UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

An analysis of Circular Economy disclosures and the impact on Integrated Reporting.

A research report submitted by

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Abstract:

The impact of global markets on the natural environment has resulted in a rapid depletion of resources. The circular economy (CE) model is a sustainable business model which aims to stay within the limits of the planet and reduce the impact on the environment by decreasing excessive resource use, minimizing waste, and converting end-of-life goods into resources for further use. This research aims to investigate disclosures by Johannesburg Stock Exchange (JSE) listed companies by analysing the type of investments in developing and achieving a CE, the quality and nature of disclosures on a CE, and the related impact on the six capitals. A content analysis method was used to analyse a sample of integrated reports of JSE listed companies. Correlation coefficients were used to evaluate the relationships between the CE disclosures and 21 identified elements, and the Kruskal-Wallis and Jonckheere-Terpstra tests were used to evaluate the significant differences among industries, company size, and year when analysing the CE disclosures. This paper finds that a significant number of CE disclosures are located in the value creation and business model location of the integrated reports, the quality and type of investments to achieve a CE model tending to differ across different industries, company sizes, and year. The research revealed that CE disclosures are becoming more prominent in South Africa. The quality of reporting is moderately low. Industries which have a higher environmental impact and have extensive physical infrastructure tend to have better disclosure on their investments in the six capitals than service-driven industries. Both the quantity and quality of disclosures are better for larger companies. The research finds that companies are increasingly investing in research and development, and partnerships with research groups, think tanks and other third parties to drive their CE adoption. This paper contributes to both corporate reporting and the CE concept by evaluating the link between a CE model and integrated reporting and the impact which CE disclosures have on the six capitals of a company.

Key words:

Circular economy (CE), six capitals, integrated reporting, value creation, reporting quality

Declaration

I, Kashmira Mahadew, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Commerce at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: KASHMIRA MAHADEW

Signature: 

Signed at: UNIVERSITY OF WITWATERSRAND

ON THE MONDAY. DAY OF NOVEMBER 22, 2021

Dedication

This dissertation is dedicated to my parents, Minesh and Nasema Mahadew. Your words of encouragement and support is most valued. To my father, your work ethic and ambition for learning has always been my biggest inspiration. To my mother, your prayers and unconditional love is my strength. Thank you both, for bestowing courage, humility, and confidence on me.

Acknowledgements

I would like to thank my supervisor, Professor Warren Maroun who introduced me to Circular Economy literature. Thank you for your advice, patience, and support. Your passion has inspired to me give my best effort. I would also like to thank my colleagues Chad Everitt who helped me in the initial pilot study and to Dino Da Mata for all the advice and support throughout our master's program.

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List of acronyms:

CE	Circular Economy
CIMA	Chartered Institute of Management Accountants
EMF	Ellen MacArthur Foundation
GRI	Global Reporting Initiative
IFAC	International Federation of Accountants
IIRC	International Integrated Reporting Council
IR	Integrated Reporting
IODSA	Institute of Directors Southern Africa
JSE	Johannesburg Stock Exchange
KING IV	King IV Report on Governance for South Africa 2016
SAAA	Southern African Accounting Association

SDG	Sustainable Development Goals
TCWG	Those charged with governance
UNDP	United Nations Development Programme
WITS	University of the Witwatersrand

1. Introduction

1.1: Purpose of the study

This thesis will investigate the circular economy (CE) based on information included in South African integrated reports. The purpose of this research is to explore how a sample of South African listed companies adopt and report on their CE policy. Using a coding system, an extent and quality of circular economy disclosures will be highlighted and used to provide the first preliminary review of CE adoption in South Africa.

1.2: Context of the study

Rapid globalisation has brought a change to the way organisations conduct their operations and add value to their stakeholders (EMF, 2013a). A major part of this change is an increase in resource depletion, market instabilities and technological innovation (EMF, 2013a, Berg, et al., 2018) Conventional economic systems have developed and promoted economic policies and strategies without accounting for their consequence on the sustainability of society and the environment (Pla-Juliána & Guevarab, 2019). These types of economic systems are drawing on resources faster than they can be restored (Buchmann - Duck & Beazley, 2020).

Consequently, there is a need for sustainable economic systems and practices. CE is one such system. A study by PricewaterhouseCoopers (PWC) in 2012 suggests that:

> "the success of companies depends more and more on their ability to create value without depleting resources of any kind - whether natural, social, human, or financial. Stakeholders will increasingly look for information on how companies connect their business strategy with their financial and non-financial performance" (PWC, 2012).

The CE is characterised by sustainable consumption of resources as opposed to a conventional economic system. Reporting on CE adoption is likely to provide useful information to stakeholders on value creation. The purpose of this thesis is to investigate the application and reporting of CE adoption by South African listed companies.

1.3: Research Questions

This research will utilise a disclosure checklist to investigate CE disclosures. The checklist is used to gain a sense of the frequency and quality of CE disclosures in integrated reports. The first research question (RQ) is:

> **RQ1: What is the level[1]of CE disclosures among South African listed companies based on the information included in their integrated reports?**

The second research question will examine possible trends and associations of CE disclosures based on the level of CE disclosures investigated in RQ1.

> **RQ2: What are possible determinants of CE disclosures?**

RQ2 is divided into the following sub-questions:

> **RQ2.1: Are there differences in the level of CE disclosures among different industries of the South African listed companies[2].**
>
> **RQ2.2: Is there an association between the size[3] of South African listed companies and the level of their CE disclosures?**
>
> **RQ2.3: Is there an association between the financial year of South African listed companies and the level of their CE disclosures?**

[1] The term, "level" is used in this research to investigate if the company has a disclosure which is applicable to one of the content elements in the disclosure checklist (see Table 3 and Section 2.6) and, thereafter, the detail of such disclosure for each theme in the disclosure checklist (see Section 2.6 and Section 4.2).

1.4: Contribution of the study

The emergence of CE is becoming increasingly prominent (Hopkinson et al., 2020; Mishra et al., 2018). Globally there is a call for CE adoption as companies are facing significant pressure to uphold environmental and sustainable values (Lahti et al., 2018). Further the needs of stakeholders have moved towards integrating financial and non – financial information to drive decision making (Ilic & Nikolic, 2016; IODSA, 2016; Lahti et al., 2018). Organisations can adopt and report on sustainable practices such as CE as a value creation process for stakeholders (see Section 2.3). There is extensive research on the operational aspect of CE policies (EMF, 2013a, 2013b, 2013c, 2015) and companies are increasing reporting on their CE policies (Barnabe & Nazir, 2020). However, limited research has been done on

[2] The sample of companies investigated represent 3 industries: Mining, Banking and Financial Services, and Consumer Goods and Retail.
[3] "Size" is determined by market capitalisation

investigating the reporting and accounting of CE disclosures (Barnabe & Nazir, 2020; Hamza et al., 2020).

From an empirical perspective, this study will develop a disclosure checklist to provide the first overview of CE in a South African context. The study will provide evidence of how JSE - listed companies report on aspects of CE to their stakeholders.

From a practical and theoretical view there are a number of reporting frameworks and practices which aim to add value to companies and stakeholders. This includes the International Integrated Reporting Council's (IIRC) Integrated Reporting (IR) Framework, King IV, The Global Reporting Initiative (GRI) guidelines and United Nations (UN) Sustainable Development Goals (SDG). These frameworks provide a theoretical guide to organisations to adopt an integrated thinking approach. CE practices are a practical guide for companies to adapt to achieve sustainable development (Buchmann - Duck & Beazley, 2020; Velenturf et al., 2019).

CE provides an overview on how sustainable operations are designed and will help practitioners in adopting and reporting on their sustainable development and integrated thinking approach. CE may be seen as a specialised area of sustainable corporate reporting and will help companies understand the importance of sustainability, the value creation process from CE and how to achieve and report on such value to stakeholders (Barnabe & Nazir, 2020; Hamza et al., 2020). This research will add to the limited body of CE research and can be used to assist entities by providing a practical insight to unlocking the value from sustainable operations.

1.5: Assumptions, limitations, and delimitations

- This thesis will only deal with the application of CE policies in the context of South African integrated reports. The companies will include only JSE-listed companies as these companies have to prepare annual integrated reports(JSE, 2019) This scope is set as non – listed companies are not obliged to prepare an integrated report. The level of CE disclosures will not be investigated in different jurisdictions. Examining only South African entities controls for inherent differences in regulatory systems, environmental and cultural contexts which may affect the level of CE reporting. Testing for the effects of these factors on CE reporting is deferred for future research.

- Only the integrated report, the primary report available to stakeholders, will be analysed. However, it is likely that supplementary reports such as Sustainability Reports have further information on how companies drive their transition towards a CE. The choice to limit the study to integrated reports is made because the integrated

report is the main form of communication with stakeholders and is aimed at consolidating financial and non – financial information to stakeholders (IIRC, 2021).

- The aim of this study is to conduct an exploratory study on CE policies. The study will not aim to redefine a CE, but rather, to gain insight into the execution and evaluation of sustainable practices by South African listed companies.

- The study is only based on disclosures in the disclosure checklist (see Table 3). Divergences between reporting and practice of CE policies are possible but was not addressed in the research.

The remainder of this thesis is set out as follows: Section 2 provides a literature review on the CE and IR. Section 3 sets out the derivation of the research questions. Section 4 presents the method. Section 5 presents the research findings and results, and Section 6 concludes the study and suggests future areas of research.

2. Literature review

A review of prior literature consists of five core themes. These are as follows: defining a CE (Section 2.1); the need for the transition to a CE (Section 2.2); the value creation process from CE (Section 2.3), the link between adopting a CE and integrated reporting (Section 2.4), and the limitations for adopting a CE (Section 2.5). Lastly, the section includes details on the development of the disclosure checklist (Section 2.6). Each is discussed in more detail below.

2.1: Defining a CE

There is a lack of consensus on the definition of a CE. There is disagreement about the nature and content of CE among scholars. However, the prominent characteristics or concepts of a CE policy is a system which closes the loop reducing resources needed for operations, recycling and reusing waste material, and extending product life cycles (Prieto-Sandoval et al., 2018)

The underlying concepts of CE, such as reducing the strain on the environment and extending product life cycles emerged in the 1970s. The concepts become very popular by policy makers as CE address a long-term solution to sustainability and overcomes the resource exploitation typically within a linear economy (Korhonen et al., 2018). However, there is still no definition on which global consensus has been reached (Tapia et al.,2021). Kirchherr et al. (2017), has collected more than 100 definitions of CE. As publications on CE are increasing, there is still no “comprehensive definition on what its essence is” (Stoyanova, 2019, pg264).

Homrich et al. (2018), performed an analysis into the definition of CE by analysing 35 definitions of the term from literature. Based on the result of the analyses, the following definition was proposed,

> "CE is a strategy that emerges to oppose the traditional open-ended system, aiming to face the challenge of resource scarcity and waste disposal in a win-win approach with economic and value perspective." (Homrich et al., 2018, p534).

While there are several different definitions for CE, the following commonalities among the different definitions are noted in Table 1 (Tapia et al.,2021).

Table 1 – Commonalities among different CE definitions.

COMMON COMPONENT IN DEFINITIONS	EXPLANATION OF COMMONALITIES	REFERENCE
1. Achieving sustainable development	All definitions suggest that CE aspires to achieve sustainable development.	Dobrota et al. (2017); Ghisellini et al. (2016)
2. Achieving operational goals	Some definitions view CE as tool to achieve the strategic goals set out by an organisation. These goals mainly include innovation, strategic design, and creative thinking.	Haas et al. (2015); Ma et al. (2014)
3. Reduce, reuse and recycle component	All definitions outline CE as a system that increases product life cycles and closes the loop as opposed to a linear system.	Geissdoerfer et al. (2017); Hobson (2016); Moreau et al. (2017)
4. Achieving increased efficiency	CE is often aimed to improve efficiency by using fewer materials and energy to produce. CE drives innovation such as the use of energy sources and natural resources which results in a greater level of efficiency.	Corona et al. (2019); Dobrota et al. (2017); Ghisellini et al. (2016)
5. Creative design component	The role of product design is noted by some writers for material efficiency. Other definitions link product design to	Moreno et al. (2016); Vanegas et al. (2018)

Table 1 – Commonalities among different CE definitions.		
COMMON COMPONENT IN DEFINITIONS	**EXPLANATION OF COMMONALITIES**	**REFERENCE**
	extend product life cycles and promote recoverability of products.	
6. Interdependence between sectors	To achieve a circular flow, there needs to be symbiosis between different production units. This cooperation between value chains is noted in most definitions. For example, organisations can design products that which are easier to recycle or reuse. Or organisations can provide financing for sustainable manufacturing.	Merli et al. (2018)
7. Interaction between supply and consumption system	Most definitions acknowledge the mutual flow between supply and consumption systems which is essential for a CE to be successful.	Corona et al. (2019); Lazarevic and Valve (2017); Nogueira et al. (2019); Stahel and Clift (2016)
Adapted from Tapia et al. (2021)		

Table 1 provides clarity on how a CE is defined and understood. It is clear literature tends to agree on the purpose and goals of a CE system. By understanding the commonalities within the various definitions, it is easier to characterize a CE system.

One of the most significant barriers faced for transitioning to a CE is the lack of global consensus regarding policy adoption on the CE (Muradin & Foltynowicz, 2019). Furthermore, stakeholders often interpret the concept of CE in different ways resulting in ambiguity on the understanding (Homrich et al., 2018). The contradictory interpretations are another factor which leads to differences in applying a CE policy (Muradin & Foltynowicz, 2019).

Hopkinson et al. (2020) state that the application of CE is largely based on CE business models which organisations adopt in context of their value creation process. There are a range of business models which can be designed to transition towards a CE. These models include creating energy such as electricity or fuel through material conversion, product leasing models

or the development of new technology such as robotics and 3D printing (Lewandowski, 2016). Understanding the different business models is key to understanding what a CE looks like and how to achieve it despite incoherence on the definition. The Ellen MacArthur Foundation (EMF), has the following breakdown of these different business models (see Table 2):

Table 2– Breakdown of business models a CE may be based on.

CATEGORIZATION OF BUSINESS MODEL	**EXPLANATION OF BUSINESS MODEL**
REGENERATE	This business model moves to using renewable materials and energy. For example, using paper instead of plastic bags that can be reused and recycled.
SHARE	This business models aims at extending product life cycles. For example, a product is remanufactured into a new product or restored to its original functionality, instead of being disposed of.
OPTIMISE	This business model promotes efficiency through waste management and use of information and communications technology. Examples include the use of automation, artificial intelligence, and digitalisation.
LOOP	This business model has a link to the Optimise business model and deals with waste management. For example, a discarded glass bottle can be used to produce fibreglass. In essence, waste that typically ends up in a landfill is used to produce a new product. This is a means of closing the loop.
VIRTUALISE	This business model links to product dematerialization. In context of CE, that means delivering a product or service using less resources. This can be achieved through an Optimise business model by selling a product electronically or through selling a product as a service. For example, instead of selling a boat, you allow customers to rent a boat.
EXCHANGE	This business model aims at promoting innovation and creative design. For example, 3D printing or artificial intelligence as a production process is a novel use of technology and materials.
Adapted from Berg et al. (2018) and EMF, (2015).	

Despite guidance given on CE business models, there is often confusion and uncertainty about implementing a CE (Lahti et al., 2018; Moraga et al., 2019). To grasp the activities under CE business models, the following 4 broad content elements have been identified to categorise the CE policy (Bocken et al., 2016; EMF, 2013a):

1. Circular Design
2. Slowing the loop
3. Closing the loop
4. Financing/ investments

Bocken et al. (2016); EMF (2013a) detailed these categories as: circular design relates to smarter product use and design or manufacture; slowing the loop relates to extending the lifecycle of a product and its part; closing the loop relates to the useful application of materials; financing or investments relates to loans or investments to companies for CE policies.

Specific examples of each are given in Table 3 below. Table 3 is used in this research to identify CE disclosures in integrated reports and aims to bridge the research gap on CE at a reporting level (see Section 2.6 and Section 4.2).

Table 3– Key CE disclosures elements in integrated reports.

CONTENT ELEMENT	EXAMPLE OF CE DISCLOSURE WITHIN CONTENT ELEMENT.	Primary references
Circular Design: smarter product use and design	• Product redundant: functions abandoned or replaced by radically different product • More intensive use of product: sharing/leasing/JVs • More intensive use of product: multi-functional design • More intensive use of product: used for longer periods • Increased efficiency by using fewer natural resources to produce	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)

Table 3– Key CE disclosures elements in integrated reports.		
CONTENT ELEMENT	**EXAMPLE OF CE DISCLOSURE WITHIN CONTENT ELEMENT.**	**Primary references**
	• Increased efficiency by designing products easier to re-use/re-deploy/repair/maintain • Increased efficiency by designing products easier to recycle	
Slowing the loop: extending product lifespan	• Re-use by another customer of a still functional product • Repair of defective product to be re-used with original functions • Restore an old product to bring it up-to-date • Use parts of a discarded product in a new product with the same functionality • Use a discarded product or its parts in a new product with different functionality • Increase repairs and maintenance to extent useful life (preventative)	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)
Closing the loop: useful application of materials.	• Recycle (H): process materials to obtain same (high grade) quality • Recycle (L): process materials to obtain lower (low grade) quality • Incineration of material with energy recovery	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)

Table 3– Key CE disclosures elements in integrated reports.		
CONTENT ELEMENT	**EXAMPLE OF CE DISCLOSURE WITHIN CONTENT ELEMENT.**	**Primary references**
	• Other examples of energy recovery	
Circular design: smarter product use and manufacture	• Investment in staff development and training specific to current activities • Investment in physical health and safety standards to improve efficiency • Investment in mental health to improve efficiency • Investment in team dynamics, inter-group relations • Enabling innovation, creative design, critical reflection etc. • Long-term employee incentives to attract talent and promote innovation (monetary) • Long-term employee incentives to attract talent and promote innovation - non-monetary • Short-term employee incentives to attract talent and promote innovation (monetary) • Short-term employee incentives to attract talent and promote innovation (non-monetary)	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)

Table 3– Key CE disclosures elements in integrated reports.		
CONTENT ELEMENT	**EXAMPLE OF CE DISCLOSURE WITHIN CONTENT ELEMENT.**	**Primary references**
	• Partnerships with professional bodies, training institutions and think tanks to attract talent • Partnerships with NGOs, community groups and other stakeholders to attract talent	
Slowing the loop	• Investment in staff development and training specific to emerging issues/contexts/etc • Reduction of staff-turnover to avoid loss of talent • Transfers of staff to subsidiaries and other related parties • Downstream staff transfers (suppliers) • Upstream staff transfers (customers) • Changes to remuneration strategies in response to changing business context • Partnerships with professional bodies, training institutions and think tanks to retain talent • Partnerships with NGOs, community groups and other stakeholders to retain talent	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)

Table 3– Key CE disclosures elements in integrated reports.		
CONTENT ELEMENT	**EXAMPLE OF CE DISCLOSURE WITHIN CONTENT ELEMENT.**	**Primary references**
Closing the loop	• Redeployment of staff without training and functional changes • Redeployment of staff with training and functional changes • Improved recruitment policies and practices to increase talent/capacity • Balance between automation and use of labour • Balance between energy consumption and use of labour • Balance between manufactured capital and use of labour	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)
Financing: Investment/Loans to sustainable companies	• Finance for sustainable product design and development • Financing for more sustainable manufacturing • Financing to extend lifespan of products and parts • Financing for alternate application of materials and waste products • Financing reduction in energy and emissions • Financing for social and community development	EMF (2013a, 2013b, 2013c, 2015); Bocken et al. (2016); Geissdoerfer et al. (2018); Lewandowski (2016); Berg et al. (2018); Murray et al. (2017)

Table 3– Key CE disclosures elements in integrated reports.		
CONTENT ELEMENT	**EXAMPLE OF CE DISCLOSURE WITHIN CONTENT ELEMENT.**	**Primary references**
	• Financing for staff training	

As of now, literature has provided clarity on what a CE is and how organisations interpret and adopt a CE system (EMF, 2013c, 2015; Lahti et al., 2018). Next, the study will look at why organisations should adopt a CE system and the underlying value which a CE realises.

2.2: The need for the transition towards a CE

Rapid globalisation has brought a change in the way organisations conduct their operations and add value to their stakeholders (A´ lvarez & Ruiz-Puente, 2016; Velenturf et al., 2019). A major part of this change is because of an increase in resource depletion, market instabilities and technological innovations (Pla-Juliána & Guevarab, 2019). Conventional economic systems have developed and promoted economic policies and strategies without accounting for the consequence of these on the sustainability of the environment (Pla-Juliána & Guevarab, 2019). These types of economic systems are drawing on resources faster than they can be restored (Buchmann - Duck & Beazley, 2020).

The significant increase in economic growth has resulted in increasing global populations, consumption rates and environmental pressure. All these factors have put human society at risk (Stoyanova, 2019). Consequently, there is a need for sustainable economic systems and practices to address these matters (Hopkinson et al., 2020).

The need for a CE is driven to overcome the limitations of conventional economic systems as already noted (Buchmann - Duck & Beazley, 2020; Van Loon & van Wassenhove, 2020). A traditional linear economy does not account for rapid growth (Korhonen et al., 2018). The system is designed assuming that there is an abundant stock of natural resources and cheap energy, and that science can continuously develop substitute materials and resources should exploitation of resources occur (Schroder et al., 2020). In essence, a linear economy has accounted for growth with a neglect for the planet's carrying capacity. However, economic growth has occurred at such a rate that the consumption of resources is rapid (Geissdoerfer et al., 2017; Nedelea et al., 2018). The traditional linear economy is not an economic system which promotes sustainability (A´ lvarez & Ruiz-Puente, 2016).

The CE is a system which address the limitations of a linear economy by ensuring a resource can be used for as long as possible. The system accounts for economic growth with regard to

the planet's carrying capacity (EMF, 2013b). Table 2 (see Section 2.1) outlined how different CE business models can achieve the efficient use of resources and promote sustainable operations.

Figures 1 and 2 illustrates the difference between a linear economy and a CE:

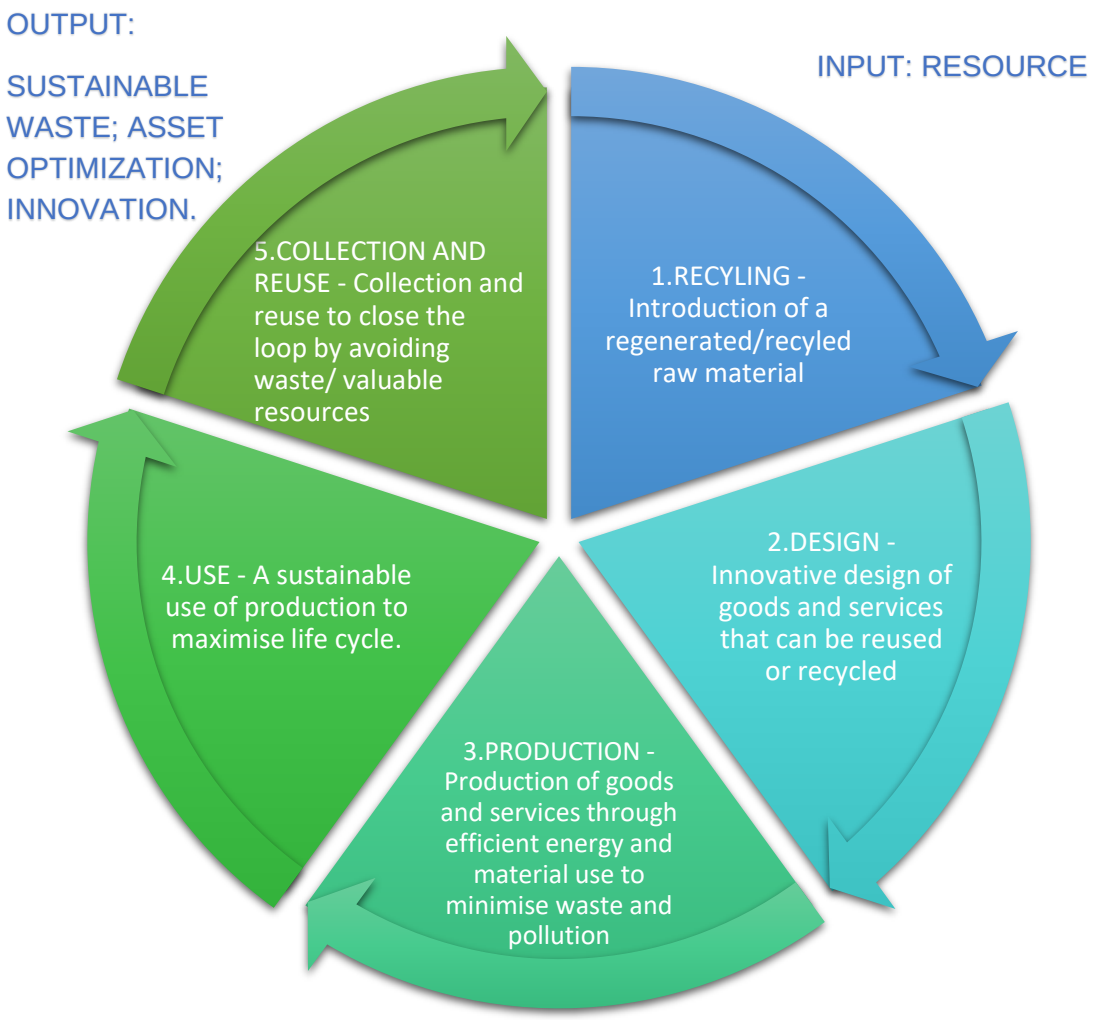
Figure 1: Overview of a linear economy

Adapted from Pla-Juliána and Guevarab (2019)

Figure 1 outlines a linear economy. This system is summarized as a take-make-dispose business model (Pla-Juliána & Guevarab, 2019; Sariatli, 2017). This means once a resource is taken, it is converted into a product and sold. The process ends by disposing of all parts of the resource not used and the product at the end of its lifecycle (Sariatli, 2017).

Figure 2 outlines a CE. The system aims to address the shortcoming of a linear economy by maximising the value of resources. At first glance, this might imply merely extending existing resource practices, such as more recycling, reusing, and reducing(Hobson, 2016). While this is part of the picture, a CE involves a redesign of all aspects of the production process (see Table 3 for specific examples of CE adoption). This includes limiting the use virgin raw materials, and introducing creative production designs to limit the quantity of unsustainable waste (Hobson, 2016) .

Figure 2: Overview of CE



Adapted from EMF (2013b, 2013c); (Hobson, 2016; Moreno et al., 2016)

To gain a better understanding of what sustainability is and how it can be achieved by organisations, the United Nations Development Programme (UNDP) have set out 17 SDG. The UNDP is a global leader in addressing environmental, economic, and political matters. The SDG is an agenda aimed at preserving the wellbeing of society through promoting sustainability and addressing global challenges (UNDP, 2015). The 17 SDG are presented in Table 4:

Table 4: 17 SDG.

1. END EXTREME POVERTY IN ALL FORMS BY 2030.
2. END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE.
3. ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES.
4. ENSURE INCLUSIVE AND EQUITABLE QUALITY EDUCATION AND PROMOTE LIFELONG LEARNING OPPORTUNITIES FOR ALL.
5. ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS.
6. ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL.
7. ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL.
8. PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL.
9. BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION.
10. REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES.
11. MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE.
12. ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS.
13. TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS.
14. CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT.
15. PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS.
16. PROMOTE PEACEFUL AND INCLUSIVE SOCIETIES FOR SUSTAINABLE DEVELOPMENT, PROVIDE ACCESS TO JUSTICE FOR ALL AND BUILD EFFECTIVE, ACCOUNTABLE, AND INCLUSIVE INSTITUTIONS AT ALL LEVELS.
17. STRENGTHEN THE MEANS OF IMPLEMENTATION AND REVITALIZE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT.

Extracted from UNDP (2015)

The SDGs have their own targets which organisations can use as a guideline for adopting sustainable practices (Adams & Frost, 2008; UNDP, 2015). The underlying benefits of a CE policy have direct links to the SDG (Berg et al., 2018; Desmond & Asamba, 2019). The advantages of adopting a CE includes a cleaner environment through lower greenhouse gas emissions and waste pollution (Lewandowski, 2016). There is also less strain on non-renewable and renewable resources through reusing and recycling (Benachio, 2020). Together, these advantages result in less pressure on the natural environment and contribute to long-term sustainability for stakeholders (Moreau et al., 2017). Broadly, adopting a circular flows has benefits from an economic, social, and environmental view (Berg et al., 2018; EMF, 2013c). Examples of the benefits or outcomes of a CE policy include:

- Improved resource productivity
- Technological development through innovation
- An overall increase in gross domestic product
- A reduction in greenhouse gas emissions
- Reduced consumption of plastic, steel, aluminium and cement
- Creation of new markets and increased competitiveness in existing markets.
- Reduction in pollution and waste as well as other economic and social benefits such as, job creation, welfare for low-income households and price stability.

adapted from Berg et al. (2018); EMF (2013b, 2013c).

The advantages discussed above have direct links to the SDG outlined in Table 4 and reinforces the idea that CE provides practical guidance to sustainable operations (Berg et al., 2018; Hartley et al., 2020; Schroder et al., 2020).

Based on the above, a CE transition is an innovative solution to achieve sustainable operating and overcomes the resource strain because of traditional economic systems (Buchmann - Duck & Beazley, 2020; Ghenta & Matei, 2018). The creation of sustainable operations and the underlying benefits is likely to result in value creation process for organisations (Ranta et al., 2020). The link between CE and value creation is discussed below.

2.3: The value creation process from a CE

The term 'value' can vary across organisations (CIMA, 2015). However, the overall aim of a value creation process is to execute the organisational strategy and ensure long-term success (CIMA, 2015).

The fundamental concepts to understand value creation (IFAC, 2020) are:

- **Defining value:** value is defined by an organisation's investors, customers, and other stakeholders.
- **Creating value:** value is created by an organisation's business model, purpose, and strategy. The type of economic system such as a CE system is a business model which can create value.
- **Delivering value:** value is delivered to stakeholders through innovative and appropriately priced goods and services. Delivering value requires integrating strategic, operational, and risk information that considers the changing external environment and ensures that performance is aligned to an organisation's value creation strategies. The outcome of efficient business models allows for appropriate delivering of value.
- **Sustaining value:** value should be protected and retained internally. This is important for long term success and value creation.

adapted from IFAC (2020)

The value creation process of CE is analysed in two ways. Firstly, how is value created through the design of the CE system (creating value and sustaining value)? Secondly, how can reporting on CE systems provide value to stakeholders and organisations (defining value and delivering value)? This subsection will examine how value is created through the design of a CE system. The section deals with the value creation process from an operational point of view.

Literature notes several reasons for the movement to a closed loop economy (see Section 2.2) Many of these reasons arise from a shift in the needs of society, including the need for environmental protection and long-term sustainable supply chains (Ghenta & Matei, 2018) A driver for the movement to CE is a paradigm change in society. Neoliberal investors preserve the transition to a CE as a means to increase competition in economic environments through effective resource management (Schröder et al., 2020).

Organisations expect positive benefits from adopting a CE policy to create value such as cost savings, innovation and the creation of new jobs (Ghența & Matei, 2018). Stoyanova (2019), supports this by stating that there is value in underutilised resources and waste which a CE realises through circularity as opposed to linear production. Therefore, adopting a CE is a means of managing resource risk to materialize the value in under-utilised resources. The

system offers a prospect of generating value from an economic, social and environmental view (Mishra et al., 2018).

A CE business model (Section 2.1, Table 2) is a practical implementation to realise the value in under-utilised resources (EMF, 2015). As a result, adopting a CE policy is a means by which organisations can create value (EMF, 2013c; Hopkinson et al., 2020) and given that CE is a sustainable model, value creation is sustained. The value creation process can be achieved in a range of methods depending on how an organisation designs their production process and what materials or inputs are used in the process. EMF (2013c, 2015); Mishra et al. (2018) set out the basic principles a CE system address as a value creation process. These are outlined in Figure 3.

Figure 3: Value creation and circular economy.

Headings per Mishra et al. (2018)

Figure 3 demonstrates how a CE policy fits into the value creation process. Different CE business models (see Section 2.1, Table 2) and organisational sustainability strategies are a means to realise value which is typically disposed of in a linear economy.

Next, the creation and sustaining of value through CE will result in organisations delivering such value to stakeholders. CE fits into the value process above through communicating the value from their CE strategy. This core theme is explored below in Section 2.4.

2.4: The link between CE and integrated reporting

Rapid globalisation and numerous corporate failures have brought a change in how stakeholders drive their decision – making (IIRC, 2021; Roberts et al., 2020; Van Zijl et al., 2017). Information about a company's financial and non – financial performance is become increasingly relevant to stakeholders (Atkins & Maroun, 2015; PWC, 2019).This includes information on social, environmental and governance practices (De Villiers et al., 2020; De Villiers et al., 2017; IIRC, 2021).

King IV states that no governing body can operate without considering how the changed world is directing their organisation (IODSA, 2016). Consequently, there is a need for organisations to introduce sustainable economic systems to add value to their stakeholders and account for the context in which they operate (Hopkinson et al., 2020). Stakeholders have a greater expectation from organisations in the face of global issues such as inequality, social tensions, climate change, technological innovation, and globalisation (IODSA, 2016; Velenturf et al., 2019). In response, the IIRC developed the IR Framework in 2013. The framework aims to communicate value to stakeholders (IIRC, 2021). It is a means to consolidate financial and non-financial information relating to the use of resources (IIRC, 2021). It includes information on the company's financial performance, strategy and business models, risk governance, corporate governance, and social and environmental considerations (Atkins & Maroun, 2015; IIRC, 2021).

IR is defined by the IIRC as:

> "A concise communication about how an organisation's strategy, governance, performance, and prospects, in the context of its external environment, lead to the creation of value over the short, medium and long term" (IIRC, 2021, pg10).

The framework is underpinned by the concept of integrated thinking. The concept is defined by the IIRC as:

> "the active consideration by an organization of the relationships between its various operating and functional units and the capitals that the organization uses or affects" (IIRC, 2021, pg3).

Integrated thinking allows for integrated decision making and actions that account for the creation, preservation or erosion of value over time (IIRC, 2021). The key features of integrated thinking to create value over the short-, medium- and long-term include:

- the capitals used and affected by the organisation's actions, including the interrelationships and trade-offs between such capitals.
- responding to key stakeholder's legitimate needs and interests.

- amending business models to respond to risks and opportunities in the external environment.
- analysis of the organisation's financial and non-financial performance, activities, and outcomes over time.

adapted from IIRC (2021), Roberts et al. (2020) and Atkins et al. (2020)

The IIRC sets out the six capitals which are viewed as stocks of value which an organisation can integrate in their business model as a value creation process. The capitals are financial, manufactured, human, intellectual, natural, and social and relationship capital. Each capital is defined in Appendix B. By reporting on how capitals have been used and maximised, organisations can communicate their value creation process to stakeholders (IIRC, 2021).

The IR framework (IIRC, 2021) is viewed as a potentially useful tool to aid on CE disclosures. This stems from the idea that the IR framework is centred in sustainable corporate reporting (Hamza et al., 2020). The IR framework communicates the 6 capitals and promotes corporate reporting within the 'triple context' as set out by King IV. CE principles are also based on the efficient use of capitals to create value (Barnabe & Nazir, 2020; Hamza et al., 2020). Both CE and IR set the tone around a value creation process which is adopted over time through innovative use of the six capitals. There is an interdependence between the capitals which promote a closed loop economy which underpins the value creation process through using all 6 capitals simultaneously as set out by IR (Barnabe & Nazir, 2020). This is a key concept of 'integrated thinking' (IIRC, 2021) which underpins CE as it promotes the efficient use of resources/ capitals.

However, the link between IR and CE disclosures is not conclusive. To illustrate how IR may fit in the value creation of CE, the fundamental concepts of IR per IIRC is outlined and applied. There are three fundamental principles underpinning IR (IIRC, 2021): value creation, preservation, or erosion for the organisations and for others; the stocks and flows of the six capitals; process through which value is created, preserved, or eroded. Each is discussed below.

Value creation, preservation or erosion for the organisation and for others

The term 'value' is traditionally viewed as the present value of expected cashflows and based on an organisation's financial performance (CIMA, 2015; IIRC, 2021). In the context of IR, value is dependent on a wider range of capitals which ultimately impact the financial performance of the organisation. As a result, value creation is defined by IIRC as:

> "Value creation, preservation or erosion is the process that results in increases, decreases or transformations of the capitals caused by the organisation's business activities and outputs" (IIRC, 2021, pg54).

The purpose of the IR is not to measure the value of capitals or the organisation but to provide information that aids users to assess the capability of the organisation to create value over the short-, medium- and long-term (CIMA, 2015). Value consists of two components: value to the organisation and value to society and stakeholders (IIRC, 2021). Consequently, the value process considers meeting the organisation's strategic goals, meeting customer and shareholder's needs, and accounting for the broader spectrum of stakeholders such as society and communities at large (IFAC, 2020).

The use of all six capitals in a CE policy aims to achieve such value. For example, an organisation can increase repairs and maintenance to extend the useful life of assets (Section 2.1, Table 3). This action will increase manufactured capital but decrease financial capital to cover the cost of repairs. An organisation can also provide financing for the reduction in energy and emissions (Section 2.1, Table 3). This action increases natural capital as well as social and relationship capital because the community at large will benefit from a cleaner environment.

The stocks and flows of the six capitals:

Traditionally, organisations placed major emphasis on financial and manufactured capital. However, increasingly value creation has relied on intangible factors such as intellectual, human, social and relationships and, considering continuing access to essential natural capital (CIMA, 2015). This is the core of IR as it considers the impact of an organisation's activities across the six capitals and informs decision making which recognises the necessary trade-offs between the capitals (Van Zijl et al., 2017).

A balance between the economy, environment and society is indicative of a CE transition (Nedelea et al., 2018) **I**nstances, where organisations aim to maximise all six capitals at the same time, may be indicative of a CE policy in effect. This fundamental concept of IR can be met through CE reporting because CE has links to all 6 capitals (Barnabe & Nazir, 2020; Nedelea et al., 2018). Specific examples from Table 3 (see Section 2.1) provides evidence:

- financing for alternate application of materials and waste products: impact on financial and natural capital.

- investment in staff development and training specific to emerging issues/contexts/etc: impact on financial and human capital.
- increase repairs and maintenance to extent useful life (preventative): impact on financial and manufactured capital.
- financing for social and community development: impact on financial and social and relationships capital.
- enabling innovation, creative design, critical reflection etc.: impact on financial and intellectual capital.

Process through which value is created, preserved, or eroded:

IR requires details on how a business model creates, preserves, and captures value (CIMA, 2015). A business model will require details on the inputs, business activities, outputs, and outcomes of the value creation process (IIRC, 2021). CE reporting can be associated to these requirements.

For example, inputs include the resources used in the business model (CIMA, 2015; IIRC, 2021). In the context of CE, this will include reporting the introduction of recycled raw materials as opposed to new raw materials. Business activities are the conversion of the inputs into outputs (CIMA, 2015; IIRC, 2021). In the context of CE, this will include reporting on innovative production design and used of specialised skills to produce sustainable products. (Table 2 (Section 2.1) and Figure 3 illustrate the different business models and underlying value creation from such processes). Outputs is the key products and services (CIMA, 2015; IIRC, 2021). In the context of CE, this will include details on lower carbon emissions, less waste, more recyclable and reusable waste and products with longer useful lives. Outcomes relate to details on the consequences of the organisation's business model on the internal and external environment (CIMA, 2015; IIRC, 2021). This includes both positive and negative aspects and a broad view of the capitals. In the context of CE, this will include details on how innovative use of technology such as artificial intelligence is improving efficiency but eroding staff morale (decreasing human capital).

Based on the above, CE fits into the value creation process, meeting all three fundamental concepts of IR. As a result, this indicates that companies will disclose CE practices in their IRs as this demonstrates the value created for the company through its impact on the six capitals. Using IR framework to analyse information on CE may be useful and effective, however, this area is under-researched (Barnabe & Nazir, 2020). Section 3 will aim to address this research gap by developing a disclosure checklist to investigate the link between IR and CE.

As of now, we have analysed the value creation process. Lastly, an analysis of the limitations or barriers faced by organisations to adopt a CE system is done.

2.5: The limitations for adopting a CE

Adopting a CE system is ultimately re-designing an entire industrial system (Khan et al., 2019). Given that production units are linked between several enterprises and sectors, there may be some difficulty in optimizing the flow of a closed loop economy to ensure symbiosis or interdependence between all these production units (A´ lvarez & Ruiz-Puente, 2016). The adoption of CE requires a paradigm shift by supply chains to become more innovative and have a deep understanding of their materials and energy to optimize the system (Farrell et al., 2020).

Applying CE requires organisations to re-design how they manage resources, implement technology and logistics and account for funding and legal frameworks (Korhonen et al., 2017). These are examples of major challenges which will need to be developed in organisations' business models.

There are a number of critical success factors for the successful transition towards CE. These factors need to be considered by an organisation when transitioning to a CE and may present challenges or limitations to achieving a successful re – design of their economic system. The factors can be considered at the organisational, economic, technological and environmental levels [4] (Khan et al., 2019).

Organisation level

An organisation needs to have a clear vision on how to adopt a CE (Pan et al., 2015). Public policies such as recycling policies should be considered to develop a sound CE system (Genovese et al., 2017; Maitre-Ekern & Dalhammar, 2016). The adoption of CE should address an organisation's business model to increase differentiation, reduce risk and diversify revenue streams (Mangla et al., 2018; Stratan, 2017). There is also a need for training for employees and suppliers to achieve the initiative of implementing a CE (Dubey et al., 2019; Stratan, 2017).

Economical level

Organisations need to manage financial resource effectively to maximise the value of CE. There should be capital investments in CE to secure the organisation's business ideas and growth (Wyman, 2017). The reuse of resources is critical to adopting a CE (Stratan, 2017). An

[4] The headings below are obtained from Khan et al. (2019).

organisation will have to ensure that remanufactured or recycled products are cheaper than raw materials or natural resources available (Lieder & Rashid, 2016; Shahbazi et al., 2016).

Technological level

Organisations should adopt a form of methodology and monitoring to measure performance to CE (EMF, 2015). The use of digital tools to drive the transition to enable rapid innovation of goods and services (Bressanelli et al., 2018; Pagoropoulos et al., 2017). There needs to be individuals who are experts in their field to drive the transition to CE (Stratan, 2017). An organisation must have the ability to innovate (Stratan, 2017). The use of technological resources to reuse and recover products is necessary as this process is complex (Genovese et al., 2017; Maqbool et al., 2020). The quality of recycled products needs to be preserved and enhanced. (Ghisellini et al., 2016; Singh & Ordonez, 2016)

Environmental level

Eco-innovation is a key success factor that must be considered (De Jesus & Mendonna, 2017). In addition, eco-design is important to re-design economic system from a linear system to a closed loop system that is profitable (Moreet et al, 2016). The CE system must result in cleaner production (Ghisellini et al., 2016; Lieder & Rashid, 2016).There needs to be a re-designing of laws and regulations governing CE to ensure environmental protection and sustainability (Stratan, 2017).

Social level

It is important to inspire and educate society on the need for CE to create opportunities for innovation and design (EMF, 2015; Lieder & Rashid, 2016; Stratan, 2017). An organisation should consider that the adoption to CE may result in job creation (Ilic & Nikolic, 2016; Schiller et al., 2017).There is a negative perception by customers on remanufactured products which results in reluctance to purchasing products of CE (Ghisellini et al., 2016; Van Loon & van Wassenhove, 2020)).

The adoption of CE largely depends on an organisation designing a profitable business model (Hopkinson et al., 2020). However, several barriers and critical success factors need to be overcome. Most of these barriers are often outside the control or scope of the organisation's business model. Examples include, uncertain legislature, consumer behaviour and financial limitations (Kirchherr et al., 2017). It is evident that more research is needed to address how organisations can mitigate risks and uncertainties in moving towards a CE (Van Loon & van Wassenhove, 2020).

These critical success factors (Khan et al., 2019) detail the practical challenges in implementing a CE. They indicate that organisations will need significant research and development for the successful implementation of CE.

A review of the five core themes outlined by prior researched has provided insight into CE. Existing research is fundamentally based on a CE system from an operational or strategic point of view. The need for CE and value creation process from it is researched from the production viewpoint. As of now, existing research does not address the reporting or accounting of CE in detail. As stated in section 2.4, there is not a clear and coherent link between IR and CE. The aim of this research is to address this gap by evaluating CE disclosures and reporting in more detail. Table 5 provides a summary of the key literature consulted.

Table 5- Review of Existing Literature.					
NAME OF SOURCE	DIFFERENCES IN DEFINING A CE	THE NEED FOR THE TRANSITION TOWARDS A CE	THE VALUE CREATION PROCESS FROM A CE SYSTEM	THE LIMITATIONS OF ADOPTING A CE	THE LINK BETWEEN ADOPTING A CE SYSTEM AND INTEGRATED REPORTING
Barnabe and Nazir (2020)					X
Berg et al. (2018)		X	X		
Buchmann - Duck & Beazley (2020)		X		X	
Bocken et al. (2016)	X		X		
EMF (2013a)	X	X	X		
EMF (2013b)	X	X	X		
EMF (2013c)	X	X	X		
EMF (2015)		X	X	X	
Geissdoerfer et al. (2017)	X		X		
Ghenta and Matei (2018)				X	
Hamza et al. (2020)					X
Hopkinson et al. (2020)			X		
Homrich et al. (2018)	X				
IIRC IR Framework (2021)					X
Khan et al. (2019)				X	
Kirchherr et al. (2017)	X			X	
King IV (2016)					X
Korhonen et al. (2018)	X	X			

Table 5- Review of Existing Literature.					
NAME OF SOURCE	DIFFERENCES IN DEFINING A CE	THE NEED FOR THE TRANSITION TOWARDS A CE	THE VALUE CREATION PROCESS FROM A CE SYSTEM	THE LIMITATIONS OF ADOPTING A CE	THE LINK BETWEEN ADOPTING A CE SYSTEM AND INTEGRATED REPORTING
Korhonen et al. (2017)				X	
Lewandowski (2016)			X	X	
Mishra et al. (2018)		X	X		
Moraga et al. (2019)		X	X		
Murray et al. (2017)	X	X	X		
Muradin and Foltynowicz (2019)	X			X	
Pla-Juliána and Guevarab (2019)		X			
Prieto-Sandoval et al. (2018)	X				
Stoyanova (2019)	X				
Tapia et al. (2021)	X				
Van Loon and van Wassenhove (2020)				X	

The next section will discuss the interpretation of the core literature above and will provide a practical insight into investigating CE adoption by companies. A disclosure checklist has been interpretatively developed by the researcher.

2.6. Development of disclosure checklist

There is limited research on CE disclosures in IR. To investigate how South African listed companies report on CE in their integrated reports, a holistic view of CE is adopted. The disclosure checklist was interpretatively constructed using CE content element grounded in prior literature (see Section 2.1). Specific examples of each are given in Table 3 (see Section 2.1). Table 3 is used in this research to identify CE disclosures in integrated reports and aims to bridge the research gap on CE at a reporting level.

The checklist will then investigate four core themes on reporting on CE. These are the type of investment to developing or implementing CE, location of the disclosure, impact of disclosure on the capitals, and quality of the disclosure. Each theme is discussed in more detail below.

2.6.1: Type of investment to developing or implementing CE:

Transitioning to CE in South Africa will require several contributors. There are numerous organisations which aim to support the transition to circular practices. Examples of these organisations include:

- the Circular Economy Club. This is a global network of professionals which advocates CE practices. The organisation has mapped CE practices in Cape Town, South Africa.
- The African Circular Economy Alliance was announced in November 2017. It is a collaboration between the governments of South Africa, Rwanda and Nigeria to ensure that businesses protect the natural environment and preserve water usage.
- Non-governmental organisation such as The African Circular Economy Network was formed in 2016 in Cape Town, South Africa. The organisation has initiated several research and development projects to aid in the practical implementation of CE in business.
- Other research groups, think tanks and NGOs include bodies such as World Economic Forum, and local governments.

adapted from Desmond and Asamba (2019)

Companies are likely to engage in research and development to drive sustainability practices (Maroun & Atkins, 2018). Partnerships with such organisations is a useful tool for business to obtain funding and engage with research and development to drive their CE policies (Desmond & Asamba, 2019). In addition, business are will expend financial capital by allocating financial resources for sustainable practices (IIRC, 2021).

2.6.2: Location of CE disclosure:

The objective of this theme is to gauge the level of CE detail in the contents of companies' integrated reports. There is no specific format for the content of an integrated report (PWC, 2019). However, there are content elements of IR set out by the IIRC (IIRC, 2021). The eight content elements are: organizational overview and external environment, governance, business model, risks and opportunities, strategy and resource allocation, performance, outlook and basis of preparation and presentation (see IIRC, 2021, p. 38). These content elements are used to investigate the location of CE disclosures in IRs.

2.6.3: Impact of CE disclosure on the capitals:

A balance between the economy, environment and society is indicative of a CE transition (Nedelea et al., 2018) Therefore, instances by which organisations aim to maximise all 6 capitals simultaneously may be indicative of a CE policy in effect. Presently, CE has a direct link to natural capital and manufactured capital as CE is primarily founded on the preservation of the natural environment through efficient resource use and waste management (EMF, 2013c). To bridge the gap between CE and reporting on CE using the IR framework, the link between CE and human and intellectual capital must be made. Per Table 3, the social aspect of CE is noted. Disclosures dealing with financing for social and community development, investment for staff training and safety, balance between automation and use of labour are examples of CE activities that relate to human, social and intellectual capital. The link to financial capital is implied as organisations are likely to invest financial resources when adopting the practices in Table 3. As CE has links to all 6 capitals, this strengthens the link between CE and IR.

2.6.4: Quality of the disclosure:

Investigating the quality of reporting is relevant because despite having a significant quantity of reporting, information needs to be understood by and useful to stakeholders (PwC, 2015). The 'usability' of information relates to the availability, usefulness, adaptability, ease of interpretation, relevance, reliability, and completeness (Malola & Maroun, 2019; Maroun & Atkins, 2018). However, the IIRC has not defined quality nor provided a direct measure of it (Malola & Maroun, 2019). Literature on IR quality is limited (Pistoni et al., 2018). The main issues on the quality of IR are:

> "the absence of connectivity among strategy, the business model, performance and future outlook, due to the poor narrative flow and the limited use of diagrams and maps; the presence of an informative gap in areas such as governance, stakeholder engagement, and the materiality process; the inadequate description of the business model; and internal auditing, completeness of information, and limited third-party verification" (Pistoni et al., 2018, p491)

To assess the quality of CE disclosures, the following quality indicators for CE disclosures are identified:

- Disclosures can be qualitative, quantitative, or monetary. Quantitative or monetary disclosures provide useful information to stakeholders and are a signal of high reporting quality.
- Disclosures can be classified as substantive disclosures (action-specific) or symbolic (policy-level). Substantive disclosures indicate high reporting quality as it indicates proactive steps taken or actual actions taken to meet sustainability needs. Symbolic disclosures are not supported by actions and are typically vague or broad polices and missions which the organisation has implemented or plans to implement.
- Disclosures are either generic or context-specific. Generic disclosures are often provided to appease stakeholders needs but suggests a lack of commitment to actually implement sustainable practices. Context-specific disclosures often build on action-specific disclosures and provide relevant details on the actual engagement by the organisation. Therefore, context-specific disclosures are of higher reporting quality.
- Disclosures can be historical or forward-looking in nature. Forward looking disclosures details steps taken to ensure long -term sustainability and clearly justified explanations of future actions. As discussed with substantive disclosures, these disclosures show commitment sound sustainability practices as opposed to mere reporting compliance.
- Disclosures can be cross-referenced or linked to valid sources. For example, the organisation will reference additional details to a complementary sustainability report. This may indicate high reporting quality as it may indicate that the organisation is committed to provide information on financial and non-financial performance to stakeholders.
- Disclosures can be accompanied with graphs or tables. The use of visual aids improves the quality of reporting, and it eases stakeholders with interpretation of information. Disclosures that are easily interpreted has more useful to stakeholders as it is easier to understand and be applied in decision making. Further, illustrations can also include trends which further eliminate the need for lengthy discussions and improve the readability of information.

adapted from Malola and Maroun (2019), Pistoni et al. (2018), and Borghei et al. (2016).

3. Derivation of research questions:

CE policies are becoming more popular and prominent. Many countries and regions such as China, the USA, the European Union, the Netherlands, the UK and the Nordic countries are advocating for the implementation of the CE (Hopkinson et al., 2020; Prieto-Sandoval et al., 2018). In a South African context, the country has taken a leading role in presenting sustainable reporting (McNally et al., 2007). The country despite being a developing country, features sophisticated non-financial guidelines on social, environmental and governance issues (McNally et al., 2007). IR in South Africa is often viewed as more developed and refined than that in some of world's leading economies (McNally et al., 2007). Given that South Africa has a sound IR environment and there is a growing prominence of CE practices, so this study asks:

RQ1: What is the level of CE disclosures among South African listed companies based on the information included in their integrated reports?

As discussed in Section 2.1, there is uncertainty on how the shift to a CE can be achieved by organisations as there is no standardised or agreed upon method which can be adopted to guide the shift to a CE(Muradin & Foltynowicz, 2019). There are norms which organisations adopt in guiding this movement. However, one of the most significant barriers to the transition is the lack of global consensus regarding policy adoption on the CE (Muradin & Foltynowicz, 2019). There is also a lack of consensus on the definition of a CE (Homrich et al., 2018; Stoyanova, 2019). Stakeholders often interpret the concept of CE in different ways resulting in ambiguity. The contradictory interpretations are another factor which leads to differences in applying a CE policy (Muradin & Foltynowicz, 2019).

RQ2: What are possible determinants of CE disclosures?

Different organisations and industries apply the transition to CE, based on their interpretation and based on a method which is likely to create value for their stakeholders on their individual value creation paradigm. This is supported by Hopkinson et al. (2020) which states that the application of CE is largely based on CE business models which organisations adopt in context of their value creation process. Given that value creation is based on an entity business model (Hopkinson et al., 2020; Lewandowski, 2016; Mishra et al., 2018), it is expected that organisations which have the same or similar business models will have similar emphases on their investments in the six capitals and CE policy (see also Section 2.1 and 2.3). Given the flexibility and subjectivity of value creation, the study asks:

RQ2.1: Are there difference in the level of CE disclosures among different industries of the South African listed companies.

The link to the CE and value creation can be supported by King IV and the SDG. King IV introduces the six capitals and sets the tone that investors are attracted to companies which have integrated these six capitals into their business model (IODSA, 2016). As discussed in Section 2.5, the six capitals can be seen as building blocks for value creation and success of an organisation (IIRC, 2021; IODSA, 2016). King IV is based on the fundamental principles of the SDG (IODSA, 2016) and literature has noted that CE policy can help achieve the goals set out in the SDGs (see Section 2.2).

Consequently, there may be an association between the success of a company and the integration of the six capitals within the entity. Companies which have a high public interest or have a large environmental and social impact are likely to have integrated the six capitals to a greater degree than companies which do not. This is because the needs of stakeholders have inclined towards sustainability and the organisation itself can benefit from these investments (IODSA, 2016; PwC, 2015; Velenturf et al., 2019).

> *RQ2.2: Is there an association between the size of South African listed companies and the level of their CE disclosures?*

The call for sustainable practices is increasing (Ilic & Nikolic, 2016). Th interest toward CEs has grown in recent years as companies are encouraged to continuously re-examine their operations, management systems, and production processes in order to identify value-added practices (Geissdoerfer et al., 2017). Implementing a CE model provides a company with an opportunity to integrate sustainability into the company's vision and to balance its social, economic, and environmental activities. CE adoption has several underlying benefits (see Section 2.2) and is a key value creation process (see Section 2.3 and 2.4). As a result, this indicates that companies will disclose CE practices in their IRs as this demonstrates the value created for the organization and stakeholders.

> *RQ2.3: Is there an association between the financial year of South African listed companies and the level of their CE disclosures?*

4. Methodology

The study is grounded in an interpretative approach (Baker & Bettner, 1997). The researcher collected and analysed data to describe, understand and interpret the meaning of CE disclosures (Baker & Bettner, 1997).

A mixed method approach was used to address RQ1 and RQ2. Firstly, a qualitative content analysis was used to evaluate the level of CE disclosures in integrated report (Section 4.2, RQ1). Examples are provided to illustrate how companies are reporting on CE. The data collected during the content analysis is also used to construct disclosure frequency and quality scores. This information is presented graphically. Secondly, non-parametric Kruskal Wallis tests are used to test for associations between identified determinants and the level of CE disclosures. The tests are supported by a non-parametric correlation analysis (Kendall Tau-b) and descriptive statistics (Section 4.2, RQ2).

4.1: Sample

The study is based on the Top 40 Companies listed on the JSE by market capitalisation. The research examined the primary report available to stakeholders over a period of three years (2018 to 2020). The largest public companies were investigated as these companies are more likely to have the resources and controls to obtain the necessary data to implement integrated thinking principles (Stubbs & Higgins, 2014). This controls for the possible lack of resources or technical expertise, lack of financial analyst following or a lack of experience in applying the IR Framework which may impact the report quality (IIRC, 2021; Malola & Maroun, 2019).

South African companies are selected because the country has a sound reporting framework (IODSA, 2016; McNally et al., 2007). Further, JSE-listed companies are selected as the JSE requires these companies to prepare IRs or document reasons for not doing so (JSE, 2019).

The small sample size is appropriate as the nature of the data collection is interpretive and addresses the level of disclosures across all themes in the disclosure checklist (see Section 4.2). This was an exploratory study of the CE which required analysis of the entire integrated report for each year per company. The aim was to assess the nature and emphasis of the disclosures as opposed to extrapolating findings over a population.

4.2: Data collection and analysis

The research examined the primary integrated report issued to stakeholders. Supplementary reports such as sustainability reports, interim results, ESG checklists, and company websites were not included in the analysis (see Section 1.5).

Research Question 1

Following a similar approach to that of prior studies (Büchling & Maroun, 2021; Hassan et al., 2020) a thematic content analysis was used to collect data for RQ1. A thematic content analysis is appropriate as it is suitable for dealing with material whichx is not consistently formatted, while highlighting trends and investigating both text and graphic disclosures (Krippendorff,2013).

The researcher used a multi-phase approach to collect and analyse data. Each integrated report for each company and financial year under review was broken into sections based on their table of contents to gain a sense of its structure (Büchling & Maroun, 2021; Malola & Maroun, 2019). Thereafter, each section was disaggregated into individual paragraphs which served as the unit of analysis. This prevented the overlooking of context and misinterpreting content. The paragraphs were be analysed to identify CE content elements per Table 3 (Section 1.2).

The identified disclosures were then processed into a disclosure checklist (see Section 2.6). The checklist consists of the following headings or themes:

- Theme one: Type of investment to developing or implementing CE
- Theme two: Location of the disclosure
- Theme three: Impact of disclosure on the capitals
- Theme four: Quality of the disclosure and

A breakdown of themes one to three is presented in Table 6.

Table 6 – Breakdown of disclosure checklist for themes one – three.			
THEME		**THEME INDICATOR**	**REFERENCE**
THEME ONE	TYPE OF INVESTMENT TO DEVELOPING OR IMPLEMENTING CE	Financial resource	See Section 2.6.1
		Funding or grants	
		Partnerships with NGOs, research groups or think tanks	
		Research and development	
THEME TWO	LOCATION OF DISCLOSURE	Strategy and risk analysis and business model section	See Section 2.6.2
		Key performance and value creation section	
		Director's review of the business section	
		Overview of the business section	
		Financial statements section	
		Social and environmental subsection	
		Corporate governance subsection	
THEME THREE	IMPACT OF DISCLOSURES ON SIX CAPITALS	Financial capital	See Section 2.6.3
		Manufactured capital	
		Natural capital	
		Intellectual capital	
		Social and relationship and Human capital	

Specific examples of each CE content element (see Table 3) are:

> "At Illawarra Metallurgical Coal, our gas drainage system improvement efficiency project is in the execution phase, and we achieved post drainage capture efficiency of 56.5 per cent in FY20. The captured methane is either flared or directed to third party to generate power. Both activities significantly reduce the amount of CO2-e released into the atmosphere by converting methane to CO2, providing an abatement of approximately 88.7 kilo tonnes of CO2-e in FY20" (Extracted from Company 34, 2020).

This is an example of a circular design model (see Table 3). The company has increased efficiency by using fewer natural resources to produce. The disclosure is located in the strategy, risk analysis and business model section. The action impacts financial, natural and manufactured capital.

> "Atlatsa Resources placed Bokoni Platinum Mine on care and maintenance effective 1 October 2017. Company 2 holds a 49% interest in Bokoni Holdco (equity accounted as an associate) and committed to support Bokoni Mine while on care and maintenance until the end of December 2019. A total of R139 million was advanced in 2019." (Extracted from Company 2, 2019).

The increased repairs and maintenance to extend the mine useful life is an example of slowing the loop (see Table 3) through expanding the lifespan of the mine and its parts. Company 2

have expended financial resources of R139 million, and the disclosure was in the director's review of the business. The disclosure impacts financial and manufactured capital.

> "Our customers have told us of their increasing concern about the amount of packaging used for our food products and the related environmental impact. In the current year, we announced our commitment to achieve zero packaging waste to landfill by 2022." (Extracted from Company 40, 2018)

The disclosure is an example of the closing the loop model (see Table 3). Company 40 has committed to zero packaging which shows incineration of materials with energy recovery. The disclosure was located in the key performance and value creation section and impacts natural and social and relationships capital.

> "Worth noting is our involvement in a global climate fund, Climate Investor One, which was launched as a partnership between the Netherlands Development Finance Company (FMO) and Company 30 InfraWorks in 2017. Climate Investor One has mobilised commercial funds to reach $US850 million and is invested in the development of a number of projects, with two having received construction financing: Cleantech Solar, currently a 116MW Pan-Asian corporate and industrial rooftop solar platform; and Africa Hydro Holdings, a 42MW run-of-river hydro platform in Uganda." (Extracted from Company 30, 2019).

The disclosure deals with the investment or loans to sustainable companies' model (see Table 3). Company 30 has provided financing for reduction in energy and emissions. The company has implemented this through partnerships with other sustainable groups and the disclosure was located in the overview of the business. Lastly, the actions impact financial, natural and social and relationship capital.

The disclosures were scored and recorded in a frequency table according to the disclosure themes one, two and three. A score of 0 was awarded for no disclosure at all. A score of 1 was awarded for a disclosure relating to the theme (Hassan et al., 2020).

The quality of the disclosure (theme four) was then analysed using the identical scoring system as Hassan et al. (2020, p6):

> 'A score of "0" was awarded for no disclosure at all. A score of "1" was awarded when the disclosure relating to a particular item was minimal, vague, and/or completely general. A score of "2" was awarded when disclosures contained objective, verifiable, and current data. A score of "3" was awarded when disclosure included all the ingredients of code "2," as well as providing specific information identifying the site/operating facility, affected species, and/or number of affected flora/fauna; a description of specific measures taken and/or amount of money spent; a discussion of trend information; and/or a linking of the data presented to a company strategy, aim performance measure, target, incident, or accident.'

A breakdown of the scoring system for theme four is illustrated in Table 7. Table 7 been formulated using quality indicator from prior literature (see Section 2.6.4).

Table 7: Breakdown of disclosure checklist – theme four		
QUALITY INDICATORS	***QUALITY INDICATOR COMPONENTS***	**SCORE**
Measurement indicator	Quantification – Qualitative	1
	Quantification – Quantitative	2
	Quantification – Monetary	3
Relevance indicator 1	Policy level	1
	Action specific	2
Relevance indicator 2	Generic	1
	Context Specific	2
Relevance indicator 3	Historical	1
	Forward – looking	2
Usefulness indicator	No Cross references and hyperlinks to valid sources	0
	Cross referenced and hyperlinks to valid sources	1
Interpretation indicator	No Tables or graphs	0
	Tabulated or graphs – Negative trend	1
	Tabulated or graphs – Positive trend	2

A total quality score is calculated from Table 7. This is calculated as follows:

$$Quality\ score =$$

$$\sum (Measurement\ indicator\ score + Relevance\ indicator\ 1\ score + Relevance\ indicator\ 2\ score + Relevance\ indicator\ 3\ score + Usefulness\ indicator\ score + Interpretation\ indicator\ score)$$

The highest possible score for a disclosure is 12[5].

The codified data across all four themes were then presented using frequency tables and graphical plots to depict the level of CE disclosures by the companies in each of the relevant years. The number and percentage of CE disclosures were categorised according to each theme and subsequently analysed for trends and patterns using descriptive statistics and graphical plots. To further illustrate theme four, a qualitative content analysis was done. Specific examples of disclosures are provided in Section 5.1.

Further analysis was conducted using descriptive statistics methods such as mean, median, variance and standard deviation (Leedy & Ormrod, 2021) for each theme in the disclosure checklist.

Research Question 2

The results from RQ1 were further analysed to address RQ2. The codified data is classified as ordinal data (Leedy & Ormrod, 2021). As such, the data was not normally distributed. Consequently, a battery of non-parametric tests was conducted to provide additional insights.

A Spearman correlation test was performed to evaluate possible correlations and relationships between the level of CE disclosures and the themes outlined in Section 4.2. A Kruskal Wallis test with Jonckheere-Terpstra post-hoc assessment was also used to determine if the CE disclosures (per theme) vary with the level of the grouping variables (see Table 8) and the signs of any association. The grouping variables are outlined in Table 8. The frequency of the disclosures and the quality score per each theme addressed in RQ1 were the dependant variables.

Table 8: Summary of variables to be used in the statistical analysis

Grouping Variable	Assessment	Research Question
Size	Company size was measured by market capitalisation with companies grouped by quartile	RQ2.1
Industry	Industries included Mining, Banking and Financial Services, and Consumer Goods and Retail. Each group	RQ2.2

[5] Highest possible quality score = $\Sigma 3\,(\text{Measurement indicator score}) + 2\,(\text{Relevance indicator 1 score}) + 2\,(\text{Relevance indicator 2 score}) + 2\,(\text{Relevance indicator 3 score}) + 1\,(\text{Usefulness indicator score}) + 2\,(\text{Interpretation indicator score})$

Table 8: Summary of variables to be used in the statistical analysis		
Grouping Variable	**Assessment**	**Research Question**
	was treated as a separate category based on environmental impact.	
Financial year	Disclosure scores were aggregated according to each separate year (2018, 2019 and 2020).	RQ2.3

4.3: Validity and reliability of data

As this research follows a mixed methods approach, it must have validity and reliability to provide legitimate results (Leedy & Ormrod, 2021). Reliability is the assurance that the research instrument will yield similar results when there has been no change in the item being assessed (Leedy & Ormrod, 2021). Validity is ensuring that the research findings are authentic and explanations are plausible (Lukka & Modell, 2010). The research instrument has validity if it measures what it is intending to measure (Lukka & Modell, 2010). The research utilises a research instrument to collect and code the data (Leedy & Ormrod, 2021). This increases the risk that the construction of the research instrument is not complete nor accurate. The coding process is also inherently subjective, which further increases the need for validity and reliability.

The following steps have been taken to address the validity and reliability of the data:

- Disclosures are analysed using paragraphs as the unit of analysis to prevent the misinterpretation of the content and to avoid overlooking a CE disclosure.
- The coding of all companies for each period of review is completed by the researcher. This will ensure consistency of the investigation.
- The disclosure checklist (see Section 2.6 and Section 4.6) has been interpretatively developed by the researcher using current reporting frameworks as well as prior literature. To ensure the validity and reliability, each of the themes in the disclosure checklist has been grounded in the relevant prior research.
- The CE content elements as outlined in Table 3 (see Section 2.1) has been developed from relevant prior research. A breakdown of the research consulted is in Table 6 (section 2.5)

- The qualitative content analysis was adopted from Büchling and Maroun (2021) and the scoring system used in the coding has been adapted from Hassan et al. (2020). This reduces the possibility of inconsistencies with prior research and the effect of researcher bias.
- The coding process was initially piloted by the researcher with 15 listed companies to gain comfort over the process and resolve uncertainties with the supervisor. This has been reviewed by the supervisor.
- The disclosure checklist and preliminary findings were accepted and presented at the Southern African Accounting Association (SAAA) conference held on 20 September 2021. The researcher has considered the comments from anonymous SAAA reviewers for this thesis.

5. Findings

The results section will address research question one (Section 5.1) and research question two (Section 5.2).

5.1: Research question 1: The level of CE disclosures

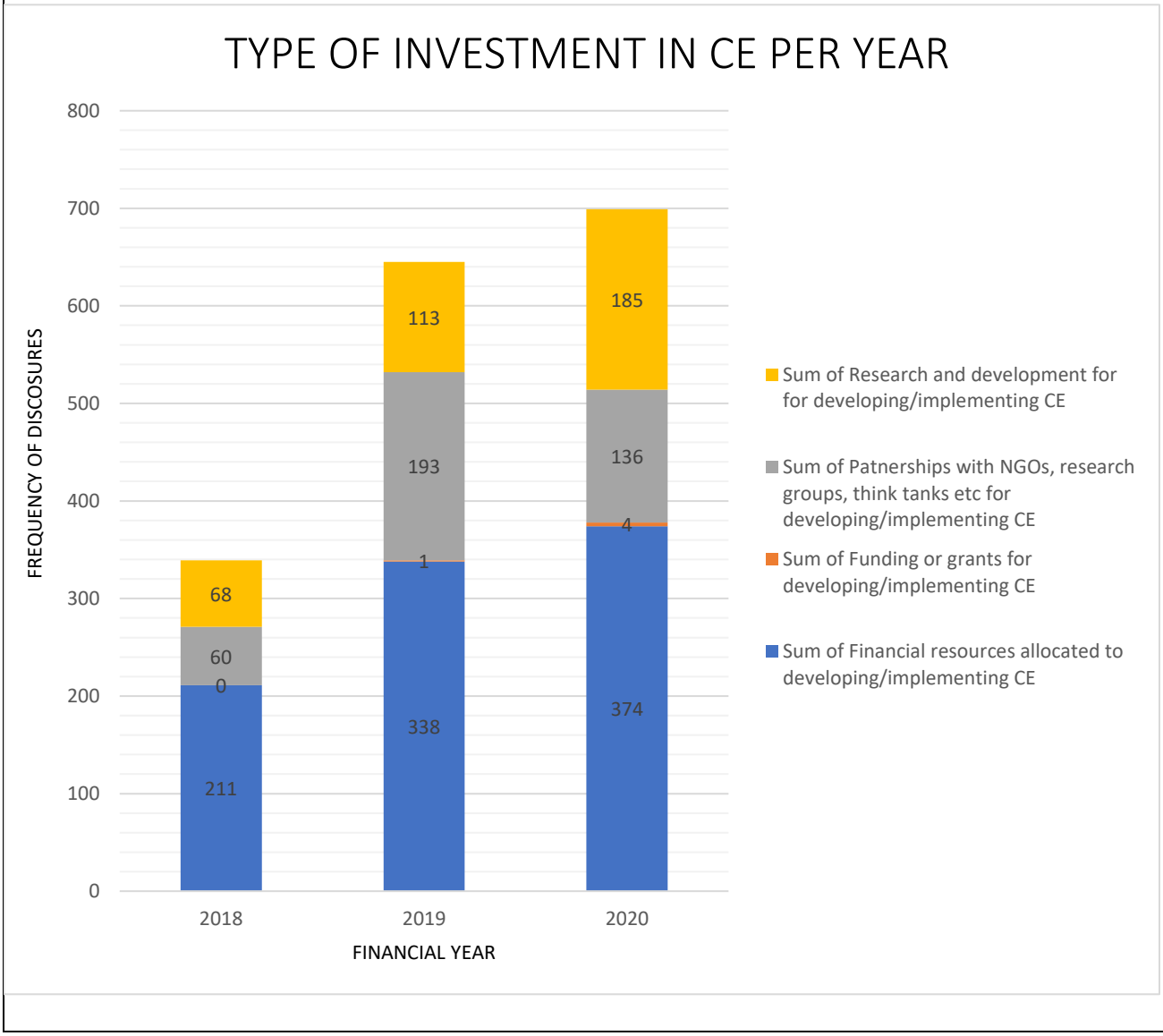
This section includes graphical illustrations to gain a sense of the level CE disclosures per each disclosure checklist theme. Thereafter, the section presents descriptive statistics for each theme.

In this section the disclosures on CE are reviewed in aggregate before specific examples of CE disclosures are provided and analysed in more detail.

Preliminary analysis

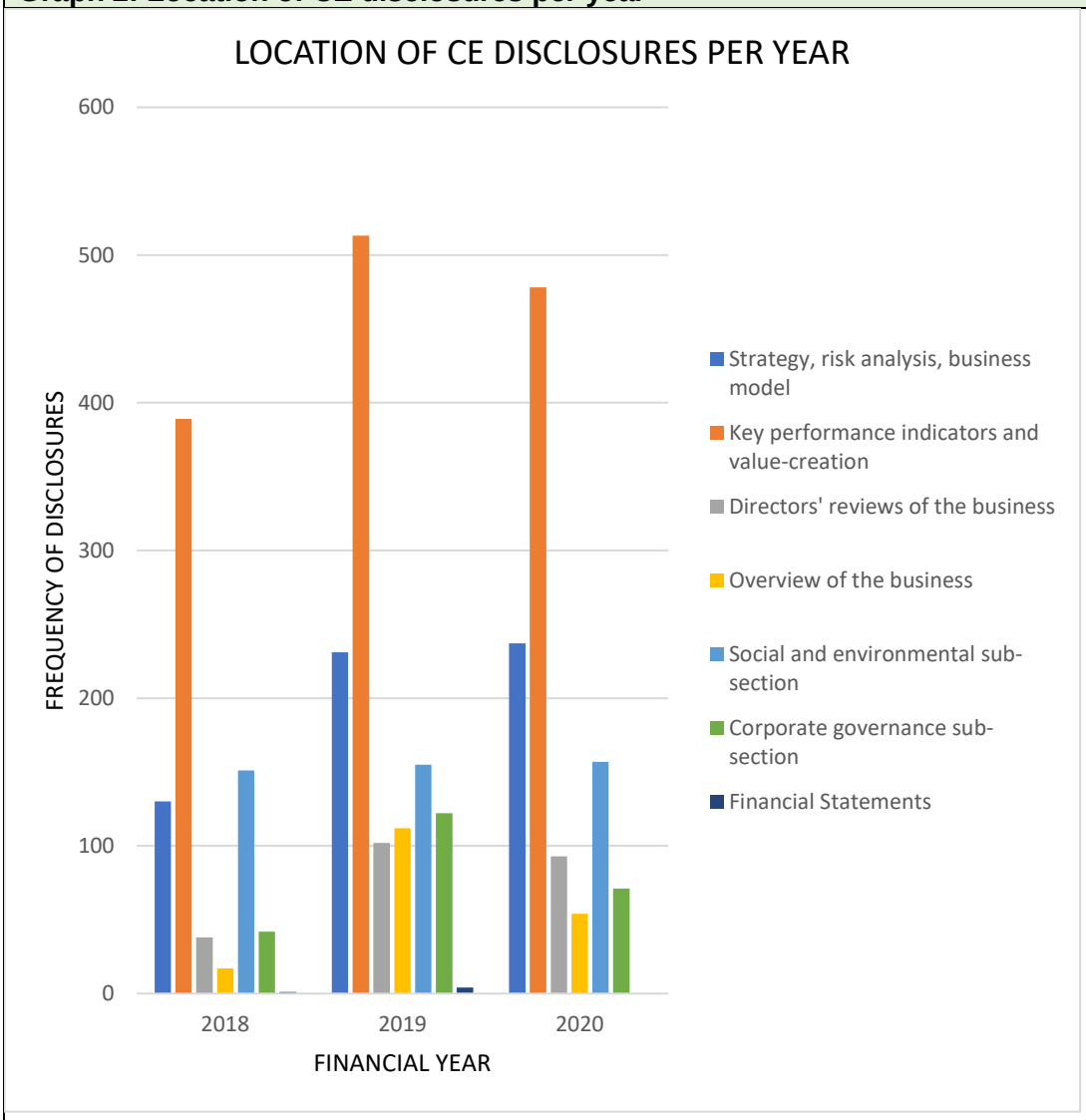
Graph 1 provides an overview of the type of investment for developing and implementing a CE (section 4.2, RQ1, theme one). Across each year, the use of financial resources is most significant. Most of the companies invest research and development in CE and engage with NGOs, research groups, think tanks and other external parties to drive their CE transition. As CE is not well standardised (Muradin & Foltynowicz, 2019), it is likely that companies invest in research and development, and engage with third parties for developing a CE policy. There is minimal funding obtained through grants or external funding.

Graph 1: Type of investment in CE per year



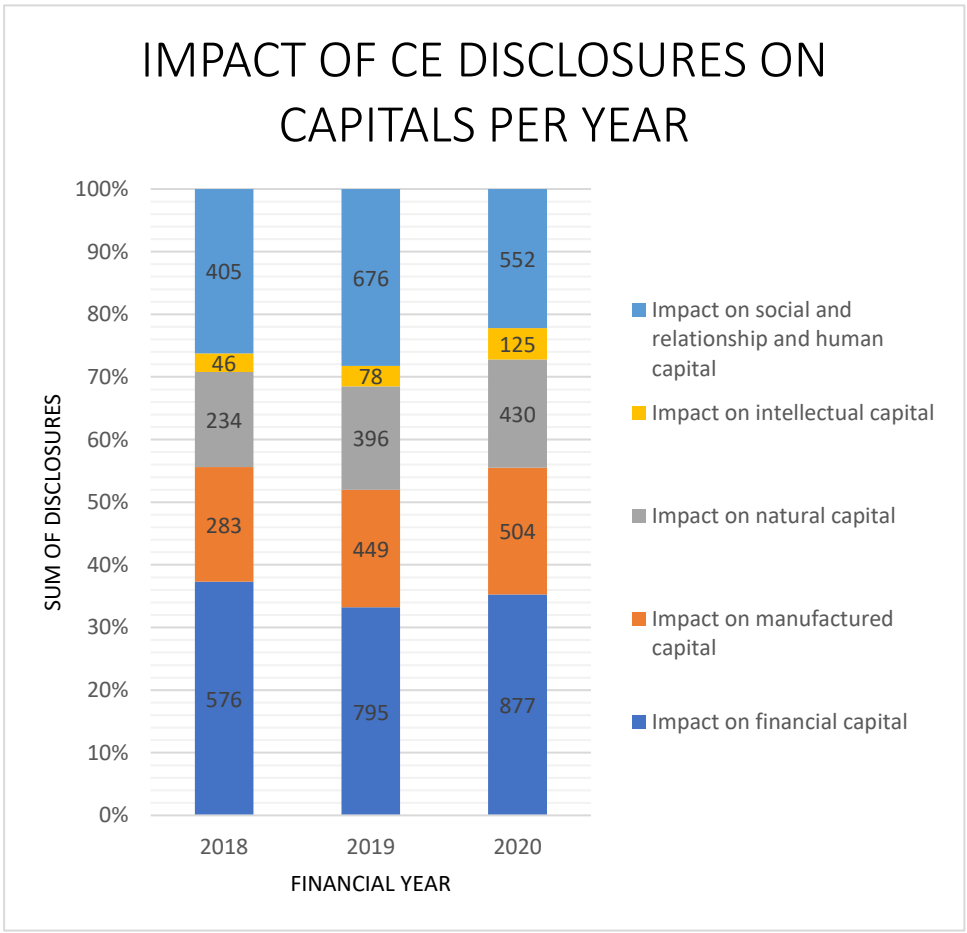
Graph 2 presents the location of the CE disclosures (section 4.2, RQ1, theme two). Most of the disclosures are concentrated in the key performance and value creation section. This shows that investments in CE are largely interpreted as a value creation process. Across each year, many disclosures are found in the strategy, risk analysis and business model section. Lastly, the least number of disclosures are situated in the financial statement section and corporate governance sections. As these sections are primarily compliance-based reporting, companies tend not to interpret CE transition as a compliance requirement.

Graph 2: Location of CE disclosures per year



Graph 3 and 4 provides an overview of the impact of the CE disclosures on the capitals set out by IIRC, IR framework (section 4.2, RQ1, theme three). Companies prioritise the six capitals differently (Roberts et al., 2020). Graph 3 shows that across each year, the most impacted capital is financial capital. The impact on intellectual capital has consistently increased from 2018 to 2020. This suggests that companies may be engaging in more innovative research to drive their transition to CE. This ties into the results from Graph 1 which suggested significant research and development in CE adoption.

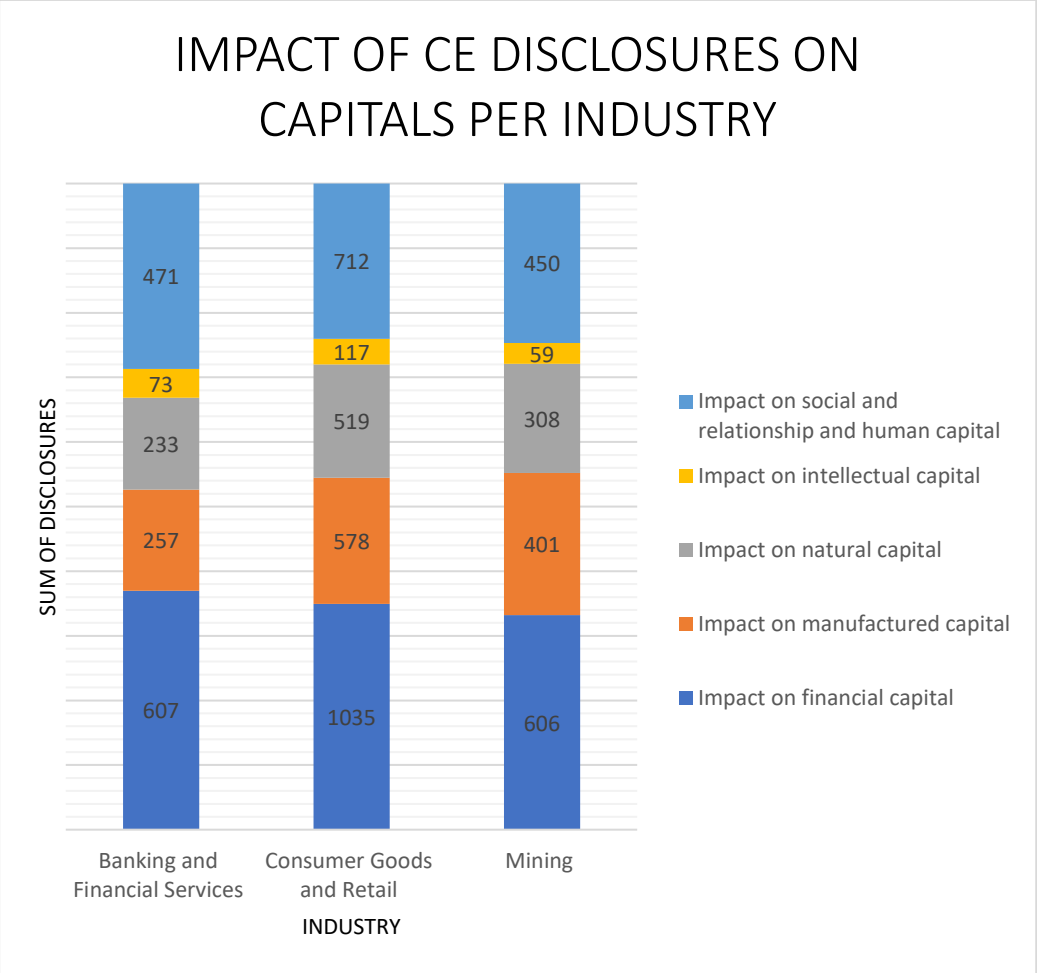
Graph 3: Impact of CE on capitals per year



Graph 4 presents the impact on the capital across the three industries. Of the 40 companies investigated, 13 are from banking and financial services, 18 are from consumer goods and retail, and 9 are from mining industry.

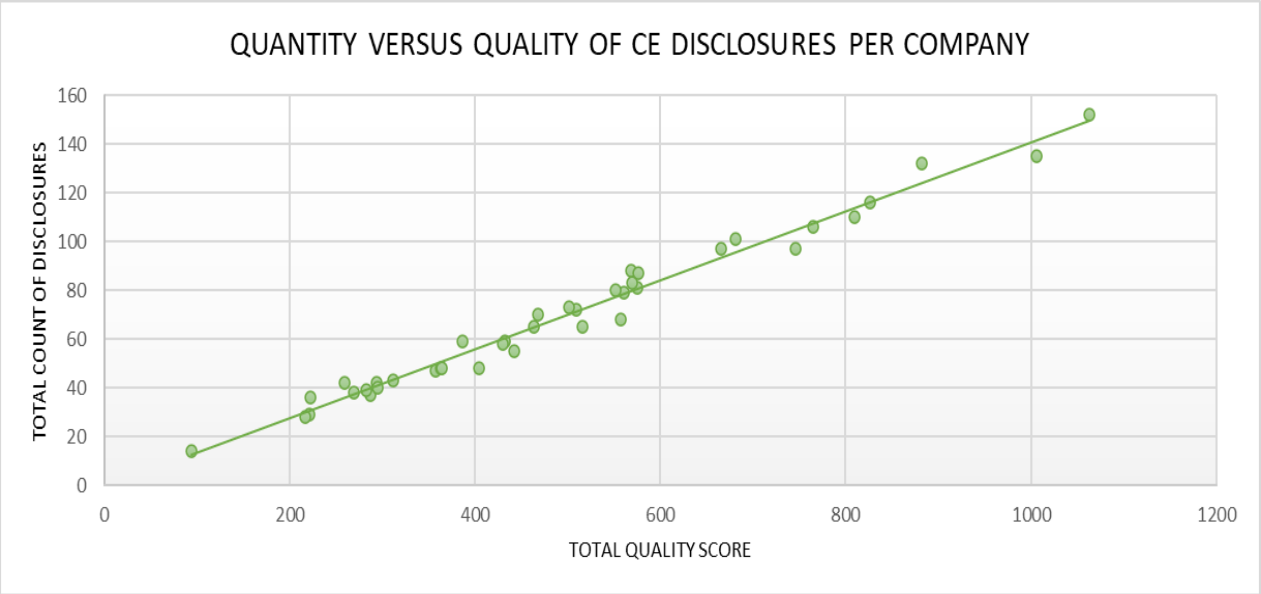
It suggests that different industries impact the capitals differently based on their operations. Further, in each industry there is an aim to balance each capital as each have impacted all the capitals.

Graph 4: Impact of CE on capitals per industry



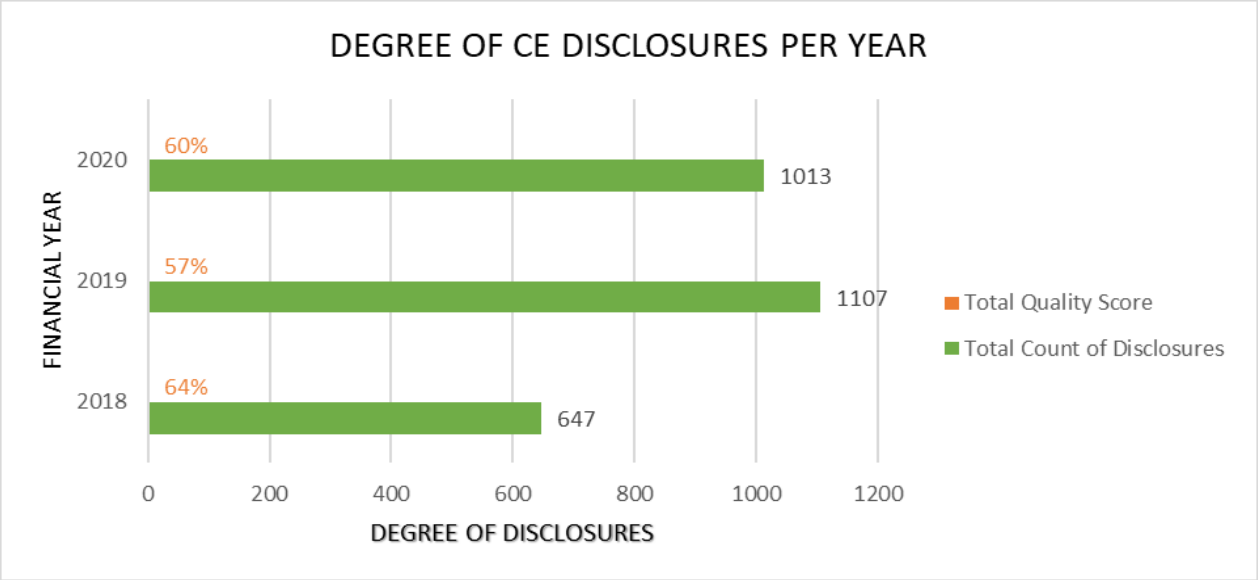
Graphs 5 – 9 provides insight on the quality of the CE disclosures (Section 4.2, RQ1, theme four). The total quality score was calculated as the sum of the quality indicators presented in Table 7 (see Section 4.2). Graph 5 illustrates the relationship between the quantity of CE disclosures and the quality over 3 years. The relationship between the two variables tends to be positively related. The quality of CE disclosures tends to increase as the quantity of CE disclosures increase. This is illustrated by the trend line.

Graph 5: Quality versus Quantity of CE disclosures per company



Graph 6 presents the quantity and quality of CE disclosures across 3 years. The total quality score is presented as a percentage over the total possible score of 12 per disclosure (see Section 4.2). There is a clear trend that both the quantity and quality of the disclosures are increasing in each year. This suggests continuous sustainable business practices being adopted by companies. The quality score ranges between 57%-64%, this is a moderately low score and suggests companies can improve their reporting quality.

Graph 6: Degree of CE disclosures per year

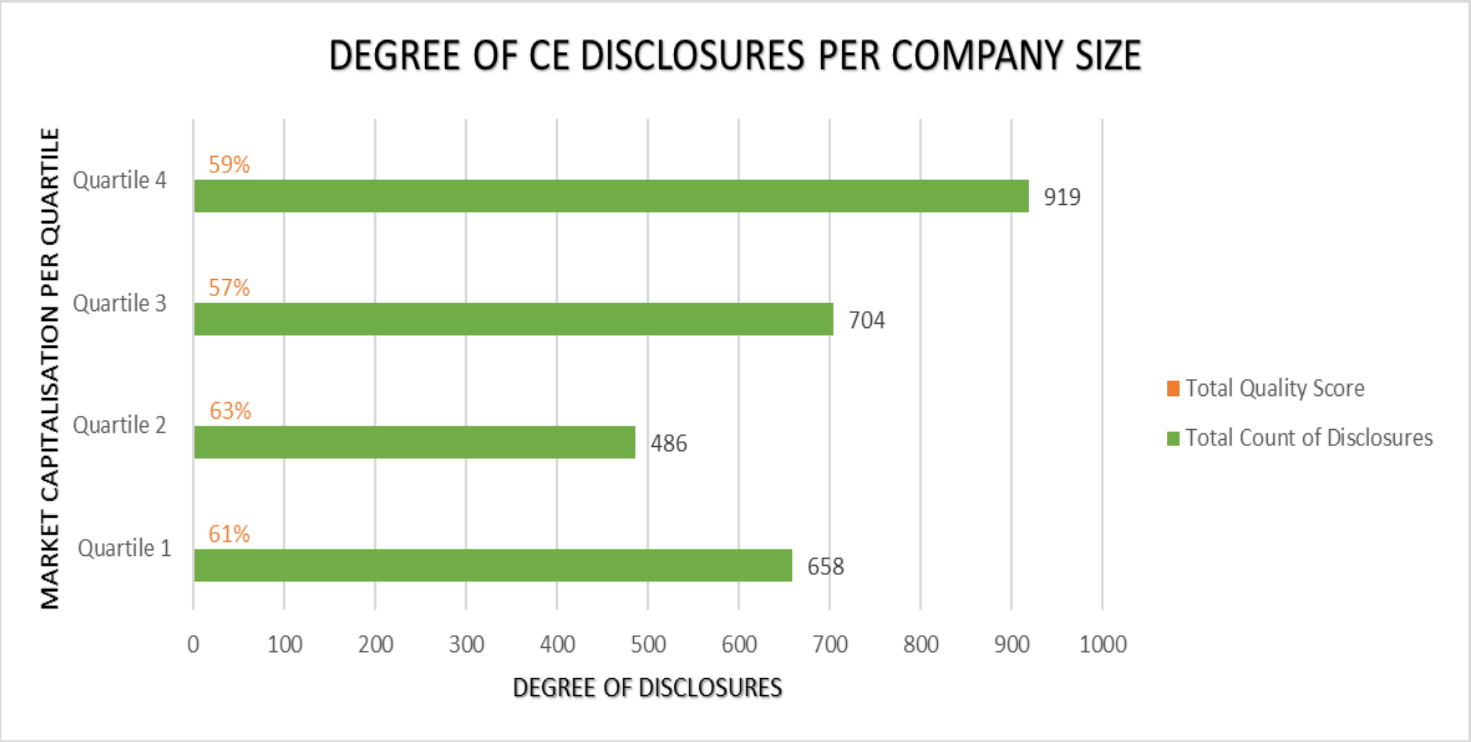


Graph 7 illustrates the degree (quantity and quality) of CE disclosures per company size. The market capitalisation was grouped across 4 quartiles[6]. Each quartile contained 10 companies.

Overall, the graph suggests that companies with a large market capitalisation (quartiles 4 and 3) tend to have higher count of disclosures than companies with a small market capitalisation (quartiles 1 and 2). Larger companies may have more financial resources and access to technical expertise to aid in their CE adoption. The quality score across all four quartiles range between 57%-63%. The scores are very similar and suggests that quartiles 1 and 2 have higher reporting quality than quartiles 3 and 4. Overall, the quality score is moderately low and suggests that companies can improve their reporting quality.

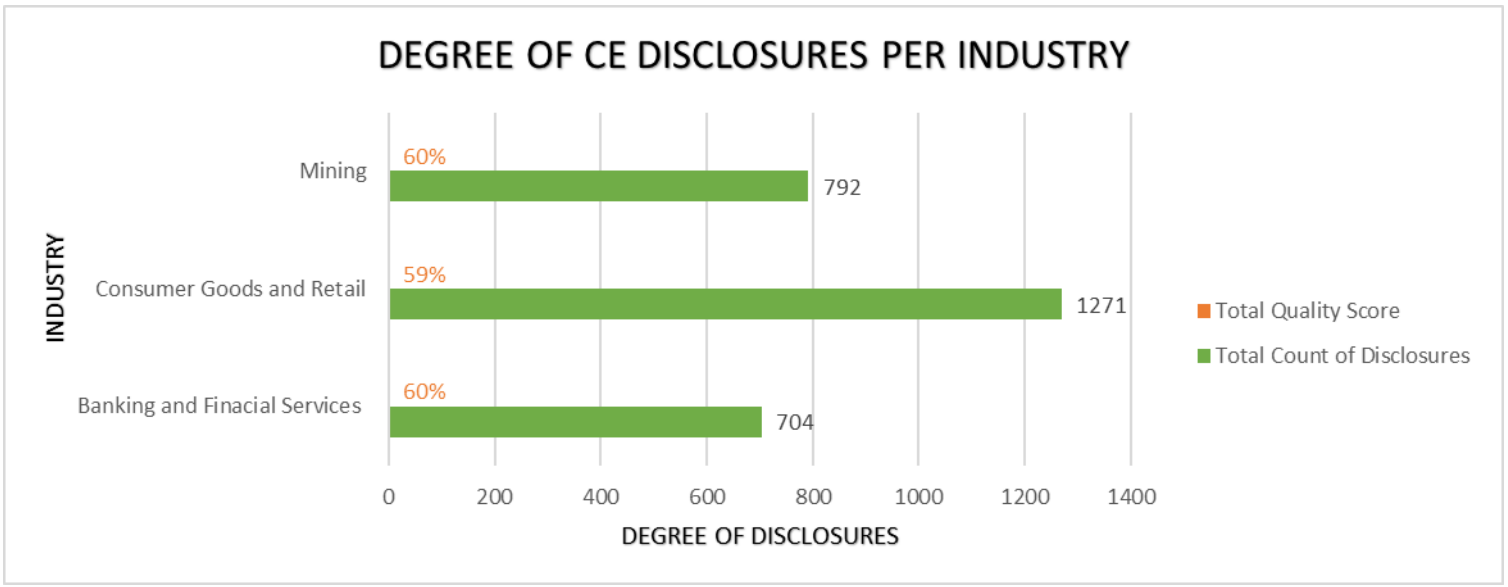
[6] Quartile 1: Market Capitalisation lower/equal to R35 657 500 000
Quartile 2: Market Capitalisation between R35 657 500 000 and R96 995 000 000
Quartile 3: Market Capitalisation between R96 995 000 000 and R247 942 500 000
Quartile 4: Market Capitalisation greater than R247 942 500 000

Graph 7: Degree of CE disclosures per company size



Graph 8 provides the quantity and quality of CE disclosures per industry. The graph suggests that consumer goods and retail industry has the highest count of disclosures, followed by mining, and banking and financial services industry. This suggests the CE adoption does differ across industries. The total quality scores are very close ranging between 59%-60%. These are moderately low scores that can be improved through better reporting quality.

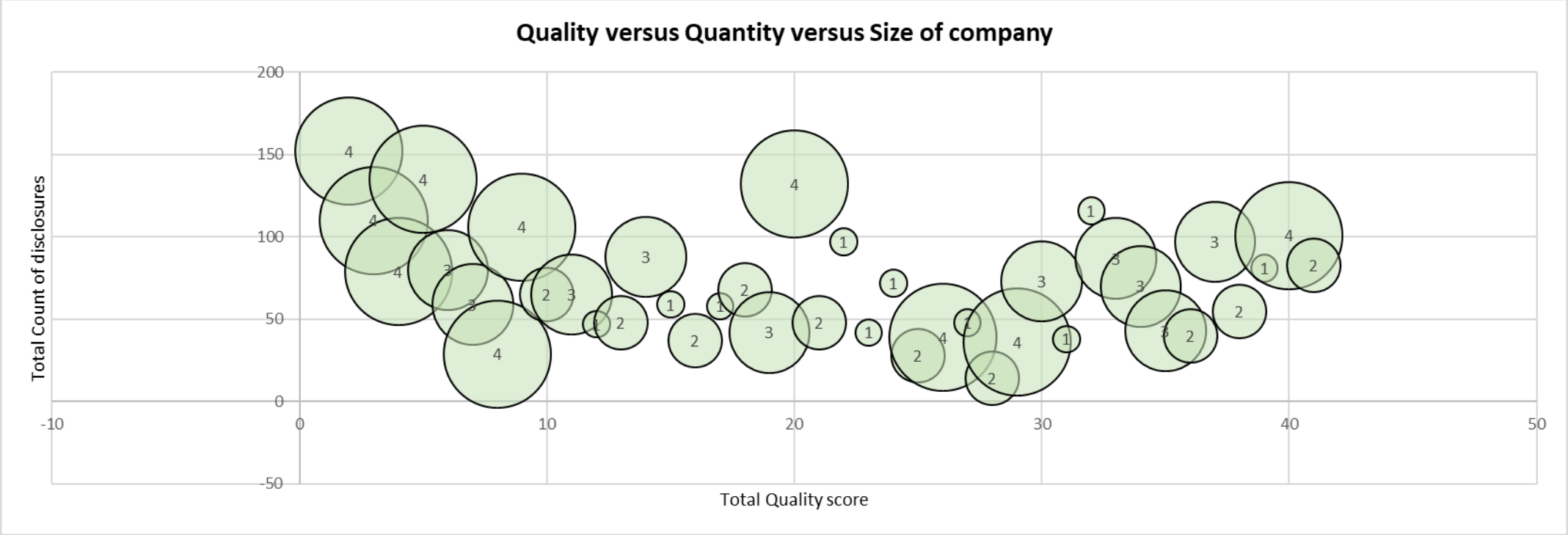
Graph 8: Degree of CE disclosures per industry



Graph 9 shows the relationship between 3 variables: count of disclosures, quality of disclosures and company size. The quantity of CE disclosures is the total count for each company from 2018-2020. The total quality score is calculated from 2018-2020 per company. Each bubble represents a company, and the bubble size is measurement of company size by market capitalisation. The market capitalisation was grouped across 4 quartiles. Each quartile contained 10 companies.

Companies with a large capitalisation (quartile 4 and 3) have poorer reporting regarding CE as the quantity of disclosures are high but the quality of the disclosures are low. There are also instances whereby, companies with a small market capitalisation (quartile 2 and 1) have very good reporting regarding CE. The quantity and quality of their disclosures are high. Overall, the chart suggests that smaller companies tend to have less CE disclosures that are of a lower quality than the bigger companies.

Graph 9: Quality versus Quantity versus Size of company



Bubble size represents the market capitalisation of each company (grouped in quartiles from 1 – 4)

Table 9 presents the descriptive statistics across each disclosure theme per year. See Appendix A (Section 7) for key used to interpret Table 9. The results are consistent with the graphs. From 2018-2020, the average investment in research and development, and partnerships with NGOs, think tanks, and research groups have been increasing. Disclosures are concentrated in the key performance and value creation section and the least number of disclosures are found in the financial statements. The average quality score has increased significantly from 2018 to 2019 (49% increase). The quality score has decreased slightly from 2019 to 2020. The average for the impact on all capitals has also increased from 2018-2020. Overall, the descriptive statistics complement the pre-liminary finding and suggests a positive move towards CE adoption.

Table 9: Descriptive Statistics

Disclosure Checklist		2018				2019				2020			
THEME	**THEME INDICATOR**	**MINIMUM**	**MAXIMUM**	**MEAN**	**SD***	**MINIMUM**	**MAXIMUM**	**MEAN**	**SD***	**MINIMUM**	**MAXIMUM**	**MEAN**	**SD***
TYPE OF INVESTMENT TO IMPLEMENT CE	D1	2	18	6	3	1	17	9	5	3	23	10	5
	D2	0	0	0	0	0	1	0	0	0	2	0	0
	D3	0	7	2	2	0	27	5	5	0	18	4	4
	D4	0	8	2	2	0	13	3	3	0	16	5	4
LOCATION OF DISCLOSURE	L1	0	30	3	6	0	29	6	8	0	27	6	8
	L2	0	27	10	7	0	65	13	14	0	54	13	11
	L3	0	6	1	2	0	16	3	3	0	10	2	3
	L4	0	3	0	1	0	32	3	6	0	9	1	2
	L5	0	1	0	0	0	2	0	0	0	0	0	0
	L6	0	16	4	5	0	29	4	6	0	32	4	7
	L7	0	4	1	1	0	15	3	3	0	11	2	2
QUALITY OF DISCLOSURES	Q1	9	77	32	14	4	107	47	22	10	100	47	22
	Q2	7	83	31	16	5	118	48	24	10	107	48	23
	Q3	9	76	29	14	3	94	41	21	8	90	40	21
	Q4	7	79	30	16	3	120	46	25	9	107	46	23
	Q5	0	9	2	2	0	27	4	6	0	18	5	5
	Q6	0	22	5	5	0	19	7	6	0	22	6	6
	Q7	36	319	130	61	15	435	194	92	43	427	192	94
IMPACT ON CAPITALS	C1	4	36	15	7	3	50	20	10	4	51	23	11
	C2	0	19	7	5	0	42	12	10	1	34	13	10
	C3	0	21	6	5	0	40	10	8	0	45	11	9
	C4	0	8	1	2	0	8	2	2	0	13	3	3
	C5	4	41	11	6	3	44	17	9	5	28	15	6

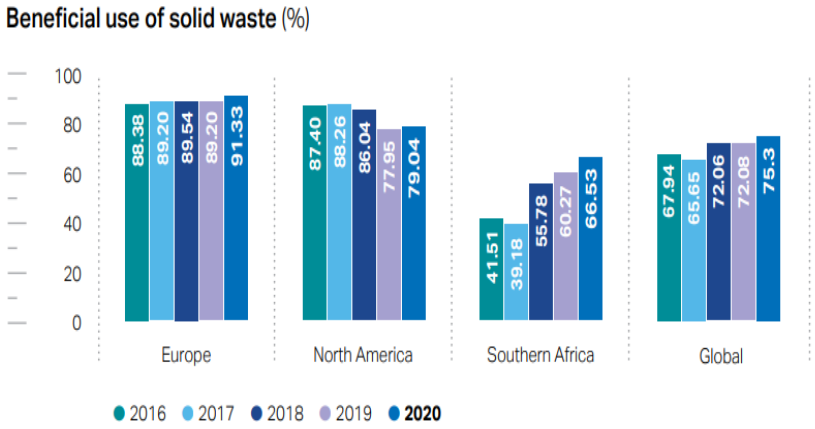
*Standard deviation.

Examples of CE disclosures

The section will include extracts from the companies' integrated reports. Extracts 1, 2 and 3 provide examples of high-quality disclosures.

Extract 1: High quality disclosure.

Key developments in 2020: In keeping with our focus on circular economy principles, we are working to increase our use of renewable energy and eliminate waste through superior product and process design. As an example, we increased the percentage of solid waste beneficiated from 72.08% in 2019 to 75.3%. This meant that waste sent to landfill decreased by 7.6% year-on-year – a positive environmental benefit as landfills generates methane, a powerful GHG associated with global warming.



Extracted from Company 31, 2020

Extract 1 is awarded a total quality score (see Table 7) of 10 out of 12 (83%). This is an example of a high-quality CE disclosure as Company 31 has quantified the disclosure by providing percentages of beneficial use of solid waste across 2016-2020. The disclosure states that the company is making use of renewable energy and creative product design to meet their CE policy. Details have also been included on the benefits of reducing landfill waste. As a result, the disclosure is action specific and context specific. Company 31 has stated that they are working on increasing the use of renewable energy and limiting waste. This implies that CE adoption is forward-looking in nature. Lastly, the disclosure is easy to interpret as the graphs provide a well-structured breakdown of the beneficial use of waste across the company from 2016-2020. There is a positive trend as solid waste usage has increased across operations.

Extract 2: High quality disclosure.

Our approach to reducing the environmental impacts of our operations is long established and we have an internal reporting system in place for monitoring Group environmental performance. During 2018 and following on from our acquisition of Reynolds American Inc. (RAI), we took the opportunity to review our long-term targets to reflect our new operations portfolio. Having undertaken a full analysis of our Scope 1, 2 and 3 carbon emissions we have now established a new 2017 baseline reflective of our enlarged operations and established new long-term targets including a commitment to setting science-based emissions targets. Our new targets have gained Science-Based Targets initiative (SBTi) formal approval, and we join the ever-growing number of companies that have committed to making significant emissions reductions, in line with the most up-to-date climate science. Read about our Group risk factor relating to environmental laws on page 276. Further details of our approach to our reporting methodology can be found at www.company 3.com/corporatebehaviour/scope

Emissions*

	2018	2017
Scope 1 CO_2e emissions ('000 tonnes)	**415**	427
Scope 2 CO_2e emissions ('000 tonnes)	**426**	438
Scope 3 CO_2e emissions ('000 tonnes)*	**n/a**	8,254
Total statutory emissions (Scope 1 and 2 in '000 tonnes)	**841**	864
Intensity (tonnes per £ million of revenue)	**32.6**	34.7

Extracted from Company 3, 2018

Extract 2 is awarded a total quality score (see Table7) of 11 out of 12 (92%). Company 3 has provided a high-quality disclosure as they have quantified their emissions per scope. The disclosure outlines the internal reporting systems and aims to measure such emissions. The company has clearly stated their target and commitment to make significant energy reductions. Therefore, the CE disclosure is both action specific and context specific. Company 3 has implied a forward-looking CE adoption as they stated that they will continuously work on such energy targets. The disclosure is cross-referenced to a valid source for additional information. Lastly, the company has provided a table to ease with interpretation of the emissions per scope. There is also a positive trend as emissions are decreasing from 2017 to 2018.

Extract 3: Moderately high-quality disclosure

In all REIPPP projects to date we have arranged 42 transactions in renewable-energy projects, underwriting a total of R35,9bn and paying out R27bn.
• We concluded deals worth over R700m with leading developers in the embedded energy generation space as well as our commercial and agriculture clients, in the process establishing ourselves as a leading financier in this sector.
• We funded Africa's first commercial floating solar park on the dam of a fruit farm outside Franschhoek. It can produce up to 60 kW of power, effectively allowing the uninterrupted functioning of the farm and generating significant energy savings.
• In 2019 we were the first commercial bank in SA to launch a green bond on the JSE. The instrument was significantly oversubscribed, and raised R1,7bn in investment proceeds, all of which is being applied to deliver financial support to solar and wind-renewable-energy projects. Based on the success
of the first green bond, we issued a second one that raised a further R1bn.

Extracted from Company 20, 2019.

Extract 3 is awarded a quality total score (see Table 7) of 8 out of 12 (67%). The disclosure does not have tables or graphs to ease with interpretation and it is not cross-referenced to other sources for additional information. Company 20 has also not stated any future investments in such CE projects. However, the quality of the disclosure is moderately high as Company 20 has measured investments by providing monetary disclosure. The disclosure details the aim and benefit of each investment. For example, Company 20 has explained the power capacity and benefit of a solar park. Therefore, the disclosure is both action specific and context specific.

Extracts 4, 5 and 6 provide examples of low-quality disclosures.

Extract 4: Low quality disclosure

By encouraging a circular economy in plastics, we will create opportunities for economic growth for a wide range of stakeholders including unskilled individuals, local communities, as well as the downstream plastics and waste management industries.

Extracted from Company 32, 2019.

Extract 4 will be awarded a total quality score (see Table 7) of 5 out of 12 (42%). The disclosure is qualitative in nature and symbolic. Company 32 has merely stated the policy to manage plastics and waste. No details on actions are provided. Overall, the disclosure is generic as Company 32 has not stated what the how they plan to manage plastics and waste or how they will create the opportunities for economic growth. Therefore, the disclosure lacks relevance. Lastly, Company 32 has not provided a cross-reference for additional information and there is no tables or graphs to ease with the interpretation of the information. This contributes to low quality CE reporting.

Extract 5: Low quality disclosure
We have driven various energy efficiency and renewable energy initiatives in many of our offices. Extracted from Company 39, 2019.

Extract 5 is also awarded a score of 5 out of 12. The disclosure is qualitative in nature and action specific because it states that they have already driven energy initiatives. However, no explanation of the initiatives and benefits have been mentioned. This results in a generic and historical disclosure. The disclosure lacks relevance and usefulness.

Extract 6: Low quality disclosure
Our diverse businesses across the group adopt appropriate environmentally sustainable practices minimising the impact on natural capital, for example energy-saving, water-saving and recycling initiatives. Extracted from Company 19, 2018

Extract 6 scores 4 out of 12 (48%). The disclosure is qualitative in nature. Company 19 has stated their sustainability practices and very clearly made the link to natural capital. However, no detail has been provided on the actual energy-saving, water-saving, or recycling initiatives. The benefit, progress or goals of such objectives have not been outlined. As a result, the disclosure is both policy level, generic and historical in nature.

The total quality scores remain moderately low ranging from 57-64% between 2018 and 2020. There are some very good disclosures in which companies are providing useful, relevant, and reliable information to stakeholders. Disclosure scores are usually low when companies do not disclose the specific actions to implement their CE policy or when they do not disclosure the goals, progress, and benefits of the value their CE policy adopted. As a result, disclosures are generic, symbolic and lacks relevance.

5.2: Research question 2: The possible determinants of CE disclosures.

This section addresses research question two by analysis of the relationship among disclosure themes (Section 5.2.1) and the level of CE disclosures across: industry, company size and financial year (Section 5.2.2).

5.2.1: Relationship among disclosure themes:

Table 10 reports the correlation matrix for all the variables used in the study. A Spearman's rho correlation and Kendall's tau-b was used to examine the correlations between the variables.

Table 10: Correlation Matrix

	Y1	Y2	Y3	D1	D2	D3	D4	L1	L2	L3	L4	L5	L6	L7	Q1	Q2	Q3	Q4	Q5	Q6	Q7	C1	C2	C3	C4	C5
Y1	1,000	1,000	.231*	0,032	0,090	0,129	.286**	.457**	0,002	.219*	0,058	0,085	-0,021	.260**	.268**	.271**	.333**	.238*	.264**	.236*	.290**	.197*	.348**	.281**	-0,001	.201*
Y2	0,000	1,000	.194*	0,024	0,085	0,104	.239**	.374**	0,000	.185*	0,051	0,080	-0,015	.215**	.206**	.213**	.260**	.184*	.214**	.194*	.225**	.157*	.271**	.225**	0,000	.157*
Y3	0,029	.231*	1,000	-0,119	0,041	0,116	0,088	0,042	0,033	.225**	0,035	0,116	0,097	0,080	.139*	.175*	.195**	.165*	0,075	-0,085	.159*	0,059	.244**	0,091	0,144	.142*
D1	.377**	0,032	-0,152	1,000	0,138	.198**	.317**	.192**	.218**	0,127	0,028	0,073	0,085	0,073	.526**	.436**	.360**	.441**	.182**	.214**	.448**	.524**	.261**	.364**	.298**	.407**
D2	0,176	0,090	0,045	0,162	1,000	0,142	.213**	0,138	0,041	0,054	0,062	-0,036	-0,038	0,140	.157*	.157*	0,144	.167*	0,068	0,017	.161*	.176*	.190*	.174*	0,088	0,102
D3	.238*	0,129	0,148	.270**	0,164	1,000	.314**	0,132	.277**	0,125	.166*	0,091	.150*	0,113	.391**	.423**	.426**	.430**	.192**	0,083	.427**	.360**	.289**	.260**	.255**	.499**
D4	.381**	.286**	0,109	.420**	.245**	.416**	1,000	.233**	.254**	.158*	0,036	-0,076	0,099	0,102	.449**	.478**	.491**	.492**	.204**	.249**	.492**	.531**	.417**	.459**	.405**	.325**
L1	0,143	.457**	0,052	.250**	0,159	0,169	.304**	1,000	-0,076	.290**	0,112	0,069	-.207**	0,070	.309**	.308**	.328**	.290**	0,070	.143*	.306**	.192**	.255**	.240**	.151*	.273**
L2	0,055	0,002	0,040	.303**	0,048	.368**	.340**	-0,104	1,000	-0,067	-0,052	-0,006	.229**	-.159*	.409**	.425**	.461**	.442**	.167*	0,133	.441**	.477**	.319**	.369**	.259**	.348**
L3	.279**	.219*	.279**	0,167	0,060	0,165	.205*	.366**	-0,093	1,000	.274**	0,062	-.155*	.183*	.258**	.297**	.251**	.263**	0,128	-0,100	.251**	.168*	.301**	.156*	.215**	.276**
L4	.246**	0,058	0,045	0,036	0,068	.211*	0,046	0,134	-0,070	.317**	1,000	0,058	-.184*	0,104	0,137	.162*	0,108	0,129	0,093	0,005	0,124	0,068	.152*	0,112	0,078	0,104
L5	-0,058	0,085	0,128	0,088	-0,036	0,104	-0,087	0,079	-0,008	0,070	0,063	1,000	0,105	0,091	0,083	0,060	0,054	0,043	-0,035	-0,026	0,057	-0,032	0,064	-0,005	-0,032	0,081
L6	-0,054	-0,021	0,120	0,115	-0,042	.197*	0,123	-.263**	.308**	-.197*	-.230*	0,117	1,000	-0,106	.240**	.220**	.221**	.244**	-0,013	.188**	.239**	.253**	.186**	.282**	-0,005	.154*
L7	0,136	.260**	0,100	0,095	0,158	0,152	0,131	0,088	-.214*	.220*	0,125	0,103	-0,134	1,000	0,109	0,125	0,088	0,100	.236**	0,049	0,115	0,040	0,087	0,047	-0,013	.179*
Q1	.295**	.268**	.185*	.680**	.191*	.518**	.597**	.402**	.539**	.350**	0,179	0,101	.326**	0,151	1,000	.856**	.765**	.841**	.181**	.239**	.864**	.746**	.589**	.644**	.328**	.670**
Q2	.325**	.271**	.230*	.576**	.191*	.558**	.625**	.403**	.559**	.402**	.213*	0,073	.297**	0,171	.964**	1,000	.836**	.905**	.209**	.223**	.913**	.754**	.641**	.666**	.372**	.689**
Q3	.222*	.333**	.248**	.490**	0,174	.563**	.639**	.425**	.598**	.336**	0,138	0,065	.300**	0,115	.919**	.956**	1,000	.841**	.200**	.256**	.864**	.723**	.624**	.649**	.319**	.658**
Q4	.292**	.238*	.215*	.582**	.203*	.564**	.640**	.381**	.572**	.358**	0,171	0,052	.330**	0,135	.959**	.981**	.957**	1,000	.191**	.245**	.922**	.775**	.661**	.671**	.356**	.675**
Q5	.308**	.264**	0,099	.253**	0,079	.247**	.268**	0,090	.225*	0,164	0,112	-0,041	-0,016	.286**	.252**	.290**	.273**	.263**	1,000	.259**	.227**	.228**	.205**	.158*	0,105	.196**
Q6	0,119	.236*	-0,108	.295**	0,020	0,108	.329**	.189*	.186*	-0,126	0,008	-0,030	.236*	0,061	.325**	.302**	.352**	.331**	.340**	1,000	.287**	.265**	.206**	.293**	-0,048	.183**
Q7	.287**	.290**	.212*	.593**	.196*	.563**	.645**	.402**	.576**	.343**	0,165	0,069	.325**	0,160	.971**	.987**	.970**	.988**	.318**	.390**	1,000	.771**	.645**	.678**	.330**	.677**
C1	.300**	.197*	0,082	.680**	.210*	.475**	.675**	.255**	.617**	.229*	0,087	-0,038	.332**	0,056	.879**	.864**	.849**	.888**	.317**	.360**	.884**	1,000	.525**	.623**	.330**	.567**
C2	.220*	.348**	.305**	.361**	.228*	.390**	.547**	.338**	.429**	.411**	.194*	0,076	.238*	0,117	.761**	.805**	.803**	.827**	.283**	.270**	.816**	.686**	1,000	.624**	.290**	.380**
C3	.280**	.281**	0,120	.475**	.208*	.353**	.584**	.319**	.492**	.211*	0,146	-0,006	.359**	0,061	.819**	.826**	.821**	.832**	.218*	.392**	.846**	.781**	.777**	1,000	.188**	.405**
C4	.333**	-0,001	0,180	.395**	0,099	.326**	.503**	.197*	.336**	.280**	0,094	-0,037	-0,006	-0,016	.449**	.506**	.442**	.485**	0,138	-0,063	.458**	.440**	.390**	.256**	1,000	.301**
C5	.295**	.201*	.188*	.527**	0,122	.647**	.443**	.358**	.465**	.367**	0,132	0,098	.211*	.243**	.820**	.844**	.819**	.827**	.266**	.244**	.833**	.699**	.520**	.543**	.397**	1,000

* - significant at 10% level; ** - significant at 5% level; *** - significant at 1% level.

See Appendix A (Section 7) for key.

The results from correlation matrix investigates the relationships between the themes in the disclosure checklist.

Reporting quality and type of investment to developing or implementing a CE

There is a moderately strong correlation between the total quality score and: financial resources allocated ($r=0.593$, $p<0.05$); partnerships with NGOs, research groups and think tanks ($r= 0.563$, $p<0.05$); research and development ($r=0.645$. $p<0.05$). This links to Graph 1 as these types of investments were most prioritised across the 3 years. As a result, companies have spent more resources to provide high quality reporting on these CE investments.

Reporting quality and location of CE disclosure

There is a moderately strong correlation between total quality score and: strategy, risk analysis and business model section ($r= 0.402$, $p<0.05$); key performance indicators and value creation section ($r= 0.576$, $p<0.05$). This links to Graph 2 as CE disclosures is mostly concentrated in these sections. As a result, companies have expended more resources to provide high quality reporting in these sections.

The correlation matrix (Table 10) shows a moderately strong correlation between disclosures in the strategy, risk analysis and business model section and industry ($r=0.457$, $p<0.05$). This is consistent with the results above.

Reporting quality and impact on capitals

There is a strong correlation between total quality score and: financial capital ($r=0.884$, $p<0.05$); manufactured capital ($r= 0.816$, $p<0.05$); natural capital ($r=0.846$, $p<0.05$); human and social and relationship capital ($r=0.833$, $p<0.05$). There is also a moderately strong correlation between total quality score and intellectual capital ($r=0.458$, $p<0.05$). Overall, these correlations strengthen the link between CE reporting and the six capitals. Companies tend to provide high quality reporting when addressing the impact that their CE adoption has on the capitals.

Type of investment to developing or implementing a CE and the impact on capitals

There is a moderately strong relationship between the use of research and development and: financial capital ($r=0.675$, $p<0.05$); manufactured capital ($r= 0.547$, $p<0.05$); natural capital ($r=0.584$, $p<0.05$); human and social and relationship capital ($r=0.503$, $p<0.05$); intellectual capital ($r=0.443$, $p<0.05$). Interestingly, this suggests that companies tend to expend more research and development to drive their CE adoption through the innovative use of the capitals. Significant research is concentrated in balancing financial, social and environmental aspects.

5.2.2: Reporting determinants

Table 11 presents the results of the non – parametric tests on the possible determinants of CE disclosures. A Kruskal-Wallis test and a Jonckheere-Terpstra test was used to test if there was a significant change in CE disclosures across each theme in the disclosure checklist. The results will consider a significant change in terms on industry, company size, and financial year. See Appendix A (Section 7) for key used to interpret Table 11.

Table 11: Results of non-parametric tests.							
Disclosure Checklist		**INDUSTRY**		**YEAR**		**COMPANY SIZE**	
THEME	**THEME INDICATOR**	**H – STAT**	**JT – STAT**	**H – STAT**	**JT - STAT**	**H - STAT**	**JT - STAT**
TYPE OF INVESTMENT TO IMPLEMENT CE	D1	0.188	0,33	17,935***	3,968***	3,46	-1,648*
	D2	2.207	0,96	3,67	1,878*	2,22	0,48
	D3	2.348	1,36	16,168***	2,533**	4,36	1,56
	D4	9.674***	3,105***	16,526***	4,149***	8,901**	1,19
LOCATION OF DISCLOSURE	L1	25.541***	4,837***	3,04	1,55	9,412**	0,57
	L2	0.224	-0,01	0,35	0,58	2,78	0,46
	L3	14.187***	2,341**	11,639***	3,005**	21,612***	2,947***
	L4	0.546	0,63	13,149***	2,583***	9,013**	0,44
	L5	1.695	0,90	3,51	-0,62	2,11	1,36
	L6	3.376	-0,19	0,36	-0,59	13,636***	1,26
	L7	10.632***	2,714***	15,658***	1,44	1,78	1,04
QUALITY OF DISCLOSURES	Q1	8.208**	2,812***	14,171***	3,195***	12,860***	1,965**
	Q2	8.410**	2,903***	16,919***	3,455***	13,776***	2,483**
	Q3	12.687***	3,549***	8,539**	2,394**	15,398***	2,748***
	Q4	6.562**	2,511**	13,930***	3,121***	13,090***	2,335**
	Q5	7.965**	2,793***	10,866***	3,281***	5,44	1,01
	Q6	7.265**	2,530**	2,45	1,27	5,86	-1,15
	Q7	9.588***	3,092***	13,867***	3,079***	12,746***	2,270**
IMPACT ON CAPITALS	C1	4.410	2,135**	10,759***	3,223***	7,268*	0,83
	C2	13.853***	3,660***	5,607*	2,381**	15,497***	3,405**
	C3	10.147***	3,028***	10,585***	3,026***	8,869**	1,27
	C4	1.175	0,00	12,609***	3,579***	11,858***	1,902*
	C5	4.956*	2,113**	19,558***	3,071***	9,361**	1,981**
* - significant at 10% level; ** - significant at 5% level; *** - significant at 1% level.							

Research Question 2.1: Industry.

Type of investment to developing or implementing a CE

There is a significant difference between industry and research and development ($H=9.674$, $p<0.01$). There is a strong upward trend for the use of research and development ($J=3.105$, $p<0.01$). This suggests that the mining industry engages more in finding innovative methods to implementing a CE. This is possibly because the mining industry has a heavy environmental and social impact and is under stringent laws to maintain the integrity of the natural environment in which they operate.

Location of CE disclosures

There is a significant difference between the disclosures located in strategy, risk analysis and business model section and industry ($H= 25.241$, $p<0.05$). As the risk profile and business model among the mining industry, consumer goods and retail and financial services industry differs, there is likely to a difference in the how these industries invest and transition to CE based on their business models (Hopkinson, Angelis, & Zils, 2020).

There is a strong upward trend for disclosures in the strategy, risk analysis and business model section ($J= 4.837$, $p<0.01$). This suggests that service driven industries tend to not incorporate CE disclosures in their strategic objectives and risk analysis. However, the mining industry tends to view CE adoption as in integral part of their business model, strategic objectives and aims to grasps the risks and opportunities from such adoption.

There is a significant difference between the disclosures located the in directors' reviews of the business section and industry ($H= 14.187$, $p<0.05$). There is a strong upward trend between the location and industry ($J= 2.341$, $p<0.05$). This suggests that those charged with governance (TCWG) in the mining and consumer goods and retail industries tend to report on CE more frequently than TCWG in service driven industries.

This supported that there is a significant difference between disclosures located in the corporate governance subsection and industry ($H= 10.632$, $p<0.01$), with a strong upward trend ($J= 2.714$, $p<0.01$). TCWG are the custodians of an organisation's corporate citizenship (IODSA, 2016). This suggests that industries that focus on asset management and have a heavyimpact on the natural and social context in which they operate tend to have a higher level of governance when reporting on investments. TCWG in such industries tend to be held more accountable for the actions of the organisation due to the nature of mining operations.

There is no significant difference between disclosures in the key performance and value creation section and industry (H= 0.224, p>0.10). This is important to note as it suggests that across the three industries, the transition to CE tends to be seen as a value creation process. This supports the need for the transition to a CE(Ghența & Matei, 2018).

Quality of CE reporting

There is a significant difference between the total quality score and industry (H=9.588, p<0.01). There is a strong upward trend between the total quality score and industry (H=3.092, p<0.01). This suggests that the mining industry practices better reporting quality than the consumer goods and retail, and banking industry. By inspection of Table 11, there is significant difference among all the quality indicators (Q1 – Q6) and industry. There is also a strong positive trend for all the indicators across industry.

This suggests that the mining industry provide higher quality CE reporting than other industries by: expending monetary resources to measure their CE adoption (Q1); providing actual details on actions or steps taken to implement CE (Q2); providing forward-looking disclosures detailing future plans to develop CE (Q3); disclosing less generic details on CE (Q4); providing supplementary details on CE by cross-referencing disclosures to supplementary reports and other valid sources (Q5); investing resources in developing graphs, tables and other illustrations to present their CE adoption (Q6).

Impact on capitals

There is a significant difference between the impact of CE disclosures on natural capital and industry (H=10.147, p<0.01). Further, there is a strong positive trend between the impact on natural capital and industry (J=3.028, p<0.01). This indicates that the mining sector which consumes a large amount of non-renewable resources and has large physical infrastructure for operations, tends to impact natural capital more than service industries.

Research Question 2.2: Company Size.

Type of investment to developing or implementing a CE

There is a significant difference between research and development and company size (H= 8.901, $p<0.05$). This suggests that not all companies expend resources to develop innovative CE policies. As a result, it is expected that CE adoption across different company sizes is likely to differ.

Location of CE disclosure

There is a significant difference between CE disclosures in the directors' review of the business section and company size (H=21.612, $p<0.05$). There is also a strong upward trend between these disclosures and company size (J=2.947, $p<0.01$). This suggests that TCWG in larger companies tend to report more on CE adoption than smaller companies. TCWG may have a larger corporate responsibility to adopt sustainable practices and are held accountable for the social and environmental context in which the business operates. Hence, CE policies are reporting more frequently in this section.

There is no significant difference between disclosures in the key performance and value creation section and company size (H= 2.78, $p>0.10$). This is important to note as this suggests that across the market capitalisation, the transition to CE tends to be seen as a value creation process. This supports the need for the transition to a CE (Ghența & Matei, 2018).

Quality of CE reporting

There is a significant difference between the total quality score and company size (H=12.746, $p<0.05$). There is also a strong upward trend between total quality score and company size (J=2.270, $p<0.05$). This suggest that larger companies tend to provide higher quality CE reporting than smaller companies. By inspection of Table 11, there is a significant difference between Q1, Q2, Q3 and Q4, and company size. There is also a strong upward trend between the indicators and company size. This suggests that larger companies tend to provide higher reporting quality than smaller companies through expending monetary resources to measure their CE adoption (Q1); providing actual details on actions or steps taken to implement CE (Q2); providing forward-looking disclosures detailing future plans to develop CE (Q3); disclosing fewer generic details on CE (Q4).

Impact on capitals

There is a significant difference between the impact of CE on intellectual capital and company size (H= 11.858, $p<0.01$). There is also a slight upward trend between this impact and company

size (H=1.902, p<0.10). This suggests that larger companies tend to engage more in innovation, automation and creative designs when adopting CE. Larger companies may have more access to financial resources and expertise to develop such policies.

There is also a significant difference between the impact on social and relationship and human capital, and company size (H= 9.361, p<0.05). There is also a strong upward trend in these disclosures and company size (J= 1.981, p<0.05). Larger companies tend to have a bigger human capital pool and a heavier impact on society. Hence, their CE adoption is likely to impact these capitals more than smaller companies.

Research Question 2.3: Financial year

Type of investment to developing or implementing a CE

There is a significant difference between the use of financial resources and year (H=17.935, p<0.01). There is also a strong upward trend between these disclosures and year (J=3.968, p<0.01). This suggests that from 2018 to 2020, companies are expending more monetary resources to drive their CE policy. This is positive to note as it suggests that CE adoption is becoming increasingly important to organisations.

There is a significant difference between the use of partnerships with NGOs, research groups or thinks tanks and year (H=16.168, p<0.01). There is also a strong upward trend between these disclosures and year (J=2.533, p<0.01). In addition, there is a significant difference between the use of research and development and year (H= 16.526, p<0.01). There is also a strong upward trend between these disclosures and year (J= 4.149, p<0.01). Overall, these results suggests that from 2018 to 2020, companies tend to engage more with third parties for research and development of CE policies. The use of such resources to implement a CE will increasingly drive innovation and creative design.

Location of CE disclosure

There is a significant difference between disclosures located in directors review of the business section and year (H= 11.639, p<0.05). There is also a strong upward trend between these disclosures and year (J=3.005, p<0.05). This suggests that from 2018 to 2020, TCWG have been reporting more on CE adoption. This is positive as it suggests that organisations are taking accountability and placing importance on sustainable business practices.

There is a significant difference between disclosures located in the overview of business section and year (H= 13.149, p<0.05). There is also a strong upward trend between these disclosures and year (J= 2.583, p<0.01). This suggests that since 2018, companies view both financial and

non-financial information as part of their organisational image. There is increasingly more disclosure on CE being presented as part of the companies' overall operations.

There is no significant difference between disclosures in the key performance and value creation section and year (H= 0.35, p>0.10). This is important to note as this suggests that from 2018 to 2020, the transition to CE tends to be seen as a value creation process. This supports the need for the transition to a CE(Ghența & Matei, 2018).

Quality of CE reporting

There is a significant difference between the total quality score and year (H= 13.867, p<0.05). There is also a strong upward trend between the score and year (J=3.079, p<0.01). This suggests that the quality of CE reporting has increased from 2018 to 2020. From Table 11, there is a significant difference between Q1, Q2, Q3, Q4 and Q5, and year. There is a strong upward trend for the indicators and year. This suggests that from 2018 to 2020, companies have provided higher quality reporting by: expending monetary resources to measure their CE adoption (Q1); providing actual details on actions or steps taken to implement CE (Q2); providing forward-looking disclosures detailing future plans to develop CE (Q3); disclosing fewer generic details on CE (Q4); providing supplementary details on CE by cross-referencing disclosures to supplementary reports and other valid sources (Q5).

Impact on capitals

There is a significant difference between the year and the impact on: financial capital (H= 10.759, p<0.05); manufactured capital (H=5.607, p<0.10); natural capital (H= 10.585, p<0.01); intellectual capital (H= 12.609, p<0.01); social and relationship and human capital (H=19.558, p<0.01). There is a strong upward trend between year and the impact on: financial capital (J=3.228, p<0.01); manufactured capital (J=2.381, p<0.05); natural capital (J=3.026, p<0.01); intellectual capital (J=3.579, p<0.01); social and relationship and human capital (J=3.071, p<0.01). Overall, these results suggests that from 2018 to 2020, companies tend to increasingly impact all six capitals. There is increasingly integration of financial and non – financial information in integrated reports. This supports the link that CE has direct links to IR, value creation and the six capitals.

6. Conclusion and future areas of research.

6.1: Summary of key findings

CE disclosures are becoming more prominent in South Africa (RQ1). Companies are increasingly seeing the system as practical means to achieve sustainable goals and meet the objectives of IR. Across all industries and company size, CE disclosures tend to be concentrated in the key performance and value creation section. This shows that companies view CE an integral part of creating value for the organisation, shareholders, and other stakeholders.

Given the uncertainty and absence of a standardised system on how to achieve a CE (Muradin & Foltynowicz, 2019) and various limiting factors (see Section 2.5) , companies are making the transition through significant investment in research and development. There are also prominent partnerships with NGOs, research groups and think tanks. Many disclosures are found in the strategy, risk analysis and business model section. As business models vary across companies it results in certain disclosures on CE being prioritised over others and of different reporting quality.

IR is founded on the integration of the six capitals, companies tend to report on these capitals based on their value creation, preservation, and deterioration process (IIRC, 2021). Consequently, certain capitals are emphasised more through better reporting quality. CE practices tend to impact all six capitals. Instances, whereby organisations aim to prioritise all capitals equally and balance the economy and environment through their operations, are indicative of a transition to a CE model.

The level of CE disclosures across different industry (RQ 2.1), company size (RQ2.2) and year (RQ2.3) differs. Table 12 summarises the significant differences.

Table 12: Summary of significant differences			
Significant difference	**Industry**	**Company Size**	**Year**
Financial resources allocated			✓
Partnerships with NGOs, research groups, and thin tanks			✓
Research and Development	✓	✓	
Strategy, risk analysis and business model section	✓		
Directors' review of business section	✓	✓	✓
Overview of business section			✓
Corporate governance subsection	✓		
Total quality score	✓	✓	✓
Impact on natural capital	✓		✓
Impact on intellectual capital		✓	✓
Impact on social and relationships and human capital		✓	✓
Impact on financial capital			✓
Impact on manufactured capital			✓

Companies that have a higher environmental impact such as the mining industry tend to integrate sustainability in their operations and engage research and development to find innovative CE models.

The CE transition for mining is more integrated in the industry's business model and provides more useful details to shareholders by high reporting quality. The service-driven industry is also investing in sustainable practices and integrating the six capitals into their operations. This indicates an overall CE transition in effect. The reporting quality of this industry tends to be lower than the mining industry as the service industry does not have a large environmental impact.

TCWG in the mining industry tends to execute their social responsibility better than TCWG in the service industry as significant disclosures are found in directors' review and corporate governance sections. This suggests that TCWG use CE reporting as means to communicate their value creation process to stakeholders.

Larger companies tend to have better access to research and development. As a result, the CE transition does differ across market capitalisation. However, smaller companies are also making investment in CE and integrating the six capitals into their business models. TCWG of larger companies tend to report more on CE, and overall quality of reporting is better than that of smaller companies. Smaller companies tend not to impact intellectual capital, and social and relationship and human capital as significantly as larger companies.

CE transition is improving throughout the years. The total count and total quality score have improved from 2018-2020. Companies are expending more financial resources and engaging more with research groups to drive their CE transition. TCWG are increasingly communicating and taking accountability for CE actions. Overall, this indicates an improving value creation process. The impact on all six capitals has significant differences which shows companies are integrating six capitals and aiming to balance both financial and non-financial value.

6.2: Contribution of findings.

The exploratory nature of the study has found that the CE disclosures are prominent and are impacted by industry, company size and year. The study has given insight into how South African companies engage in sustainable practices, report on such practices, and realise the underlying value of sustainability.

The disclosure checklist developed is a sound theoretical tool used to evaluate the link between IR and CE. CE is seen as a specialised are of sustainability and is often misunderstood to encompass mere recycling, reducing, and reusing. However, the disclosure checklist has identified several business models and specific content elements to disregard

this misconception. This will provide a practical guide on the actions needed to achieve CE and sustainability practices such as SGDs, IR, and GRI guidelines.

The quality of CE reporting was evaluated, and examples of both high-quality and low-quality reporting were provided. This is a significant contribution as companies can maximise their value creation process by communicating useful, relevant, and reliable information to stakeholders. Organisations which have poor reporting score can use the quality indicators to improve their sustainability reporting and achieve the fundamental concepts of IR.

From a scholarly position, the concept of a CE is still slowly developing, and real literature is only starting to emerge. This results in the need for a deeper analysis of the concept of the CE (Korhonen et al., 2018). Further to this, there is a lack of frameworks for supporting 'business model innovations' in companies in the context of a CE (Antikainen & Valkokari, 2016). Consequently, this study contributed to assess the practical implementation of CE in South Africa.

6.3: Limitations and future research.

The small sample size resulted in 3 industries. The number of companies in each industry was also small. Hence, a generalization of CE adoption per industry in not conclusive. Future research should expand the sample size to include more industries and increase the number of companies in each category. This will provide more clarity on the level of CE adoption.

The study focused on companies with high market capitalisation only, future research should analyse companies with lower market capitalisation to give a better indication of how JSE listed entities are driving the transition to a CE. Analysis of should be conducted prior to 2018 to gain a holistic sense of CE emergence in South Africa.

The research inherently focused on companies that did not prioritise intellectual capital as the business model of the respective companies did not see significant value in the capital. Consequently, the impact of investments on intellectual capital could not be sufficiently analysed through this research. Companies which operate significantly with patents, copyrights, licenses, or other forms of intellectual capital should be researched in the future to assess how such business models drive the transition to CE and the related implications on their integrated reporting process.

The integrated report, the primary report available to stakeholders, was the only report analysed and references to supplementary reports were noted. However, supplementary reports such as sustainability reports are likely to have more information on how the company integrates the six capitals and drives the transition to a closed-loop economy. Future research

should focus on analysing such reports to give a better indication of the quality of a company's reporting and how value creation is achieved.

The total quality score has identified several quality indicators. However, the indicators are not exhaustive. Future research can expand on the quality indicators by assessing if assurance over integrated reports increases the quality of disclosures and identifying other indicators.

CE is often difficult to implement because it is not well-standardised. Future research should investigate the role of a Chief Value Officer to introduce and implement sustainable business policies. There is value for organisations and stakeholders which can be realised through practical implementation of sustainable practices.

7. Appendix A and B

Appendix A is the key used in Table 9 (see Section 5.1) and Tables 10 and 11 (see Section 5.2). Appendix b is the definition of the six capitals (see Section 2.4).

Appendix A: Key descriptive statistics and non – parametric tests		
THEME	**THEME INDICATOR**	**KEY**
TYPE OF INVESTMENT TO DEVELOPING CE	Financial resource	D1
	Funding or grants	D2
	Partnerships with NGOs, research groups or think tanks	D3
	Research and development	D4
LOCATION OF DISCLOSURE	Strategy and risk analysis and business model section	L1
	Key performance and value creation section	L2
	Director's review of the business section	L3
	Overview of the business section	L4
	Financial statements section	L5
	Social and environmental subsection	L6
	Corporate governance subsection	L7
QUALITY OF DISCLOSURE	Qualitative, quantitative, or monetary	Q1
	Policy level or action specific	Q2
	Historic or forward – looking	Q3
	Generic or context – specific	Q4
	Cross references and hyperlinks to valid sources	Q5
	Tabulated or graphs	Q6
	Total sum of quality indicators	Q7
IMPACT OF DISCLOSURES ON SIX CAPITALS	Financial capital	C1
	Manufactured capital	C2
	Natural capital	C3
	Intellectual capital	C4
	Social and relationship and Human capital	C5
DETERMINANTS AND SHADING	Year	Y1
	Industry	Y2
	Market capitalisation per quartile	Y3
		Strong correlation (greater than 0.7)
		Moderately strong correlation (between 0.4 and 0.7)
		Kendall's tau_b test result
		Spearman test result

Appendix B – Definition of Capitals	
Capital	**Definition**
Financial capital	The pool of funds available to an organization or obtained through financing.
Manufactured capital	Physical objects such as equipment, buildings, or infrastructure such water treatment plants, roads, and ports.
Intellectual capital	Intangible objects available to the organization such as intellectual property (patents, copyrights, licences) or organizational capital (procedures and protocols, systems, and tacit knowledge)
Natural capital	Renewable and non – renewable environmental resources such as air, water, land, and biodiversity.
Human capital	Human skills, competencies, capabilities, motivation to innovate, lead and execute the organisational strategy.
Social and relationships capital	The organisation's relationship and engagement with communities, stakeholders, and other broader networks.
Adapted from IIRC (2021), pg19.	

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