Assessing the corporate sustainability performance of organizational business models.

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ABSTRACT

This study contends that Enterprises[1] must view business through the lens of humanity; shifting from a siloed '*Business as Usual*' approach to creatively leveraging opportunities by encouraging the development of a global collective vision of best practices and strategy inspiring Enterprises to strive to thrive. Employing a thematic analysis of the emerging literature and case studies from the past fifteen years, this study aims to develop a framework for the development of a ***Sustainability Performance Scorecard*** which transparently ranks the corporate sustainability performance of Enterprises alongside their strategy or business model. The Sustainability Performance Scorecard encourages business leaders to compete with one another and individuals to reward Enterprises that choose to *do good to do well* for the prosperity of all humankind.

Keywords: corporate sustainability performance, business models, business strategy, innovation, sustainability performance scorecard, context-based sustainability.

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[1] Authors use a range of terms interchangeably, when referring to the entity under discussion in their studies. These include: company, institution, organization, corporation, business, firm and enterprise. Wherever possible, this study standardizes on the word 'Enterprise(s)' to mean the entity itself.

INTRODUCTION

Planet Earth needs a sustainable strategy; if humanity is to survive and endure for the long term. Business and governments alike have been aiding its demise (O'Neill, Dietz, & Jones, 2010; Upward & Jones, 2016). This study contends that business models - representing how a business captures and creates value (Teece, 2017) - may be our best source of redress. Whilst, for example, many of the world's major corporations have been the most significant contributors to humanity's escalating carbon emissions (Heede, 2014; Mark W. McElroy & Thomas, 2015; Najam et al., 2000; Robèrt & Broman, 2017; UN Environmental Program, 2015b), they are concurrently presented as the best agents to respond to climate change (Garnaut, 2008; Stern, 2007).

Born out of the internet revolution and facilitated by advances in technology, successful business models represent a better way of doing business, with even local disruptions having global repercussions (Upward & Jones, 2016; Vladimirova, 2016). "*A company didn't need a strategy, or a special competence, or even any customers– all it needed was a Web-based business model that promised wild profits in some distant, ill-defined future*" explains Magretta (2002). Examples such as Uber, AirBnB, Amazon and Facebook and other '*smart apps'* (Muûls, 2017; Webster, 2015) are all connecting customers with suppliers, in direct, personalized, efficient, less costly ways with a reduced carbon footprint. Another example, common in automotive, furniture and consumer goods involves competitors within a sector collaborating to tackle a common problem (Ashoka, 2015) or where cross-sector allied industries join forces to re-engineer their raw material flows to make better use of by-products and reducing waste (Vladimirova, 2016, 2017).

Sustainability is the *ability to sustain for the long-term* and is therefore essential to our success and survival as a species (G. I. Broman & Robèrt, 2017; Brundtland, 1987; UN Environmental Program, 2014). Climate scientists argue that the current environmental changes faced by society are unprecedented for our species, and should we maintain our current course into the future, it is likely to be incompatible with human civilization (New, Liverman, Schroeder, & Anderson, 2011). For Enterprises and economies to be managed within these limits or planetary boundaries (Raworth, 2012; Robèrt, Broman, & Basile, 2013) requires them to be part of the solution. By publicly warning Enterprises and consumers of businesses' impacts on social and environmental value forms (***Figure 2***), Enterprises are compelled to take *immediate* action towards achieving

sustainability (European Academies Science Advisory Council EASAC, 2016; Webster, 2015; Wright & Nyberg, 2017).

PURPOSE OF STUDY

This conceptual exploratory study identifies the key factors in developing a theoretical framework used to formulate the corporate strategy, and report and measure the sustainability impact of business models on sustainable business success by way of a public sustainability performance scorecard. Boons, Montalvo, Quist, and Wagner (2013) argue that sustainable development requires radical and systemic innovations and that such innovations can be more effectively created and studied when building on the concept of business models thus providing Enterprises with a holistic framework to envision and implement a sustainable business innovation strategy.

LITERATURE REVIEW

Conceptual Framework, Business Models and Sustainability

Building on sustainable business model frameworks and sustainability performance measurement and based on an extensive review of the prevailing literature, this study conceptually shows how innovation at the business model level drives a sustainable business strategy (***Figure 1***). This short paper will concentrate on the Sustainability (Performance) Indicators and associated (Sustainable)

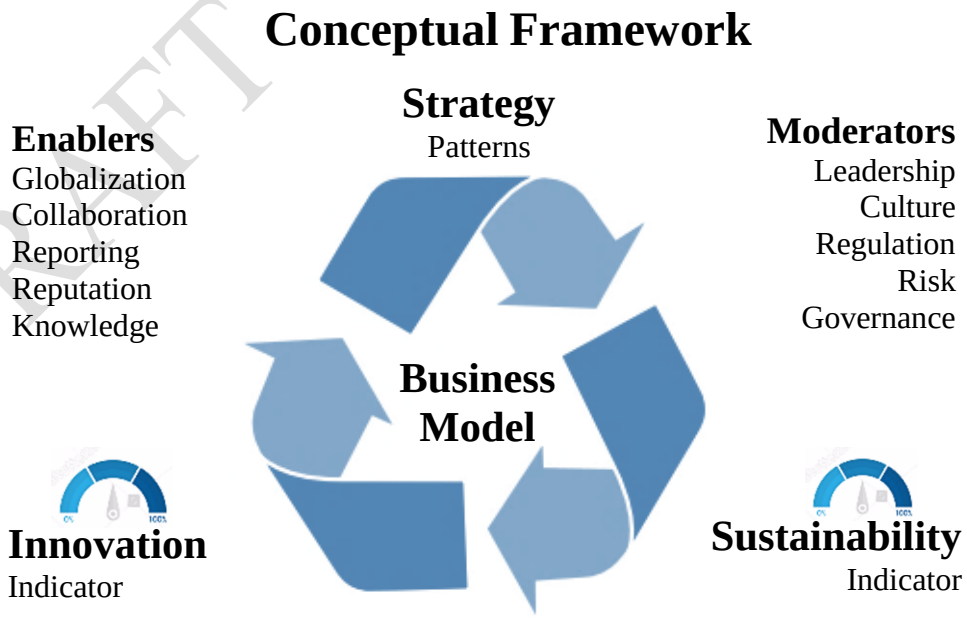

Figure 1. Conceptual Framework for this study.

Business Model patterns leading to a successful business strategy. Enablers and moderators will not form part of the discussion of this paper.

Complex, trans-disciplinary, fragmented and wicked

The study of new and sustainable business models represent a complex and trans-disciplinary field of sustainability research (von Bertalanffy, 1968; Williams, Kennedy, Philipp, & Whiteman, 2017) within the broader domain of industrial ecology (Ehrenfeld, 2004). Still fragmented and lacking an integrated and unified approach (Adams, Jeanrenaud, Bessant, & Overy, 2015; Foss & Saebi, 2016), its recognition is growing (Lüdeke-Freund & Dembek, 2017), as it is a major catalyst in transitioning Enterprises from the linear to the circular economy (Geissdoerfer et al., 2017).

Corporate sustainability is often challenged by difficult to resolve, *"wicked problems"* (Breuer & Lüdeke-Freund, 2017). For example, Wright and Nyberg (2017) identify corporations as central to the characterization of climate change as a "*wicked*" (Rittel & Webber, 1973; Wijen, 2014) or even a "*super wicked*" problem (Lazarus, 2008; Levin, Cashore, Bernstein, & Auld, 2012). Lying at the crossroads of business model innovation and corporate sustainability, this study proposes a business model for sustainability framework linking (sustainable) business models to science-based and context-based sustainability performance measurement and management, thereby pro-actively encouraging Enterprises to innovate for success.

What are Business Models and Business Model Innovation

Teece (2017) describes the concept of a business model as a framework that articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers. The business model concept provides a link between the individual Enterprise and the larger production and consumption system in which it operates (Boons et al., 2013). Business models are the conceptual design of organizational structures to enact an opportunity (Amit & Zott, 2012) and most often found to be the single best source of competitive advantage (Boons & Lüdeke-Freund, 2013; Breiby & Wanberg, 2011; Kiron et al., 2017; Pansera & Randles, 2013; Prasad & Junni, 2017; Varadarajan, 2017). Furthermore, Amit and Zott (2012) define business model innovation as designing a modified or new activity system, by (re)combining the existing resources of an Enterprise and its partners that does not require significant investments in research and development.

Business Model Innovation for Sustainability and Business Cases

Innovation for sustainability translates business models into business model innovation (Baldassarre, Calabretta, Bocken, & Jaskiewicz, 2017; Chesbrough & Rosenbloom, 2002) for sustainability (Morioka, Evans, & Carvalho, 2016; Rauter, Jonker, & Baumgartner, 2017) or more succinctly (business model) Innovation for Sustainability (Pansera & Randles, 2013). It can be said that aligning interests, thinking systemically, and purposely addressing environmental and societal needs are crucial for the development and management of business model for sustainability (N. Bocken, Short, Rana, & Evans, 2013; N. M. P. Bocken, Short, Rana, & Evans, 2014; Lüdeke-Freund et al., 2016; Stubbs & Cocklin, 2008).

A business model for sustainability allows a company to pursue corporate sustainability and shared value through the deliberate creation of business cases based on the whole business eco-system (Lüdeke-Freund et al., 2016). A business model for sustainability helps a company to improve the effectiveness and efficiency of its business activities in the spheres of the natural environment, society, and economy, and to profit from these activities (Schaltegger et al., 2012; Schaltegger, Hansen, & Lüdeke-Freund, 2016).

Business Models and the Sustainable Value Network

Traditionally, inter-organizational sustainability assessments and comparisons have taken place at the organizational or business unit level rather than at the business model level (Hansen & Schaltegger, 2014; Lüdeke-Freund, Freudenreich, Schaltegger, Saviuc, & Stock, 2017). The sustainable value network (Evans et al., 2017) (***Figure 3***) provides the backdrop and therefore defines the boundary and unit of analysis (Evans et al., 2017; Schaltegger et al., 2012; UN Environmental Program, 2015b) against which sustainable organizational performance should be assessed. Ultimately organizations can only be sustainable when the whole system of which they are part is sustainable (Jennings & Zandbergen, 1995; Stubbs & Cocklin, 2008).

Pfeffer and Salancik (2003) argue that organizations are not self-contained, but rather must embrace a contingency approach to management and consider the effect of globalization of business, rapid technological and product innovation, product and customer diversity and dealing with variations in local, state, and federal laws and regulations among others and adapt their organizational structures, managerial practices, communication systems, hiring and training

methods, and products or services to differing cultural values, expectations, and preferences to be most effective in different environments (Ashton et al 1995).

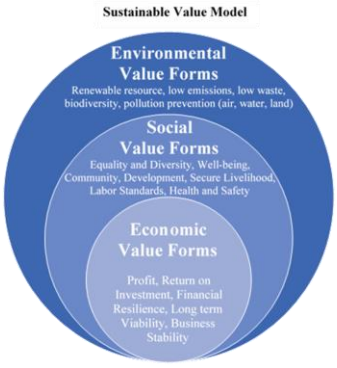

Figure 2. Sustainable Value Model.

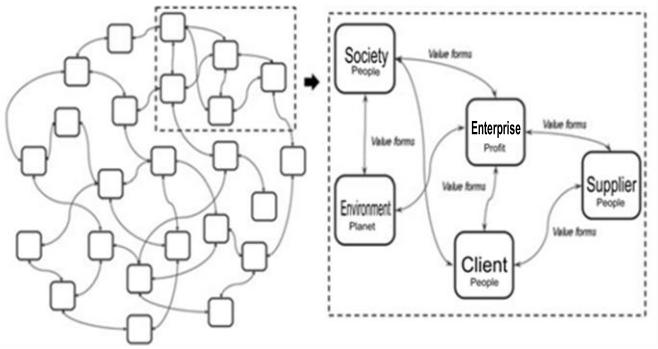

Figure 3. Sustainable Value Network.

Circular Economy and Sustainability

Organizations engage in activities which have as their logical conclusion adjustments to the environment (Hawley, 1959) and can survive only to the extent that they can seize the opportunity and develop the strategy to acquire, maintain and transform these resources (Pfeffer & Salancik, 2003) for the greater good. The circular economy promises to de-link prosperity from resource consumption growth (European Academies Science Advisory Council EASAC, 2016), going beyond incremental efficiency gains to deliver transformative change (Ellen McArthur Foundation, 2015; Preston, 2012) by – much alike in the natural world – closing the loop on energy and material flows (Antikainen, Aminoff, Kettunen, Sundqvist-Andberg, & Paloheimo, 2017; Haas, Krausmann, Wiedenhofer, & Heinz, 2015).

Business model innovation and Business Strategy

Business strategy is identified as *actionable business patterns* (Mintzberg, 2007). Findings thus far show deficiencies in linking strategic performance measurement with strategic business patterns, vis-à-vis sustainable business models (N. M. P. Bocken et al., 2014; Lüdeke-Freund, Carroux, Joyce, Massa, & Breuer, 2018; Remane, Hanelt, Tesch, & Kolbe, 2017), and thus business models for sustainability (Boons & Lüdeke-Freund, 2013). As illustrated by Michael E. Porter (1996), strategy is as much about '*what to do*' as it is about '*what not to do*'.

Bock, Opsahl, George, and Gann (2012) study shows that whilst the positive effect of creative culture is confirmed, partner reliance reduces strategic flexibility during business model

innovation as structural change is disaggregated into efforts that either focus managerial attention on core activities or reconfigure existing activities. Leaders perceive that structural flexibility requires structural simplification while retaining control of non-core functions, however find that the relative magnitude of business model innovation effort moderates the effect of reconfiguration on strategic flexibility. Moreover, as sustainability risks are business risks (Hansen, Grosse-Dunker, & Reichwald, 2009), business model innovation is seen as a risk minimization technique (Carol-Ann Tetrault & Sujit, 2013; Girotra & Netessine, 2014).

Business Strategy leading to Sustainable Business Model

A Sustainable Business Model is one that treats Nature as a stakeholder and takes a systemic view of sustainability (Stubbs & Cocklin, 2008). It does so by emphasizing the importance of systems-level thinking (Amit & Zott, 2012) which requires the adoption of a multidisciplinary systemic lens capable of appreciating the interconnectivity of economic, political, social and ecological issues across temporal and spatial dimensions (Williams et al., 2017). This includes a discussion on behavioural change, leadership, innovation, industrial ecology, social-ecological systems, transitions management, paradigm shifts and sustainability education (Williams et al., 2017). Thus, the strategy adopted by a successful sustainable business is not only profit-normative but also positively socially and environmentally driven and impactful (Schaltegger, Bennett, & Burritt, 2006; Schaltegger & Burritt, 2010).

Correlation between innovation and performance

Studies show that business leaders and innovators see innovation as the key to success (Breiby & Wanberg, 2011; Kiron, Kruschwitz, Haanaes, Reeves, & Goh, 2013; Morioka et al., 2016; Nidumolu, Prahalad, & Rangaswami, 2009; Pansera & Randles, 2013; Varadarajan, 2017), yet do not know where to start when innovating and implementing (sustainable) business models for sustainability (Adams et al., 2015; Breuer & Lüdeke-Freund, 2017; Kurucz, Colbert, Lüdeke-Freund, Upward, & Willard, 2017; Lüdeke-Freund et al., 2017; Rauter et al., 2017; Schaltegger, Lüdeke-Freund, & Hansen, 2016). Several other studies indicate a positive correlation between innovation, competitiveness and addressing ESG (Environment, Social and Governance) factors and corporate sustainability performance (including profitability) (Baldassarre et al., 2017; N. Bocken, 2014; Friede, Busch, & Bassen, 2015; Lindgardt, Reeves, Stalk, & Deimler, 2009; Najam et al., 2000; Nidumolu et al., 2009; Willard, 2009).

An R. G. Eccles, Ioannou, and Serafeim (2014) study found that in '*High Sustainability*' companies, the board of directors are more likely to be formally responsible for sustainability and top executive compensation incentives are more likely to be a function of sustainability metrics. Moreover, '*High Sustainability*' companies are more likely to have established processes for stakeholder engagement, to be more long-term oriented, and to exhibit higher measurement and disclosure of non-financial information, as well as significantly outperform their counterparts over the long-term (Bailey & Eccles, 2018), both in terms of stock market as well as accounting performance. This re-enforces the fact that implementing corporate sustainability measures are not the burden on the bottom line that many executives believe it to be, but rather represents a competitive opportunity to excel (Adams, Jeanrenaud, Bessant, Overy, & Denyer, 2012; Ball, 2006; Nidumolu et al., 2009) (Kiron et al., 2017; Varadarajan, 2017).

Disruptive Business Model Innovation

Massa and Tucci (2013) show how (new) business models are a source of innovation and competitive advantage. Several studies show that business model innovation is the most aggressive and impactful form of innovation and a key source of sustained value creation (Ball, 2006; Breiby & Wanberg, 2011). Disruptive innovation drives the development of new products and technologies, processes and supply chains, creative business models and value delivery paths and processes, leveraging on the shared resources at hand, improving effectiveness and efficiency of outcomes whilst reducing waste, environmental destruction and the squandering of resources (Christensen, 2005; Vecchiato, 2015).

Bocken et al. (2013) contend that business model redesign may be a key to radically improving sustainable performance to create greater environmental and social value while delivering economic sustainability (Michael E Porter & Kramer, 2011; Stubbs & Cocklin, 2008; Yunus, Moingeon, & Lehmann-Ortega, 2010). This study will show that *how* sustainable business models lead to enhanced competitiveness and contribute to sustainable development is a matter of business model design and systematic measurement and management (Bansal & Song, 2017; Schaltegger et al., 2012) whereby the business model design process is seen as one of configuring building-blocks in novel ways rather than a journey of discovery (Beckett, 2016).

Business Models key issues

Descriptive and Categorization tools

Several descriptive tools like the flourishing business canvas (Upward, 2013) and sustainable business model classification taxonomies exist (Lüdeke-Freund et al., 2018); together with promising approaches to assessing and contributing to sustainability through the SUST-BMA method (Lüdeke-Freund et al., 2017) for gauging the effect of business model innovation on strategic flexibility (Clauss, 2016).

A common, useful, easy to use and well accepted tool for business model evaluation, is the business model canvas by Osterwalder and Pigneur (2010), however this does not adequately account for environmental and social concerns. The triple layered business model canvas by Joyce and Paquin (2016) addresses this concern by developing a business model canvas for each economic, social and environmental layer, whereas the comprehensive strongly-sustainable flourishing business canvas tool (Upward & Jones, 2016) integrates all layers into the one approach.

For categorization purposes, N. M. P. Bocken et al. (2014) have developed a base set of eight archetypes. Additionally, Remane et al. (2017) and Lüdeke-Freund et al. (2018) show that the creation of an emerging pattern database is a complementary tool in support of systematic business model innovation helping to both identify and classify sustainable business model patterns in the context of sustainability and thus help managers or business model innovators transform business models by finding solutions to specific sustainability challenges (Carroux, 2017) such as in the case of food production and wastage (Ohnesorge, 2017), circular economy (Lüdeke-Freund, Gold, & Bocken, 2018) or digital transformation (Braun, Hanelt, & Bohnsack, 2018).

Leading and lagging indicators

Several frameworks have been developed (Compass, 2015; Lüdeke-Freund et al., 2017; Obst, 2015) for capturing the indicators. The "*performance prism*" - proposed by Morioka et al. (2016) – is a comprehensive and integrative performance measurement framework for sustainable business models to measure performance using both leading and lagging indicators, and supports the identification of sustainability innovations across five performance dimensions: stakeholders' satisfaction, strategic drivers, business processes, capabilities and stakeholders' contributions.

Value captured and uncaptured

With sustainability becoming one of the key factors for long-term business success, business model innovation is a promising approach for improving sustainability. However, business models have largely been examined from the perspectives of value proposition, value capture, value creation and delivered. Yang, Evans, Vladimirova, and Rana (2017) proposes a new perspective to include "*value uncaptured*" for sustainable business model innovation and develops four forms: value surplus, value absence, value missed, and value destroyed.

Sustainability-oriented business model innovation that considers value captured and uncaptured, turns each factor into opportunities for success across all value forms (Yang, Vladimirova, & Evans, 2017), with the underlying framework addressing internal and external factors (Schumpeter, 1939), both known as well as yet unknown in assessing the effects of sustainability-oriented innovation and business models on corporate sustainability performance.

Corporate Sustainability Performance key issues

Materiality and metrics for sustainability measurement

Materiality concerns the material topics being addressed by an individual Enterprise. These topics vary and impact each Enterprise differently based on its industry, scope of operation and product or service offerings. Enterprises may choose to adopt its own set of metrics or use established ones such as IRIS provided by the Global Impact Investing Network to measure and manage resources within global thresholds and allocations using science-based targets (UN Global Compact, 2018). A review of 40,000 corporate responsibility reports between 2000-2014 shows that the proportion of companies referring to ecological limits in their corporate responsibility reports remains stable at just 5% (Bjørn, Bey, Georg, Røpke, & Hauschild, 2017). In another study on materiality, it was found that sustainability reports often fail to address the context, nor allow for clear guidelines on what material concerns should be included (UN Environmental Program, 2015b).

A 2016 study showed marked variation in the ways materiality was defined and developed, and in the material issues being identified by Enterprises (Jones, Comfort, & Hillier, 2016). A universal set of 36 material topics across the economic, social and environmental pillars of sustainability are provided by the UN partner the Global Reporting Initiative (2016). GRI provides a platform for Enterprises to publicly publish their corporate sustainability reports online, however does not veto

the same. It has therefore been argued that the GRI Standard Disclosure Database does not provide a complete, just or fair basis of comparison, often omitting thresholds and allocations within context (M. McElroy, 2017a). Several approaches have been suggested, such as Figge and Hahn (2005) sustainable value added method and Mark W. McElroy and Thomas (2015) Multi-capital Scorecard which aims to ensure fair and just allocations are being met based on minimum thresholds and maximum ceilings derived from science-based targets.

Tri-impact integrated reporting (<IR>)

Over the last decade 'integrated reporting' often denoted as <IR>, has been gaining momentum in spite of its largely voluntary nature (Lai et al., 2016; Sustainable Consumption and Production Branch UNEP Division of Technology Industry and Economics (DTIE), 2006) with several Enterprises self-publishing audited tri-impact integrated reports (R. Eccles, 2018) - seen as an effort towards good governance (Blasco & King, 2017) – and defining their "*materiality determination process*" and concurrently reporting on the same using congruent units and within context (Lai et al., 2016).

Delphine Gibassier, Michelle Rodrigue, and Arjaliès (2017) suggest that integrated reporting is probably one of the most disruptive innovations in the field of corporate reporting (De Villiers, Rinaldi, & Unerman, 2014; Implementing Integrated Reporting, 2015; Robertson & Samy, 2015; Simnett & Huggins, 2015) although empirical studies such as the ExxonMobil First Integrated Report (R. G. Eccles & Krzus, 2018) show that common concerns expressed by Enterprises including complexity, cost, and litigation risks are ill-founded. Instead, integrated reporting is a motivator for transparency in business conduct which has long been a primary engine of improvement and will remain critical as stakeholders across the world continue to advance the shared goals of the United Nations 2030 Agenda for Sustainable Development (2018).

Evidence suggests that corporate engagement in integrated reporting is not a matter of strategic legitimation (Lai et al., 2016) and that Enterprises use integrated reporting to describe strategic priorities and related actions and results (Lai et al., 2017). For instance, by providing a way to interpret what otherwise would be narratives in a meaningful way, integrated reporting could be employed by the industry led Task Force on Climate-Related Financial Disclosures (TCFD), to encourage better and more *consistent* reporting by standardizing on the format of corporate reports on emissions and on climate-related risks faced by businesses (Farnworth & Swanborough, 2017).

APPROACH and METHOD

Research Dimensions

The primary research question in this study uses a transformative lens (Mertens, 2007) to assess the corporate sustainability performance of an Enterprise at the business model level; noting that the unit of analysis (R. K. Yin, 2004) is the business model which extends beyond the Enterprise to encompass all three value forms (***Figure 2***). Employing a rationalist worldview, illustrated by case studies, with an emphasis on science-based targets and context-based sustainability this conceptual exploratory study reviews the literature over the past fifteen years (Foss & Saebi, 2016), investigating the key areas of corporate sustainability performance (Searcy, 2011), business model innovation (Amit & Zott, 2012) and sustainable performance measurement with a view to building the theoretical model underscoring a successful sustainable business innovation strategy. An emergent qualitative thematic analysis (Lapadat, 2010) approach with grounded theory-building capabilities will be used to determine the elements underpinning a unified underlying theory or theoretical framework (***Table 1)***.

General Research Dimensions							
Worldview			**Approach**		**Other**		
Ontology	**Epistemology**	**Paradigm**	**Design**	**Framework/ Type**	**Logic**	**Outcome**	**Ethics**
Atheist Realist	Rationalist	Critical Realist	Thematic Analysis	Transformative Observational	Inductive / Abductive / Deductive	Cross-Sectional Basic Theoretical	Humanist

Table 1. General Research Dimensions for this study.

Thematic Analysis

The process of thematic analysis will allow for the identification of patterns or themes within the narrative of the corporate reports and literature without being tied to a specific epistemological or theoretical perspective (Moira Maguire & Delahunt, 2017), making replicable and valid inferences from texts as to the context of their use (Krippendorff & Bock, 2009). This analysis will identify and examine the underlying ideas, assumptions, and conceptualisations within the documents to make sense of the information contained therein, by more than simply summarizing, but by looking beyond the semantic meaning of what has been said for latent meaning (Erlingsson & Brysiewicz, 2017). This study will combine both a top-down or theoretical thematic analysis that is driven by the specific research question and/or the researcher's focus, and a bottom-up or inductive approach that is more driven by the secondary data itself (Clarke & Braun, 2013).

Rigour is achieved through method triangulation (Cameron & Miller, 2011) and by integrating a variety of types of study employing a mix of methodological approaches (Bowen, 2009) (Tashakkori & Teddlie, 2010). The capture of different dimensions of the same phenomenon (Bryman, 2016) and cross-validation of data provides triangulation (Morse, 1991). The use of multiple secondary data sources also will aid in data triangulation and verification and improve the rigour of the research (Denzin & Lincoln, 2017; Patton, 2002; R. Yin, 2013). Multiple data sources coupled with the maintenance of the chain of evidence provides construct validity (Healy & Perry, 2000; Huberman & Miles, 2002) thus ensuring the measuring procedure represents the intended concept (Neuendorf & Kumar, 2006) and quality, whereby the expected outcome is true (Krippendorff & Bock, 2009). Lastly, thematic analysis is about sense making, based on more than just a few anecdotal examples, and therefore requires coherence and consistency between claims and data as well as explaining what theoretical presumptions have been made (Javadi & Zarea, 2016).

Data Collection, Analysis and Interpretation

Secondary case data was collected from publicly available online resources, including official Enterprise websites and repositories (***Table 3***) combined with a comprehensive review of the literature (Bryman, 2016). During the process of discovery, the Researcher used an iterative coding and categorization technique using NVivo software to reveal and interpret emergent themes using thick descriptions (Geertz, 1973).

RESULTS and DISCUSSION

Issues and Key Factors

Organizations do not operate in a vacuum and in practice are affected by a plethora of issues including regulatory approvals, risk assessment, internal business processes and the law of the respective country in which they operate among others (Pfeffer & Salancik, 2003; Yadava & Sinha, 2015) (refer to ***Figure 1***). A list of key factors has been identified in ***Table 2***, to be further analysed and developed as part of this study.

Factor	Abbreviation	Notable Author(s)
Trans-disciplinary	Trans-disciplinary **(TD)**	(Lüdeke-Freund, Massa, Bocken, Brent, & Musango, 2016)
Finite resources	Planetary Boundaries **(PB)**	(Raworth, 2012; Rockstrom, 2009; Steffen et al., 2015)
Complex wicked problems	Integrated, complex, wicked **(WICKED)**	(Breuer & Lüdeke-Freund, 2017; Lazarus, 2008)
Boundary/Unit of Analysis	Unit of Analysis **(UOA)**	(Evans et al., 2017; Schaltegger, Freund, & Hansen, 2012; UN Environmental Program, 2015b)
Materiality/Topics	Materiality **(Material Topic)**	(R. G. Eccles, 2012; Lai, Melloni, & Stacchezzini, 2017; UN Environmental Program, 2015a)
Integrated reporting (<IR>)/ Tri-impact	Integrated Report **<IR>**	(R. G. Eccles & Krzus, 2018; Ghisellini, Cialani, & Ulgiati, 2016; Lai, Melloni, & Stacchezzini, 2016; Steffen et al., 2015)
Science evidence-based targets/ Congruent units	Science-Based Targets **(SBT)**	(Lydenberg, Rogers, & Wood, 2010; UN Environmental Program, 2015b)
Context-based sustainability	Context Based Sustainability **(CBS)**	(R. G. Eccles & Krzus, 2018; Mark W. McElroy & Thomas, 2015)
Strong vs weak sustainability/ Greenwashing	***Strong*** vs ***Weak***	(Najam, Bergesen, Parmann, & Thommessen, 2000)
Values-based sustainability	Values-Based Sustainability **(VBS)**	(Breuer & Lüdeke-Freund, 2017; Lüdeke-Freund et al., 2016)
Multi-capital	Multi-Capital Sustainability **(MCS)**	(Mark W. McElroy & Thomas, 2015)
Linear to Circular Economy	Circular Economy **(CE)**	(Geissdoerfer, Savaget, Bocken, & Hultink, 2017; Haanaes et al., 2011)

Table 2. List of common Factors addressed in this study and notable authors on the subject.

Planetary boundaries and strong sustainability

Being acutely aware to avoid '*weakly sustainable*' '*greenwashing*' initiatives (Najam et al., 2000) and recognizing that Earth's resources are finite (O'Neill et al., 2010; Rockstrom, 2009; Steffen et al., 2015), this conceptual study lays the foundation in assessing the normative '*strong sustainability*' triple bottom line (J. Elkington, 1997) of organizations within the realm of the sustainable value network (Breuer & Lüdeke-Freund, 2017; Evans et al., 2017) (***Figure 3***) at the business model level (Lüdeke-Freund et al., 2017); and in managing sustainable business models (SBMs) for the long-term survivability of the circular economy (Geissdoerfer et al., 2017) and thrive-ability of the human species (Malone et al., 2006; Schaltegger et al., 2012).

Any approach to ensuring the long-term survival of a business must embrace these fundamental limits; after all, *there is no sustainable business in an unsustainable world*. Assessing and reporting on these allocations through integrated reporting showing how they will go about achieving these targets forms part of the process (Bjørn et al., 2017). Raworth (2012) "*Donut*"

approach shows how we can share in planet Earth within these '*inner'* and '*outer'* limits. After all, one lost in the desert cannot trade carbon credits for the last gallon of water left on Earth (M. McElroy, 2017b).

Shortcomings and Opportunities

Empirical studies into corporate reporting (Haanaes et al., 2011) and an investigation of publicly available audited sustainability reports (GRI Standard Reports) shows shortcomings in relation to:

(i) identification of material topics (R. G. Eccles, 2012; Figge & Hahn, 2005; Lai et al., 2017; UN Environmental Program, 2015b) and values-based assessment (Breuer & Lüdeke-Freund, 2017; Schaltegger, Hansen, et al., 2016);

(ii) restricted unit of analysis (Evans et al., 2017; Schaltegger et al., 2012; UN Environmental Program, 2015b), typically extending only to the Enterprise itself omitting the value and delivery chain across all three value forms (***Figure 2***).

(iii) adoption of science-based targets (Lydenberg et al., 2010) in addressing the context-based sustainability "*context gap*" (R. G. Eccles & Krzus, 2018; Mark W. McElroy & Thomas, 2015);

(iv) lack of a multi-capital approach (Mark W McElroy, 2012; Mark W. McElroy & Thomas, 2015); particularly in cross-sector and trans-national comparisons (R. G. Eccles, 2012).

And revealed opportunities in relation to the following:

Proxy variables: It has been theorized that scaled proxy variables (Clauss, 2016) such as innovation breadth or novelty or transaction efficiency, extending beyond the Enterprise, industry or market (Gronum, Steen, & Verreynne, 2016) may be used to gauge sustainability performance where a parameter is not fully known (Schaltegger, Hörisch, & Freeman, 2017).

Back-casting: Useful in addressing '*wicked problems*' (*New Business Models Conference*, 2016) with no known resolve, this technique studies the complex dependencies within the realm of corporate sustainability providing (radical) exponential solutions necessary to meet targets (J. Elkington, 2018).

Repositories: Any corporate reporting on thresholds and allocations is only as good as the reliability and accuracy of the source data. Several open sources exist, yet comparisons are hard to evaluate. ***Table 3*** list some of the common open repositories, although there is a plethora of commercial providers which albeit claiming transparency of data source and openness of methodology, lack in respect of both aspects e.g.: RobecoSAM, Arabesque, FTSE Russell (ESG Ratings and data model - Integrating ESG into investments 2018).

Repository (Abbreviation)	Address (URL)
United Nations Environmental Program (UNEP)	http://www.unep.org/
Organisation for Economic Co-operation and Development (OECD)	http://www.oecd.org/
Carbon Disclosure Project (CDP)	https://www.cdp.net/
Global Reporting Initiative (GRI)	http://database.globalreporting.org/
GreenBiz Climate Counts (CC)	https://www.greenbiz.com/
CSRHub sustainability business intelligence database (CSRHub)	http://www.csrhub.com/
WikiRate (WR)	http://www.wikirate.org/

Table 3. List of online repositories of corporate sustainability data and reports.

Example studies that have made attempts at quantifying and/or linking sustainability with business models or strategy can be found in ***APPENDIX A: Example of similar initiatives and case studies.***

FINDINGS and CONTRIBUTION

Conceptual Framework

This study proposes to develop a framework linking business model innovation (Amit & Zott, 2012) and corporate sustainability performance (Searcy, 2011) of an Enterprise and thereby provide the basis for the deployment of tools to assist in identifying the (sustainable) business model and measuring and assessing corporate sustainability performance (Nicolăescu, Alpopi, & Zaharia, 2015), based on transparently available corporate reporting (e.g: GRI Standard Reports). This framework may be used to develop assessment tools showing how certain business models perform in relation to demonstrable sustainability performance indicators and ultimately facilitate the deployment of a successful sustainable business innovation strategy for the benefit of society and the environment at large.

Measuring what matters

Sustainable business models are business models that have undergone innovation in order to achieve sustainability within context by adopting science-based targets. Given that one can only manage what is measured, are we *measuring what matters* (Bansal & Song, 2017)? The outcome of this study aims to develop the framework providing the logic linking evaluation, categorization and measurement tools in support of assessing the impact of innovation of business models on corporate sustainability performance (Nicolăescu et al., 2015).

Sustainability Performance Scorecard

Bailey and Eccles (2018) argue for the mapping of material sustainability factors as identified by the Sustainability Accounting Standards Board to the objectives of the United Nations' Sustainable Development Goals. Similarly, the mapping of the GRI material topics onto the business model canvas (Lüdeke-Freund, Saviuc, Schaltegger, & Stock, 2015) or the Flourishing Business Canvas and use of tools such as the sustainability balanced scorecard (Hansen & Schaltegger, 2014) or the multi-capital scorecard (Mark W. McElroy & Thomas, 2015) alongside a robust database of sustainable business models (Lüdeke-Freund et al., 2018; Remane et al., 2017), can provide the basis for assessing which business models and associated sustainable performance indicators are more likely to lead to success (***Table 4***). Corporate leaders, governments and individuals alike may use this information to determine performance relative to others and encourage improvements from within as well as receive external pressure by consumers to abide by fair and just sustainability standards.

Integrated Report Generator Tool

Tri-impact integrated reporting (Lai et al., 2016; Lydenberg et al., 2010) provides the basis for the next leap towards dynamic Integrated Report Generator Tools bringing together some of the newer technologies in modern life, namely Artificial Intelligence and Big Data and Analytics (R. G. Eccles & Krzus, 2018). These technologies will ultimately only be as good as the underlying frameworks who dictate how data is to be assembled, reports constructed and as accurate and reliable as the source datasets are. This study serves to bridge this gap by contributing on the framework and tool sets necessary to inform these comparisons.

Sustainability Performance Scorecard (SPS)				
Enterprise	**Industry (ICB)**	**BMI/SBM pattern # [1..45]** 	**SPI score [0..1]** 	**Sustainable [Y|N]**
Enterprise A	Pharmaceutical	32	0.768	Y
Enterprise B	Technology	14	0.625	Y
Enterprise C	Household Goods	07	0.891	Y
Enterprise D	Consumer Goods	27	0.503	Y
Enterprise E	Health Care	45	1.106	N
Enterprise F	Financial Services	39	1.282	N
SPS: 0 <= score <= 1 means sustainable enterprise [Y], score > 1 means NOT a sustainable enterprise [N]. Context-based Sustainability Performance Scorecard (SPS) values are calculated based on figures from public sources covering a range of material topics.				

Table 4. Illustrative Sustainability Performance Scorecard developed for this study.

CONCLUSION and FUTURE

Current

Commissioned thirty years ago the Brundtland report (Brundtland, 1987; UN Environmental Program, 2014) foreshadows the emerging field of corporate sustainability requiring *"Sustainable development …that meets the needs of the present without compromising the ability of future generations to meet their own needs"* with planet Earth posing '*outer'* and '*inner'* limits to ensure a safe operating space for humankind. Past incremental resolutions to our systemic, complex wicked problems must give way to transformative solutions based on radical innovative business models if we are to avoid our existential crisis; with leaders committing their Enterprises to their fair and just share of doing good to do well. The proposed sustainability performance scorecard ranking Enterprises with associated business model or strategy provides the impetus to encourage competition and excellence among businesses aligning themselves with the United Nations Sustainable Development Goals and provides the knowhow for individual consumers to support those Enterprises who *do good to do well*.

Future

As tri-impact integrated reporting becomes the norm, the use of artificial intelligence and Big Data and Analytics will become common place. These technologies will allow for comprehensive and complex levels of analysis and automation (R. G. Eccles & Krzus, 2018), making online

sustainability performance score comparison and ranking easily available to all. Accuracy and reliability of data is paramount and studies like this one should encourage Enterprises to collect and report performance within context, based on science-based targets. In the longer term, one can envision the use of real-time data acquisition through environmental sensors (robots and drones) to transparently provide integrated real-time reporting on the global stage, allowing interactive display of Enterprise's sustainability performance, truly closing the loop on sustainability and the circular economy.

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APPENDIX A: Example of similar initiatives and case studies

The following example studies are largely based on transparent public information, although some have been augmented with (non-public) interview transcripts. Some focus on business model and others on corporate sustainability performance

(i) Climate Counts: Initially a standalone initiative producing a sustainable ranking "*Company Scorecard*" based on climate factors covering 2007-2012; when funding ceased it was absorbed by GreenBiz (Bellamente, 2011; Climate Counts, 2013). The report produced showcased a list of top 100 corporations worldwide together with their associated sustainability score based on public data pertaining to CO_2 emissions, however did not specify business model

(ii) BP Solar case study: Compiled by Lüdeke-Freund (2014) as part of his PhD dissertation, the author examines BP's changing business model as it made its foray into the field of Photo Voltaic cell production and distribution through BP Solar. Whilst the study did consider the sustainability of the business, it did not quantitively calculate the same.

(iii) ExxonMobil integrated report (R. G. Eccles & Krzus, 2018): is an individual study centered around ExxonMobil whereby the authors found that they were able to produce a complete integrated report in 40 hours based solely on publicly available sustainability and corporate reports. They did not analyze the business model

(iv) Impact investing in South East Asia: This study is based on primary research conducted with over 100 stakeholders, thorough a review of existing research, and aggregate analysis of 514 direct capital impact deals between 2007 and 2017. In developing the impact investment deal database, the research team examined publicly available information, evaluated investor websites, and reviewed press releases (2018).

(v) WikiRate (http://wikirate.org/): is an online repository attempting to transparently bring corporate empirical sustainability data to the public in a usable way. Data is sourced from various locations and entered by approved encoders following a set method. Whilst it does not specifically list corporate business model projects are currently underway to add this information (Theresa Heithaus, *personal communication*, 19th June 2018).

Additionally, the non-profit Reporting 3.0 consortium (Baue & Thurm, 2018) and the newly established World Business Alliance publisher of the "*Better Business, Better World*" report in Jan 2017 (Oppenheim et al., 2017) are working towards developing a network of like-minded individuals, academics, government bodies and corporates who are looking to seize the $12 trillion economic opportunity for business in pursuing sustainable and inclusive business models and the creation of 380 million jobs by 2030 (UN Global Compact, 2018).