term Debt} + \text{Short Term Debt} + \text{Current Portion of Long Term Debt}) / \text{Common Equity} * 100$

⁴⁴ No differentiation is made between those reports that explicitly mention to be “in accordance with” the GRI guidelines and those that have *applied* them. Including the dummy variable GRI in the model allows for

In a similar vein, a dummy variable (*IIRC*) that equals 1 or 0, depending on whether the report mentions the IIRC framework or not, was included. Consulting the IIRC framework during the report preparation might increase the amount of connections, because report preparers are more aware of the different possibilities of integrating different types of information.

Report length (*Length*) is included to control for disclosure complexity, since lengthy reports have a higher amount of disclosure than shorter ones and might thus be more complete (Li, 2008). Reports spanning 200 pages include more information than one that has only 20 pages. Thus, they might have a higher level of completeness. Table 12 includes all relevant variables for the regression model as well as their definitions.

The variable *Logem* is the ratio of total CO₂ emissions and revenue in million USD. It is used for robustness checks and replaces the dependent variable *CCPerf* in section 5.7.2. Both, the CDP grade (*CCPerf*) as well as the emission-revenue ratio constitute valid measures for a company's climate change management performance. The CDP grade represents a more comprehensive approach to performance, whereas *Logem* interprets performance more narrowly in terms of actual CO₂ emissions output.

inferences about whether using the guidelines in the report's preparation might have an effect on the independent variables *Complete* and *Connect*. Both of these scores are self-developed and with a particular focus on climate change-related information, covering only a small portion of the GRI indicators. Whether or not the report is in accordance with the guidelines should therefore not make a difference.

Table 12

Variable Definitions

Variable	Definition	Source
<i>CCPerf</i>	Measures the comprehensiveness of the content, as well as the company's awareness of, management methods for and progress in climate change-related issues; provided by the CDP	CDP
<i>Type</i>	Type of Report: Integrated, Sustainability or Hybrid	Self-collected
<i>Complete</i>	Measures the completeness of external climate change-related reporting based on 6 key topics; ranges from 0 to 2.	Self-collected
<i>Connect</i>	Measures the amount of connections of external climate change-related reporting.	Self-collected
<i>Industry</i>	11 high-polluting industries: Chemicals, Construction & Materials, Containers & Packaging, Electric Utilities, Forest & Paper Products, Gas Utilities, Mining (Coal; Iron, Aluminum & Other Metals; Other), Oil & Gas, Water Utilities	CDP
<i>Country</i>	7 countries: Australia, Canada, Ireland, New Zealand, South Africa, United Kingdom, United States	CDP
<i>Logassets</i>	Natural logarithm of total assets; proxy for firm size	Thomson Reuters Worldscope
<i>ROA</i>	Income before extraordinary items scaled by total assets at the end of the year; proxy for firm's profitability	Thomson Reuters Worldscope
<i>Loglev</i>	Natural logarithm of total leverage; Debt to equity ratio; proxy for investor strength	Thomson Reuters Worldscope
<i>Logsales</i>	Natural logarithm of total sales	Thomson Reuters Worldscope
<i>GRI</i>	Dummy variable coded 1 if the company adheres to the most recent version of the GRI G4 Guidelines, 2 if it adheres to the G3 Guidelines and 0 if the GRI Guidelines were not applied	Self-collected
<i>IIRC</i>	Dummy variable coded 1 if the company mentions the IIRC framework and 0 if not	Self-collected
<i>Length</i>	Number of pages according to last numbered page in report	Self-collected
<i>Logem</i>	Natural logarithm of emissions; Ratio of total CO ₂ Emissions and Revenue in million USD	Thomson Reuters ESG data

The predicted relations between these variables are outlined in following sections.

4.3. Hypotheses Development

Based on the proclaimed benefits of IR depicted in section 1.2. and its evidenced implications discussed in section 3.4., this study's primary hypotheses focus on the relation between reporting completeness as well as connectivity and performance. The review of literature in chapter three already touches upon various theories when outlining certain determinants and implications of IR. Particularly Laughlin's (1991) model of organizational change offers great potential in predicting and explaining the hypothesized link between reporting sophistication and performance, as laid out in the following sections.

4.3.1. Organizational Change through IR

The literature on organizational change has long acknowledged the need to include the underlying change dynamics of organizational transformations in its analyses as opposed to focusing only on context-free change techniques or agents (e.g., Greenwood & Hinings, 1987). These change dynamics are understood as “the processes at work and the elaboration of the significant concepts and theoretical linkages driving those processes” (ibid: 562). In line with organizational change research, IR as a novel management tool potentially causes such change dynamics by acting as an environmental *disturbance*. Environmental disturbances or jolts require a response from the organization and thus, potentially drive change within (Laughlin, 1991). Figure 2 presents an organizational model developed by Laughlin (1991) with which he explains these changes.

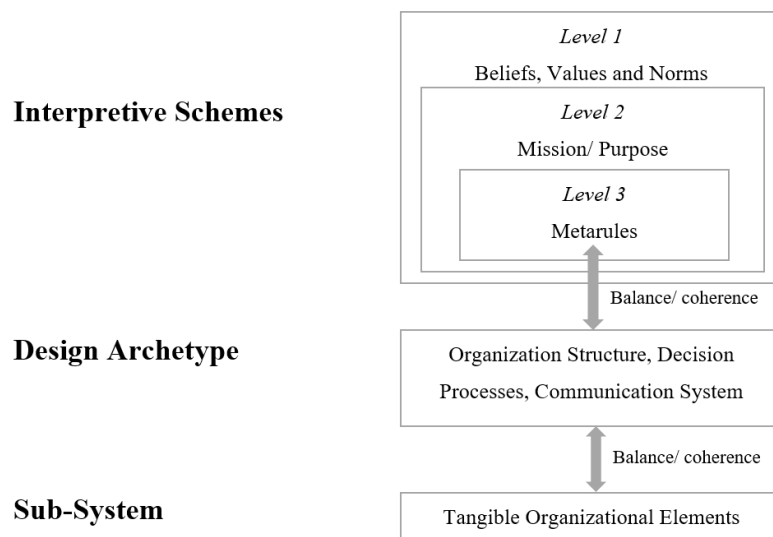


Figure 2. Organizational Model. Adapted from “Environmental Disturbances and Organizational Transitions and Transformations: Some Alternative Models,” by R.C. Laughlin, 1991, *Organization Studies*, 42, p. 211. Copyright 1991 by SAGE publications.

The upper component of the model represents the organization’s interpretive scheme. Bartunek (1984) defines such schemes as “cognitive schemata that map our experience of the world, identifying both its relevant aspects and how we are to understand them. Interpretive schemes operate as shared fundamental (though often implicit) assumptions about why events happen as they do and how people are to act in different situations.” (ibid: 355).

Interpretive schemes are divided into three components or levels of abstraction. By building upon Levy’s (1986) work, Laughlin (1991) differentiated between organizational *Beliefs, Values and Norms* on the first level. On the second level *Mission/Purpose* refers to any programs that guide the

direction of actions. *Metarules* on the third level are paradigms that underpin and guide all actions at the lower levels. The second component, the design archetype, is composed of the organization's structure, its communication system and decision processes.⁴⁵ The author further argues that interpretive schemes are in a dynamic balance and coherent with its design archetype as well as tangible organizational sub-systems – the third component of the model. This balance among different components favors a state of inertia (Laughlin, 1991). Miller and Friesen (1980) define inertia as an inability to effectuate internal change given significant external changes or threats.

Laughlin (1991) presumes that such a state of inertia can be dissolved when the organization is required to respond to the previously mentioned environmental disturbances or jolts. According to Smith (1982) such responses can lead to either first or second order organizational change (as cited in Laughlin, 1991). The author regards first order change as morphostatic, which makes “things to look different while remaining basically as they have always been” (ibid: 318). Second order, morphogenetic changes, however “occur when the model of the organization held in view is questioned, when, as a result of learning and developmental processes, a new model emerges and when new processes are instituted to achieve the new objectives entailed by the new model” (Robb, 1990, p. 318).

Laughlin (1991) highlights that environmental disturbances causing first order change do not affect the interpretive scheme of managers but rather shifts in organizational sub-systems or processes. Second order, morphogenetic change goes beyond these shifts and causes alterations in the interpretive schemes of managers. By elaborating upon different change pathways that the organization chooses, based upon environmental jolts, Laughlin (1991) argues that only *colonization* and *evolution* pathways cause such second order change.⁴⁶ In the case of colonization, second order change is forced upon the organization, such as with the case of a financial crisis, drives changes in organizational systems and processes, and “colonizes the guiding interpretive schemes of the organization” (ibid: 218).⁴⁷ This colonization leads to a new underlying mindset (i.e. new interpretive scheme) for the organization. The evolution pathway, on the contrary, is chosen and accepted by all organizational participants. Through free discourse it intends to “facilitate the development of a common organizational vision based on shared values” (Dunphy & Stace, 2016, p. 323).

⁴⁵ The term was introduced by Miller, Friesen & Mintzberg (1984).

⁴⁶ Namely rebuttal, reorientation, colonization and evolution (Laughlin, 1991).

⁴⁷ The author refers to Habermas' model of societal development (1981) where *internal colonization* is taking place once systems as parts of society actually invade the core of society.

The two alternative pathways, *rebuttal* and *reorientation*, only cause first order organizational change. In the case of rebuttal or, as Smith (1982; as cited in Laughlin, 1991) calls it, repetition models, the organization aims to achieve a state that is equal to that before the disturbance. It is rebutted by making some changes in organizational processes (i.e. its design archetype), but without changing its interpretive scheme (Laughlin, 1991). According to Laughlin (1991), changes in line with a reorientation, in turn, cannot be rebutted, but have to be accepted and internalized in processes and structures as well as organizational sub-systems. Thus, it might drive a first-order transition within the organization, but no second order morphogenetic transformation of its interpretive scheme.

There is initial evidence that externally mandated or desired sustainability reporting triggers first and second order organizational change (Tang & Demeritt, 2018; Herremans & Nazari, 2016). Tang and Demeritt (2018), for example, argue that reporting on ESG issues will enhance a company's awareness of these issues and thus cause a behavioral change. In addition, Herremans and Nazari (2016) detected an improvement in the overall quality of CSR policies based on the linkages between internal and external organizational reporting paradigms. The following sections expand these presumptions and initial findings to the concept of IR. In addition, the hypotheses that motivate the underlying empirical study are formulated on the basis of the aforementioned theoretical arguments.

4.3.2. The Link between Performance and Reporting Completeness and Connectivity

The stated research aim of investigating the link between IR and a firm's climate change management performance is based on the following line of argumentation. In the process of compiling and organizing the necessary information for integrated reports, measurement methodologies are improved and new metrics defined. At the same time, informational connections and even cause-and-effect relationships between ESG and financial outcomes are established (Eccles & Krzus, 2010). This is attributable to the primary aim of IR 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, 2013c, p. 5). Such improvements in sustainability-related measurements, metrics and information connections assist managers in decisions involving financial alongside non-financial information (Burritt & Schaltegger, 2010), for example regarding strategic planning, performance measurement and decision-making including risk management (Adams & Frost, 2008).

The notion that this, in fact, improves economic and environmental performance is based on two assumptions. Firstly, such advanced data for internal decision-making as well as external reporting potentially drives steady improvement by monitoring compliance with environmental regulation

(Henri & Journeault, 2010). Secondly, it enables managers to develop a holistic view of the company (Mio et al., 2016) and possibly influences their decisions, which is termed “integrated thinking” (e.g., Vesty et al., 2016).

In line with Laughlin’s (1991) model of organizational change, IR is voluntarily introduced at the organization and acts as an environmental disturbance that requires changes in communication systems, decision processes and potentially even the organizational structure (i.e. design archetype). Such changes go hand in hand with integrated thinking – the understanding of interactions between the organization and its external stakeholders as well as between different organizational units (Tweedie & Martinov-Bennie, 2015). They have the potential to change the interpretive scheme of managers – either by colonizing these schemes with a heightened susceptibility of social and environmental issues beyond mere profit-making, or by evolutionizing them through the development of a new organizational vision that also demonstrates such a heightened susceptibility.

Chapter three revealed that studies on this heightened susceptibility are generally qualitative in nature and mostly investigated mediating effects between IR’s adoption and internal as well as external implications. Only one study investigated whether IR and an increase in integrated thinking has a direct effect on a company’s ESG performance (Maniora, 2015). However, conclusions about the casual relationship between the adoption and quality of IR and a company’s ESG performance are impaired by other factors that might have a profound influence but cannot be controlled for. Given this difficulty to derive accurate results concerning specific effect mechanisms and relations when considering an overall ESG performance score, the focus is placed on climate change reporting and management performance. This concentration on one aspect of ESG performance allows for conclusions about the casual relationship between reporting (*Complete* and *Connect*) and performance (*CCPerf*).

Hence, the assumption that climate change-related IR could foster a heightened awareness of managers of the climate change-related impacts of their companies is investigated by observing the level of completeness and connectivity in its reporting. A higher or lower completeness score depends on how detailed a company provides information on the key topics in climate change-related reporting, such as regarding GHG emissions, reduction initiatives or targets. As outlined before, the compilation of such information from multiple sources, the development of innovative metrics and, as a result, the enhanced internal collaboration and communication across departments might encourage social and environmental awareness in decision-making. Studies examining such an enhanced application of climate mitigation measures based on the participation in carbon reporting yielded ambiguous results (e.g., Tang & Demeritt, 2018; Jones & Levy, 2007).

Initial studies on IR evidenced an increasing amount of non-financial information (e.g., Carels et al., 2013), a strengthened collaboration across departments (e.g., Burke & Clark, 2016) and an effect on decision-making (e.g., Barth et al., 2017) upon its adoption. Especially with regard to an enhanced collaboration between different business units, second order change through the colonization or evolution (Laughlin, 1991) of interpretive schemes might be achieved and thus have an effect on performance. Based on these findings and assumptions, the following hypothesis is derived:

H_{1a}: Companies with a higher completeness score (*Complete*) in their external climate change reporting exhibit a better climate change management performance (*CCPerf*) than those with a lower completeness score.

In addition, IR requires information to be presented in an integrated or connected manner. A higher or lower connectivity score depends on the amount of information connections established in the report. These are depictions of the combination, interrelatedness and dependencies (IIRC, 2013c) between different climate change-related factors and different types of information, such as financial and non-financial, quantitative and qualitative. Research on whether the adoption of IR favors the consideration of social and environmental issues in corporate decision-making and their integration in the organizational strategy yielded mixed results (e.g., Adams et al., 2016; Lai et al., 2016).

Nonetheless, in line with Laughlin's (1991) model of organizational change, it is assumed that IR has the potential to effect changes in the organizational structure, decision processes and communication systems (Stubbs & Higgins, 2014; Guthrie et al., 2017). This in turn might also change the interpretive scheme of managers and therefore their norms, values and paradigms, eventually leading to socially and environmentally more advantageous decisions. Hence, the second hypothesis is:

H_{1b}: Companies with a higher connectivity score (*Connect*) in their external climate change reporting exhibit a better climate change management performance (*CCPerf*) than those with a lower connectivity score.

IR is a fairly new reporting format that might not induce organizational changes right away. All hypotheses are therefore tested with a delayed effect which is further specified in section 4.4.

4.3.3. Interaction Effects

Interaction effects are present when the strength and direction of the relation between two variables is influenced by a third variable (Stock & Watson, 2007), which might also be the case in the

estimation of this study. In that vein, interaction effects are likely to occur between the independent variables *Complete* and *Connect*, and the control variable *Type*.

On the one hand, *Type* might be moderating the relationship between *Complete* and *CCPerf*. The sole purpose of a sustainability report is the depiction of ESG-related information. Integrated and annual reports, by comparison, include a plethora of financial and other company-related data alongside sustainability information (IIRC, 2013c) Hence, given the fact that sustainability reports have more space available to depict ESG information, their level of completeness might be higher than in annual or integrated reports. Thus, a dummy interaction term measures the effect of *Complete* on *CCPerf* moderated by *Type* ($Type \times Complete$), which is hypothesized as:

H_{2a} : The influence of the completeness score (*Complete*) on the climate change performance score (*CCPerf*) is significantly higher for a sustainability report as compared to an integrated or hybrid report (*Type*).

On the other hand, *Type* is also moderating the relationship between *Connect* and the dependent variable *CCPerf*. The amount of connections might depend on the type of the report in that IR potentially favors such connections in line with its core principle of connectivity. For example, a number of studies evidenced an increased collaboration across departments and an effect on decision-making by IR (e.g., Adams, 2017; Burke & Clark, 2016). Another dummy interaction term therefore measures the effect of *Connect* on *CCPerf* moderated by *Type* ($Type \times Connect$). The underlying hypothesis is summarized as:

H_{2b} : The influence of the amount of connections (*Connect*) on the climate change performance score (*CCPerf*) is significantly higher for an integrated or hybrid report as compared to a sustainability report (*Type*).

Both two-way interaction terms are included in the regression estimation (1) when performing OLS and subsequent analyses as outlined in the following sections.

4.4. Estimation Model and Statistical Method

To test this study's primary hypotheses H_{1a} and H_{1b} , the empirical model regresses the dependent variable for climate change management performance (*CCPerf*) on the explanatory variables measuring the completeness (*Complete*) and connectivity (*Connect*) of climate change-related external disclosures. It also controls for those mentioned additional variables that might affect the relation. The following equation captures this model:

$$\begin{aligned}
CCPerf_{i,t} = & \beta_0 + \beta_1 Type_{i,t-1} + \beta_2 Complete_{i,t-1} + \beta_3 Connect_{i,t-1} \\
& + \beta_4 (Type_{i-1} \times Complete_{i-1}) + \beta_5 (Type_{i-1} \times Connect_{i-1}) \\
& + \beta_6 Industry_{i,t} + \beta_7 Country_{i,t} + \beta_8 Logassets_{i,t-1} + \beta_9 ROA_{i,t-1} \\
& + \beta_{10} Loglev_{i,t-1} + \beta_{11} Logsales_{i,t-1} + \beta_{12} GRI_{i,t-1} + \beta_{13} IIRC_{i,t-1} \\
& + \beta_{14} Length_{i,t-1} + u_{i,t-1}
\end{aligned} \tag{1}$$

The subscript i refers to firm ($i = 1, 2, \dots, 94$) and subscript t refers to year t ($t = 2013, 2014, \dots, 2016$). The report type is captured by the dummy *Type*, whereby integrated reports serve as the reference category.⁴⁸ *CCPerf* of 2014 assesses the company's performance in 2014. This performance is assumed to be a result of the information disclosed in the reports for the 2013 reporting period, because changes in *CCPerf* might be due to changes in decision-making which are based on a higher *Complete* and *Connect* score. The effects on *CCPerf* by *Complete* and *Connect* are therefore delayed. Thus, the time-lag effect between the dependent and independent variable is $t - 1$. For example, *CCPerf* 2014 is thought to be correlated with *Complete* _{$t-1$} and *Connect* _{$t-1$} of the respective company report. Hence, these are distributed lag variables with lagged values X_{t-1} of the observed exogenous predictor, or X -variables *Complete* and *Connect*.

The multiple regression model specified above extends a simple linear regression equation by including more than just one independent variable X that explains the dependent variable Y . Simple linear regression postulates a linear relationship between the Y and X . Hence a change by one unit in X also causes a one-unit change in Y . The slope β_1 indicates this change of Y for each unit change of X , whereas the intercept β_0 represents the expected mean value of Y when X is zero (Stock & Watson, 2007). β_0 and β_1 are also referred to as estimators. Stock and Watson (2007) write the equation of a simple linear regression as

$$Y_i = \beta_0 + \beta_1 X_i + u_i. \tag{2}$$

The error term u_i incorporates all factors other than X that determine Y for a specific observation i (Stock & Watson, 2007).

Ordinary Least Squares (OLS) is a prevalent method to estimate the effects of independent variables on the dependent variable in a multiple regression model (Kennedy, 2003). As described in the work of Kennedy (2003), the coefficients that measure the effect of X_i on Y_i are estimated by minimizing

⁴⁸ Since *Type* is a categorical variable, the dummy takes on the value 0 or 1 depending on whether a sustainability or hybrid report is present or not to capture all three categories (00=IR, 10=SR or 01=HR).

the sum of squared prediction mistakes, also called the sum of squared residuals.⁴⁹ The sum of squared residuals measures the closeness of the observed data to the estimated regression line or, with other words, the sum of squared mistakes made in predicting Y given X . In that vein, OLS chooses the estimators β_0 and β_1 so that the sum of squared residuals is as small as possible (Kennedy, 2003). The value of Y_i is then predicted by using the regression line based on β_0 and β_1 , so that $Y_i = \beta_0 + \beta_1 X_i$. The mistake in predicting the i^{th} observation is $Y_i - (\beta_0 + \beta_1 X_i)$ or $Y_i - \beta_0 - \beta_1 X_i$. Hence, the sum of squared residuals over all observations n in a multiple regression model as depicted by Stock and Watson (2007) is:

$$\sum_{i=1}^n (Y_i - \beta_0 - \beta_1 X_i - \dots - \beta_k X_{ki})^2. \quad (3)$$

The OLS estimators of $\beta_0, \beta_1, \dots, \beta_k$ derived in (3) are denoted $\hat{\beta}_0, \dots, \hat{\beta}_k$ and computed from a sample of n observations of $(X_{1i}, \dots, X_{ki}, Y_i), i = 1, \dots, n$. Its predicted value is \hat{Y}_i and the OLS residual is \hat{u}_i . Hence, the authors formulate the OLS equation for the predicted values of \hat{Y}_i as:

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \dots + \hat{\beta}_k X_{ki}, \quad (4)$$

Where $i = 1, \dots, n$ and the estimates of the error terms are:

$$\hat{u}_i = Y_i - \hat{Y}_i, i = 1, \dots, n. \quad (5)$$

However, OLS estimators are only unbiased when six core assumptions are fulfilled that are listed in table 13 below.

⁴⁹ The difference between the estimated and observed value is called residual, whereas the error term represents the deviation of the observed from the true value (Stock & Watson, 2007)

Table 13

Assumptions of the Classical Linear Regression Model

1. **Linearity:** $y_i = x_{i1}\beta_1 + x_{i2}\beta_2 + \dots + x_{iK}\beta_K + \varepsilon_i$. The model specifies a linear relationship between y and x_1, \dots, x_K .
 2. **Full rank:** There is no exact linear relationship among any of the independent variables in the model. This assumption will be necessary for estimation of the parameters of the model.
 3. **Exogeneity of the independent variables:** $E[\varepsilon_i | x_{j1}, x_{j2}, \dots, x_{jK}] = 0$. This states that the expected value of the disturbance at observation i in the sample is not a function of the independent variables observed at any observation, including this one. This means that the independent variables will not carry useful information for prediction of ε_i .
 4. **Homoscedasticity and nonautocorrelation:** Each disturbance, ε_i has the same finite variance σ^2 and is uncorrelated with every other disturbance, ε_j .
 5. **Exogenously generated data:** The data in $(x_{j1}, x_{j2}, \dots, x_{jK})$ may be any mixture of constants and random variables. The process generating the data operates outside the assumptions of the model – that is, independently of the process that generates ε_i .
 6. **Normal distribution:** The disturbances are normally distributed.
-

Note. Adapted from Greene, W. H. (2003, p. 10). *Econometric analysis* (5. ed). Upper Saddle River, NJ: Prentice-Hall.

The most problematic assumption for the underlying study is the third one that requires strict exogeneity of the independent variables. In that vein, the error term u_i or, as Greene (2003) refers to it, disturbance ε_i should not be explainable by any independent variable. However, the simultaneous causality between the dependent variable depicting performance and the independent variables leads to exactly this correlation of these independent variables with the regression models' error term. This, in turn, causes biased OLS estimates, because it violates the above mentioned third core assumption. The use of lagged variables is one possibility to deal with this endogeneity. However, there is no certainty about the direction of causality and whether disclosure influences performance or the other way around.

Apart from the problem of simultaneous causality, the underlying data provides a second challenge for its analysis. It is assumed that there are firm-specific variables, such as internal communication and decision structures that determine the dependent variable *CCPerf* and influence the independent variable *Complete* and *Connect*. These are not considered in this study. Given its methodological

focus on content analysis, company-specific internal processes were not analyzed, for example through conducting interviews. The quantitative research design was purposefully chosen as opposed to qualitative methods given the lack of quantitative empirical studies and potential insights they might deliver, as described in section 3.4.2.

These internal processes, however, certainly play a role in the relation between climate change-related disclosures and performance. Only the dissemination of more connected information within the company can create awareness regarding potential trade-offs or efficiency gains. Additionally, possible benefits can only be reaped and environmental damages can only be avoided through utilizing this awareness in decision-making. Hence variables that operationalize this awareness or the decision-making processes are probably having a substantial impact on the firm's climate change performance, among other things.⁵⁰

This so called omitted variable bias due to explanatory variables that the estimation model does not include makes the OLS estimator misleading by inducing bias in its coefficient estimates.⁵¹ For example, the above-mentioned decision-making processes have an impact on climate change management performance that is unexplained, but are themselves also influenced by the underlying informational environment (*Connect and Complete*). Thus, OLS coefficient estimates are biased, because residuals are correlated either across years for a given firm, indicating the presence of a firm effect as mentioned above, or across firms for a given year, implying a time-effect. For that reason, fixed and random effects regression models are commonly used to control for such omitted variables in panel data (Stock & Watson, 2007).

Fixed effects (FE) models assume that something within the individual or entity impacts the predictor or outcome variables (Wooldridge, 2002), written as:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}, \tag{6}$$

where $\alpha_i, \dots, \alpha_n$ are unknown intercepts due to omitted variables to be estimated for each entity. By including this intercept, effects that vary across entities (but not over time) are accounted for (Greene, 2003). Y_{it} is the dependent variable per entity i and year t . X_{it} is one independent variable with the coefficient β_1 for that variable and u_{it} is the error term (Stock & Watson, 2007). In the context of this

⁵⁰ Although Maniora (2015) accounted for these aspects through including ASSET4 variables, she doubted the supportability of these measures herself.

⁵¹ Petersen (2008) gives a concrete example in which a firm fixed effect causes 50% of the variability in the independent variable as well as the residual which results in an OLS estimated standard error that is one half of the true standard error. An estimation of the standard error of the coefficient using clustered standard errors, however, is very close to the true standard error.

study, unobserved entity fixed effects exist, for example through the above-mentioned organizational communication and decision-making processes that are likely to be correlated with the climate change performance score (*CCPerf*).

There are several estimation strategies for a FE model to control for such variables that are constant over time but differ across entities. The least squares dummy variable model, for example, includes a dummy variable for every entity in the model. However, this can become problematic with a large number of entities, in this case companies (Baltagi, 2005). The “within” FE estimation on the other hand uses the variation within each individual or entity instead of a large number of dummies (Stock & Watson, 2007). The model therefore includes deviations from group means:

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)' \beta + (u_{it} - \bar{u}_i). \quad (7)$$

Here, \bar{y}_i is the mean of the dependent variable of the entity/ group i , whereas \bar{x}_i is the mean of the independent variable of the entity/ group i . \bar{u}_i is the mean of errors of entity/ group i .

Apart from entity fixed effects, time fixed effects can control for omitted variables that are constant across entities but change over time. For example, global trends and national legislation in external corporate reporting, such as a growing comprehensiveness or increasing integration of information even beyond the IIRC framework (Pounder, 2011) change over time, but potentially influence all companies. In addition, certain financial figures included in the data, such as sales, leverage or return on assets might be influenced by macroeconomic *shocks* that have an effect on the firm’s returns (Petersen, 2008; Jermann & Quadrini, 2012).⁵² Such economic downturns effectuate change across most firms. The combined entity and time fixed effects regression model that accounts for these impacts, expands (7) as:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \lambda_t + u_{it}, \quad (8)$$

where α_i is the entity’s fixed effect and λ_t is the time fixed effect (Stock & Watson, 2007). After running a fixed effect model, a Wald test was performed to see whether removing the variable *Year* from the model would harm its fit. The Null Hypothesis stating that every year equals zero could be rejected with extremely high confidence ($Prob > F = .000$), confirming the presence of time effects.

Random effects (RE) models on the other hand assume a random and uncorrelated variation across entities with the independent variables, but that these differences influence the dependent variable

⁵² Jermann and Quadrini (2012) found that historic economic downturns are significantly associated with a firm’s debt and equity financing.

(Stock & Watson, 2007). The difference between FE and RE models lies in the dummy variable. FE includes a parameter estimate of a dummy variable for each entity (α_i), whereas RE includes an error component (u_{it}), which is why it is also called the error component model (Wooldridge, 2002).

Based on the previously stated concern that there are additional explanatory variables within the firm that have an influence on *CCPerf* as well as on *Connect* and *Complete*, but that are not included in the analysis for technical reasons (i.e. internal communication and decision-making processes), a FE estimation seems to be a better fit than RE. Changes in the climate change management performance of a firm are very likely caused by other internal factors following FE. RE on the other hand assumes that such internal firm-specific effects are not correlated with the independent variables *Connect* and *Complete*.

However, FE models omit time-invariant variables in their estimation. They are designed to analyze the causes for change within an entity and assume that the effects of the omitted variables on this entity at a certain point of time will be the same effect at a later time (Stock & Watson, 2007). Hence, the effect of potential time-invariant characteristics is held constant for each entity to control for them (Kohler & Kreuter, 2006).⁵³ The data set includes an important time-invariant variable with regard to the study's research aim, namely *Type*. The report type either takes on the value 1 if the company publishes an integrated report, 2 for a sustainability and 3 for a hybrid report. The significance of this variable for the estimation lies in the assumption that integrated reports have a higher connectivity score than sustainability and hybrid reports. As described in section 4.3.3., *Type* is assumed to moderate the relationship between *Connect* and the dependent variable *CCPerf*. *Type* takes on the same values over the observed time period, but not across companies. It is thus time-invariant with the coefficients being omitted in the FE estimation analysis.

Petersen (2008) offers a viable solution for accounting for a firm effects and omitted time-invariant variables. After comparing a variety of methods for estimating standard errors given correlated residuals, he demonstrated that standard errors clustered by the firm account for the residual dependence created by the firm effect. This clustered standard error approach squares the sum of $X_{it}u_{it}$ within each cluster (i.e. firm). X_{it} is the firm-specific component of the independent variable

⁵³ As opposed to FE models, RE estimators can include time-invariant variables – so those characteristics of the organization that do not change over time. Given the RE model's assumption that the entity's error term is not correlated with the independent variables, time-invariant variables can be added to play a role as additional explanatory variables.

and u_{it} are the residuals.⁵⁴ Squaring the sum of $X_{it}u_{it}$ estimates the covariance between residuals within the cluster which is assumed to have the same distribution across clusters (Petersen, 2008). The standard errors are therefore consistent even if the number of clusters increases. A dummy variable for each time period is also included based on Petersen's (2008) suggestion: "When both a firm and a time effect are present in the data, researchers can address one parametrically (e.g., by including time dummies) and then estimate standard errors clustered on the other dimension" (ibid: 475).

Hence, the underlying fixed time effect is absorbed by removing the correlation between observations in the same time period (Petersen, 2008). Accordingly, the fixed effects model:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}, \quad (9)$$

is extended by

$$u_{it} = \gamma_i + \delta_t + \eta_{it} \quad (10)$$

$$X_{it} = \mu_i + \zeta_t + v_{it}. \quad (11)$$

Here, one-third of the variability of the residual u_{it} and the independent variable X_{it} is due to the firm effect – denoted with the subscript i – and one-third is due to the time effect t (e.g., $\text{Var}(\gamma) = \text{Var}(\delta) = \text{Var}(\eta)$ and $\text{Var}(\mu) = \text{Var}(\zeta) = \text{Var}(v)$) (Petersen, 2008).

Based on these extensions given firm- and time-fixed effects as well as due to interaction effects specified in section 4.3.3., the following equation adjusts estimation model (1):

$$\begin{aligned} CCPerf_{i,t} = & \beta_0 + \beta_1 Type_{i,t-1} + \beta_2 Complete_{i,t-1} + \beta_3 Connect_{i,t-1} & (12) \\ & + \beta_4 (Type_{i-1} \times Complete_{i-1}) + \beta_5 (Type_{i-1} \times Connect_{i-1}) + \beta_6 Industry_{i,t} \\ & + \beta_7 Country_{i,t} + \beta_8 Logassets_{i,t-1} + \beta_9 ROA_{i,t-1} + \beta_{10} Loglev_{i,t-1} \\ & + \beta_{11} Logsales_{i,t-1} + \beta_{12} GRI_{i,t-1} + \beta_{13} IIRC_{i,t-1} + \beta_{14} Length_{i,t-1} + \alpha_i \\ & + u_{i,t-1} \end{aligned}$$

Again, the subscript α_i refers to the entity's fixed effect and u_i to its error term. Before outlining the regression's results in chapter 4.7., the following sections first explain the scoring procedure by which individual *Complete* and *Connect* scores have been identified. A detailed description of

⁵⁴ The residuals consist of a firm-specific component (γ_i) as well as an idiosyncratic component unique for each observation (η_{it}) (Wooldridge, 2002). The components of X_{it} and u_{it} have finite variance, zero mean and are independent – a necessary condition for the coefficient estimates to be independent (Petersen, 2008).

the sample as well as key properties of the independent variables are further outlined in section 4.6.

4.5. Scoring Procedure

A quantitative content analysis of company reports was conducted to retrieve information on the variables *Type*, *Complete*, *Connect*, *GRI*, *IIRC* and *Length*. Krippendorff (2009) defines content analysis as “a research technique for making replicable and valid inferences from text (or other meaningful matter) to the contexts of their use” (ibid: 18). The content analysis of corporate reports was conducted by consulting a stepwise scoring procedure. In line with this procedure, information was transferred to a data extraction form in excel. The coding procedure as well as the data extraction form’s structure are described in more detail in the following sections. Two student research assistants rated the reports in addition to the author over a period of four months during the summer of 2018. The research assistants are students in business administration with background knowledge on CSR-related topics. Prior to individual rating of both research assistants, the scoring procedure was discussed in detail as well as existing questions. In a next step, they had to rate two reports independently and then review the results together with the researcher. Potential questions were again discussed and faulty assessments reviewed. A measure of inter-rater reliability was applied to check for the degree of agreement among the three raters, as described in section 4.5.3.

4.5.1. Stepwise Scoring Procedure

The scoring procedure as part of the content analysis of each report involved several steps that are described in table 14. Figures, quotes or other information derived from the analysis of these reports were collected in a data extraction form in Microsoft Excel.

Table 14

Stepwise Scoring Procedure

Step 1	Open PDF file of respective company report
Step 2	Transfer total page number and report year to data extraction form ⁵⁵
Step 3	Check for reporting period and transfer to data extraction form
Step 4	Search document for the following words: “climate”, “emission”, “carbon”, “energy”, “environment”, “green”, “target”, “footprint” ⁵⁶
Step 5	Highlight relevant figure, sentence or paragraph in PDF file yellow
Step 6	Transfer relevant figure, sentence or paragraph to respective cell in data extraction form, depending on whether it covers one of the six key topics, represents a connection or accounts for both scores (<i>Complete</i> and <i>Connect</i>)
Step 7	Assign values 0, 1 or 2 to each of six key topics depending on amount and quality of information in data extraction form
Step 8	Count amount of connections in data extraction form

Apart from this stepwise procedure for each report, it was also checked for the absence (0) or presence (1) of a sustainability report alongside the integrated or hybrid report, as well as for reference to the GRI guidelines or IIRC. The search function Strg + F was utilized to detect relevant information with the unit of analysis being the report’s pages.

A figure, phrase or sentence from the reports was either directly copied and transferred to the data extraction sheet or an indication of the page number was given on which the information was found.⁵⁷ A coding decision for each key topic under the completeness score was indicated directly in the XLS file by assigning the values 0,1 or 2 to the respective cross-referenced piece of information. Information that might count as a connection was also transferred to the data extraction form. The decision about whether it counts as a connection or not, however, was only made by the author. Despite the fact that the principle of connectivity in line with IR is defined in a very detailed manner in section 4.2.3., this ensures a stronger reliability and coherence of the measure.

4.5.2. Data Extraction Form

The data extraction form includes company data, CDP data, technical report data and information derived from the qualitative content analysis. Table 15 provides an overview of the aspects included

⁵⁵ The page number is based on the last page that is numbered in the report.

⁵⁶ Initially 22 search terms were inductively derived from the six key topics that define the completeness score; see section 4.2.1. After the analysis of 20 reports, those 22 search terms were reduced to 8 words, because all relevant information was covered by them.

⁵⁷ Only the author indicated the page number in the data extraction form. The respective figure, phrase or sentence in the PDF file was highlighted and is therefore easy to find in retrospect. The other two coders transferred whole citations to the data extraction form.

in the data extraction form and appendix A presents an abstract of this data extraction form with some exemplary data sets. This data was analyzed with the statistical software STATA (Version 14).

Table 15

Information in Data Extraction Form

Company Data	CDP Data	Technical Report Data	Content Analysis Data
Company Name	Date	Scoring Date of Report	Complete Strategy
Company as in Code	Submittance CDP Disclosure Score ⁵⁸	Type of Report	Complete GHG
Company CDP ID	Performance Score	Page Number	Complete Energy
Country		Year on Title Page	Complete Risks & Opportunities
Industry		Start Date Reporting Period	Complete Target
Performance Year ⁵⁹		End Date Reporting Period	Complete Emission Reduction Initiatives
Total Assets		Presence Sustainability Report	Complete Total
Return on Assets		Reference to GRI Indicators	Connect Total
Sales		Reference to IIRC Framework	
Leverage			
Total GHG Emissions			

4.5.3. Inter-rater Reliability

In order to draw replicable and valid inferences from the data collected, the content analysis' reliability is ensured by means of checking the inter-rater reliability (Krippendorff, 2009). Inter-rater reliability refers to the measurement of the reproducibility of data derived from the coding of information involving multiple coders (Weber, 1990). It assesses the proportion of coding errors between coders, for which several calculations are available. Inter-rater reliability ultimately requires the same pieces of information being coded the same way by each coder (Milne & Adler, 1999).

Inter-rater reliability was not checked among all three raters, but among the author (rater 1) and both student raters (rater 2 and 3) bilaterally, because the student research assistants coded different types of reports. Based on their individual availability, they could not start the rating process of the reports at the same time. With a few exceptions, the report types were coded one after another, starting with integrated reports, followed by hybrid reports and then sustainability reports. Hence, the first coding assistant scored integrated and hybrid reports, whereas the second one rated sustainability reports only. Milne and Adler (1999) suggest that less experienced raters should code around 20 reports before their coded output can be relied on. Thus, in addition to the two reports which have been coded and subsequently compared and discussed, the author and both student research assistants each coded

⁵⁸ Until 2015 the CDP collected a separate score for disclosure performance alongside overall performance scores. As of 2016, there is only a single score.

⁵⁹ Year to which CDP performance score refers.

another 18 reports that were also compared and discussed bilaterally. The coding decisions of these 20 reports for each of the three coders were used for inter-rater reliability calculations to verify the reliability of the scoring instrument.

Cohen's kappa, a prominent measure for inter-rater reliability, was used to check for this reliability and ensure a sufficient level of agreement among raters.⁶⁰ It goes beyond calculating a simple coefficient of agreement that ignores the possibility of agreement occurring by chance (Cohen, 1960). Based on the small number of coding categories in this study, however, the likelihood of random agreement is certainly given (Lombard, Snyder-Duch, & Bracken, 2002). Cohen's Kappa corrects for this random agreement in the ratio of the proportion of observed agreement cases and the maximum proportion of cases that the raters could potentially agree on (Gisev, Bell, & Chen, 2013). Based on six key topics that were coded for 20 companies, a total of 120 cases were tested that could be rated as either 0, 1 or 2.

Cohen's kappa suggests a sufficiently high level of agreement between rater 1 and 2 as well as between rater 1 and 3 for these cases. Raters 1 and 2 agreed on 85.8% of the cases with a Kappa value of .762 that indicates a substantial agreement (Landis & Koch, 1977). Similarly, raters 1 and 3 agreed on 86.7% of the cases with a Kappa value of .798, evidencing a sufficiently high reliability of the coding instrument.

⁶⁰ All three assumptions specified by Cohen (1960) are met: (1) Rated items are independent; (2) Categories are independent, exhaustive and mutually exclusive; (3) Raters are independent.

4.6. Sample Description

4.6.1. Industry and Country Distribution

The empirical analysis uses unbalanced panel data consisting of 94 companies that are observed over a period of four years from 2013 to 2016. Given that a company is not obliged to publish an integrated, sustainability or hybrid report, there is missing data on some years.

Based on the selection criteria laid out in section 4.1. the final sample consists of 235 company-year observations (i.e. company reports) distributed across seven countries and 11 industries.⁶¹ Of these observations, 13 companies have provided either an integrated, sustainability or hybrid report over all four years. 42 companies and their respective reports are included over 3 years, 21 companies over 2 years and 15 over one year. The average length of integrated reports is 159 pages. Sustainability reports are on average 58 pages long and hybrid reports 136 pages.

Figure 3 provides an overview of the amount of reports by report type and country, and figure 4 by type and industry.

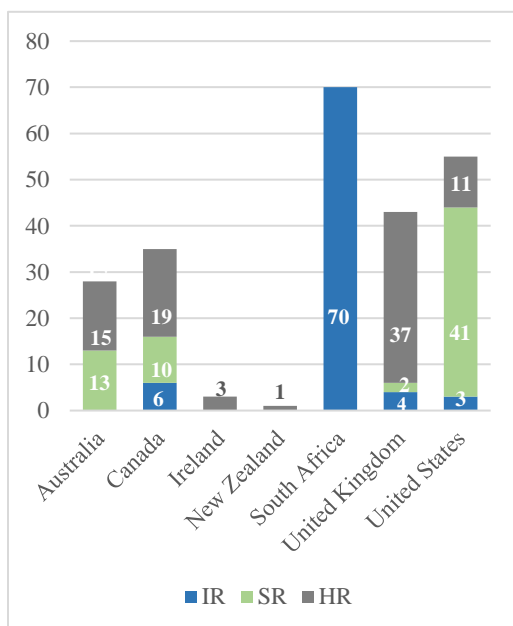


Figure 4. Amount of Reports by Type and Country

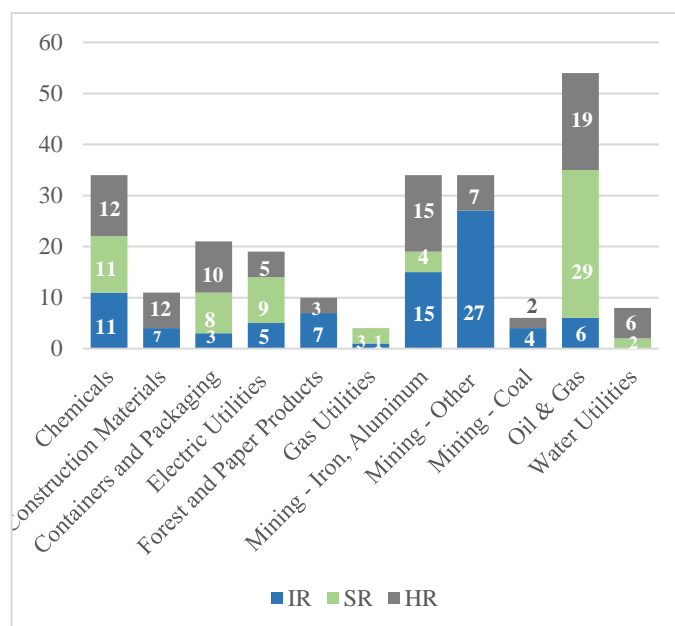


Figure 3. Amount of Reports by Type and Industry

⁶¹ There was no CDP data available for companies in Hong Kong, Israel, Malaysia and Singapore that also fit the remaining sample selection criteria.

Figure 3 illustrates that the majority of analyzed reports are from South Africa (70), followed by the US (55) and the UK (43). South African reports are exclusively integrated given the respective regulatory requirement for companies listed on the JSE. The majority of sustainability reports in the sample stems from US companies, which is in line with other research findings (e.g., KPMG, 2017). Firms located in the UK publish the majority of hybrid reports in the sample, hence they include more sustainability information in their annual reports than other companies. This might be attributable to the Non-Financial Reporting Directive of the EU. Despite the fact that it has not become effective for reports before the 2017 financial year, its anticipation might have already boosted the disclosure of ESG aspects in European firms (KPMG, 2017).

However, conclusions on the prevalence of certain reporting formats in different countries are impaired by the fact that the sample is not representative but limited to those companies that participate in the CDP's investor initiative. This participation goes hand in hand with a certain susceptibility for disclosing ESG information in external reporting. In a similar vein and as discussed in more detail in section 4.1.1. the affiliation with certain industries also increases the likelihood of companies to provide stakeholders with information on their ESG impacts and actions. Industries displayed in figure 4 are all underlying external pressures to disclose non-financial ESG aspects given their high pollution levels. The greatest number of reports in the sample is by far from companies in the oil and gas sector (54). Reports from the chemicals (34) and mining (68) sector, especially the mining of iron, aluminum, precious metals and gems, also make up a large proportion of the sample. In addition, both sectors publish the largest relative amount of sustainability reports in the sample. Interestingly, this is also in line with more representable research on ESG reporting across industries that identified that the oil and gas, chemicals and mining sector have the highest reporting rates (KPMG, 2017). The fact that most integrated reports are published by mining firms is due to their location in South Africa which is known to be rich in mineral resources.

4.6.2. Summary of Climate Change Performance

Table 16 provides an overview of the descriptive statistics for the dependent performance grade *CCPerf*. Mean, standard deviation (SD), minimum and maximum values are presented across report types, countries and industries. Analysis of variance (ANOVA) coefficients illustrate differences in *CCPerf* dependent on *Type*, *Country*, *Industry* and *Year*.

Table 16

Summary statistics and ANOVA

	Obs	Mean	SD	CCPerf		Coef	t
				Min	Max		
Type							
<i>IR</i>	83	3.25	1.62	1.00	7.00		
<i>SR</i>	66	4.30	1.87	1.00	7.00	1.05***	3.62
<i>HR</i>	86	4.90	1.98	1.00	9.00	1.65***	6.21
Country							
<i>Australia</i>	28	5.28	1.57	3.00	9.00		
<i>Canada</i>	35	4.96	1.67	1.00	9.00	-0.32	-0.85
<i>Ireland</i>	3	6.00	2.00	5.00	9.00	0.72	0.77
<i>New Zealand</i>	1	5.67	1.15	5.00	7.00	0.39	0.36
<i>South Africa</i>	70	3.27	1.62	1.00	7.00	-2.01***	-5.70
<i>United Kingdom</i>	43	4.29	2.26	1.00	9.00	-0.99**	-2.70
<i>United States</i>	55	3.79	1.71	1.00	7.00	-1.49***	-4.29
Industry							
<i>Chemicals</i>	34	3.90	2.00	1.00	9.00		
<i>Construction Materials</i>	11	4.60	1.55	3.00	7.00	0.70	1.24
<i>Containers and Packaging</i>	20	3.80	1.68	1.00	7.00	-0.10	-0.24
<i>Electric Utilities</i>	19	3.30	1.59	1.00	7.00	-0.61	-1.32
<i>Forest and Paper</i>	10	3.67	1.37	1.00	5.00	-0.24	-0.39
<i>Products</i>							
<i>Gas Utilities</i>	4	5.83	1.33	4.00	7.00	1.93*	2.38
<i>Mining - Iron, Aluminum</i>	35	4.88	2.04	1.00	9.00	0.98*	2.38
<i>Mining - Other</i>	34	3.66	1.96	1.00	9.00	-0.24	-0.59
<i>Mining - Coal</i>	7	3.75	1.04	3.00	5.00	-0.15	-0.21
<i>Oil & Gas</i>	53	4.71	1.97	1.00	9.00	0.81*	2.25
<i>Water Utilities</i>	8	3.91	2.02	2.00	7.00	0.01	0.01
Year							
2013	71	4.25	2.05	1	9		
2014	77	4.94	2.16	1	9	0.69*	2.31
2015	69	3.60	1.58	1	7	-0.66*	-2.16
2016	18	3.92	1.52	1	7	-0.33	-1.06
Total	235	4.19	1.92	1.00	9.00		

Note. Individual coefficients are statistically significant at the *.05, **.01, or ***.001 level.

The higher the climate change management performance score, the worse the actual performance, given that a score of 1 represents the grade A and 8 D-. Hence, a mean score of 4.9 for those performance years in which a hybrid report is published represents a worse performance than a mean score of 3.25 for integrated reports. Those years in which only sustainability reports were published correspond to a mean performance score of 4.30. The one-way ANOVA results also evidence significant differences between the sample means of different report types. The corresponding F-statistic for *Type* is 19.39 ($p < .01$). The base level β -coefficients report that the performance score increases by 1.05 when sustainability reports are present as compared to IR ($p < .001$). The score increases by 1.65 for hybrid reports ($p < .001$). The climate change management performance is

therefore worse for years in which sustainability and hybrid reports were published as compared to those with an integrated report.

With reference to the temporal development of performance scores, coefficients indicate a decrease in performance score by 0.69 from 2013 to 2014 ($p < .05$), but a subsequent increase by 0.66 in the following year ($p < .05$) as compared to 2013. Conclusive judgements about the differences depicted in table 16, however, cannot be made because of the comparably high standard deviations ranging from 1.04 to 2.26 as well as the assumption that the effect of reporting on performance becomes visible with a time delay of one year.

The sample is distributed unequally across industries with a maximum of 70 reports from South Africa and only one and three reports from New Zealand and Ireland respectively. Group means of the latter two countries are therefore not representative. From those country groups with larger sample sizes, Australian firms have a comparably bad performance score (5.28) with a standard deviation of 1.57. With regard to industries, companies in mining (iron) and gas and oil are similarly outperformed by other industries with respect to their mean scores of 4.88 and 4.71 respectively. Even though gas utility firms also have a high mean score, their low group size does not allow valid inferences. A more refined analysis of differences among means for certain country and industry groups is achieved by means of a post hoc pairwise comparison test. More specifically, Tukey's honestly significant difference (HSD) method was applied because of unequal sample sizes per group (Stevens, 1999). Table 17 reports the pairwise differences of the mean of *CCPerf* across different countries as well as across different industries.

Table 17

Pairwise Comparisons

<i>Country Comparisons</i>	<i>CCPerf</i>		
	<i>Contrast</i>	<i>SE</i>	<i>t</i>
<i>Australia vs Canada</i>	-0.32	0.38	-0.85
<i>Australia vs Ireland</i>	0.72	0.94	0.77
<i>Australia vs New Zealand</i>	0.39	1.07	0.36
<i>Australia vs South Africa</i>	-2.01	0.35	-5.70***
<i>Australia vs United Kingdom</i>	-0.99	0.37	-2.70
<i>Australia vs United States</i>	-1.49	0.35	-4.29***
<i>Canada vs Ireland</i>	1.04	0.93	1.12
<i>Canada vs New Zealand</i>	0.71	1.06	0.67
<i>Canada vs South Africa</i>	-1.69	0.32	-5.24***
<i>Canada vs United Kingdom</i>	-0.67	0.34	-1.98
<i>Canada vs United States</i>	-1.17	0.32	-3.69**
<i>Ireland vs New Zealand</i>	-0.33	1.36	-0.24
<i>Ireland vs South Africa</i>	-2.73	0.92	-2.98*
<i>Ireland vs United Kingdom</i>	-1.71	0.92	-1.86
<i>Ireland vs United States</i>	-2.21	0.91	-2.42
<i>New Zealand vs South Africa</i>	-2.40	1.05	-2.28
<i>New Zealand vs United Kingdom</i>	-1.38	1.06	-1.31
<i>New Zealand vs United States</i>	-1.87	1.05	-1.79
<i>South Africa vs United Kingdom</i>	1.02	0.31	3.27*
<i>South Africa vs United States</i>	0.52	0.29	1.83
<i>United Kingdom vs United States</i>	-0.50	0.30	-1.63
<hr/>			
<i>Industry Comparisons</i>			
<i>Chemicals vs Construction Materials</i>	0.70	0.56	1.24
<i>Chemicals vs Containers and Packaging</i>	-0.10	0.43	-0.24
<i>Chemicals vs Electric Utilities</i>	-0.61	0.46	-1.32
<i>Chemicals vs Forest and Paper Products</i>	-0.24	0.61	-0.39
<i>Chemicals vs Gas Utilities</i>	1.93	0.81	2.38
<i>Chemicals vs Mining - Iron, Aluminum</i>	0.98	0.41	2.38
<i>Chemicals vs Mining - Other</i>	-0.24	0.41	-0.59
<i>Chemicals vs Mining - Coal</i>	-0.15	0.72	-0.21
<i>Chemicals vs Oil & Gas</i>	0.81	0.36	2.25
<i>Chemicals vs Water Utilities</i>	0.01	0.63	0.01
<i>Construction Materials vs Containers and Packaging</i>	-0.80	0.57	-1.40
<i>Construction Materials vs Electric Utilities</i>	-1.30	0.59	-2.18
<i>Construction Materials vs Forest and Paper Products</i>	-0.94	0.72	-1.30
<i>Construction Materials vs Gas Utilities</i>	1.23	0.90	1.37
<i>Construction Materials vs Mining - Iron, Aluminum</i>	0.28	0.56	0.50
<i>Construction Materials vs Mining - Other</i>	-0.94	0.56	-1.68
<i>Construction Materials vs Mining - Coal</i>	-0.85	0.81	-1.05
<i>Construction Materials vs Oil & Gas</i>	0.11	0.53	0.21
<i>Construction Materials vs Water Utilities</i>	-0.69	0.74	-0.94
<i>Containers and Packaging vs Electric Utilities</i>	-0.50	0.48	-1.06
<i>Containers and Packaging vs Forest and Paper Products</i>	-0.13	0.62	-0.21
<i>Containers and Packaging vs Gas Utilities</i>	2.03	0.82	2.48
<i>Containers and Packaging vs Mining - Iron, Aluminum</i>	1.08	0.43	2.52
<i>Containers and Packaging vs Mining - Other</i>	-0.14	0.43	-0.33
<i>Containers and Packaging vs Mining - Coal</i>	-0.05	0.73	-0.07
<i>Containers and Packaging vs Oil & Gas</i>	0.91	0.38	2.40
<i>Containers and Packaging vs Water Utilities</i>	0.11	0.64	0.17
<i>Electric Utilities vs Forest and Paper Products</i>	0.37	0.64	0.57

<i>Electric Utilities vs Gas Utilities</i>	2.54	0.84	3.03
<i>Electric Utilities vs Mining - Iron, Aluminum</i>	1.58	0.46	3.44*
<i>Electric Utilities vs Mining - Other</i>	0.36	0.46	0.79
<i>Electric Utilities vs Mining - Coal</i>	0.45	0.75	0.61
<i>Electric Utilities vs Oil & Gas</i>	1.41	0.42	3.40
<i>Electric Utilities vs Water Utilities</i>	0.61	0.66	0.92
<i>Forest and Paper Products vs Gas Utilities</i>	2.17	0.93	2.33
<i>Forest and Paper Products vs Mining - Iron, Aluminum</i>	1.21	0.61	1.99
<i>Forest and Paper Products vs Mining - Other</i>	-0.01	0.61	-0.01
<i>Forest and Paper Products vs Mining - Coal</i>	0.08	0.85	0.10
<i>Forest and Paper Products vs Oil & Gas</i>	1.04	0.58	1.81
<i>Forest and Paper Products vs Water Utilities</i>	0.24	0.78	0.31
<i>Gas Utilities vs Mining - Iron, Aluminum</i>	-0.96	0.81	-1.18
<i>Gas Utilities vs Mining - Other</i>	-2.18	0.81	-2.68
<i>Gas Utilities vs Mining - Coal</i>	-2.08	1.00	-2.08
<i>Gas Utilities vs Oil & Gas</i>	-1.12	0.79	-1.43
<i>Gas Utilities vs Water Utilities</i>	-1.92	0.94	-2.04
<i>Mining - Iron, Aluminum vs Mining - Other</i>	-1.22	0.41	-2.97
<i>Mining - Iron, Aluminum vs Mining - Coal</i>	-1.13	0.72	-1.57
<i>Mining - Iron, Aluminum vs Oil & Gas</i>	-0.17	0.36	-0.47
<i>Mining - Iron, Aluminum vs Water Utilities</i>	-0.97	0.63	-1.54
<i>Mining - Other vs Mining - Coal</i>	0.10	0.72	0.13
<i>Mining - Other vs Oil & Gas</i>	1.05	0.36	2.92
<i>Mining - Other vs Water Utilities</i>	0.265	0.63	0.40
<i>Mining - Coal vs Oil & Gas</i>	0.96	0.69	1.39
<i>Mining - Coal vs Water Utilities</i>	0.16	0.86	0.18
<i>Oil & Gas vs Water Utilities</i>	-0.80	0.60	-1.34

Note. Individual coefficients are statistically significant at the *.05, **.01, or ***.001 level.

There is a statistically significant difference between country ($F(6,306) = 9.06; p < .001$) and industry ($F(10,302) = 3.08; p < .001$) as determined by one-way ANOVA. Results from a Tukey post-hoc test reveal that climate change performance is statistically lower in Australia as compared to South Africa and the US ($-2.01; -1.49 \mp 0.35; p < .001$). In a similar vein, South African companies ($-1.69 \mp 0.32; p < .001$) as well as US ones ($-1.17 \mp 0.32; p < .01$) perform better than Canadian ones. Furthermore, South African firms have a better climate change performance than Irish firms ($-2.73 \mp 0.92; p < .05$) as well as companies from the United Kingdom ($1.02 \mp 0.31; p < .05$). With regard to industries, pairwise comparisons in table 17 identified a significant difference between the electric utilities and mining (iron) sector ($1.58 \mp 0.46; p < .05$).

4.6.3. Summary of Completeness and Connectivity Score

Descriptive statistics of the explanatory variables *Complete* and *Connect* are provided in table 18. It further includes the rank-based Kruskal-Wallis test statistic to determine whether *Complete* and *Connect* each differ based on *Type*, *Country* and *Industry*.

Table 18

Summary Statistics for Connect and Complete

		Obs	Complete				X ²	Connect				
			Mean	SD	Min	Max		Mean	SD	Min	Max	X ²
Type			1.10	0.53	0.00	2.00	47.66***	2.79	2.05	0.00	10.00	58.97***
	<i>IR</i>	83	1.39	0.41	0.50	2.00		3.95	2.11	0.00	9.00	
	<i>SR</i>	66	1.14	0.43	0.33	2.00		2.93	1.88	0.00	10.0	
	<i>HR</i>	86	0.80	0.56	0.00	1.83		1.57	1.34	0.00	5.00	
Country			1.10	0.53	0.00	2.00	33.29***	2.79	2.05	0.00	10.00	36.53***
	<i>Australia</i>	28	0.87	0.42	0.00	1.67		1.97	1.40	0.00	5.00	
	<i>Canada</i>	35	0.81	0.63	0.00	2.00		2.23	2.16	0.00	8.00	
	<i>Ireland</i>	3	1.22	0.42	0.83	1.67		3.00	1.73	2.00	5.00	
	<i>New Zealand</i>	1	0.83		0.83	0.83		1.00	0.00	1.00	1.00	
	<i>South Africa</i>	70	1.38	0.40	0.67	2.00		3.99	2.12	0.00	9.00	
	<i>United Kingdom</i>	43	1.12	0.47	0.33	2.00		2.26	1.50	0.00	7.00	
	<i>United States</i>	55	1.03	0.57	0.00	2.00		2.53	2.01	0.00	10.00	
Industry			1.10	0.53	0.00	2.00	37.37***	2.79	2.05	0.00	10.00	32.35***
	<i>Chemicals</i>	34	1.22	0.51	0.17	2.00		2.66	1.68	0.00	6.00	
	<i>Construction</i>	11	1.06	0.37	0.67	1.67		2.75	2.05	1.00	7.00	
	<i>Materials</i>											
	<i>Containers and Packaging</i>	20	0.77	0.50	0.00	1.50		1.48	1.63	0.00	6.00	
	<i>Electric Utilities</i>	19	1.33	0.50	0.17	2.00		3.89	2.64	1.00	10.00	
	<i>Forest and Paper Products</i>	10	1.62	0.22	1.17	2.00		3.70	1.49	2.00	7.00	
	<i>Gas Utilities</i>	4	0.92	0.29	0.50	1.17		1.25	0.50	1.00	2.00	
	<i>Mining - Iron, Aluminum</i>	35	0.99	0.56	0.00	1.83		2.59	1.97	0.00	9.00	
	<i>Mining - Other</i>	34	1.23	0.54	0.00	2.00		3.85	2.38	0.00	9.00	
	<i>Mining - Coal</i>	7	0.89	0.74	0.00	1.83		1.33	1.37	0.00	3.00	
	<i>Oil & Gas</i>	53	0.97	0.51	0.17	2.00		2.52	1.88	0.00	8.00	
	<i>Water Utilities</i>	8	1.48	0.21	1.17	1.67		3.13	0.99	2.00	4.00	

Note. Individual coefficients are statistically significant at the *.05, **.01, or ***0.001 level. Last column reports chi-square coefficients (χ^2) from Kruskal-Wallis test.

A strong interest of this study - also formulated by means of H_{2a} and H_{2b} in section 4.3.3. - lies in the difference between report types. The mean values of *Complete* as well as *Connect* suggest that integrated reports are more complete and more connected than sustainability reports. Sustainability reports, in turn, are more complete and more connected than hybrid reports. Given that the connectivity measure is based upon IR specifications, the strong *Connect* score for IR comes as no surprise. In contrast, the high complete score of integrated as compared to sustainability reports is striking given the sole purpose of sustainability reports to display ESG information. The high standard

deviation for *Complete* and even more so for *Connect*, however, does not allow for solid conclusions based on their means.

Therefore, a Kruskal-Wallis H test was conducted to determine if the level of completeness or the number of connections in company reports is different for either integrated, sustainability or hybrid reports. The nonparametric Kruskal-Wallis test is suitable to assess the differences between nominal variables with three or more characteristics and an ordinal or rank variable (McKight & Najab, 2010). Test results show that there is a significant difference in *Complete* as well as *Connect* between the three groups given that the chi-squared value (χ^2) for *Complete* is 47.66, and for *Connect* $\chi^2 = 58.97$ ($p < .001$; 2 degrees of freedom).

The Kruskal-Wallis test shows similar results for differences in completeness and connectivity scores by *Country* ($\chi^2 = 33.29, 37.37$; $p < .001$) and *Industry* (and $\chi^2 = 36.53, 32.35$; $p < .001$). Reports from South African companies exhibit a higher completeness regarding climate change-related issues than those from other countries, followed by Ireland and the UK. As before, results for Irish firms should be neglected given the small sample size. Additionally, South African are more connected with almost four connections on average. Ranked second are US reports with a mean connectivity score of 2.53.

4.6.4. Bivariate Analysis

The relationship between the strength and direction of the variables under investigation is explored by conducting a bivariate correlation analysis. For that reason, table 19 reports Kendall's Tau pairwise correlation coefficients for the relation between two continuous as well as between a continuous and ordinal variable. The assumed distributed time lag effect is considered by lagging each regressor variable. Table 20, in contrast, displays Cramer's V coefficients for correlations between the study's nominal variables *Type*, *GRI* and *IIRC*.

Table 19

Pairwise correlation matrix (Kendall's Tau-b)

	Mean	SD	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) CCPerf	4.19	1.92	1.00	9.00	1.00							
(2) Complete _{lagged}	1.08	0.52	0.00	2.00	-.27***	1.00						
(3) Connect _{lagged}	2.75	2.01	0.00	10.00	-.21***	.56***	1.00					
(4) Logassets _{lagged}	22.56	1.30	19.33	26.29	-.10	.06	.06	1.00				
(5) Loglev _{lagged}	3.98	1.38	-2.47	8.09	-.02	.01	-.02	.27***	1.00			
(6) ROA _{lagged}	3.84	7.94	-35.26	39.21	-.07	.09	-.00	-.08	.02	1.00		
(7) Logsales _{lagged}	2.85	0.79	0.10	4.86	-.02	.03	.04	.14**	-.05	.06	1.00	
(8) Length _{lagged}	119.89	64.80	8.00	312.00	-.04	.22***	.17*	-.21***	-.08	.05	-.05	1.00

Note. Individual coefficients are statistically significant at the *.05, **.01, or ***.001 level (Kendall's Tau-b).

Table 20

Pairwise correlation matrix (Cramer's V)

	Mean	SD	Min	Max	(1)	(2)	(3)
(1) Type	2.08	0.84	1.00	3.00	1.00		
(2) GRI	0.88	0.89	0.00	3.00	.33***	1.00	
(3) IIRC	0.21	0.41	0.00	1.00	.66***	.37***	1.00

Note. Individual coefficients are statistically significant at the *.05, **.01, or ***.001 level (Cramer's V).

Kendall's Tau coefficient assesses the relation between two variables based on the ranks of the data and ranges between -1 and +1. With reference to the first three lines of table 19, it can be noted that both predictor variables *Complete* and *Connect* are weakly negatively correlated with the performance score ($p < .001$). Hence, an increase in either the completeness or connectivity score of a report is related to a decrease in the climate change performance score of the following year. Again, a lower climate change performance score represents a better performance than a higher one. The reported results further reveal a moderate correlation between connectivity and completeness score (Kendall's Tau-b-coefficient = .56) as well as a weak relation between the report's length and its level of completeness. This result suggests that longer reports are either more complete or more complete reports have more pages.

In addition, there are weak positive correlations between the logarithmized variables' leverage and assets as well as sales and assets. However, as these variables are used as controls and their interpretation with each other is not the subject of this research, these relations are not further elaborated. Despite the fact that Kendall's Tau correlation coefficient suggests a moderate correlation between the dependent and independent variables, this does not say anything about the causality (Kohler & Kreuter, 2006).

Table 20 reports Cramer's V values of correlations between *Type*, *GRI* and *IIRC*. Whereas the relationship between *Type* and *GRI* as well as *IIRC* and *GRI* is only moderately strong, *Type* and *IIRC* have a stronger and positive correlation. This result is expectable given that more than two thirds (51) of the analyzed integrated reports have referred to the IIRC framework in the preparation of their report, whereas only two sustainability and three hybrid reports mention the IIRC. Nevertheless, the fact that one third of the integrated reports do not refer to the single most important guiding document for IR is surprising. Even though report preparers might have used the framework without referring to it in the actual document, it might also be the case that the IR trend is disconnected from the IIRC institution. Contrastingly, the GRI guidelines are referenced by an equally large number of integrated, sustainability and hybrid reports. The prevalence of GRI references in 49 out of 66 sustainability reports is comprehensible, the fact that 64 integrated and 27 hybrid reports also refer to the GRI is surprising and underlines their relevance and usefulness for corporate reporting in general.

4.6.5. Information Properties of Completeness and Connectivity Score

The differentiated composition of the completeness score, based on six climate change-related key topics that are identified in section 4.2.2., allows for a detailed analysis of these topics. In a similar

vein, the specific criteria for the connectivity score defined in section 4.2.3. also provides some insights into the types and informational aspects of established connections.

4.6.5.1. Completeness Score

The completeness score ranging from zero to two consists of six sub-scores on the following topics: Strategic relevance (*Strategy*), GHG emissions (*GHG*), Energy consumption (*Energy*), Risks and opportunities (*Riskopp*), Targets (*Target*) and Emission reduction initiatives (*Initiative*). Table 21 provides an overview of the completeness scores by key topic across the three report types.

Table 21

Completeness Score per Complete Topic and Type

	Strategy		GHG		Energy		Riskopp		Target		Initiative		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
IR	0.98	0.78	1.89	0.44	1.86	0.50	1.10	0.88	1.14	0.78	1.36	0.76	1.39	0.41
SR	0.81	0.79	1.70	0.69	1.10	0.94	0.75	0.88	0.77	0.89	1.67	0.56	1.14	0.44
HR	0.60	0.77	1.38	0.93	0.74	0.95	0.44	0.73	0.78	0.88	0.89	0.80	0.80	0.56
Total	0.79	0.79	1.65	0.75	1.23	0.94	0.76	0.87	0.90	0.87	1.28	0.79		

Note. The minimum and maximum values for each score are 0 and 2 respectively.

As stated in section 4.6.3. preliminary findings suggest that integrated reports are overall more complete than sustainability and hybrid reports. With reference to table 21 this is also the case for each of the single key topics. The means across all topics are higher for integrated reports. In addition, and except for *Target*, the means of single key topics are also higher for sustainability than hybrid reports. The last line of the table reports the total mean and standard deviation values for each topic, illustrating that most companies disclose information on their GHG emissions (1.65). The second and third most reported topics are emission reduction initiatives (1.28) and energy consumption (1.23). Companies seem less eager to disclose information on the risks and opportunities they associate with climate change (0.76) as well as on the strategic relevance of it for their business (0.79).

4.6.5.2. Connectivity Score

A closer examination of the properties of the connectivity score (*Connect*), specifically the types and informational aspects of information connections, provides insights into how IR is interpreted and implemented by report preparers. Figure 5 lists the number of times that the key words defined in section 4.2.3. have been used in counted information connections.

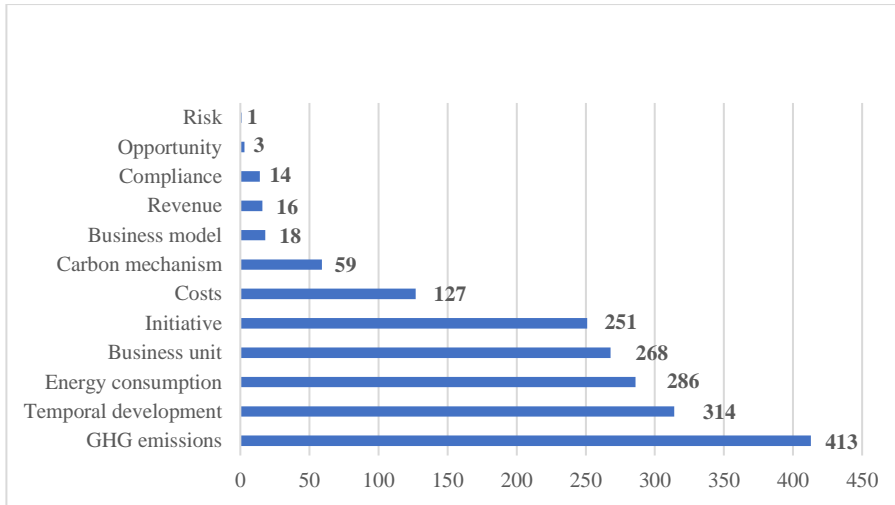


Figure 5. Number of Key Words

There are two findings of interest depicted in figure 5. Firstly, information regarding the temporal development of certain indicators (314), such as GHG emission (413) or energy consumption figures (286) as well as for specific business units (268) is reported most frequently in connections. This suggests that the depiction of emission and energy figures over several years and for different business units, such as regional branches or departments, is quite common in external reporting.

Secondly, risk- (1) and opportunity-related (3) climate change aspects or respective compliance issues (14) are under reported in information connections despite the fact that there are numerous possibilities for connections. For example, cost figures could be assigned specific risks stemming from climate change-related extreme weather events to make these more tangible. The amount of connections across the nine most often used key word combinations, illustrated in figure 6 below, support these two findings.

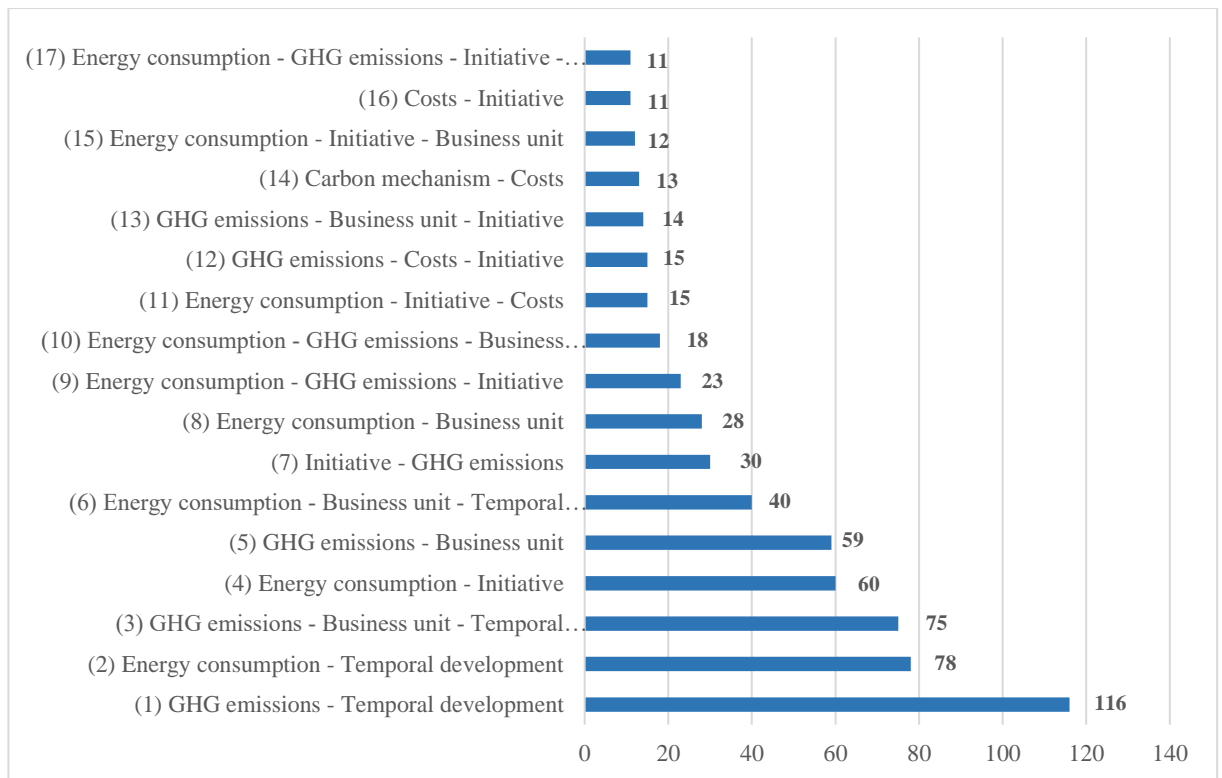


Figure 6. Combinations of Key Words (Connections)

By far the greatest number of connections in reports depicted the temporal development of GHG emission (#1; 116 connections) or energy consumption figures (rank #2; 78 connections) over several years and/ or across business units (rank #3; 75 connections). This is in line with the previously mentioned finding, that GHG and energy figures as well as those on the development over time or across business units are used most often to establish information connections in the form of tables. The following six most widely adopted key word combinations all include information on specific emission reduction initiatives (*Initiative*), for example combined with the respective reduction in energy consumption (rank #4), GHG emissions (rank #7) or both (rank #9). For example, such a connection is established as: “electricity is made from waste heat generated during the process of making sulphuric acid. By maximising this process during the year, purchased electricity was reduced by 15,566,685 kWh which reduced Scope 2 GHG emissions by 13,387 tCO₂e” (Incitec Pivot, 2015, p. x).

Lastly, costs are also mentioned many times and in connection with other pieces of information, namely with initiatives and energy consumption (rank #11) or initiatives and GHG emissions (rank #12), such as: “energy efficiency and business optimization initiatives [...] resulted in cumulative

energy savings of 1,098TJ between 2012 and 2016. This has led to US\$41m in cumulative cost savings and avoidance of 165,005t CO₂-eq in emissions” (Gold Fields, 2016, p. 78).

The 14th most frequently established connection is made between cost figures as well as carbon mechanism-related information: “we estimate that a carbon tax would add some R300 million to our annual costs” (Arcelor Mittal, 2016, p. 58).

Figure 7 presents a summarized view on these connections. A core element of the IIRC framework and the central idea of IR, among other things, is the connection of financial with non-financial information or, generally speaking, of different capital types as outlined in section 2.3. As the focus of this study lies on climate change information and performance, data on intellectual, human, social and relationship, and manufactured capital is not collected. Nevertheless, the differentiation of key words defined in section 4.2.3., permits an analysis of the relations between natural and financial capital. Thus, figure 7 depicts the number of combinations between natural, financial and other types of information. Natural and financial capital is defined very narrow, such as in the form of GHG emissions and energy consumption figures (i.e. natural) or cost and revenue figures (i.e. financial). There are, however, key words that can make up an information connection, but are not attributable to either the natural or financial dimension. These are considered as *other* types of information and regard the key words *Compliance, Business Unit, Business Model, Initiative, Opportunity, Risk* and *Temporal Development*.

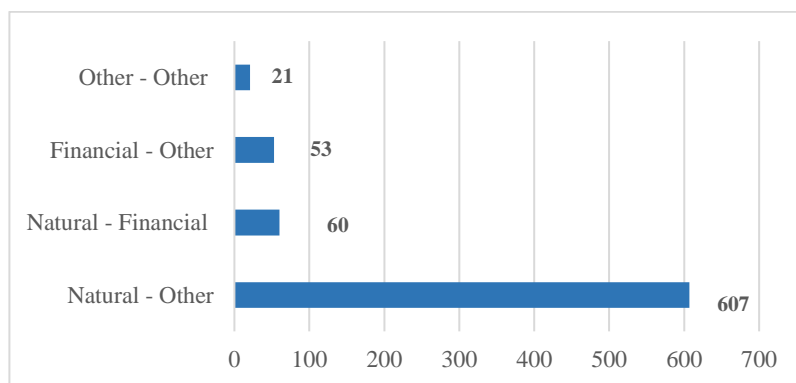


Figure 7. Summarized Types of Connections

By far the greatest number of connections has been established between natural capital and other types of information (607). The disclosure of emission or energy figures over several years or across business units exemplifies such a connection. Out of 741 connections in total, only 60 combine financial with natural information, such as the following example: “While we continue to work to

reduce our environmental impact, in the year, we reduced our CO2 equivalent emissions per R1 million revenue by 6.7%” (Nampak, 2014, p. 9).

Another 53 connections are made between financial and other climate change-related pieces of information, such as: “to ensure ongoing legal compliance and environmental performance improvement, a new boiler emissions abatement plant was advanced during the year and this R250 million project is still planned for completion by the end of calendar 2015” (Impala Platinum Holdings, 2014, p. 45).

4.7. Regression Analysis

4.7.1. Results and Discussion

As described in section 4.4., standard errors were clustered by firm to account for the residual dependence created by the firm effect. Table 22 presents the results of the regression. Including only the control variables in the model (1) explains a moderate amount of variance in the data ($R^2 = .403$). Hence, the dependent variable *CCPerf* can certainly be explained by control variables, but to check whether the variables that are of primary interest in this study also add explanatory power to the model, column 2 shows the beta-coefficients for the regressors *Complete* and *Connect*. The low model fit (model 2; $R^2 = .122$) is attributable to the exclusion of the control variables and improved once these were included (model 4; $R^2 = .417$).

In order to test for the presence of interaction effects, specified in section 4.3.3., model 3 was calculated. To see the effect of these interaction effects in the presence of controls, model 5 includes predictors, interaction terms as well as controls. It shows a good model fit ($R^2 = .467$). Given the large number of clusters (82) with a comparably low amount of observations (196 in model 1 and 191 in models 4 and 5), an adjusted R^2 -value and F-statistic cannot be calculated for models 1, 4 and 5. Based on the risk of collinear predictors in nonlinear regression models distorting the calculated results of single predictors (Greene, 2003), the Variance Inflation Factor (VIF) was calculated to quantify to what extent estimated coefficients are inflated due to these collinear predictors. The mean VIF scores range from 1.91 to 4.66 throughout models, indicating that multicollinearity is generally not a problem (Greene, 2003).

4.7.1.1. Relation between Reporting Completeness, Connectivity and Performance

The results presented in table 22 shed some light on the research question of whether the extent and quality of climate change-related reporting, in the form of the scores *Complete* and *Connect*, have an

effect on the climate change mitigation performance of a company. Those models including the predictors, but neglecting the interaction terms (2 and 4) provide initial evidence for H_{1a} , namely that the level of completeness has a positive influence on performance (model 2; $p = .001$). The size of this casual effect, however, can only be interpreted for models four and five that include the control variables and interaction terms respectively. In these models the effect between the level of completeness and connectivity and performance is not significant ($p > .05$).

Table 22

Regression Results with CCPerf

Dependent variable: CCPerf		Model							
Independent variables	Hypothesis	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)
		(1)	(2)	(3)	(4)	(5)	(1) + (2)	(1) + (3)	(1) + (3)
		Controls only	Predictors only	(2) +	Interaction terms	(1) + (2)	(1) + (3)	(1) + (3)	(1) + (3)
Complete _{lagged}	H1a		-1.107*** (.001)	0.132	(.805)	-0.782	(.069)	0.226	(.699)
Connect _{lagged}	H1b		-0.056 (.515)	-0.019	(.883)	0.028	(.744)	-0.048	(.657)
Type _{lagged} x Complete _{lagged} , binary	H2a								
<i>SR</i>				-0.185	(.807)			-0.162	(.836)
<i>HR</i>				-1.005	(.186)			-1.355	(.163)
Type _{lagged} x Connect _{lagged} , binary	H2b								
<i>SR</i>				-0.780	(.311)			-1.613*	(.018)
<i>HR</i>				0.511	(.528)			-0.602	(.394)
Type _{lagged}									
<i>SR</i>		0.616	(.594)			0.758	(.554)	2.030	(.166)
<i>HR</i>		1.078	(.279)			0.927	(.425)	2.349	(.106)
Loglev _{lagged}		-0.056	(.693)			-0.112	(.431)	-0.210	(.158)
ROA _{lagged}		-0.029	(.216)			-0.028	(.231)	-0.027	(.219)
Logassets _{lagged}		-0.264	(.164)			-0.218	(.280)	-0.164	(.382)
Logsales _{lagged}		-0.074	(.789)			-0.079	(.770)	-0.064	(.791)
Length _{lagged}		0.002	(.627)			0.003	(.334)	0.002	(.547)
Year									
2015		-1.394***	(.000)			-1.367***	(.000)	-1.342***	(.000)
2016		-0.956**	(.002)			-0.892**	(.006)	-0.852**	(.008)
Country									
<i>Canada</i>		0.212	(.720)			0.238	(.677)	0.519	(.356)
<i>Ireland</i>		1.267	(.115)			1.459	(.074)	2.339*	(.011)
<i>New Zealand</i>		1.042	(.182)			1.479	(.060)	1.345	(.133)
<i>South Africa</i>		-0.525	(.642)			-0.353	(.783)	-0.014	(.991)
<i>United Kingdom</i>		-0.859	(.142)			-0.756	(.218)	-0.719	(.211)
<i>United States</i>		-0.435	(.416)			-0.521	(.356)	-0.413	(.428)

Industry						
<i>Construction Materials</i>	-0.175	(.858)		-0.173	(.862)	-0.601 (.584)
<i>Containers and Packaging</i>	-0.410	(.563)		-0.497	(.476)	-0.724 (.302)
<i>Electric Utilities</i>	-0.353	(.602)		-0.247	(.735)	-0.093 (.892)
<i>Forest and Paper Products</i>	-0.783	(.410)		-0.517	(.605)	-0.398 (.701)
<i>Gas Utilities</i>	1.200	(.161)		1.363	(.143)	0.998 (.287)
<i>Mining - Iron, Aluminium</i>	0.285	(.725)		0.047	(.958)	0.001 (.999)
<i>Mining - Other</i>	-0.366	(.664)		-0.719	(.414)	-0.841 (.344)
<i>Mining - Coal</i>	-0.272	(.726)		-0.629	(.509)	-0.955 (.290)
<i>Oil & Gas</i>	0.169	(.803)		-0.062	(.935)	-0.414 (.606)
<i>Water Utilities</i>	-0.483	(.689)		-0.101	(.935)	0.767 (.481)
GRI _{lagged}						
1	-0.338	(.364)		-0.095	(.812)	0.010 (.979)
2	-0.044	(.935)		0.206	(.721)	0.444 (.400)
3	0.923	(.201)		1.028	(.167)	1.065 (.146)
IIRC _{lagged}	-0.315	(.379)		-0.299	(.424)	-0.302 (.393)
N	196	206	206	191	191	
F		.000	.000			
R ²	.403	.122	.217	.417	.467	
Adjusted R ²		0.113	.177			
Mean VIF	3.09	1.91	4.66	3.29	4.34	

Note. Individual coefficients are statistically significant at the *.05, **.01 or ***.001 level

The beta-coefficients of *Connect* are also insignificant in all models given that their standard errors are very large and, thus, provide no support for H_{1b} . Connectivity – a key principle in IR that is assumed to potentially change decision-making in favor of sustainability matters – does therefore not have an effect on climate change mitigation performance. However, a more granulated view on the differences between report types might shed more light on this finding.

4.7.1.1. The Role of Report Type

H_{2a} and H_{2b} assume that the influence of the completeness score and amount of connections is higher for a sustainability report and integrated or hybrid report, respectively. To test H_{2a} and H_{2b} , interaction terms were examined in model 3 as well as in the fully specified model 5. Despite the fact that a report might be more or less complete and connected than others, distances between single values measuring the level of completeness and connectivity are not equal but qualitatively defined in section 4.2. Instead of individual differences between scores, category differences might add interpretational strength to both constructs in spite of the loss of individual-level information (Rucker, McShane, & Preacher, 2015). Hence, both ordinal variables *Complete* and *Connect* are transformed to binary variables by means of median split.

Whereas model 3 provides no significant results for neither interaction terms, adding controls in model 5 yielded a significant beta-coefficient of -1.613 for the second interaction term ($Type_{lagged} \times Connect_{lagged}$; $p = .018$). Accordingly, the effect of the now binary variable *Connect* on *CCPerf* for the next year is different for sustainability reports (SR) as opposed to the reference category of integrated reports (IR). More specifically, firms publishing a sustainability report have a significantly higher performance grade based on the connectivity score of the previous year than those that publish an integrated report. Once the amount of connections increases, so that the binary variable *Connect* in sustainability reports changes from a lower to a higher value as compared to integrated reports, this results in an increase in performance grade by 1.613 for the next year. Thus, the number of connections seems to have a larger effect in the group of sustainability reports on the performance grade than in the group of integrated reports. The predicted influence of *Type* on *Connect*, however, described the opposite in that H_{2b} assumed the number of connections on the climate change performance score to be more significant for an integrated or hybrid report as compared to a sustainability report.

To test whether the effect of completeness depends on the type of report, the first interaction ($Type_{lagged} \times Complete_{lagged}$) was also included in model 3 and 5, but yielded non-significant

coefficients. The level of completeness affecting the performance grade does therefore not depend on the report type.

In sum, the findings do not lend empirical support for both H_{2a} and H_{2b} . However, this is not attributable to the lack of explanatory power of the underlying report *Type*, but rather due to those preliminary assumptions with which the underlying hypotheses were developed. The effect of the level of connectivity does depend on the type of report, but is significant for sustainability reports instead of integrated and hybrid reports. These findings are discussed in greater detail in section 5.2.

4.7.1.2. Influence of Controls and Preliminary Summary

With reference to table 19, there are considerable differences in size⁶² and profitability⁶³ of firms included in the sample. However, those models including the respective control variables *ROA*, *Loglev*, *Logassets* or *Logsales* (i.e. 1, 4 and 5), do not provide any significant coefficients that suggest an effect of size or profitability on the climate change management performance of the following year. These results contradict findings from previous studies that regard size and profitability as relevant determinants of ESG performance (e.g., Wickert, Scherer, & Spence, 2016).

Nonetheless, results further report that the year has an effect on performance in all three models in which it was included ($p < .01$). The beta-coefficient for the year 2015 is higher than for 2016, suggesting a decrease in performance grade from one year to the other. In other words, the performance in 2015 increased by 1.394 as compared to 2014 and by 0.852 in 2016 as compared to the same year. Given the distributed lag effect, performance grades in 2013 are not considered.

In sum, regression results provided no evidence for the underlying hypotheses. Neither the level of completeness in external corporate climate change reporting, nor the number of information connections in line with IR in such reports seem to affect the climate change management performance of companies of the following year. In addition, the analysis yielded no evidential support for hypotheses H_{2a} and H_{2b} . This is surprising given that initial findings in line with a descriptive analysis of the variables *Complete* and *Connect* in section 4.6.3. reported that integrated reports are in fact more complete and more connected as compared to sustainability and hybrid reports. Thus, the previously mentioned finding that firms publishing a sustainability report in comparison to an integrated report exhibit a better climate change performance in the following year based on the connectivity score is unanticipated. By replacing the dependent variable *CCPerf* with a

⁶² The natural logarithm of total assets of company-year observations ranges between 19.33 and 26.29.

⁶³ The ROA of sampled company-years ranges between -35.26 and 29.21.

different measure of climate change management performance, namely the amount of GHG emissions, these generally unexpected findings are challenged by further analyses of robustness.

4.7.2. Robustness of the Model

The discussion surrounding the model selection in section 4.4. already touched upon potential violations of standard OLS assumptions and how these are approached. A substitution of the dependent variable *CCPerf* with a different proxy for climate change performance further provides insights into the susceptibility of analysis results based on a change of measure. Hence, the analysis from section 4.7.1. is repeated with the exception that *CCPerf* is replaced by the variable *Logem* – the ratio of total CO₂ emissions and revenue in million USD. This led to a decrease in the number of observations (119 in model 1, 117 in models 4 and 5) and in company-cluster (63). Table 23 reports the results of this regression with *Logem* as the dependent variable.

Whereas *Connect* does not have any significant influence on the CDP performance grade (*CCPerf*), this changes when *Logem* is regressed on predictor and control variables in model 4. Table 23 reports a significant negative β -coefficient for *Connect* (0.171; $p = .025$). Hence, any additional connection in a company report results in a decrease in *Logem* by 0.171 in the following year, given all other variables being equal. The assumption that connectivity in climate change reporting positively affects the climate change management performance, in line with H_{1b} , can therefore be confirmed when considering carbon emissions as a measure of climate change performance. The effect of *Complete* on *Logem* as the dependent variable, is not significant. This finding coincides with those results in the previous regression analysis with the CDP performance score as a dependent variable. Thus H_{1a} can be rejected.

However, the significant effects of the number of connections on emission performance disappears once interaction terms are included (models 3 and 5). Similarly, the interaction term between *Type* and *Connect* is not significant anymore (model 5; $p = .060$). With regard to the control variables and unlike previous results, *Loglev* and *ROA* are significantly correlated with *Logem* in both models 4 and 5. A β -coefficient of -0.229 ($p = .049$) for *Loglev*, and -0.050 ($p = .025$) for *ROA* in model 5 indicates that more profitable companies and those with a high leverage also have a better carbon performance.

Models 4 and 5 in table 23 capture more significant country and industry effects than for the accumulated *CCPerf* grade in table 22. For example, companies from Canada seem to have a significantly higher emissions-to-revenue-ratio than those from the reference category of Australia

(Model 5; β -coefficient = 1.005, $p = .034$). In a similar vein, firms in the construction materials, electric utilities and forest and paper products sectors have a higher *Logem* as compared to the chemicals sector. In contrast to the previous regression table 22, the year has no effect on the emissions to revenue ratio. Without going into detail with regard to certain country and industry effects, these initial findings support the general notion that different countries and industries have different emission intensities.

Table 23

Regression results with Logem

Dependent variable: Logem		Model								
Independent variables	Hypothesis	(1) Controls only	(2) Regressors only	(3) (2) + Interaction terms		(4) (1) + (2)		(5) (1) + (3)		
Complete _{lagged}	H1a		0.248 (.596)	-0.202 (.682)		0.437 (.271)		0.490 (.346)		
Connect _{lagged}	H1b		0.128 (.155)	0.072 (.512)		-0.171* (.025)		-0.081 (.295)		
Type _{lagged} x Complete _{lagged} , binary	H2b									
<i>SR</i>				0.380 (.564)				0.546 (.453)		
<i>HR</i>				-0.544 (.402)				1.052 (.130)		
Type _{lagged} x Connect _{lagged} , binary	H2a									
<i>SR</i>				-0.913 (.180)				-1.041 (.060)		
<i>HR</i>				-0.436 (.537)				-0.656 (.235)		
Type _{lagged}										
<i>SR</i>		-0.79 (.267)				-0.452 (.512)		-0.416 (.609)		
<i>HR</i>		-1.402 (.073)				-0.865 (.283)		2.349 (.214)		
Loglev _{lagged}		-0.295** (.007)				-0.275* (.016)		-0.210 (.049)		
ROA _{lagged}		-0.045** (.007)				-0.055** (.003)		-0.027 (.025)		
Logassets _{lagged}		0.164 (.280)				0.158 (.310)		-0.164 (.528)		
Logsales _{lagged}		0.201 (.486)				0.179 (.538)		-0.064 (.540)		
Length _{lagged}		0.001 (.707)				0.001 (.770)		0.002 (.702)		
Year										
2015		0.164 (.252)				0.149 (.310)		-1.342*** (.367)		
2016		0.010 (.977)				-0.340 (.355)		-0.852*** (.455)		
Country										
<i>Canada</i>		0.714 (.147)				0.883 (.066)		0.519 (.034)		
<i>Ireland</i>		-2.752** (.002)				-2.988** (.002)		2.339** (.000)		
<i>New Zealand</i>		-1.198 (.065)				-1.548* (.025)		1.345 (.017)		
<i>South Africa</i>		0.341 (.684)				1.007 (.256)		-0.014 (.257)		
<i>United Kingdom</i>		-0.552 (.401)				-0.788 (.279)		-0.719 (.116)		
<i>United States</i>		-0.125 (.848)				0.393 (.542)		-0.413 (.311)		

Industry						
<i>Construction Materials</i>	2.210	(.011)		2.352**	(.010)	2.446** (.007)
<i>Containers and Packaging</i>	0.187	(.741)		0.047	(.932)	0.116 (.871)
<i>Electric Utilities</i>	2.098	(.007)		(.014)	(.014)	1.874* (.014)
<i>Forest and Paper</i>	0.727	(.349)		(.022)	(.022)	1.859** (.007)
<i>Products</i>						
<i>Gas Utilities</i>	0.921	(.273)		(.271)	(.271)	0.737 (.423)
<i>Mining - Iron, Aluminium</i>	0.614	(.324)		(.368)	(.368)	0.720 (.276)
<i>Mining - Other</i>	0.281	(.704)		(.685)	(.685)	0.414 (.608)
<i>Mining - Coal</i>	-0.723	(.439)		(.231)	(.231)	-0.600 (.549)
<i>Oil & Gas</i>	0.607	(.338)		(.291)	(.291)	1.020 (.186)
<i>Water Utilities</i>	0.899	(.311)		(.262)	(.262)	0.663 (.480)
GRI _{lagged}						
<i>1</i>	0.116	(.729)		(.588)	(.588)	-0.021 (.957)
<i>2</i>	0.259	(.435)		(.485)	(.485)	0.089 (.798)
<i>3</i>	1.119	(.142)		(.123)	(.123)	1.099 (.125)
IIRC _{lagged}	0.062	(.822)		(.568)	(.568)	0.048 (.878)
N	119		123		117	117
F			.079		0.00	
R ²	.681		.053		.696	.722
Adjusted R ²					.259	
Mean VIF	3.60		1.70		4.03	4.81

Note. Individual coefficients are statistically significant at the *.05, **.01 or ***.001 level

In sum, the substitution of *CCPerf* with *Logem* could not confirm the previous finding that there is a positive effect of the level of connectivity in sustainability reports on the climate change management performance as compared to IR and hybrid reports. This yields no supportive evidence for H_{2a} and H_{2b} . However, the inclusion of control variables and exclusion of interaction terms in model 4 found supportive evidence for the influence of the connectivity score on climate change performance (H_{1b}). Replacing *CCPerf* with *Logem* additionally yielded significant results regarding the influence of *ROA*, *Loglev* as well as some countries and industries on the emission-revenue ratio of the following year, with everything else being equal.

The differences in findings based on diverse dependent variables is surprising at first sight, as they both measure the climate change management performance, but from different angles. A closer look at their distinct scopes in the following chapter, however, will illustrate potential reasons for these differences in findings. Whereas chapter five discusses these results with respect to both dependent variables, chapter six summarizes the study's main findings. The seventh chapter then provides further implications of these results for the academic research landscape as well as the regulatory and corporate environment of IR.

5. Discussion

The focal object under investigation in this study is IR and its implications for companies adopting it. More precisely, the study attempts to answer the question of whether the extent and quality of climate change-related IR have an effect on the climate change mitigation performance of a company. The question was motivated based on the transformative qualities ascribed to IR concerning informational structures and decision-making processes. Against the background of an organizational change model developed by Laughlin (1991), it is assumed that these transformative qualities of IR might induce second order change within the organization (e.g., Stubbs & Higgins, 2014). According to the author, such second order change alters the interpretive scheme of managers and thus their beliefs, values and norms in the organizational context. This, in turn, could have an impact on managerial decision-making and, ultimately, on performance.

The majority of existing studies on IR examined relating changes on the organizational, decision-making-level by means of qualitative research (e.g., Beck, Dumay & Frost, 2015). They generally verified an improvement in data quantity and quality, and an enhanced collaboration regarding sustainability issues within the firm (e.g., Burke & Clarke, 2016). However, they provided only inconclusive results on whether IR actually advances sustainability performance (e.g., Maniora, 2015). The underlying study thus investigated this potential advancement by means of quantitative research and with a focus on climate change management. The extent and quality of reporting was measured by means of a self-developed completeness and connectivity score. To allow for comparisons among different reporting formats, sustainability and hybrid reports were analyzed alongside integrated ones. Overall, the analysis yielded four noteworthy findings that are discussed in the following paragraphs.

5.1. Connections Reduce Emissions

The regression analysis in section 4.7.1. found no supportive evidence for an effect of the level of completeness or connectivity on the CDP performance score of the next year. However, once this score is replaced by an emission-to-revenue ratio that represents the CO₂ performance of the company in section 4.7.2., the assumed effect between connectivity and performance becomes significant. Here, the amount of connections in climate change-related information is positively correlated with the CO₂ performance of the following year, lending support to hypothesis H_{1b}. These different effects depending on the differing proxy for climate change performance are surprising at first sight. The CDP grade as well as the emission-revenue ratio both constitute valid measures for a company's climate change management performance. Whereas the former represents a more comprehensive approach by incorporating aspects of disclosure, awareness,

management and leadership, the latter interprets performance more narrowly in terms of actual CO₂ emission output.

The differences in scope between both measures of management performance potentially explain the differing results retrieved in the robustness check as compared to initial regression analysis. In line with H_{1b}, a higher connectivity score has a positive influence on the firm's CO₂ emission performance as measured by an emission-to-revenue ratio. The prevalence of GHG emission figures in established connections, as identified in section 4.6.5.2. support this finding. Quantitative figures on GHG emissions and energy consumption as well as qualitative descriptions of relating emission reduction initiatives are more frequently found in external reporting than other aspects, such as climate change-related risks and opportunities. Hence, this prominence of information regarding GHG emissions might cause a reduction in actual emissions.

Given preliminary analyses in section 4.6.4. (i.e. table 18) that identified a positive relation between both independent variables, *Complete* and *Connect*, the fact that the number of connections has a positive influence on CO₂ emission performance, whereas the level of completeness does not, is quite surprising. The pairwise correlation analysis revealed that a more complete report is also a more connected report without specifying the direction of causality. This might be based on the high number of possibilities for potential connections in reports that are more complete and, hence, depict more information.

In a similar vein, the correlation matrix in table 18 reported a significant relation between both independent variables and the CDP's climate change performance score. Accordingly, a higher level of completeness and larger number of connections in external climate change reporting is correlated with a better climate change management. Hence, an improved performance might go hand in hand with an extensive disclosure of the same information, but this study provides no solid evidence on disclosure driving this performance based on changes in the interpretive schemes of managers. Before going into detail on these findings in section 5.5., further findings are discussed in the following paragraphs.

5.2. Connectivity Beyond IR

As mentioned in this chapter's introductory sentence, the focal object under investigation is IR, but sustainability and hybrid reports were also analyzed to allow for comparisons. A preliminary, one-way ANOVA analysis in section 4.6.2. evidenced significant differences between the sample means of report types regarding climate change performance. The descriptive analysis of mean completeness and connectivity scores in section 4.6.3. further revealed that integrated reports are generally more complete and more connected than sustainability or hybrid reports.

These findings that point towards a difference in performance based on report type, however, could not be confirmed by regression results. In that vein, the preliminary assumption that the effect of the connectivity score on performance is significantly higher for an integrated or hybrid report as compared to a sustainability report, in line with H_{2b} , proved wrong. Instead, the effect of the number of connections on the CDP performance score is moderated by sustainability reports, as laid out in section 4.7.2. Accordingly, connectivity is positively correlated with the climate change performance of a company when presented in sustainability reports as opposed to integrated reports. The assumption about a sustainability report further moderating the link between completeness and performance, as expressed in H_{2a} , could not be confirmed by analysis results. The findings therefore do not lend empirical support for both H_{2a} and H_{2b} .

Although sustainability reports are on average less connected than IR, as reported in section 4.6.3., connectivity in sustainability reports has a larger effect on performance than integrated reports. One possible explanation for this significance lies in the comprehensive depiction of social and environmental aspects in sustainability reports as opposed to the selective depiction of ESG matters in integrated reports. The publication of a standalone sustainability report might inadequately integrate financial and non-financial information or fail to effectively engage with investors, as discussed in section 1.1. It does, however, portray the resources, thoughts and efforts that firms have invested in sustainability-related matters. These investments seem to have a positive effect on the climate change management performance of the following year, especially when information is presented in a connected manner. On the contrary, integrated reports have no such effect, possibly because of the alleged dominance of the business case logic over environmental and social issues (e.g., Cheng et al., 2014; Flower, 2015; Thomson, 2015; Villiers et al., 2018; van Bommel, 2014).

A second potential explanation for this result becomes apparent when considering a reversed direction of causality. Based on the underlying issue of endogeneity, as discussed in section 4.4., no definite conclusions can be drawn on whether disclosure drives performance or performance has an influence on disclosure. Despite the fact that a time lag effect of one year was included in the regression, it might also be the case that better performers simply report more connected information in their sustainability reports to illustrate their positive performance. This is in line with voluntary disclosure theory described in section 3.2.4. Voluntary disclosure theory predicts a positive relation between ESG performance and disclosure (e.g., Dye, 1985; Verrecchia, 1983), because increased transparency conveys a signal to the market and reduces information asymmetries for relevant stakeholders.

5.3. Negligence of Strategic Considerations

Apart from the aforementioned findings derived from the regression analyses in sections 4.7.1. and 4.7.2., this study's methodological rigor with regard to the connectivity and completeness measures further allows for conclusions on the general extent and quality of IR. Accordingly, results presented in section 4.6.5. emphasize the negligence of strategic considerations in IR as well as other reporting formats. Although GHG emission figures are long-established components of corporate sustainability reports, financial implications based on climate change-induced risks and opportunities were included only recently (KPMG, 2017). The growing interest of investors in the company's strategy to deal with global environmental challenges, such as climate change, is gaining traction and forces companies to include strategic considerations and financial implications regarding these challenges in their external reporting. However, the majority of firms has yet to find ways to fulfil this informational need that is left largely unsatisfied.

A closer look at the composite completeness score in section 4.6.5.1. as well as the properties of the connectivity score in section 4.6.5.2. supports this argument. Accordingly, companies disclose on average and throughout different report types less information on the risks and opportunities they associate with climate change and its strategic relevance for their business than on their GHG emissions or energy consumption. Whereas the average completeness score of information on those risks and opportunities and strategic considerations is 0.76 and 0.79 respectively, the score is twice as high for GHG emission figures (1.65).

Given this focus, the connectivity score is also characterized rather by connections between emission and energy values at different points in time or for different business units, than between risk- and opportunity-related climate change aspects. In fact, a very pressing issue that affects most large, high-polluting companies in one way or another are national or supra-national carbon mechanisms, such as carbon taxes to be paid or emission credits to be acquired. However, referring to section 4.6.5.2. the amount of connections between such carbon mechanisms and a cost figure that can be clearly assigned given market-based prices for every ton of CO₂ only makes up about 1,8% out of the total number of connections. Connections between GHG emissions and temporal development, in comparison, make up 16% of all connections. Similarly, only 60 out of a total 741 connections are established between financial and natural information types.

5.4. The Role of Regulation, Industry Affiliation and Standards

As with most managerial instruments and processes, national regulations, industry affiliation as well as recognized standards play a vital role, not only in their dissemination, but also regarding their effectiveness. The same holds true for IR. Section 2.2. describes significant regulatory developments in sustainability reporting. For example, because South Africa is the only country

that mandates IR, reports from South African countries on average also include the highest number of information connections. Regression results, however, did not yield any significant results regarding the effect on the climate change performance of South African companies. Despite the fact that the descriptive analysis of the performance score in section 5.1.2. suggests that South African companies outperform Australian firms who form the reference category, conclusions about the role that connectivity plays in this regard cannot be drawn.

The same applies to potential industry effects. Industry affiliation is a natural determinant of climate change performance, either measured by management and leadership performance or in terms of emissions. Preliminary findings discussed in section 4.6.3. suggest that there are differences in the completeness and connectivity score based on industry affiliation. However, this does not allow making judgements about the relation between both findings.

A comparison of reporting standards mentioned in the reports provided two striking insights. Firstly, whereas two-thirds of all integrated reports referred to the single most important guiding document for IR – the IIRC framework – even more than that referred to the GRI guidelines. The GRI guidelines are only superficially covering the topic of IR. However, the data reveal their significance not only for preparers of sustainability, but also of integrated reports. Hence, the GRI seems to be perceived as the most important institution in the preparation of all reports including ESG information, no matter the actual report type.

Secondly, these findings suggest that IR is applied independently of the IIRC framework to some extent. 32 integrated reports in the sample have not mentioned the IIRC at all. Report preparers might have consulted the framework in the preparation of the integrated report nevertheless. However, results indicate that the IIRC framework has not yet gained as much recognition as the GRI standards, possibly because of its recency. In addition, the fact that the sampled hybrid reports also display about two connections each on average suggests that the IR trend is followed without particularly publishing a separate integrated report that follows the IIRC's standards.

5.5. The IR – Performance Link

Based on these findings, IR – as compared to other report types – does not have an effect on performance. The only relevant finding in the investigation of the disclosure-performance link revealed that the level of connectivity is negatively associated with GHG emissions, but independent of report type. Thus, the study's connectivity score seems to be related to performance, but IR, in particular, is not. Despite the fact that IR is generally more complete and includes more connections than sustainability and hybrid reports, it does not explicitly drive performance just because it fulfils two roles at the same time – annual and sustainability reporting.

Nonetheless, the potential of IR's transformative qualities concerning informational structures and decision-making processes cannot be dismissed completely. After all, the underlying connectivity measure is mainly shaped by the IIRC's definition of connectivity of information. If this principle is applied to external and potentially internal corporate reporting beyond IR, accompanied by a further improvement in ESG metrics and enhanced collaboration across departments, effects on performance might emerge. Laughlin's (1991) theory of organizational change provided a comprehensible and valid argumentative foundation for these causal relations involved. Based on his differentiation of four change pathways, described in section 4.3.1., IR in its current form seems to cause only first order, morphostatic change within the organization as part of a reorientation, as he refers to it. Accordingly, IR alters organizational sub-systems and processes, but fails to influence the interpretive schemes, such as beliefs, norms and values.

The simultaneous progress in national and supra-national regulatory developments that mandate the inclusion of ESG information and GHG emission figures in corporate reporting, such as the 2014 EU Directive, might strengthen the growing importance of connectivity in general. Such regulations further drive corporate efforts to improve reporting. Similarly, the growing demand from investors about information on those pressing social and environmental issues that could create or destroy the company's value, encourages firms to develop a deeper understanding of these aspects themselves (Tang & Demeritt, 2018). In IR language, this augmented understanding is also called integrated thinking – the intangible and ominous ingredient that seems missing in the current link between climate change-related IR and performance.

The proceeding chapter presents a summary of this study's main findings and limitations, followed by implications for researchers as well as practitioners.

6. Conclusion and Limitations

The insights generated in this research study are diverse, but also subject to certain limitations that are discussed in parallel in the following paragraphs which outline the four main findings.

Firstly, the review of literature in chapter three describes the identified potential of IR in driving organizational change based on an improvement in data quantity and quality as well as an improved collaboration on sustainability issues within the firm. A key limitation of this rather narrative review lies in its inability to allow for robust conclusions on the magnitude of the various effects of IR. Much of the ambiguity in reviewed results is attributable to differences in their research designs and samples. A smaller sample of more homogenous studies in terms of both methodology and data could have provided clearer results. In addition, it fails to go in-depth on the large number of identified determinants and implications. Nonetheless, the comprehensive account of all determinants as well as internal and external implications of IR provides the researcher as well as the reader of this study with a better overall understanding of the reporting concept and prepares them for further analyses.

Secondly, the number of connections in corporate reports is positively related to the firm's climate change management performance for the following year, measured as actual emission output. Although integrated reports are generally more complete and more connected than sustainability and hybrid reports, there are no significant differences between report types regarding this performance. Whereas the completeness score takes into consideration key topics regarding climate change based on two different sources (i.e. GRI guidelines and CDP questionnaire), the connectivity score only draws on the IIRC's definition of connectivity. Hence, it is limited to the IIRC's understanding of connectivity without elaborating on other potential interpretations.

Thirdly, results are different when performance is measured either in terms of climate change management as expressed by the CDP score or as an emission-to-revenue ratio. A regression analysis with the former score did not yield significant findings, whereas the latter shows a relation with the connectivity score. Despite the sophisticated methodology behind the CDP's climate score, the data basis is self-reported and does not take any other company activities or publications into consideration. This might impair the construct validity of the score and therefore questions to what extent it actually reflects an organization's performance. Nonetheless, CDP's data has a generally high credibility and is used in a growing number of scientific studies given its large data set (e.g., Guenther et al., 2015; Kolk, Levy, & Pinkse, 2008).

Regarding the regression analysis, the study's validity is further impaired by the problem of endogeneity. The simultaneous causality between the dependent variable depicting performance and the independent variables leads to a correlation of these independent variables with the

regression models' error term. This leads to biased estimates because it violates the core OLS assumption of exogeneity as mentioned in section 4.4. (Greene, 2003). Thus, there is no certainty about the direction of causality between dependent and independent variables and the identified effect of connectivity on the emission-to-revenue ratio.

The use of distributed lag variables may alleviate this problem, as has been the case in previous studies in accounting research (e.g., Larcker & Rusticus, 2007). The influence of the independent variables is assumed to be expressed by a change in performance in the following year. This lag effect allows for tentative conclusions regarding the direction of causality in the underlying study – reporting influencing performance. However, it does not eliminate the simultaneity bias completely (Reed, 2015).

Fourthly, scoring 235 company reports based on their level of completeness and connectivity yielded a number of interesting findings. On average, companies publish more information on their GHG emissions, energy consumption and emission reduction initiatives than on the risks and opportunities, strategic considerations or targets in line with climate change. Information connections are mostly sketched between emission and energy values at different points in time or for different business units. Only 8% of all connections are between natural and financial information.

In that vein, every manual scoring process allows some discretion regarding its assessment and is therefore always subject to bias. A number of actions were taken to reduce this bias. The connectivity score, for example, is defined as narrow as possible with a collection of potential indicators for each topic in section 4.2.3. as well as different forms and approaches to connectivity (i.e. through text, graphs, contrasting figures). What exactly qualifies as a connection or piece of information with strategic relevance might be regarded differently by different people.

Based on their individual availability, the student research assistants could not start the rating process of the reports at the same time. Hence, the scoring procedure had to be explained two times which might have impaired reproducibility, given that differences in explanations are likely at different points in time. However, both raters received the same document describing the scoring procedure in great detail. In addition, first results were discussed with both raters and the inter-rater reliability was also tested for both students. In addition, citations that were transferred to the data extraction form were all checked by the author and, in rare cases, adjusted.

7. Implications and Further Research

As IR is a comparably recent phenomenon brought forward by the financial and sustainability accounting community, research on the topic is still in its infancy. Hence, every additional insight into its effects, challenges and conceptual base is valuable and provides important implications for practitioners.

In that vein, the study's results suggest that the adoption of IR has some benefits for the firm. For example, the informational infrastructure of ESG data improves, specifically with regard to the level of completeness and connectivity. The previously discussed growing regulatory demand and informational need of investors urges companies to disclose more advanced ESG indicators as well as information on the strategic relevance they assign to single climate change-induced risks and opportunities. However, the underlying research evidenced that particularly the strategic relevance of climate change issues and relating discussion of its risks and opportunities for the firm is not sufficiently reported. Companies could utilize IR to improve their ESG information environment to meet these demands. As an example, some of the firms in the sample reported the costs associated with carbon taxes or emission credits. This type of information is increasingly expected from external stakeholders.

Results further suggest that informational benefits go beyond IR. Its connectivity principle is also applied to sustainability and hybrid reports, because the integration of different types of information is a trend partly detached from IR. In fact, the underlying research found that such an integration might be even more effective regarding performance when presented in sustainability as compared to integrated reports. Future research should further investigate potential differences between report types especially regarding their usage within the firm.

In conclusion, companies are well-advised to engage with IR at least with regard to its key principle of connectivity. As evidenced by several other studies, another benefit concerns the increased collaboration between different departments upon the introduction of IR. Again, this is attributable to an increased connectivity of information demanded by the reporting concept. Hence, even without explicitly publishing an integrated report, employees and decision-makers from different departments are naturally entering a dialogue with each other when the aim is to compile different types of information and connectedly disclose it.

However, information on whether such a dialogue and advancement of ESG data actually leads to integrated thinking, as described in section 1.2., is not certain. Further research should investigate internal communication and decision-making processes to examine whether such an integrated thinking and improved understanding of the non-financial aspects that influence a company's ability to destroy or create value actually has an impact on performance. Whereas the

underlying research focused solely on both ends of the causal chain – information and performance – a thorough understanding of those factors that lie in between and mediate this relationship allows for conclusions on whether IR substantially affects the way in which companies deal with sustainability issues. Without knowing these exact internal mechanisms, regulators can already draw on the knowledge produced by studies on IR when drafting new policies for non-financial reporting. Based on the finding that the connectivity of climate change-related external reporting potentially goes hand in hand with a better carbon performance, policy makers should require more advanced ESG indicators that combine financial and non-financial information, instead of just mandating the separate disclosure of GHG emission figures.

Another potential avenue for further research on this reporting-performance link lies in its econometric analysis. A major limitation of this study is the simultaneous causality between reporting and performance. Although this effect is partly alleviated by lagged variables, instrumental variable techniques might be applied to further address this problem of endogeneity. Here, instrumental variables are included in the regression to isolate the portion of variance attributable to the correlation between the independent variable and the error term. For example, all voluntary ESG disclosures are subject to self-selection bias, because companies might choose to disclose such information based on their superior or inferior performance. South Africa is the only country that mandates IR, hence South African firms publish integrated reports no matter their performance and are therefore not subject to self-selection bias and simultaneous causality. A detailed examination of reports before and after IR was mandated in South Africa and a subsequent analysis of ESG performance would eliminate the issue of endogeneity. However, this instrumental variable estimation method only becomes relevant once significant results have been obtained.

8. References

- ACCA. (2017). ACCA Embeds Integrated Reporting. Retrieved from <http://www.accaglobal.com/ie/en/student/sa/features/acca-embeds-integrated-reporting.html>
- Adams, C. A. (2015). The International Integrated Reporting Council: A call to action. *Critical Perspectives on Accounting*, 27, 23–28. <https://doi.org/10.1016/j.cpa.2014.07.001>
- Adams, C. A. (2016). Environmental, Social and Governance (ESG) risk, strategy, corporate reporting and board oversight: interviews with Board Directors. In EMAN (Ed.), *Proceedings of the 20th Conference of the Environmental and Sustainability Management Accounting Network (EMAN), Lüneburg, 2016* (pp. 9–16).
- Adams, C. A. (2017). Conceptualising the contemporary corporate value creation process. *Accounting, Auditing & Accountability Journal*, 30(4), 906–931. <https://doi.org/10.1108/AAAJ-04-2016-2529>
- Adams, C. A., & Frost, G. R. (2008). Integrating sustainability reporting into management practices. *Accounting Forum*, 32(4), 288–302. <https://doi.org/10.1016/j.accfor.2008.05.002>
- Adams, C. A., Potter, B., Singh, P. J., & York, J. (2016). Exploring the implications of integrated reporting for social investment (disclosures). *The British Accounting Review*, 48(3), 283–296. <https://doi.org/10.1016/j.bar.2016.05.002>
- Aerts, W., & Cormier, D. (2009). Media legitimacy and corporate environmental communication. *Accounting, Organizations and Society*, 34(1), 1–27. <https://doi.org/10.1016/j.aos.2008.02.005>
- Al-Htaybat, K., & Alberti-Alhtaybat, L. von. (2018). Integrated thinking leading to integrated reporting: Case study insights from a global player. *Accounting, Auditing & Accountability Journal*, 31(5), 1435–1460. <https://doi.org/10.1108/AAAJ-08-2016-2680>
- Allen, F., & Gale, D. (2000). Financial Contagion. *Journal of Political Economy*, 108(1), 1–33. <https://doi.org/10.1086/262109>
- Al-Tuwaijri, S. A., Christensen, T. E., & Hughes, K. (2004). The relations among environmental disclosure, environmental performance, and economic performance: A simultaneous equations approach. *Accounting, Organizations and Society*, 29(5-6), 447–471. [https://doi.org/10.1016/S0361-3682\(03\)00032-1](https://doi.org/10.1016/S0361-3682(03)00032-1)
- Anglo Gold Ashanti. (2016). Supporting our Strategy for Sustainable Cash Flow Improvements and Returns: Integrated Report 2015. Retrieved from https://thevault.exchange/?get_group_doc=143/1502782044-2015Intergratedreport.pdf
- Arcelor Mittal. (2016). Integrated Annual Report 2015. Retrieved from http://arcelormittal-reports.com/reports/ar_2015/pdf/full-integrated.pdf
- Arguelles, M., Balatbat, M., & Green, W. (2017). Is there an Early-Mover Market Value Effect for Signalling Adoption of Integrated Reporting? Retrieved from http://ceem.unsw.edu.au/sites/default/files/documents/Maria%20Balatbat%20_Is%20there%20an%20early%20mover%20market%20value%20effect.pdf
- Australian Government. (2018). Clean Energy Regulator: Reporting thresholds. Retrieved from <http://www.cleanenergyregulator.gov.au/NGER/Reporting-cycle/Assess-your-obligations/Reporting-thresholds>

- Baboukardos, D., & Rimmel, G. (2016). Value relevance of accounting information under an integrated reporting approach: A research note. *Journal of Accounting and Public Policy*. Advance online publication. <https://doi.org/10.1016/j.jaccpubpol.2016.04.004>
- Baiman, S., & Verrecchia, R. E. (1996). The Relation Among Capital Markets, Financial Disclosure, Production Efficiency, and Insider Trading. *Journal of Accounting Research*, 34(1), 1. <https://doi.org/10.2307/2491329>
- Baltagi, B. H. (2005). *Econometric analysis of panel data* (3. ed.). Chichester: Wiley. Retrieved from <http://www.loc.gov/catdir/enhancements/fy0621/2005006840-b.html>
- Barkemeyer, R., Preuss, L., & Lee, L. (2015). On the effectiveness of private transnational governance regimes—Evaluating corporate sustainability reporting according to the Global Reporting Initiative. *Journal of World Business*, 50(2), 312–325. <https://doi.org/10.1016/j.jwb.2014.10.008>
- Barth, M. E., Cahan, S. F., Chen, L., & Venter, E. R. (2017). The economic consequences associated with integrated report quality: Capital market and real effects. *Accounting, Organizations and Society*, 62, 43–64. <https://doi.org/10.1016/j.aos.2017.08.005>
- Bartunek, J. M. (1984). Changing Interpretive Schemes and Organizational Restructuring: The Example of a Religious Order. *Administrative Science Quarterly*, 29(3), 355. <https://doi.org/10.2307/2393029>
- Beck, C., Dumay, J., & Frost, G. (2015). In Pursuit of a ‘Single Source of Truth’: From Threatened Legitimacy to Integrated Reporting. *Journal of Business Ethics*, 141(1), 191–205. <https://doi.org/10.1007/s10551-014-2423-1>
- Bernardi, C., & Stark, A. W. (2015). The transparency of environmental, social and governance disclosures, integrated reporting and the accuracy of analyst forecasts.
- Beyer, A., Cohen, D. A., Lys, T. Z., & Walther, B. R. (2010). The financial reporting environment: Review of the recent literature. *Journal of Accounting and Economics*, 50(2-3), 296–343. <https://doi.org/10.1016/j.jacceco.2010.10.003>
- Bilson, C., Birt, J., Smith, T. M., & Whaley, R. E. (2006). Ownership, Competition, and Financial Disclosure. *SSRN Electronic Journal*. Advance online publication. <https://doi.org/10.2139/ssrn.907852>
- Botosan, C. A. (1997). Disclosure Level and the Cost of Equity Capital. *The Accounting Review*, 72(3), 323–349.
- Botosan, C. A., & Stanford, M. (2005). Managers' Motives to Withhold Segment Disclosures and the Effect of SFAS no. 131 on Analysts' Information Environment. *The Accounting Review*, 80(3), 751–771.
- Bowen, F. E. (2000). Environmental visibility: A trigger of green organizational response? *Business Strategy and the Environment*, 9(2), 92–107. [https://doi.org/10.1002/\(SICI\)1099-0836\(200003/04\)9:2<92::AID-BSE230>3.0.CO;2-X](https://doi.org/10.1002/(SICI)1099-0836(200003/04)9:2<92::AID-BSE230>3.0.CO;2-X)
- Brown, N., & Deegan, C. (1998). The public disclosure of environmental performance information—a dual test of media agenda setting theory and legitimacy theory. *Accounting and Business Research*, 29(1), 21–41. <https://doi.org/10.1080/00014788.1998.9729564>

- Bucaro, A. C., Jackson, K. E., & Lill, J. B. (2017). The Influence of CSR Measures on Investors' Judgments when Integrated in a Financial Report versus Presented in a Separate Report. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2930360
- Burke, J. J., & Clark, C. E. (2016). The business case for integrated reporting: Insights from leading practitioners, regulators, and academics. *Business Horizons*, 59(3), 273–283. <https://doi.org/10.1016/j.bushor.2016.01.001>
- Burritt, R. L., & Schaltegger, S. (2010). Sustainability accounting and reporting: Fad or trend? *Accounting, Auditing & Accountability Journal*, 23(7), 829–846. <https://doi.org/10.1108/09513571011080144>
- Carels, C., Maroun, W., & Padia, N. (2013). Integrated Reporting in The South African Mining Sector. *Corporate Ownership and Control*, 13(1), 957–971.
- Carroll, A. B. (1979). A Three-Dimensional Conceptual Model of Corporate Performance. *The Academy of Management Review*, 4(4), 497–505. <https://doi.org/10.2307/257850>
- CDP. (2017a). CDP 2017 climate change scoring methodology. Retrieved from https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/guidance_docs/pdfs/000/000/509/original/CDP-climate-change-scoring-methodology.pdf
- CDP. (2017b). The Carbon Majors Database: CDP Carbon Majors Report 2017. Retrieved from <https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/002/327/original/Carbon-Majors-Report-2017.pdf?1499691240>
- Chaidali, P., & Jones, M. J. (2017). It's a matter of trust: Exploring the perceptions of Integrated Reporting preparers. *Critical Perspectives on Accounting*. Advance online publication. <https://doi.org/10.1016/j.cpa.2017.08.001>
- Chartered Professional Accountants Canada. (2017). State of Play: Study of Climate-Related Disclosures by Canadian Public Companies. Retrieved from <file:///C:/Users/linda/Downloads/G10218-RG-State-of-Play-Study-Climate-Related-Disclosures-Report-June-2017.pdf>
- Chen, Y., Jermias, J., & Nazari, J. (2016). The Effects of CSR Reporting Frameworks and Financial Conditions on Managers' Willingness to Invest in CSR.
- Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, 35(1), 1–23. <https://doi.org/10.1002/smj.2131>
- Cheng, M., Green, W., Conradie, P., Konishi, N., & Romi, A. (2014). The International Integrated Reporting Framework: Key Issues and Future Research Opportunities. *Journal of International Financial Management & Accounting*, 25(1), 90–119. <https://doi.org/10.1111/jifm.12015>
- Cho, C. H., Freedman, M., & Patten, D. M. (2012). Corporate disclosure of environmental capital expenditures. *Accounting, Auditing & Accountability Journal*, 25(3), 486–507. <https://doi.org/10.1108/09513571211209617>
- Cho, C. H., & Patten, D. M. (2007). The role of environmental disclosures as tools of legitimacy: A research note. *Accounting, Organizations and Society*, 32(7–8), 639–647. <https://doi.org/10.1016/j.aos.2006.09.009>

- Churet, C., & Eccles, R. G. (2014). Integrated Reporting, Quality of Management, and Financial Performance. *Journal of Applied Corporate Finance*, 26(1), 56–64.
<https://doi.org/10.1111/jacf.12054>
- CIMA. (2014). Tomorrow's Business Success: Using Integrated Reporting to help create value and effectively tell the full story. Retrieved from
https://www.cimaglobal.com/Documents/Thought_leadership_docs/reporting/Tomorrows-Business-Success-Integrated-Reporting-guide.pdf
- Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society*, 33(4-5), 303–327.
<https://doi.org/10.1016/j.aos.2007.05.003>
- Cohen, J. (1960). A Coefficient of Agreement for Nominal Scales. *Educational and Psychological Measurement*, 20(1), 37–46. <https://doi.org/10.1177/001316446002000104>
- Corporate Register. (2019). Statistics. Retrieved from <http://www.corporateregister.com/>
- Cortesi, A., & Venay, L. (2017). Creating Value Through the Integrated Reporting: a Value Relevance Analysis. Retrieved from
https://www.researchgate.net/publication/319579103_Creating_Value_Through_the_Integrated_Reporting_A_Value_Relevance_Analysis
- DCC. (2015). Annual Report and Accounts 2014. Retrieved from
www.dcc.annualreport14.com/DCC_AR_2014.pdf
- Deloitte. (2011). Integrated Reporting: A better view? Retrieved from
<https://www.iasplus.com/en/binary/sustain/1109integratedreportingview.pdf>
- Denyer, D., & Tranfield, D. (2011). Producing a Systematic Review. In D. A. Buchanan & A. Bryman (Eds.), *The Sage handbook of organizational research methods* (pp. 671–689). Thousand Oaks, CA: Sage Publications Inc.
- Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting. *The Accounting Review*, 86(1), 59–100. <https://doi.org/10.2308/accr.00000005>
- DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147–160. <https://doi.org/10.2307/2095101>
- Djankov, S., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2008). The law and economics of self-dealing. *Journal of Financial Economics*, 88(3), 430–465.
<https://doi.org/10.1016/j.jfineco.2007.02.007>
- Donaldson, T., & Preston, L. E. (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *The Academy of Management Review*, 20(1), 65–91.
<https://doi.org/10.2307/258887>
- Dumay, J., Bernardi, C., Guthrie, J., & Demartini, P. (2016). Integrated reporting: A structured literature review. *Accounting Forum*. (40), 166–185.
<https://doi.org/10.1016/j.accfor.2016.06.001>

- Dunphy, D. C., & Stace, D. A. (2016). Transformational and Coercive Strategies for Planned Organizational Change: Beyond the O.D. Model. *Organization Studies*, 9(3), 317–334. <https://doi.org/10.1177/017084068800900302>
- Dye, R. A. (1985). Disclosure of Nonproprietary Information. *Journal of Accounting Research*, 23(1), 123. <https://doi.org/10.2307/2490910>
- Dye, R. A., & Verrecchia, R. E. (1995). Discretion vs. Uniformity: Choices among GAAP. *The Accounting Review*, 70(3), 389–415.
- E&Y. (2014). Integrated reporting: Elevating value. Retrieved from [https://www.ey.com/Publication/vwLUAssets/EY-Integrated-reporting/\\$FILE/EY-Integrated-reporting.pdf](https://www.ey.com/Publication/vwLUAssets/EY-Integrated-reporting/$FILE/EY-Integrated-reporting.pdf)
- Eccles, R. G., & Armbrester, K. (2011). Integrated Reporting in the Cloud. *IESE Insight*, 8, 13–20.
- Eccles, R. G., & Krzus, M. P. (2010). *One report: Integrated reporting for a sustainable strategy* / Robert G. Eccles, Michael P. Krzus. Hoboken, N.J.: Wiley.
- Eccles, R. G., & Serafeim, G. (2015). Corporate and integrated reporting: A Functional Perspective. In S. A. Mohrman (Ed.), *Corporate stewardship: Achieving sustainable effectiveness* (pp. 156–171). Sheffield: Greenleaf Publ.
- Eldorado Gold. (2016). Balancing our Responsibilities: Year in Review and Financials 2015. Retrieved from http://www.annualreports.com/HostedData/AnnualReportArchive/e/AMEX_EGO_2015.pdf
- Elkington, J. (2018). 25 Years Ago I Coined the Phrase “Triple Bottom Line.” Here’s Why It’s Time to Rethink It. Retrieved from <https://hbr.org/2018/06/25-years-ago-i-coined-the-phrase-triple-bottom-line-heres-why-im-giving-up-on-it>
- European Commission. (2017). Non-financial reporting directive - transposition status. Retrieved from https://ec.europa.eu/info/publications/non-financial-reporting-directive-transposition-status_en
- Feller, R. H. (1995). Environmental Disclosure and the Securities Laws. *Boston College Environmental Affairs Law Review*. (2), 225–265. Retrieved from <https://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1358&context=ealr>
- Flower, J. (2015). The International Integrated Reporting Council: A story of failure. *Critical Perspectives on Accounting*, 27, 1–17. <https://doi.org/10.1016/j.cpa.2014.07.002>
- Frias-Aceituno, J. V., Rodríguez-Ariza, L., & García-Sánchez, I. M. (2014). Explanatory Factors of Integrated Sustainability and Financial Reporting. *Business Strategy and the Environment*, 23(1), 56–72. <https://doi.org/10.1002/bse.1765>
- Frías-Aceituno, J. V., Rodríguez-Ariza, L., & García-Sánchez, I. M. (2013a). The Role of the Board in the Dissemination of Integrated Corporate Social Reporting. *Corporate Social Responsibility and Environmental Management*, 20(4), 219–233. <https://doi.org/10.1002/csr.1294>
- Frías-Aceituno, J. V., Rodríguez-Ariza, L., & García-Sánchez, I. M. (2013b). Is integrated reporting determined by a country's legal system? An exploratory study. *Journal of Cleaner Production*, 44, 45–55. <https://doi.org/10.1016/j.jclepro.2012.12.006>

- García-Sánchez, I.-M., & Noguera-Gámez, L. (2017). Integrated Reporting and Stakeholder Engagement: The Effect on Information Asymmetry. *Corporate Social Responsibility and Environmental Management*, 24(5), 395–413. <https://doi.org/10.1002/csr.1415>
- García-Sánchez, I.-M., Rodríguez-Ariza, L., & Frías-Aceituno, J.-V. (2013). The cultural system and integrated reporting. *International Business Review*, 22(5), 828–838. <https://doi.org/10.1016/j.ibusrev.2013.01.007>
- Gisev, N., Bell, J. S., & Chen, T. F. (2013). Interrater agreement and interrater reliability: key concepts, approaches, and applications. *Research in Social & Administrative Pharmacy : RSAP*, 9(3), 330–338. <https://doi.org/10.1016/j.sapharm.2012.04.004>
- Gold Fields. (2016). *Integrated Annual Report 2016: A Year of Growth*. Retrieved from http://www.goldfields.com/reports/annual_report_2016/pdf/full-integrated.pdf
- Gray, R., Kouhy, R., & Lavers, S. (1995). Corporate social and environmental reporting. *Accounting, Auditing & Accountability Journal*, 8(2), 47–77. <https://doi.org/10.1108/09513579510146996>
- Greene, W. H. (2003). *Econometric analysis* (5. ed., internat. ed.). Upper Saddle River, NJ: Prentice-Hall.
- Greenwood, R., & Hinings, C. R. (1987). Editorial Introduction: Organizational Transformations. *Journal of Management Studies*, 24(6), 561–564. <https://doi.org/10.1111/j.1467-6486.1987.tb00463.x>
- GRI. (2013). New reforms strengthen non-financial reporting in the UK. Retrieved from <https://www.globalreporting.org/information/news-and-press-center/Pages/New-reforms-strengthen-non-financial-reporting-in-the-UK-.aspx>
- GRI. (2015). G4 Sustainability Reporting Guidelines. Retrieved from <https://www.globalreporting.org/resourcelibrary/GRIG4-Part1-Reporting-Principles-and-Standard-Disclosures.pdf>
- GRI. (2016). G4 Sector Disclosures. Retrieved from <https://www.globalreporting.org/information/g4/sector-guidance/sectorguidanceG4/Pages/default.aspx>
- GRI. (2017). GRI and IIRC. Retrieved from <https://www.globalreporting.org/information/current-priorities/integrated-reporting/Pages/default.aspx>
- Guenther, E., Guenther, T., Schiemann, F., & Weber, G. (2015). Stakeholder Relevance for Reporting. *Business & Society*, 55(3), 361–397. <https://doi.org/10.1177/0007650315575119>
- Guenther, E., Hoppe, H., & Poser, C. (2006). Environmental Corporate Social Responsibility of Firms in the Mining and Oil and Gas Industries: Current Status Quo of Reporting Following GRI Guidelines. *Greener Management International*. (53), 7–25.
- Günther, E., Herrmann, J., & Lange, A. (2017). Hemnisse der Integrierten Berichterstattung: Warum entscheiden sich Unternehmen gegen die Umsetzung? Erste Erkenntnisse aus Experteninterviews von Wissenschaft und Praxis. *Rechnungslegung*, 12, 131–136.
- Günther, E., & Schmiedchen, E. (2013). Integrated Reporting – Stand der Forschung: Ergebnisse einer systematischen Literaturrecherche. *Zeitschrift Für Corporate Governance*, 8(6), 241–292.

- Guthrie, J., Manes-Rossi, F., & Orelli, R. L. (2017). Integrated reporting and integrated thinking in Italian public sector organisations. *Meditari Accountancy Research*, 25(4), 553–573. <https://doi.org/10.1108/MEDAR-06-2017-0155>
- Habermas, J. (1981). *Theorie des kommunikativen Handelns Band I: Handlungsrationalität und Gesellschaftliche Rationalisierung*. Suhrkamp-Taschenbuch Wissenschaft: Vol. 1175. Frankfurt/Main: Suhrkamp.
- Hackston, D., & Milne, M. J. (1996). Some determinants of social and environmental disclosures in New Zealand companies. *Accounting, Auditing & Accountability Journal*, 9(1), 77–108. <https://doi.org/10.1108/09513579610109987>
- Haji, A. A., & Anifowose, M. (2016). The trend of integrated reporting practice in South Africa: Ceremonial or substantive? *Sustainability Accounting, Management and Policy Journal*, 7(2), 190–224. <https://doi.org/10.1108/SAMPJ-11-2015-0106>
- Halme, M., & Huse, M. (1997). The influence of corporate governance, industry and country factors on environmental reporting. *Scandinavian Journal of Management*, 13(2), 137–157. [https://doi.org/10.1016/S0956-5221\(97\)00002-X](https://doi.org/10.1016/S0956-5221(97)00002-X)
- Harmony Gold Mining. (2015). Integrated Annual Report 2015. Retrieved from <http://www.har.co.za/15/>
- Hart, S. L., & Ahuja, G. (1996). Does it Pay to Be Green? An Empirical Examination of the Relationship between Emission Reduction and Firm Response. *Business Strategy and the Environment*, 5(1), 30–37. [https://doi.org/10.1002/\(SICI\)1099-0836\(199603\)5:1<30::AID-BSE38>3.0.CO;2-Q](https://doi.org/10.1002/(SICI)1099-0836(199603)5:1<30::AID-BSE38>3.0.CO;2-Q)
- Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics*, 31(1-3), 405–440. [https://doi.org/10.1016/S0165-4101\(01\)00018-0](https://doi.org/10.1016/S0165-4101(01)00018-0)
- Heckerman, D. G. (1975). Motivating managers to make investment decisions. *Journal of Financial Economics*, 2(3), 273–292. [https://doi.org/10.1016/0304-405X\(75\)90016-1](https://doi.org/10.1016/0304-405X(75)90016-1)
- Henri, J.-F., & Journeault, M. (2010). Eco-control: The influence of management control systems on environmental and economic performance. *Accounting, Organizations and Society*, 35(1), 63–80. <https://doi.org/10.1016/j.aos.2009.02.001>
- Herremans, I., & Nazari, J. (2016). Sustainability Reporting Driving Forces and Management Control Systems. *Journal of Management Accounting Research*, 28. <https://doi.org/10.2308/jmar-51470>
- Hess, D. (2008). The Three Pillars of Corporate Social Reporting as New Governance Regulation. *Business Ethics Quarterly*, 18(4), 447–482. <https://doi.org/10.5840/beq200818434>
- Higgins, C., Stubbs, W., & Love, T. (2014). Walking the talk(s): Organisational narratives of integrated reporting. *Accounting, Auditing & Accountability Journal*, 27(7), 1090–1119. <https://doi.org/10.1108/AAAJ-04-2013-1303>
- Hoffman, A. J. (2005). Climate Change Strategy: The Business Logic behind Voluntary Greenhouse Gas Reductions. *California Management Review*, 47(3), 21–46. <https://doi.org/10.2307/41166305>

- Hofstede, G. (1980). Motivation, leadership, and organization: Do American theories apply abroad? *Organizational Dynamics*, 9(1), 42–63. [https://doi.org/10.1016/0090-2616\(80\)90013-3](https://doi.org/10.1016/0090-2616(80)90013-3)
- Hung, M., & Subramanyam, K. R. (2007). Financial statement effects of adopting international accounting standards: The case of Germany. *Review of Accounting Studies*, 12(4), 623–657. <https://doi.org/10.1007/s11142-007-9049-9>
- Husch Blackwell. (2016). The SEC Revisits Sustainability: Will Sustainability Reporting Become Mandatory for Publicly-Traded U.S. Corporations? Retrieved from <https://www.tmtindustryinsider.com/2016/10/the-sec-revisits-sustainability-will-sustainability-reporting-become-mandatory-for-publicly-traded-u-s-corporations/>
- IIRC. (2011). *Towards integrated reporting: communicating value in the 21st century*. Retrieved from International Integrated Reporting Council website: <http://theiirc.org/wp-content/uploads/2011/09/IR-Discussion-Paper->
- IIRC. (2013a). Capitals: Background Paper for <IR>. Retrieved from <https://integratedreporting.org/wp-content/uploads/2013/03/IR-Background-Paper-Capitals.pdf>
- IIRC. (2013b). Value Creation: Background Paper. Retrieved from <http://integratedreporting.org/wp-content/uploads/2013/08/Background-Paper-Value-Creation.pdf>
- IIRC. (2013c). *The International <IR> Framework*. Retrieved from International Integrated Reporting Council website: <http://integratedreporting.org/wp-content/uploads/2013/12/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf>
- IIRC. (2015). The Integrated Reporting journey: the inside story. Retrieved from <http://integratedreporting.org/wp-content/uploads/2015/07/The-Integrated-Reporting-journey-the-inside-story.pdf>
- IIRC. (2019). The IIRC. Retrieved from <http://integratedreporting.org/the-iirc-2/>
- IIRC, & Black Sun Plc. (2014). Realizing the benefits: The impact of integrated reporting. Retrieved from https://integratedreporting.org/wp-content/uploads/2014/09/IIRC.Black_Sun_.Research.IR_.Impact.Single.pages.18.9.14.pdf
- IIRC, & IFRS Foundation. (2014). Memorandum of Understanding. Retrieved from <http://integratedreporting.org/wp-content/uploads/2013/02/MoU-IIRC-IFRS-FOUNDATION-20130204.pdf>
- IIRC and SASB. (2013). Memorandum of Understanding. Retrieved from <http://integratedreporting.org/wp-content/uploads/2014/01/MoU-IIRC-SASB-Final.pdf>
- Impala Platinum Holdings. (2014). Integrated Annual Report 2014. Retrieved from <http://www.implats.co.za/pdf/annual-reports/annual-integrated-report/2014/implats-iar-2014.pdf>
- Impala Platinum Holdings. (2015). Integrated Annual Report 2015. Retrieved from <http://www.implats.co.za/pdf/annual-reports/annual-integrated-report/2015/implats-iar-2015.pdf>

- Incitec Pivot. (2015). Sustainability Report 2015. Retrieved from <https://www.incitecpivot.com.au/~media/Files/IPL/Sustainability/2015%20Sustainability%20Report/2015%20IPL%20Sustainability%20Report.pdf>
- Inglehart, R. (2011). Inglehart–Welzel Cultural Map of the World. Retrieved from http://www.worldvaluessurvey.org/wvs/articles/folder_published/article_
- International Financial Reporting Standards (IFRS) Foundation. (2016). Trustees' Review of Structure and Effectiveness: Feedback Statement on the July 2015 Request for Views. Retrieved from <http://www.ifrs.org/About-us/IFRS-Foundation/Oversight/Trustees/Trustee-reviews-of-structure-and-effectiveness/2015-Review-of-Structure-and-Effectiveness/Documents/Review-of-Structure-and-Effectiveness-Feedback-Statement.pdf>.
- Ioannou, I., Li, S. X., & Serafeim, G. (2016). The Effect of Target Difficulty on Target Completion: The Case of Reducing Carbon Emissions. *The Accounting Review*, *91*(5), 1467–1492. <https://doi.org/10.2308/accr-51307>
- Ioannou, I., & Serafeim, G. (2011). The Consequences of Mandatory Corporate Sustainability Reporting. *Harvard Business School Research Working Paper*. Advance online publication. <https://doi.org/10.2139/ssrn.1799589>
- Jenkins, H., & Yakovleva, N. (2006). Corporate social responsibility in the mining industry: Exploring trends in social and environmental disclosure. *Improving Environmental, Economic and Ethical Performance in the Mining Industry. Part 1. Environmental Management and Sustainable Development*, *14*(3), 271–284. <https://doi.org/10.1016/j.jclepro.2004.10.004>
- Jensen, J. C., & Berg, N. (2012). Determinants of Traditional Sustainability Reporting Versus Integrated Reporting. An Institutional Approach. *Business Strategy and the Environment*, *21*(5), 299–316. <https://doi.org/10.1002/bse.740>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Jermann, U., & Quadrini, V. (2012). Macroeconomic Effects of Financial Shocks. *American Economic Review*, *102*(1), 238–271. <https://doi.org/10.1257/aer.102.1.238>
- Johnson Matthey. (2014). 2013 Annual Report and Accounts: Technology Leadership. Retrieved from <https://matthey.com/~media/files/investors/reports/ar-2013.pdf?la=en&hash=8F852BCB4C59651347282C5B151C52A6F27882C8>
- Jones, C. A., & Levy, D. L. (2007). North American Business Strategies Towards Climate Change. *European Management Journal*, *25*(6), 428–440. <https://doi.org/10.1016/j.emj.2007.07.001>
- Kannenberg, L., & Schreck, P. (2018). Integrated reporting: Boon or bane? A review of empirical research on its determinants and implications. *Journal of Business Economics*, *27*, 1–53. <https://doi.org/10.1007/s11573-018-0922-8>
- Kennedy, P. (2003). *A guide to econometrics* (5. ed.). Cambridge, Mass.: MIT Press.
- Klassen, R. D., & McLaughlin, C. P. (1996). The Impact of Environmental Management on Firm Performance. *Management Science*, *42*(8), 1199–1214. <https://doi.org/10.1287/mnsc.42.8.1199>

- Knauer, A., & Serafeim, G. (2014). Attracting Long-Term Investors Through Integrated Thinking and Reporting: A Clinical Study of a Biopharmaceutical Company. *Journal of Applied Corporate Finance*, 26(2), 57–64. <https://doi.org/10.1111/jacf.12067>
- Kohler, U., & Kreuter, F. (2006). *Datenanalyse mit STATA: Allgemeine Konzepte der Datenanalyse und ihre praktische Anwendung*. München: Oldenbourg.
- Kolk, A., Levy, D., & Pinkse, J. (2008). Corporate Responses in an Emerging Climate Regime: The Institutionalization and Commensuration of Carbon Disclosure. *European Accounting Review*, 17(4), 719–745. <https://doi.org/10.1080/09638180802489121>
- Kolk, A., & Pinkse, J. (2004). Market Strategies for Climate Change. *European Management Journal*, 22(3), 304–314. <https://doi.org/10.1016/j.emj.2004.04.011>
- KPMG. (2015). *Towards Better Business Reporting: Integrated Reporting and Value Creation*. Retrieved from KPMG website: <http://integratedreporting.org/resource/kpmg-and-nus-towards-better-business-reporting/>
- KPMG. (2017). The KPMG Survey of Corporate Responsibility Reporting 2017. Retrieved from <https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/10/kpmg-survey-of-corporate-responsibility-reporting-2017.pdf>
- Krippendorff, K. (2009). *Content analysis: An introduction to its methodology* (2. ed., [Nachdr.]). Thousand Oaks, Calif.: Sage Publ.
- Krzus, M. P. (2011). Integrated reporting: if not now, when? *IRZ Zeitschrift Für Internationale Rechnungslegung*. (6), 271–276.
- Kumba Iron Ore. (2014). Integrated Report 2013. Retrieved from <https://www.angloamericankumba.com/~media/Files/A/Anglo-American-Kumba/documents/integrated-report.pdf>
- Kumba Iron Ore. (2016). Integrated Report 2015. Retrieved from <https://www.angloamericankumba.com/~media/Files/A/Anglo-American-Kumba/documents/866715-kumba-ir-fy15-fin-2.pdf>
- La Porta, R., Florencio, L. d. S., & Andrei Shleifer. (2006). What Works in Securities Laws? *The Journal of Finance*, 61(1), 1–32. <https://doi.org/10.1111/j.1540-6261.2006.00828.x>
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (1996). *Law and Finance*. Cambridge, MA: National Bureau of Economic Research.
- Lai, A., Melloni, G., & Stacchezzini, R. (2016). Corporate Sustainable Development: Is ‘Integrated Reporting’ a Legitimation Strategy? *Business Strategy and the Environment*, 25(3), 165–177. <https://doi.org/10.1002/bse.1863>
- Landis, J. R., & Koch, G. G. (1977). The Measurement of Observer Agreement for Categorical Data. *Biometrics*, 33(1), 159. <https://doi.org/10.2307/2529310>
- Larcker, D. F., & Rusticus, T. O. (2007). Endogeneity and Empirical Accounting Research. *European Accounting Review*, 16(1), 207–215. <https://doi.org/10.1080/09638180701269905>
- Laughlin, R. C. (1991). Environmental Disturbances and Organizational Transitions and Transformations: Some Alternative Models. *Organization Studies*, 12(2), 209–232. <https://doi.org/10.1177/017084069101200203>

- Lee, K.-W., & Yeo, G. H.-H. (2015). The association between integrated reporting and firm valuation. *Review of Quantitative Finance and Accounting*, 47(4), 1221–1250. <https://doi.org/10.1007/s11156-015-0536-y>
- Lenssen, G., Albareda, L., Tencati, A., Lozano, J. M., & Perrini, F. (2006). The government's role in promoting corporate responsibility: A comparative analysis of Italy and UK from the relational state perspective. *Corporate Governance: the International Journal of Business in Society*, 6(4), 386–400. <https://doi.org/10.1108/14720700610689504>
- Leuz, C. (2010). Different approaches to corporate reporting regulation: How jurisdictions differ and why. *Accounting and Business Research*, 40(3), 229–256. <https://doi.org/10.1080/00014788.2010.9663398>
- Leuz, C., Nanda, D., & Wysocki, P. D. (2003). Earnings management and investor protection: An international comparison. *Journal of Financial Economics*, 69(3), 505–527. [https://doi.org/10.1016/S0304-405X\(03\)00121-1](https://doi.org/10.1016/S0304-405X(03)00121-1)
- Levy, A. (1986). Second-order planned change: Definition and conceptualization. *Organizational Dynamics*, 15(1), 5–23. [https://doi.org/10.1016/0090-2616\(86\)90022-7](https://doi.org/10.1016/0090-2616(86)90022-7)
- Lewandowski, S. (2017). Corporate Carbon and Financial Performance: The Role of Emission Reductions. *Business Strategy and the Environment*, 26(8), 1196–1211. <https://doi.org/10.1002/bse.1978>
- Li, F. (2008). Annual report readability, current earnings, and earnings persistence. *Journal of Accounting and Economics*, 45(2-3), 221–247. <https://doi.org/10.1016/j.jacceco.2008.02.003>
- Li, Y. U. E., Richardson, G. D., & Thornton, D. B. (1997). Corporate Disclosure of Environmental Liability Information: Theory and Evidence. *Contemporary Accounting Research*, 14(3), 435–474.
- Lodhia, S. (2015). Exploring the Transition to Integrated Reporting Through a Practice Lens: An Australian Customer Owned Bank Perspective. *Journal of Business Ethics*, 129(3), 585–598. <https://doi.org/10.1007/s10551-014-2194-8>
- Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content Analysis in Mass Communication: Assessment and Reporting of Intercoder Reliability. *Human Communication Research*, 28(4), 587–604. <https://doi.org/10.1111/j.1468-2958.2002.tb00826.x>
- Maniora, J. (2015). Is Integrated Reporting Really the Superior Mechanism for the Integration of Ethics into the Core Business Model? An Empirical Analysis. *Journal of Business Ethics*, 1–32. <https://doi.org/10.1007/s10551-015-2874-z>
- IIRC. (2018). *Richard Howitt, CEO, IIRC addresses our 2018 global conference in Tokyo*. Retrieved from <https://mailchi.mp/theiirc/iirc-newsletter-690325>
- Martinez, C. R. (2016). Effects of Integrated Reporting on the Firm's Value: Evidence from Voluntary Adopters of the IIRC's Framework. *SSRN Electronic Journal*. Advance online publication. <https://doi.org/10.2139/ssrn.2876145>
- McKight, P. E., & Najab, J. (2010). *Kruskal-Wallis Test*. *Major Reference Works*.
- Meyer, J. W., & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal of Sociology*, 83(2), 340–363. <https://doi.org/10.2307/2778293>

- Miles, M. P., & Covin, J. G. (2000). Environmental Marketing: A Source of Reputational, Competitive, and Financial Advantage. *Journal of Business Ethics*, 23(3), 299–311. <https://doi.org/10.1023/A:1006214509281>
- Miller, D., & Friesen, P. H. (1980). Momentum and Revolution in Organizational Adaptation. *Academy of Management Journal*, 23(4), 591–614. <https://doi.org/10.2307/255551>
- Miller, D., Friesen, P. H., & Mintzberg, H. (1984). *Organizations: A quantum view*. Englewood Cliffs, N.J.: Prentice-Hall.
- Milne, M. J., & Adler, R. W. (1999). Exploring the reliability of social and environmental disclosures content analysis. *Accounting, Auditing & Accountability Journal*, 12(2), 237–256. <https://doi.org/10.1108/09513579910270138>
- Mio, C., Marco, F., & Pauluzzo, R. (2016). Internal application of IR principles: Generali's Internal Integrated Reporting. *Journal of Cleaner Production*, 139, 204–218. <https://doi.org/10.1016/j.jclepro.2016.07.149>
- Moloi, T. (2015). Risk Management Practices in the Top 20 South Africa's Listed Companies: An Annual/ Integrated Report Disclosure Analysis. *Corporate Ownership and Control*, 12(4). <https://doi.org/10.22495/cocv12i4csp12>
- Nampak. (2014). 2014 Integrated Report. Retrieved from <http://financialresults.co.za/2014/nampak-integrated-report-2014/downloads/nampak-annual-report-2014.pdf>
- Nobes, C. (2011). *International Variations in IFRS Adoption and Practice* (Research Report No. 124). Retrieved from Association of Chartered Certified Accountants website: <https://www.accaglobal.com/content/dam/acca/global/PDF-technical/financial-reporting/rr-124-001.pdf>
- Ott, C., Schiemann, F., & Günther, T. (2017). Disentangling the determinants of the response and the publication decisions: The case of the Carbon Disclosure Project. *Journal of Accounting and Public Policy*, 36(1), 14–33. <https://doi.org/10.1016/j.jaccpubpol.2016.11.003>
- Parliament of Australia. (2010). Sustainability reporting. Retrieved from https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/Browse_by_Topic/ClimateChangeold/responses/economic/sustainability#guidelines
- Patten, D. M. (2002). The relation between environmental performance and environmental disclosure: A research note. *Accounting, Organizations and Society*, 27(8), 763–773. [https://doi.org/10.1016/S0361-3682\(02\)00028-4](https://doi.org/10.1016/S0361-3682(02)00028-4)
- Perego, P., Kennedy, S., & Whiteman, G. (2016). A lot of icing but little cake? Taking integrated reporting forward. *Journal of Cleaner Production*, 1–12. <https://doi.org/10.1016/j.jclepro.2016.01.106>
- Petersen, M. A. (2008). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *Review of Financial Studies*, 22(1), 435–480. <https://doi.org/10.1093/rfs/hhn053>
- Piermattei, Livia & Venturini, Tommaso. (2016). Integrated Reporting <IR>: Focus on Integrates Thinking: Strategy, Governance, Culture, Organization. Retrieved from <http://integratedreporting.org/wp-content/uploads/2018/03/NIBR-IR-Focus-on-Integrated-Thinking-Handbook.pdf>

- Pounder, B. (2011). Trends in Sustainability Reporting. *Strategic Finance*, (93 (6)), 21–23.
- Preston, L. E., & Post, J. E. (1981). Private Management and Public Policy. *California Management Review*, 23(3), 56–62. <https://doi.org/10.2307/41172602>
- PWC. (2015). *Implementing Integrated Reporting: PwC's practical guide for a new business language*. Retrieved from <https://www.pwc.com/gx/en/audit-services/publications/assets/pwc-ir-practical-guide.pdf>
- Ramanathan, K. V. (1976). Toward a Theory of Corporate Social Accounting. *The Accounting Review*, 51(3), 516–528.
- Rambe, P., & Mangara, T. B. (2016). Influence of integrated reporting ratings, CEO age, and years of experience on the share price of top 106 JSE listed companies. *Problems and Perspectives in Management*, 14(3-1), 216–231. [https://doi.org/10.21511/ppm.14\(3-1\).2016.08](https://doi.org/10.21511/ppm.14(3-1).2016.08)
- Reed, W. R. (2015). On the Practice of Lagging Variables to Avoid Simultaneity. *Oxford Bulletin of Economics and Statistics*, 77(6), 897–905. <https://doi.org/10.1111/obes.12088>
- Robb, F. (1990). Morphostasis and morphogenesis: Contexts of design inquiry. *Systems Research*, 7. <https://doi.org/10.1002/sres.3850070301>
- Roberts, P. W., & Dowling, G. R. (2002). Corporate reputation and sustained superior financial performance. *Strategic Management Journal*, 23(12), 1077–1093. <https://doi.org/10.1002/smj.274>
- Rodríguez, P., Correa, C., & Larrinaga, C. (2016). Integrated reporting adoption and organizational change. In EMAN (Ed.), *Proceedings of the 20th Conference of the Environmental and Sustainability Management Accounting Network (EMAN), Lüneburg, 2016* (pp. 188–189).
- Rowbottom, N., & Locke, J. (2013). The emergence of <IR>. *Accounting and Business Research*, 46(1), 83–115. <https://doi.org/10.1080/00014788.2015.1029867>
- Rucker, D. D., McShane, B. B., & Preacher, K. J. (2015). A researcher's guide to regression, discretization, and median splits of continuous variables. *Journal of Consumer Psychology*, 25(4), 666–678. <https://doi.org/10.1016/j.jcps.2015.04.004>
- Russo, M. V., & Fouts, P. A. (1997). A Resource-Based Perspective on Corporate Environmental Performance and Profitability. *Academy of Management Journal*, 40(3), 534–559. <https://doi.org/10.2307/257052>
- SAP. (2016). Integrated Performance Analysis. Retrieved from <http://www.sap.com/integrated-reports/2015/en/strategy/integrated-performance-analysis.html>
- Sappi. (2013). Integrated Report: For the Year ended September 2013. Retrieved from <https://cdn-s3.sappi.com/s3fs-public/2013%20Annual%20Report%20Sappi%20Southern%20Africa.pdf>
- Schatzki, T. R. (2005). Peripheral Vision. *Organization Studies*, 26(3), 465–484. <https://doi.org/10.1177/0170840605050876>
- Schreck, P. (2009). *The Business Case for Corporate Social Responsibility. Understanding & Measuring Economic Impacts of Corporate Social Performance*. Heidelberg: Physica-Verlag.

- Schreck, P., & Raithel, S. (2015). Corporate Social Performance, Firm Size, and Organizational Visibility: Distinct and Joint Effects on Voluntary Sustainability Reporting. *Business & Society*. Advance online publication. <https://doi.org/10.1177/0007650315613120>
- Serafeim, G. (2015). Integrated Reporting and Investor Clientele. *Journal of Applied Corporate Finance*, 27(2), 34–51. <https://doi.org/10.2139/ssrn.2378899>
- Setia, N., Abhayawansa, S., Joshi, M., & Huynh, A. V. (2015). Integrated reporting in South Africa: Some initial evidence. *Sustainability Accounting, Management and Policy Journal*, 6(3), 397–424. <https://doi.org/10.1108/SAMPJ-03-2014-0018>
- Sibanye Gold. (2014). Integrated Report. Retrieved from http://www.annualreports.com/HostedData/AnnualReportArchive/s/NYSE_SBGL_2013.pdf
- Sierra-García, L., Zorio-Grima, A., & García-Benau, M. A. (2015). Stakeholder Engagement, Corporate Social Responsibility and Integrated Reporting: An Exploratory Study. *Corporate Social Responsibility and Environmental Management*, 22(5), 286–304. <https://doi.org/10.1002/csr.1345>
- Simnett, R., & Huggins, A. L. (2015). Integrated reporting and assurance: Where can research add value? *Sustainability Accounting, Management and Policy Journal*, 6(1), 29–53. <https://doi.org/10.1108/SAMPJ-09-2014-0053>
- Sinclair, A. (1995). The chameleon of accountability: Forms and discourses. *Accounting, Organizations and Society*, 20(2-3), 219–237. [https://doi.org/10.1016/0361-3682\(93\)E0003-Y](https://doi.org/10.1016/0361-3682(93)E0003-Y)
- Slack, R., & Tsalavoutas, I. (2017). Equity Market Diffusion and Resistance to Integrated Reporting. *SSRN Electronic Journal*. Advance online publication. <https://doi.org/10.2139/ssrn.2959745>
- Smith, K. K. (1982). Philosophical problems in thinking about organizational change. *Change in Organizations : New Perspectives on Theory, Research, and Practice*, 316–374.
- Smith III, A. (1993). The CERES Principles: A Voluntary Code for Corporate Environmental Responsibility. *Yale Journal of International Law*, 18(1), 307–317. Retrieved from <https://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1614&context=yjil>
- SSE. (2014). Reliable and Sustainable: Annual Report 2013. Retrieved from http://sse.com/media/108594/SSEplcAnnualReport2013_optimised.pdf
- Steurer, R. (2010). The role of governments in corporate social responsibility: Characterising public policies on CSR in Europe. *Policy Sciences*, 43(1), 49–72. <https://doi.org/10.1007/s11077-009-9084-4>
- Stevens, J. (1999). Post Hoc Tests in ANOVA. Retrieved from <https://pages.uoregon.edu/stevensj/posthoc.pdf>
- Steyn, M. (2014). Organisational benefits and implementation challenges of mandatory integrated reporting. *Sustainability Accounting, Management and Policy Journal*, 5(4), 476–503. <https://doi.org/10.1108/SAMPJ-11-2013-0052>
- Stock, J. H., & Watson, M. W. (2007). *Introduction to econometrics* (2. ed., Pearson internat. ed.). *The Addison-Wesley series in economics*. Boston, Mass.: Pearson/Addison-Wesley.

- Stubbs, W., & Higgins, C. (2014). Integrated Reporting and internal mechanisms of change. *Accounting, Auditing & Accountability Journal*, 27(7), 1068–1089. <https://doi.org/10.1108/AAAJ-03-2013-1279>
- Stubbs, W., Higgins, C., Milne, M. J., & Hems, L. (2014). Financial Capital Providers Perceptions of Integrated Reporting. *SSRN Electronic Journal*. Advance online publication. <https://doi.org/10.2139/ssrn.2473426>
- Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *The Academy of Management Review*, 20(3), 571. <https://doi.org/10.2307/258788>
- Sullivan, P. H., JR., & Sullivan, P. H., SR. (2000). Valuing intangibles companies – An intellectual capital approach. *Journal of Intellectual Capital*, 1(4), 328–340. <https://doi.org/10.1108/14691930010359234>
- Sztompka, P. (1999). *Trust: A sociological theory*: Cambridge University Press.
- Tang, S., & Demeritt, D. (2018). Climate Change and Mandatory Carbon Reporting: Impacts on Business Process and Performance. *Business Strategy and the Environment*, 27(4), 437–455. <https://doi.org/10.1002/bse.1985>
- The South African Institute of Chartered Accountants. (2012). *Accountancy SA: Sustainability, Integrated Reporting*. Bruma Lake, South Africa.
- The UK Statutory Office. (2013). The Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013. Retrieved from <http://www.legislation.gov.uk/ukdsi/2013/9780111540169/contents>
- Thomson, I. (2015). 'But does sustainability need capitalism or an integrated report' a commentary on 'The International Integrated Reporting Council: A story of failure' by Flower, J. *Critical Perspectives on Accounting*, 27, 18–22. <https://doi.org/10.1016/j.cpa.2014.07.003>
- Tweedie, D., & Martinov-Bennie, N. (2015). Entitlements and Time: Integrated Reporting's Double-edged Agenda. *Social and Environmental Accountability Journal*, 35(1), 49–61. <https://doi.org/10.1080/0969160X.2015.1007466>
- U.S. Securities and Exchange Commission. (2017). Rules, Regulations and Schedules. Retrieved from <https://www.sec.gov/divisions/corpfin/ecfrlinks.shtml>
- UNFCCC. (1992). United Nations Framework Convention on Climate Change. Retrieved from <https://unfccc.int/resource/docs/convkp/conveng.pdf>
- United Nations World Commission on Environment and Development. (1987). Our Common Future. Retrieved from <http://www.un-documents.net/our-common-future.pdf>
- United States Environmental Protection Agency. (2018). Learn About the Greenhouse Gas Reporting Program (GHGRP). Retrieved from <https://www.epa.gov/ghgreporting/learn-about-greenhouse-gas-reporting-program-ghgrp>
- Van Bommel, K. (2014). Towards a legitimate compromise? *Accounting, Auditing & Accountability Journal*, 27(7), 1157–1189. <https://doi.org/10.1108/AAAJ-04-2013-1309>
- Vaz, N., Fernandez-Feijoo, B., & Ruiz, S. (2016). Integrated reporting: An international overview. *Business Ethics: a European Review*, 25(4), 577–591. <https://doi.org/10.1111/beer.12125>

- Velte, P., & Stawinoga, M. (2017a). Empirical Evidence of the Disclosure and Assurance of Integrated Reporting: A Content Analysis of the IIRC Examples Database. *Zeitschrift Für Umweltpolitik & Umweltrecht*, 40(1), 59–84.
- Velte, P., & Stawinoga, M. (2017b). Integrated reporting: The current state of empirical research, limitations and future research implications. *Journal of Management Control*, 28(3), 275–320. <https://doi.org/10.1007/s00187-016-0235-4>
- Veltri, S., & Silvestri, A. (2015). The Free State University integrated reporting: A critical consideration. *Journal of Intellectual Capital*, 16(2), 443–462. <https://doi.org/10.1108/JIC-06-2014-0077>
- Venter, E. R., Stiglingh, M., & Smit, A.-R. (2017). Integrated Thinking and the Transparency of Tax Disclosures in the Corporate Reports of Firms. *Journal of International Financial Management & Accounting*, 28(3), 394–427. <https://doi.org/10.1111/jifm.12064>
- Verrecchia, R. E. (1983). Discretionary disclosure. *Journal of Accounting and Economics*, 5, 179–194. [https://doi.org/10.1016/0165-4101\(83\)90011-3](https://doi.org/10.1016/0165-4101(83)90011-3)
- Vesty, G., Dellaport, S., Oliver, J., & Brooks, A. (2016). Conceptualising integrated thinking in practice. *Managerial Auditing Journal*, 31(2), 228–248. <https://doi.org/10.1108/MAJ-10-2015-1253>
- Villiers, C. de, & Hsiao, P.-C. (2016). Integrated reporting: Background, review, and future research opportunities. In EMAN (Ed.), *Proceedings of the 20th Conference of the Environmental and Sustainability Management Accounting Network (EMAN), Lüneburg, 2016* (pp. 67–72).
- Villiers, C. de, Rinaldi, L., & Unerman, J. (2018). Evaluating the Integrated Reporting journey: Insights, gaps and an agenda for future research. *Accounting, Auditing & Accountability Journal*, 31(5), Forthcoming.
- Wachira, M. M., Berndt, T., & Martinez C. R. (2017). Electronic copy available at: <https://ssrn.com/abstract=2970415> 1 The adoption of international sustainability reporting guidelines within a mandatory reporting framework: Lessons from South Africa.
- Wagenhofer, A. (1990). Voluntary disclosure with a strategic opponent. *Journal of Accounting and Economics*, 12(4), 341–363. [https://doi.org/10.1016/0165-4101\(90\)90020-5](https://doi.org/10.1016/0165-4101(90)90020-5)
- Walgenbach, P., & Beck, N. (2003). Effizienz und Anpassung. Das Erklärungspotenzial der neoinstitutionalistischen Organisationstheorie am Beispiel ISO 9000. *Betriebswirtschaft*, 63(5), 497–515.
- WBCSD. (2004). *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*. Retrieved from World Business Council for Sustainable Development website: <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>
- Weber, R. (1990). *Basic Content Analysis*. Thousand Oaks, United States: SAGE Publications, Inc.
- Wickert, C., Scherer, A. G., & Spence, L. J. (2016). Walking and Talking Corporate Social Responsibility: Implications of Firm Size and Organizational Cost. *Journal of Management Studies*, 53(7), 1169–1196. <https://doi.org/10.1111/joms.12209>
- Williams, S. (1999). Voluntary environmental and social accounting disclosure practices in the Asia-Pacific region: An international empirical test of political economy theory. *The*

International Journal of Accounting, 34(2), 209–238. [https://doi.org/10.1016/S0020-7063\(99\)00006-0](https://doi.org/10.1016/S0020-7063(99)00006-0)

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge, Mass: MIT Press.

Zhou, S., Simnett, R., & Green, W. (2017). Does Integrated Reporting Matter to the Capital Market? *Abacus*, 53(1), 94–132. <https://doi.org/10.1111/abac.12104>

Appendix A – Abstract Data Extraction Form

Table A1 shows an abstract of the data extraction that was used for analysis with the statistical software STATA (Version 14). Table A2 provides further information for each label code used in STATA, as listed in section 4.5.2. Table A3 presents the coding choices for specific labels, such as *cd_country* or *cd_industry*.

Table A1

Abstract Data Extraction Form

cd_name	cd_id	cd_isin	cd_country	cd_industry	cd_year	cd_assets	cd_roa	cd_sales	cd_lev	cd_ghg	cdp_submit	cdp_disclosure	cdp_perform	rep_scordate	rep_type	rep_pn	rep_year	rep_start	rep_end	rep_sr
AECI Ltd Ord	248	ZAE00 000022 0	9	1	2013	1326634750	8,39779	9,7102	43,4081 2	353,47	2014-05-29 10:02:00	91	3	27.06.2018	1	190	2013	01.01.2013	31.12.2013	0
AECI Ltd Ord	248	ZAE00 000022 0	9	1	2014	1229929440	8,88647	9,28829	26,4302 4	415,13	2015-07-01 08:35:11	97	5	13.06.2018	1	180	2014	01.01.2014	31.12.2014	0
AECI Ltd Ord	248	ZAE00 000022 0	9	1	2015	1115943920	7,50933	8,00173	36,8562 5	430,59	2016-06-30 14:20:12		3	17.04.2018	1	312	2015	01.01.2015	31.12.2015	0
AECI Ltd Ord	248	ZAE00 000022 0	9	1	2016	1115012630	5,95117	7,68983	19,7688 8	392,71			3	14.06.2018	1	220	2016	01.01.2016	31.12.2016	0

cd_name	rep_gri	rep_IIRC	complete_strategy	complete_ghg	complete_energy	complete_riskopp	complete_target	complete_emred	complete_total	connect_total
AECI Ltd Ord	0	0	0	2	2	0	1	1	1,00	3
AECI Ltd Ord	0	0	0	2	2	0	1	2	1,17	4
AECI Ltd Ord	0	0	1	2	2	1	0	1	1,17	1
AECI Ltd Ord	0	0	0	2	2	2	0	1	1,17	2

Table A24

Data Code Names

Company Data		CDP Data		Technical Report Data		Content Analysis Data	
cd_name	Company Name	cdp_submit	Date Data Submittance CDP	rep_scordate	Scoring Date of Report	complete_strategy	Complete Strategy
cd_isin	Company isin Code	cdp_disclosure	Disclosure Score ⁶⁴	rep_type	Type of Report	complete_ghg	Complete GHG
cd_id	Company CDP ID	cdp_perform	Performance Score	rep_pn	Page Number	complete_energy	Complete Energy
cd_country	Country			rep_year	Year on Title Page	complete_riskopp	Complete Risks & Opportunities
cd_industry	Industry			rep_start	Start Date Reporting Period	complete_target	Complete Target
cd_year	Performance Year ⁶⁵			rep_end	End Date Reporting Period	complete_emred	Complete Emission Reduction Initiatives
cd_assets	Total Assets			rep_sr	Presence Sustainability Report	complete_total	Complete Total
cd_roa	Return on Assets			rep_gri	Reference to GRI Indicators	connect_total	Connect Total
cd_sales	Sales			rep_IIRC	Reference to IIRC Framework		
cd_lev	Leverage						
cd_ghg	Total GHG Emissions						

⁶⁴ Until 2015 the CDP collected a separate score for disclosure performance alongside overall performance scores. As of 2016, there is only a single score.

⁶⁵ Year to which CDP performance score refers.

Table A3

Coding Choices

Label	Value	Meaning
cd_country	1	Australia
	2	Canada
	3	Hong Kong
	4	Ireland
	5	Israel
	6	Malaysia
	7	New Zealand
	8	Singapore
	9	South Africa
cd_industry	1	Chemicals
	2	Construction Materials
	3	Containers and Packaging
	4	Electric Utilities and Independent Power Producers and Energy Traders
	5	Forest and Paper Products
	6	Gas Utilities
	7	Mining - Iron, Aluminium, Other Metals
	8	Mining - Other (Precious Metals & Gems)
	9	Mining - Coal
	10	Oil & Gas
	11	Water Utilities
cdp_perform	1	A
	2	A-
	3	B
	4	B-
	5	C
	6	C-
	7	D
	8	D-
	9	E
rep_type	1	Integrated Report
	2	Sustainability Report
	3	Hybrid Report
rep_sr	0	No Sustainability Report
	1	Sustainability Report present
rep_gri	2	Sustainability Report not accessible
	0	No reference to GRI
	1	Reference to GRI-G4
rep_IIRC	2	Reference to GRI-G3
	3	„In accordance with GRI“ without mentioning specific version
	0	No reference to IIRC framework
	1	Reference to IIRC framework