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An Ontology for Strongly Sustainable Business Models: Defining an Enterprise Framework Compatible with Natural and Social Science

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Abstract

Business is increasingly employing sustainability practices, aiming to improve environmental and social responsibility while maintaining and improving profitability. For many organizations, profit-oriented business models are a major constraint impeding progress in sustainability. A formally defined ontology, a model definition, for profit-oriented business models has been employed globally for several years. However, no equivalent ontology is available in research or practice that enables the description of strongly sustainable business models, as validated by ecological economics and derived from natural, social, and system sciences. We present a framework of strongly sustainable business model propositions and principles as findings from a transdisciplinary review of the literature. A comparative analysis was performed between the framework and the Osterwalder profit-oriented ontology for business models. We introduce an ontology that enables the description of successful strongly sustainable business models that resolves weaknesses and includes functionally necessary relationships.

Keywords

Business Model; Strong Sustainability; Reflexive Modernization; Enterprise Ontology; Socially Desirable Value; Ecosystems, Corporate Social Responsibility; Business Strategy

Introduction

The following research presents an enterprise framework and an ontology for modelling enterprises aspiring to significant sustainability. This ontology is supported by precedent of business model research and praxis and by arguments from relevant literatures spanning multiple disciplines. Specifically, this research builds on the business model ontology (BMO; Osterwalder, 2004), an important contribution to the theory and practice of business models.

This research formulates a first step towards establishing a foundation for strongly sustainable business models (SSBMs), as a formative proposal based on scientific and grounded theoretical principles. The ontology is intended to be broadly applicable to the sustainability and societal concerns of human enterprises (including business), social and environmental scientists, and society and to be directly applicable as a reference model for formulating business models for enterprises consistent with scientific knowledge of sustainability and organizational management.

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We start this discussion by addressing the question “What is a *successful* sustainable business?” A conventional firm may measure economic performance (operating profit and corporate value) and claim the enterprise as successful. As any definition of success is normative, such firms are referred to here as “profit-normative.” When generally accepted sustainability metrics are not incorporated into accounting practices, decision making, or the business model, the enterprise cannot represent itself as a successful sustainable business (Schaltegger & Burritt, 2005). While progress has been made towards the definition of sustainability accounting measures (e.g., Global Initiative for Sustainability Ratings, 2015), the adoption of sustainability measures into business reporting remains primarily a feedback process, a measure of outputs. However, sustainability measures, and assessment systems such as the B Lab Impact Assessment (B Lab, 2008), measure the effects of business model decisions and are not design parameters for the formulation of a coherent sustainable business model. The business model is the definition by which an enterprise determines the appropriate inputs, resource flows, and value decisions and its role in ecosystems, whether natural, social, or economic. Sustainability measures are those indicators that assess the outputs and effects of business model decisions.

The following research presents an ontology for business models that establishes necessary and sufficient constructs to represent any enterprise’s business model that might be claimed as successfully sustainable. A successful sustainable firm is theoretically and practically complex so it should be expected that modelling such a complex real-world phenomenon will require the combination and integration of knowledge from multiple disciplines (Schaltegger, Beckmann, & Hansen, 2013). Therefore, to construct such an ontology a transdisciplinary review of relevant natural, social, economic, and management sciences was conducted to inform a propositional framework. The product of analytical and formative research is represented as a formally structured ontology, an “explicit partial account of a shared conceptualization” or “common conceptual vocabulary” (Bullinger, 2008, p. 148), referenced as the strongly sustainable business model ontology (SSBMO).

Background

Definition of a Successful Business

The necessarily normative definition of business success is an important starting point as the business model can be seen as a conceptual model of the logic for achieving desired outcomes. Since business is a significant part of society, it is worth asking what normative definitions of business success, what desirable outcomes from business, support a sustainable society?

For well over 70 years, arguably the entire modernist era, business success has been broadly defined by monetary returns to shareholders via a share of profits and increases in firm valuation (Handy, 2002). For example, a successful publicly listed firm can be defined as one that consistently returns capital to investors while serving its customers. This focus of firms on economic performance, rather than on an integration of economic, social, and environmental performance (Schaltegger & Burritt, 2005), has contributed to numerous well known financial, social, and environmental problems (Handy, 1991; World Watch Institute).

These problems led management and social scientists to challenge the profit-normative definition of business success by inquiring into the concept of a “good company” (Handy, 1991; Hawken, 1993/2010; Laszlo et al., 2014). Some management scholars are advocating that the desired outcomes of a successful business demonstrate compatibility with credentialed knowledge from all disciplines about engendering sustainable outcomes at all

scales: the macro—the financial economy contained by society within the biosphere, the meso—the organizations within society, and the micro—human individuals (e.g., Broman, Holmberg, & Robèrt, 2000; Ehrenfeld, 2000a; Eriksson & Robèrt, 1991; Marcus, Kurucz, & Colbert, 2010; Robèrt, Broman, & Basile, 2013; Whiteman, Walker, & Perego, 2013). Businesses that define success by such a broad range of desired outcomes that attain the necessary levels performance could then claim to be successful *sustainable* businesses (Schaltegger & Burritt, 2005, Figure 5.2). In other words, such proposed definitions of successful sustainable business attempt to follow a “compatibility rule,” by explicitly aligning their definition of success with the “current consensus in related disciplines” (Barkow, 2006, p. 29).

Descriptions of desired outcomes that are more compatible with credentialed knowledge from all disciplines toward engendering sustainable outcomes are now emerging in practice. Examples include the definitions of success adopted in Benefit Corporations (B Lab, 2008), localist businesses (Business Alliance for Local Living Economies, 2012), “flourishing enterprises” (Laszlo et al., 2014), and “future-fit businesses” (Willard et al., 2014).

Thus a continuum of possible desired outcomes for business is apparent, based on the compatibility of a given definition of business success with knowledge from across disciplines that aim toward sustainable outcomes at all scales.

Towards one end of this “continuum of compatibilities” is the low degree of compatibility exhibited by the profit-normative definition of business success. This positioning is evident by the omission of desirable business outcomes related to non-economic factors.

Other positions on this continuum can be informed from “strong” and “weak” perspectives on economic success offered by ecological economists (Ayres, 2008; Daly, 1987; Georgescu-Roegen, 1975; Lawn, 2001; Neumayer, 2013; Victor, 2008). These can be seen as varying to the extent that each follows the “compatibility rule.” Strong sustainability demands an understanding of the “macro-economy as a sub-system of the finite ecosystem” (Neumayer, 2013, p. 28) informed by natural science. On the other hand, weak sustainability “can be interpreted as an extension to neoclassical economics” (Neumayer, 2013, p. 28), where such containing systems are not considered (Victor, 2008).

“Strong sustainability” is explicitly informed by current natural science observations about the importance of certain stocks of “critical natural capital” to sustaining “basic life support functions” (Neumayer, 2013, pp. 26-27). Thus, definitions of business success informed by the desired outcome and requirements for “strong sustainability” appear towards the opposite end of the continuum from profit-normative definitions.

Our proposal strives for compatibility with the strongly sustainable perspective. In this we align with the emerging conceptions of business success, termed as the “flourishing enterprise” and “future-fit business.” These also fall on the continuum close to strong sustainability, since they explicitly reference compatibility with the relevant scientific knowledge within their conception of a successful sustainable business. Furthermore, they are informed by substantially the same body of natural, social, economic, management, and psychological science that informs our findings.

In contrast definitions of “weak sustainability” appear between the end points of the continuum. Definitions of weak sustainability assume, without supporting natural science findings, that “if investment in man-made and human capital is big enough to compensate for the depreciation of natural capital . . . then sustainability is guaranteed quasi-automatically” (Neumayer, 2013, p. 23).

The Extant Ontology of Business Models

Within the rapidly growing literature of business models, a profoundly popular and widely referenced approach to business model definition was developed by Osterwalder and Pigneur (2009) based on the earlier ontology of business models (Osterwalder, 2004). The original BMO reference shows 2,783 citations in Google Scholar (2015) and has “generated more impact than most other dissertations” (Alt & Zimmermann, 2014). Furthermore, through subsequent popular practitioner visual design tools and associated works (over 1 million books sold, 5 million downloads of the canvas template), the Osterwalder reference has attained considerable social proof (Hanshaw & Osterwalder, 2015; Osterwalder & Pigneur, 2009). The widely known business model canvas (BMC), derived from the ontology, has become a de facto reference standard and is taught in management and entrepreneurship education worldwide.

As with nearly all published business model frameworks, the embedded motivating logic of the BMO is to produce profits for the enterprise. While numerous calls have been made to “extend” the BMC to include sustainability requirements, this approach was explicitly discounted in the current research. This was due the inability to represent the complex social and ecological systems that are the context for all business (Marcus et al., 2010) in a meaningful way within the original Osterwalder ontology and canvas.

However, the BMO inspired the current research by its widespread reference and the social proof of the derived BMC. Its prior art provides the best starting point to deconstruct and evaluate its affordances and gaps with respect to the relevant sciences informing business sustainability. The BMO has not been critically assessed in this respect in the peer-reviewed management literature. Furthermore, until now there have been no published assessments of its applicability to business models describing a successful sustainable business. To make progress on research investigating sustainable business models, we argue for the necessity to evaluate the concepts and relationships in this foundation ontology, to determine its viability with respect to contributing to sustainable outcomes informed by natural and social sciences.

Formative Theories for Sustainable Business Models

Business model research has been primarily characterized by economic and entrepreneurial theories of business innovation (e.g., Teece, 2010). This bias appears within novel processes such as learning-oriented models (Itami & Nishino, 2010) and transition-oriented business models (Melnik, Hanson, & Calantone, 2010).

For example, Chesbrough (2010) defines the business model as a system that serves several functions for the enterprise. The business model articulates value propositions; identifies a market and revenue generation market segments; identifies the value chain, the firm’s position in it, complementary assets to produce the offering, and details of revenue mechanisms and cost structures; and formulates a competitive strategy. Value is implicitly and uniquely measured by financial metrics with no reference to social or environmental impacts.

Stubbs and Cocklin (2008) offered perhaps the first attempt to define a theoretical basis for sustainable business models. Developed from a small sample (interviews and case study), they provide an “illustration of a systems-based SBM” (p. 124) that relates the principles extracted from a well-known case (Interface) to the developing business model of an Australian regional bank.

Without identified process tools or system models for accomplishing this shift, the case in Stubbs and Cocklin (2008) reveals an attempt to move business models towards socially-

relevant sustainability values. However, there is insufficient comparability across other reference models, industries, or business model structures to claim a set of general principles. For example, no longitudinal references appear in the literature to establish whether the case organizations had maintained sustainability values in their business model 5 or more years on, and whether these values were increasing or decreasing in the business over time.

Another critique comes from comparing ecological modernization (EM) sociological theory (Mol & Spaargaren, 2006) that explicitly informs the Stubbs and Cocklin (2008) proposal with alternatives. Historically, sociology conceives of a successful society without reference to human stewardship of the environment (Durkheim, 1982). The EM view builds on this by attempting to reconcile the reality of business as practiced in contemporary society with the social demand for action on sustainability without reference to environmental limits described by natural science. This approach enables the predominant modernist belief that society is separate from the environment, and is not fully compatible with environmental realities as described by natural science.

An alternative environmental sociological position of “success” (Catton & Dunlap, 1978) explicitly conceives of a successful society as compatible with social-ecological requirements. This perspective underpins reflexive modernization (RM) theory (Beck, Bonss, & Lau, 2003; Law & Urry, 2004) and informs the ecological economic strongly sustainable view (Ayres, 2008; Daly, 1987; Georgescu-Roegen, 1975; Lawn, 2001; Neumayer, 2013; Victor, 2008).

Reflexive modernization posits that human social behaviour is reflexively shaped by our multiple understandings of the world as experienced and informed. It explicitly considers multiple feedback processes between society and environmental actors and articulates the necessity to propose and argue for multiple interacting and contingent boundaries. RM recognizes that a plurality of definitions and boundaries must be considered in any definition of organizational success, allowing actors to consider multiple positions as hybrids of facts and values.

The “realism” of RM contrasts with more teleological theories that posit a rational sustainability motive, including EM. These positions embed the expectation that human ingenuity (technology as broadly understood) will ensure humanity’s ability to survive through unforeseen innovations that will overcome natural and artificial barriers to human survival (McLaughlin, 2012; Mol & Spaargaren, 2006).

This suggests that since the Stubbs and Cocklin (2008) orientation to sustainable business is aligned with a “broad view of EM,” the factors in their “illustration of a systems-based SBM” are insufficient as a foundation for strongly sustainable frameworks (or guidance). For example, important requirements of compatibility with natural and social sciences are omitted. In particular, the integration or assessment of biosphere stocks and ecosystem service flows is not present (Hanson, Ranganathan, Iceland, & Finisdore, 2012). It appears to account for these systemic resources by acknowledging industrial ecosystems (Korhonen, Von Malmborg, Strachan, & Ehrenfeld, 2004) and the general proposition of “nature as a stakeholder” but without indicating ways in which this might be included as a factor within a business model framework.

Finally, we suggest that non-sustainability business model methods are typically presented in socially neutral perspectives, as instrumental artefacts that enable entrepreneurs and managers to envision and coordinate better profit-seeking business model decisions. The business model literature reveals little in the way of critique of social relevance, even for those business models that are clearly directed towards social purpose. However, no designed artefact, such as a business model or an ontology of business models, is value-neutral. The

lack of perspectival positioning in the business model literature (e.g. Zott, Amit, & Massa, 2011), including in the BMO, can be read as implicitly profit-normative. Business models and their frameworks are powerful tools for identifying points of leverage within a complex social system within which the business pursues “value.” The dearth of critique does not implicate a net positive social outcome, but rather such an absence implicates business models as embedding the default values of “business as usual.”

Method

This research was one part of a two-phase research program concerning two artefacts, as part of a design science approach: (1) formulating and evaluating an ontology and (2) formulating and evaluating a “canvas” or visual design method for stakeholder creation of candidate SSBM proposals. Here, we report only on the former aspects, the work leading to the definition of the ontology. See Jones and Upward (2014) for an initial report on the latter aspects of this research.

The artefacts and design science methodology were based on the precedent work of Osterwalder (2004) who developed the BMO within dissertation research and the BMC as praxis research. Others have successfully followed this lead in their dissertation and other research (Al-debei & Avison, 2010; Bullinger, 2008; O’Leary, 2010).

A framework of strongly sustainable business model (SSBM) propositions and principles was established from the literature using a comprehensive “traditional” literature review to establish the parameters for a subsequent “systematic” review (Jesson, 2011, p. 15). Together these reviews enabled the formulation of our framework. This formulates the definitions for a comprehensive ontology that could model a successful strongly sustainable business. The novel SSBM framework defines and describes the business model of a successful strongly sustainable business. The complete framework consists of four formative propositions (FP1-4) and five instrumental principles (IP1-5).

Once the framework was established, a comparative analysis technique was employed to identify gaps between it and the Osterwalder business model ontology (BMO). Comparative analysis has been used in other business ontology research (Bullinger, 2008; Osterwalder, 2004).

Using the BMO as a reference enabled identification of the minimum necessary changes that might be proposed to describe models of successful strongly sustainable businesses. These definitions and their relationships were selected, organized, described, and modelled in a formally structured SSBMO. The modelling of the definitions and their relationships employed the Chen (1976) entity-relationship model (ERM), as also employed in the BMO.

Establishing a Literature Base

To establish theoretical support for these methods, system modelling frameworks endorsed by management information systems, ontology engineering (Jones & Dye, 2000; Uschold & Gruninger, 1996), and systems thinking (Allen, Hoekstra, & Tainter, 2003; Jackson, 2000) were evaluated (Akkermans & Gordijn, 2006; Andersson et al., 2006; Cleven, Gubler, & Huner, 2009; Gruber, 1993; Guarino & Welty, 2002; Kuechler & Vaishnavi, 2008; March & Smith, 1995).

To establish the SSBM framework, a series of traditional literature reviews was conducted in an iterative fashion, starting with key references in business models, industrial ecology, strategic management, ecological economics, environmental sociology, and positive psychology. Key theoretical references were synthesized into a table structure of basic

(fundamental) sciences and biophysical science (macro), social and economic science (macro), and human physiological and psychological (micro-behavioural), and management and information sciences (meso). The table structure provided the parameters to guide the selection of specific works reviewed in the subsequent systematic literature review.

The traditional literature review exposed a lack of consensus with respect to definitions across nearly all of the relevant disciplines, with the natural sciences being the single notable exception. It was particularly evident that no consensus emerged to clarify the definition of “success” of a successful enterprise. For example, no consensus was observed between ecological economists and other economists for a macro-economic definition of a successful *sustainable* economy (Victor, 2008). Typically most economists define a *successful* economy as one in which GDP is growing, that is, without reference to any known constraints or limitations to such growth from other disciplines (e.g., Rockström et al., 2009). Ecological economists suggest that a successful strongly sustainable economy is one compatible with both a natural sciences understanding of the environment conducive to human life (e.g., environmental sustainability) and psychosocial science understanding for individuals to achieve a state of “happiness” (Easterlin, 2001; Layard, 2003) or “flourishing” (Ehrenfeld, 2000a; Fredrickson & Losada, 2005, p. 678; Keyes & Haidt, 2003, p. 14) – flourishing being understood as “to live within an optimal range of human functioning, one that connotes goodness, generativity, growth, and resilience” (Fredrickson & Losada, 2005, p. 678).

Research support for the perspectives of strong sustainability and human flourishing in definitions of business success are relatively recent. No comprehensive treatment is yet found in the literature. However, the support for definitions applicable to a strongly sustainable business model ontology are derivable from the literatures and were developed from these sources.

Inputs to the Framework of SSBM Propositions and Principles

No peer-reviewed critiques of the BMO were found in the systematic review. However, a number of observations were discovered from the profit-normative and weakly sustainable definition of business success. We interpreted these observations as criticisms and categorized these into seven groups as shown in Table 1.

Table 1. Critiques of the BMO Business Model Definitions

Category	BMO analysis: Profit-normative or weak sustainability perspectives	Authors
1. General, goals, governance, and measurement.	General, goal, governance, and measurement-related gaps are identified in the BMO, to which Osterwalder and others have partially responded	von Scheel, Rosenberg, and von Rosing (2011)
2. Assets	Business financial performance is primarily driven by the nature of the assets being monetized; assets are not included in the BMO.	Malone et al. (2006)
3. Stakeholders	Interests of stakeholders other than customers, such as owners and any other actor who takes on a stakeholder role, are not included in the BMO (suppliers are referenced but not with concern for their interests as stakeholders)	Donaldson and Preston (1995), Freeman (1984), Friedman and Miles (2006), summarized much recent research, Kay (1997), Klassen and McLaughlin (1996)
4. Environmental impacts	Profit opportunities are missed if environmental externalities are not reduced these are not conceptualized in the BMO.	Griffiths and Petrick (2001), Porter (1991), Stubbs and Cocklin (2008)
5. Environmental resources	Resource-based view of the firm is incomplete without inclusion of natural resources “used” by right not because of economic ownership these are not conceptualized in the BMO.	Hart (1995)
6. Social impact	The production of customer value propositions can result in societal externalities, and these are not conceptualized in the BMO.	Yunus, Moingeon, and Lehmann-Ortega (2010)
7. Changing social expectations	Natural and social science creates understanding in society, over time, of the impact of previously acceptable externalities and some of these are subsequently socially defined as unacceptable (law, regulation, social license to operate). The BMO does not conceptualize current or potential future externalities.	Eccles, Ioannou, and Serafeim (2012)

Note: BMO = business model ontology.

No formally defined conceptions of an ontology of SSBMs were found, so these could not form the basis for potential additions to the BMO. Given this lack, we reviewed the literature, only some of which was peer reviewed, suggestive of concepts that may be considered as candidate components of SSBMs. Table 2 summarizes these concepts.

Table 2. Concepts for Inclusion in Strongly Sustainable Business Models

Concept summary and relevance	References
1. Selection of stakeholders must consider moral justice for potential human and nonhuman stakeholders, leads to identification of concepts relevant to business models.	Doppelt (2012, p. 147), Heikkurinen and Ketola (2012), Holifield (2009), Jolibert, Max-Neef, Rauschmayer, and Paavola (2011), Starik (1995)
2. Governance design influences whether outcomes are strongly sustainable, hence governance concepts are relevant to business models.	Cavagnaro and Curiel (2012), Ostrom (2008), Schwaninger (2008, p. 44)
3. Various tools and frameworks embed principles for designing strongly sustainable business, leads to identification of concepts relevant to business models.	Bansal (2011), Parrish (2010, p. 517), Robèrt et al. (2002), Trist (1981, p. 30)
4. Biomimicry frameworks embed principles for designing strongly sustainable business, leads to identification of concepts relevant to business models.	Benyus (2002), Hutchins (2012)
5. Industrial ecology embeds principles for designing strongly sustainable business, leads to identification of concepts relevant to business models.	Ehrenfeld (2000b), Korhonen, Von Malmborg, Strachan, and Ehrenfeld (2004)

We also located a number of reference models of strongly sustainable business (i.e., explanatory or descriptive frameworks). None of these were formally defined, and only one was peer reviewed (Clark et al., 2009, 2010, 2011; Jorgensen, 1993, Figures 1 and 2, p. 6; Laverdure & Conn, 2010, Figure 8, p. 15; Parsey & Topp, 2010, p. 44; Stead, Stead, & Starik, 2004, Figure 5.3, p. 84).

Findings and Ontology

From the traditional review and analysis, and the subsequent systematic review of the literature, both summarized above, the four formative propositions (FP1-4) were developed. The five instrumental principles (IP1-5) were then synthesized from the formative propositions and the literature reviewed. The formative propositions create the context for all the instrumental principles and subsequently all aspects of the ontology. In contrast the instrumental principles provide the details within this context to enable the analysis of the BMO (see comparative analysis below) and subsequently the identification of the concepts and relationships in the ontology. The SSBM framework of propositions and principles are presented below before reviewing the comparative analysis and introducing the ontology.

Formative Propositions

Four critical formative propositions were identified to which we propose any ontology of SSBMs would adhere. These propositions are referenced as compatible with both fundamental and emerging knowledge in the introduced natural, social, economic, management, and psychological sciences.

FP1: Definition of a strongly sustainable firm. We define, if it were to exist, an organization that only enabled strongly sustainable outcomes as one that creates positive environmental, social, and economic value throughout its value network, thereby sustaining the possibility that human and other life can flourish on this planet forever (Ehrenfeld, 2000a; Willard et al., 2014). Such a firm would not only do no harm, it would also create social benefit while regenerating the environment (“doing good”) to be financially viable (“doing well”); Schaltegger, Lüdeke-Freund, & Hansen, 2012; Willard et al., 2014). This definition implies that a single legal entity can no longer self-declare that it is sustainable without reference to its whole value network. This is not a mistake but a requirement driven from the evidence of our mutual interdependences referenced in the natural and social sciences.

FP2: Definition of value. In turn, this definition of a strongly sustainable firm requires the central concept of value is revised from the current “thin” definition as a source of individual or organizational enrichment, measured uniquely in monetary units (Blattberg, 2000). Based on a sociological and human sciences conception of value and human values (Fredrickson & Losada, 2005; Latour, 2013; Max-Neef, Elizalde, & Hopenhayn, 1991; Tay & Diener, 2011), a socially responsive understanding of value is defined, reconsidering the processes of value creation and destruction among actors in businesses and value networks as social systems:

- Value is the perception by a human (or non-human) actor of a “fundamental need” (Max-Neef et al., 1991, p. 8) being met measured in aesthetic, psychological, physiological, utilitarian, and/or monetary terms.
- Value is created when needs are met via “satisfiers” (Max-Neef et al., 1991, p. 16) that align with the recipient’s worldview and destroyed when previously met needs go unmet due to the withdrawal of satisfiers, the application of inappropriate (“pseudo”) satisfiers, or the application of satisfiers that do not align with the recipient’s worldview.

Thus, a strongly sustainable business model must provide the organization a foundation for guiding the co-creation of value with all an organization’s stakeholders: customers, shareholders, social, and environmental constituents and indeed any and all actors in the organization’s value constellation (Hörisch, Freeman, & Schaltegger, 2014; Normann & Ramirez, 1993).

FP3: Definition of a business model. Implicit within a “thin” definition of value, current definitions of a business model reference only (and implicitly) the economic (marketplace) as a system boundary of concern. When value exchange is measured only in monetary units, the extension of the business model to other definitions of value is strictly limited.

Enterprises of any size are self-organizing social systems interacting with markets within the larger system of the financial economy, which itself is part of and dependent on the larger social and environmental systems (Marcus et al., 2010), and are guided by explicit or implicit purpose other than merely producing monetary value (Drucker, 1974; Ouchi, 1980).

Thus, the business model is reformulated as a systemic model of necessary and sufficient concepts that both describe and guide the business as a social system within its containing systems of economy, society, and environment. To achieve strongly sustainable or flourishing outcomes, a business model must recognize the functional integration of required critical components with all its containing systems. Without this, stakeholders cannot describe or design business models that explicitly consider the relationship of a business with the natural environment, society, and economy in which the business is situated and interconnected and

on which the business is ultimately dependent, and with all the individuals involved in that business (whether by choice or not).

We re-conceptualize the definition of a business model to be compatible with the above definitions of a strongly sustainable firm, the rich definition of value, and the possibility of flourishing. We define a business model as a description of how a business defines and achieves success over time, such that it provides

A description of the logic for an organization's existence: who it does it for, to and with; what it does now and in the future; how, where and with what does it do it; and how it defines and measures its success.

FP4: Definition of tri-profit. The concept of profit has an intrinsic relationship to definitions of business success, value, and the business model. The definition of profit is resistant to change due to centuries of historical and cultural denotations. A successful strongly sustainable business re-conceptualizes the meaning of profits and returns on capital as indicated by Blattberg (2000). Hence, we define “tri-profit” as a new inclusive conceptual metric to *replace* profit. This is unlike the triple bottom line accounting framework that proposes additional noneconomic profits are calculated, *as well as* economic profit “using a measurable common ‘currency’” (Norman & Macdonald, 2004). In the triple bottom line accounting framework profit is not re-conceptualized, but an attempt is made to apply its existing meaning outside the economic field. In contrast, the single tri-profit metric would be calculated as the conceptual net *sum* of the costs (harms) and revenues (benefits) arising as a result of a firm’s activities in each of the environmental, social, and economic contexts in a given time period measured in units appropriate to each. A tri-profitable firm creates sufficient financial rewards, social benefits, and environmental regeneration, with sufficiency defined by stakeholders with the governance rights (power) to do so. While the proposal of tri-profit remains conceptual in the ontology, the implementation of tri-profit in a business would be expressed as accounting entries in a general ledger, for measures that use monetary units, and nonfinancial metrics, in various units of measure, or possibly unit-less (as per B Lab, 2008 Impact Assessment).

Instrumental Principles.

The five critical instrumental principles identified are those that any ontology of strongly sustainable business must fully conceptualize, while adhering to the contextual formative propositions (FP1-4).

IP1: Conception of an SSBM. A strongly sustainable business model must ensure that ethically and practically appropriate decisions (choosing the “right” things to do) and actions (doing things “right”) are described.

The actors who choose the “right” things to do are engaged with and by the organization in numerous ways at the same time and overtime. Hence, an individual actor may take on one or more stakeholder roles. To ensure a full description of the possible relationships between actors and their stakeholder roles requires conceptualization from three related perspectives. *First*, the actors for whom the organization exists: These actors have stakeholder roles that need and define the value the organization creates. *Second*, those actors who are affected by the organization: These actors have stakeholder roles that may be affected positively (value created, meeting the actors needs) or negatively (value destroyed, impeded the actors from meeting their needs). *Third* are those actors involved in the ongoing processes the organization undertakes to create (and destroy) value.

Next, to describe the “right” actions requires conceptualization of an organization’s value propositions. These are understood to describe the positive and negative value that the organization creates and destroys for the actors taking the various stakeholder roles (allowing them to meet or impeding their ability to meet their needs).

To describe how the “right” things are to be “done right” now and in the future requires understanding how the organization acts to create the value, described by its business processes. This requires describing where things are done and how decisions are made about any and all aspects of the business (its governance arrangements).

Finally, it must be possible to describe the basis for choosing the “right” things, and how it will be determined whether these “right” things are being “done right” in practice. This includes how the actors with governance rights to do so define success for the organization, and how this success (or failure) is measured and declared.

IP2: Boundaries of an SSBM. A strongly sustainable business model must describe the relationships between the following, which collectively define the boundaries of a firm’s business model:

- *The social definition of a firm’s boundary* based on the agreement of the firm’s purposes made by the firm’s stakeholders who have, gain, or are granted sufficient power in the decision-making process. The agreed purpose is based on the value the firm will create (or destroy) for the stakeholders. This is achieved through the delivery of satisfiers that meet (or fail to meet) a subset of the stakeholder’s fundamental needs.
- *The legal definition of a firm’s boundary* based on the multidimensional concept of “ownership” (Blattberg, 2000, p. 181) and the concept of the firm as a “legal person” (with the rights and obligations this entails)
- *The systems outside a firm’s boundary* based on the system of systems of which a firm is a part (including all stakeholders, the biophysical environment, and the human constructed social and monetary domains)
- *The systems within a firm’s boundary* containing a firm’s business processes that create (and destroy) stakeholder value through interactions with the containing systems
- *The conceptual (knowledge), social (relationships), and physical objects inside a firm’s boundary* are those that need to be “owned” or “controlled” for its processes to create (and destroy) stakeholder value (broadly the firm’s capabilities and resources)
- *The social (relationships), physical, and conceptual objects that are “shared” with other social constructs via the containing systems.* These are described in (formal) agreements with stakeholders and are realized in various types of flows: monetary flows with stakeholders (investments, revenues, payments, interest, and dividends), biophysical material flows to and from biophysical stocks and ecosystem services, as well as energy flows to and from the biosphere.

IP3: Validation of a SSBM. To be useful, a SSBM will consider the requirements for sustainability of life, as understood over as long a time period as feasible. Short-term or volatile conceptions should be avoided, unless no long-term consideration is indicated by science.

This finding from the literature is not direct and requires further explication. A significant effort (and time) will be required to close the value gaps between the conditions for flourishing and existing social and ecological conditions. Long-term modelling of scenarios for global change that acknowledge the ultimate biophysical limits suggests that 30 to 100-year time frames are not unrealistic, although subject to increasing pressure (Turner, 2014). Any conception of a business model that does not attempt to include the elements necessary to model such a long-term view is likely to be of limited (ultimate) utility to create the “possibility for flourishing,” even if such elements are not currently well recognized.

IP4: Necessary financial viability of a business model. A strongly sustainable business model must be able to describe the elements of financial viability, as shown in Table 3. The majority of these concepts are from the BMO, the remainder from the introduced criticisms of the BMO (summarized in Table 1). Additionally, to comply with IP3, measures (financial and nonfinancial) to record both current and desired values (goals) are required.

Table 3. Concepts Within a Business Model (Profit-Normative)

Summary component	Related component (if any)
Actor	
Stakeholder	
Target customer	Criterion
Channel	Link
Value proposition	Offering
Decision (governance)	
Relationship	Mechanism
Value configuration	Activity
Partnership	Agreement
Capability	Resource
Process measure (nonfinancial)	Activity
Profit	
Cost	Account
Revenue	Pricing
Asset	Account

IP5: Modelling social benefits and environmental regeneration. A SSBM must be able to describe businesses that define and measure success as a result of a dialog between all actors in their various stakeholder roles, with their diverse needs and satisfiers from which they each derive value, that is, it must be able to describe tri-profit. These concepts were identified from the literature (summarized in Table 2). This implies the following:

- Resolving all stakeholder needs and satisfiers will be incommensurable, so an SSBM must be able to describe how the organization meets needs (value creation/positive value propositions) and how it fails to do so (value destruction/negative value propositions) so that judgments of appropriate value can be made.
- Stakeholders will be in sustained communication or exchanges of value, value not being static but based on mutable worldviews (Allen et al., 2003, p. 23). Therefore, an SSBM must be able to describe the following:
 - Which stakeholders are to be involved in which conversations (decisions)
 - What value is to be created/destroyed for which stakeholders (value propositions)
 - How that value is to be created and destroyed (process)
- Stakeholders will measure success in different units, not just monetary; a SSBM must be able to define and measure tri-profit using a multidimensional set of units of flourishing (economic, social, environmental), including money.

In turn, this suggests that a strongly sustainable business model must describe the following:

- The actors (and their fundamental needs) who the organization may or may not choose to acknowledge as legitimate stakeholders. Actors include individual humans, collections of humans (firms, nongovernmental organizations [NGOs], governments, etc.), and nonhumans (Jolibert, Max-Neef, Rauschmayer, & Paavola, 2011; Starik, 1995). Processes of legitimation are then determined by the relative power of actors and stakeholders via governance arrangements
- Actors who are acknowledged as playing one or more legitimate stakeholder roles, and which subset of each actor's needs are satisfied (or left unsatisfied) by organizations' (positive and negative) value propositions
- The steps by which environmental, social, and economic positive value ("revenues") and negative value ("costs") are determined (a "valuation method")
- The relevant portions of the business models of all firms in its value network so as to include all ultimate stakeholder's needs and all connections to the ultimate sources and sinks of all biophysical materials
- The geographic location and locality of any and all biophysical components of a business model (including actors who take on roles of an organization's stakeholders).

Comparative Analysis Between BMO and SSBM Framework

No single detailed visual representation of the BMO is provided in the original work, so to effectively compare the SSBM framework with the BMO, we synthesized a full representation following the entity-relationship model of the original work (See on-line supplemental material to Upward, 2013).

Using this representation, along with the detailed description in the original work (Osterwalder, 2004), a comparative analysis identified 12 specific gaps (G1-G12) between the BMO definition of a successful profit-normative business (its constructs and their interrelationships) and the SSBM framework (FP1-4 and IP1-5). These gaps are summarized in Table 4, with the citations introducing the literature identified by the review.

The identified gaps are grouped by four overarching concepts identified as important to successful SSBMs from the framework: the boundaries and goals of such a model, the need to include concepts of stakeholders, positive and negative value propositions, and all aspects of a firm's processes whether or not they relate to money.

Table 4. Gaps Between BMO and SSBM Framework.

Principle(s) assessing gap	Boundaries and Goals Gaps 1-3 identified between BMO and SSBM framework
IP1-IP3	G1. The BMO conceives of the primary (sometimes only) purpose of the firm to be monetary profitability, and hence, the purpose of the business model is to describe the “money earning logic of a firm” (Osterwalder, 2004, p. 15).
IP4-IP5	G2. The BMO conceives that ultimately value can be expressed only in monetary terms as measured by profit in monetary units. It is already common, though far from universal, for the primary concern of a subset of a firm's stakeholders to be broader than exclusively monetary profitability. Stakeholders interested in receiving integrated environmental, social, and monetary value are required for strong sustainability outcomes to emerge (Blattberg, 2000; Lawn, 2001).
IP2	G3. The BMO does not explicitly consider the boundary conditions that define a firm and the holonic context in which a firm operates. Kaplan's conception of the four perspectives within a balanced scorecard used to organize the BMO has the same drawback, e.g., “financial,” “customers,” “internal processes,” and “learning and growth” implicitly consider only items within the profit-normative definition of success, with a limited focus on the context of the firm (Kaplan & Norton, 1996). Scholars of business pay limited attention to the question “What is the whole of which a firm is a part?”—e.g., systems thinking (Ackoff & Emery, 1972; Jackson, 2000; Ulrich, 1993). Hence, any risks arising from the intentional and unintentional “impact” on society, the environment, and the economy of the concepts represented in a profit-normative business model are excluded from consideration by omission.

Principle(s) assessing gap	Stakeholders Gaps 4-6 identified between BMO and SSBM framework
IP4	G4. The BMO conception of a business model includes only the customer and to a limited extent other actors, such as suppliers. This excludes the possibility of considering the needs of the majority of types of potential stakeholders in a business model. The literature suggests that achieving strong sustainability requires firms to interact with a wide range of stakeholders (Hart & Sharma, 2004).
IP4-IP5	G5. The BMO's concept of a business model excludes nonhuman actors, noncustomer human actors, and the needs/purposes of all actors. Furthermore, the BMO provides no consideration of the mechanisms by which an organization can consider (on a equal footing) the needs/purposes of actors who have made themselves explicitly known as wishing to be its stakeholders, and those who have not made themselves known but who are affected by the organization (Max-Neef et al., 1991).
IP4-IP5	G6. The BMO ignores the key process of how the many potential human and nonhuman actors who may inform the purpose of an organization are legitimated as stakeholders of a firm at the point in time being described by the business model (past, current, or future state). Furthermore, once legitimate stakeholders are identified, the processes of determining how much power they will have in decision making is not considered (Hart & Sharma, 2004).
Principle(s) assessing gap	Value Propositions Gaps 7-10 identified between BMO and SSBM framework
IP5	G7. The BMO formally conceives value in the context of a business model as only possibly being created for customers (positive value generation) and not destroyed (negative value generation) nor a combination of the two (Max-Neef et al., 1991). Furthermore, the BMO considers only positive value in the context of customer stakeholders (Hart & Sharma, 2004).
IP3-IP5	G8. The BMO conception of a business model is to serve as tool to help design a new/changed/improved operational business in order to generate more monetary profit via the creation of (more) positive value for customer stakeholders. By implication the use of the BMO for this purpose is intended to be an (important) part of the "change the business" process. However, as a result, any value to the customer (or other) stakeholders that could be generated by designing an improved "change the business" process is not in scope of the BMO (Hoverstadt, 2008).
IP5	G9. The BMO conceptualized customer stakeholders, hence, the conception of value is necessarily focused only on customers. Hence, the potential for value to be conceived of as something that noncustomer stakeholders might wish to receive or avoid is omitted (Hart & Sharma, 2004; Max-Neef et al., 1991).
IP3-IP5	G10. This conceptualization also excludes the possibility that some stakeholders (e.g., owners, employees) would see positive value in a firm's ability to survive over time through adaptation (Kaplan & Norton, 1996).

Principle(s) assessing gap	Processes Gap No. 11-12 identified between BMO and SSBM framework
IP2-IP5	<p>G11. As the BMO does not conceive of a boundary to a firm nor a firm's ultimate social and biophysical context, it assumes that any resources</p> <ul style="list-style-type: none"> • Required for the execution of the firm's processes to generate the firm's value propositions are acceptable, so long as they may be obtained at a monetary cost that enables a net monetary profit (Lawn, 2001) • Generated intentionally (products, packaging) or as a by-product (waste) by the execution of the firm's processes to generate the firm's value propositions are acceptable, so long as the firm may claim they no longer have privileged access to those outputs at a monetary cost that enables a net monetary profit (Lawn, 2001; McDonough & Braungart, 2002). <p>No consideration is possible for any limitations on the ultimate biophysical stocks (sources and sinks) of all resources a firm requires or generates, or of any social costs involved in obtaining, moving, or transforming these resources, aka, "externalities" (Lawn, 2001; McDonough & Braungart, 2002; Rockström et al., 2009).</p>
IP5	<p>G12. As the BMO does not conceive of a boundary to a firm or a firm's ultimate social and biophysical context, it is assumed that any processes a firm needs to generate the value proposition are acceptable, so long as they may be executed legally and at a monetary cost that enables a net monetary profit (Lawn, 2001; McDonough & Braungart, 2002).</p> <p>No consideration is possible for any limitations imposed by or any impact on the ecosystem services required by a firm's processes without the firm incurring a monetary cost, aka, "externalities." Furthermore, no consideration of impact on other human or nonhuman users of those same ecosystem services is possible (Lawn, 2001; McDonough & Braungart, 2002).</p>

Note. BMO = business model ontology; SSBM = strongly sustainable business model; IP = instrumental principle.

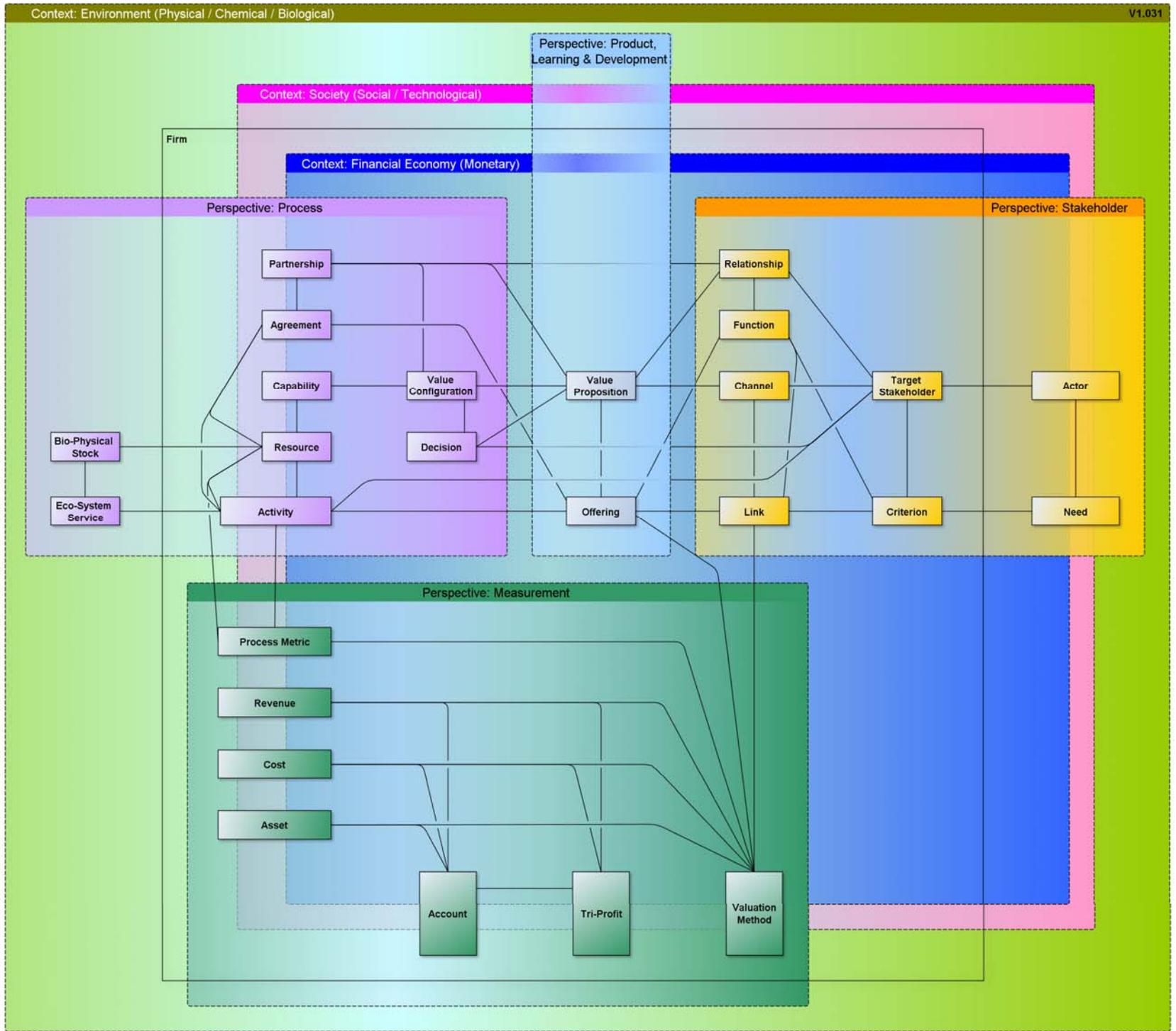
Closing the Identified Gaps: The Ontology

From this gap analysis, concepts and relationships in the BMO that would be amended were identified (in all cases generalized). New concepts were proposed and formally structured to define our strongly sustainable business model ontology. Again the SSBM framework, the above-introduced formative propositions and instrumental principles, was applied to guide this undertaking. A summary of the structured visual component of the SSBMO is presented in Figure 1.

The comparative analysis revealed that no BMO concepts need be removed, resulting in our affirmation that the SSBMO can express all aspects of any business model described using the BMO: Any business model for an enterprise defining success as profit-normative can be described using the SSBMO. A strongly sustainable business must, based on current law, be financial viable, and therefore, the core concepts and functions of the BMO must remain, albeit generalized, extended or "overloaded."

Figure 1. Strongly sustainable business model ontology (summary of entity-relationship diagram visualization)

See Supplementary Materials to Upward 2013 for complete view



As an initial formal definition of the conceptual structures and relationships, and following the approach of the BMO, the ontology is represented by the logical data structuring method of the entity-relationship model (ERM, Barker, 1989; Chen, 1976; March & Smith, 1995). In an ERM, the entities are nouns representing referent objects or concepts within the scope of the model. These are related in dyads by applicable descriptive verbs, constrained by cardinalities, as indicated by the real-world relationships between the relevant objects or concepts.

As a logical formalism for structuring data, ERMs were originated and are frequently used in the definition of logical database designs for digital computer systems. The construction of an ERM is seen as a key step to structure the knowledge of the domain in which the subsequent software systems is to operate. In turn, these logical models may then be implemented “physically” in a relational database system. Database systems instantiate the logical model by recording values (instances) of the entities and their relationships, for example, a customer order, an order line item, a customer, and the delivery and billing addresses.

An ERM is formally captured, organized, described, and visualized using a highly structured vocabulary and grammar (based on English), descriptive text, and a standard formalized diagrammatic method, the entity-relationship diagram (ERD). The structured vocabulary, grammar, and diagrammatic method capture significant detail about the real-world concepts, such as attributes to fully describe each entity and the entity interrelationships. The latter includes the cardinality of each entity dyad in each direction.

An ERM can be considered a first-stage representation, necessary but ultimately not sufficient for all purposes. The ERM is not a complete semantic representation of the business model, as it models static enduring relationships defined for any enterprise. It cannot model or simulate dynamic stocks and flows in a given instantiation of a business model.

Figure 1 shows only a *summary* of the strongly sustainable business model ontology ERM as a diagram. This summary labels all entities and indicates their relationships as arcs. To further visually simplify, in this representation, the firm boundary entity is shown as enclosing the 22 entities with which it has an inclusive relationship (rather than each of the 22 arcs being shown, as per the ERD formalism). The detailed entity-relationship representation is described in Upward (2013) consisting of the detailed representations and descriptive texts (190 pages), supported by an ERD that adheres to the ERD formalism.

Figure 1 shows each *specific* entity (27 entity boxes). These are instantiated as instances of that entity to enumerate and describe that conceptual part of the focal firm’s business model. For example, the target stakeholder entity when instantiated may, for a specific firm’s business model, have instances of: investor, customer, employee, community member, and so on, each of which is described in sufficient detail, for example, customers live within 5 km of this business’ only retail store.

Each instance of each entity also records how it is related to the instances of other specific entities. For example, each instance of the target stakeholder entity (e.g., investor, customer, employee, etc.) must record the related instances of the channel entity (e.g., retail, home delivery, web, etc.). In the complete ERD, the attributes of each entity required to fully detail an instance and record its relationships to other entities, the definitional verbs for each relation, along with the relational set inclusion (cardinality) are indicated—the latter, for instance, to define whether a target stakeholder must have at least a single relationship with an instance of channel, or whether it is optional, or one of many options.

Recording values of all the attributes of all the instances of each entity for a specific business model leads to a concise and complete description of that business model. In other words, each specific entity (and its attributes) can be thought of as posing questions. Together the responses to these questions provide a complete description of the focal firm's current or preferred future business model.

To logically reference the specific entities, as per the BMO, the four *perspectives* of the balanced scorecard are applied (suitably modified to accommodate conceptions of a successful strongly sustainable business). These are the stakeholder, product learning and development, process, and measurement perspectives. Each specific entity is uniquely related only to its enclosing perspective entity.

Finally, the necessary environmental, social, and financial economy *context* entities are represented. These are shown as a nested holon, or a system of systems, within which the focal firm's business model is entailed. The context relationships to specific entities are implied by the delineated visual position. For example, the value proposition entity has a relationship with all three contexts, whereas the biophysical stock entity is related only to the environmental context. Specific entities that straddle context boundaries indicate that these entities may have relationships with the context entities. For example, the actor entity may be modelling a nonhuman involved in a business model, and hence that instance of this entity would have no relationship with the social or economic context entities.

Discussion

The Significance of the Business Model Ontology

In light of the significant and global uptake of the Osterwalder Business Model Canvas, and the widespread citations to its ontology noted earlier, we suggest some relevant critique is warranted, given the largely uncritical acceptance of its methodology for business model definition. In our findings, we do not suggest that the BMC/BMO have revealed problematic effectiveness with respect to business model design. On the contrary, the BMC has shown to be quite powerful as a tool for formulating profit-normative business models. From the perspective of the growing sustainable business movement, we might observe instead that its popular success may now, as the reference standard, actually impede a broader transition to flourishing or strongly sustainable business models. Also, the lack of other peer-reviewed research of these tools suggests that more formal review and theoretical justification of these frameworks is indicated, even with respect to their value in profit-normative business model description and design. In this initial report, we included non-peer-reviewed comments on the BMO that we interpreted as critiques; these might form the basis for such deeper research.

Furthermore, Osterwalder recommends research into the utility of business model tools to improve the quality of business model designs (as opposed to the quality of their description—the focus of his and our work). These analyses have yet to be published in the literature. Also, his recommendation that longitudinal studies of the role of business model design tools in reducing the continued high failure rate of profit-normative businesses in all sectors has not yet been reported (Osterwalder, 2004; Osterwalder & Pigneur, 2005).

We have suggested that there are possible social and ecological risks to future business models formulated using the BMO and hence also those derived using the popular BMC. These may leave their users exposed to material risks and missed opportunities due to overlooking the inherent ecological, social, and economic entailments of all business models. Such business models might inadequately conceptualize the complexity required to describe a proposal for a successful weak or strongly sustainable business. Furthermore, the challenge of

designing weak or strongly sustainable business models quickly becomes far more complex than the BMO (and tools derived from it) can accommodate. We suggest this is primarily due to its conception of the business model itself, its theory of the firm, which fails to represent a full expression of the holonic contexts of business. These include not only the social and ecological, but also the long-duration temporal, cultural, and relational contexts of conducting ethical business. As we have shown, once understood, it becomes clear that these contexts cannot simply be “bolted on” to the BMO.

Based on a synthesis from the literature, we have taken a first step towards an improved ontology for models of successful strongly sustainable business that significantly extend not only the BMO but also early proposals by pioneers in sustainable business model research based on the wider systems thinking natural, social, economic, management, and physiological science.

An Inquiry Into Normative Definitions of Business Success

Our approach, through its explicit consideration of knowledge from systemic theories such as reflexive modernization and strong sustainability, can contribute in a modest way to the lowering of societal risk. It does this by more reliably extending the function of the business model to all known and mostly currently externalized relationships with the resources and services provided by the natural environment, and known social relationships that enhance our individual and collective well-being.

Our contribution is not to conceptualize the implications on business models of current best practice based on current social and management science “fashion” (Barkow, 2006, p. 29) which may be viewed as socially-discovered newly-unacceptable externalities. Instead, our proposal is based on and strives for compatibility with the best available knowledge across all the relevant disciplines.

Specifically, our research enables managers and stakeholders holding different normative definitions of business success to describe both extant and envisioned future business models. But, our research is not just for those who are pursuing the current profit-normative definition of business success nor just for successful (weakly) sustainable business (which by definition includes the creation of currently acceptable externalities already known to science to be problematic). Rather, we aim to consider the needs of three different groups of stakeholders who define business success at different places on the continuum introduced earlier.

First, there is a small but growing community of stakeholders who conceive of business success in the way we have labelled “strongly sustainable” on the “continuum of compatibilities.” Their definition of business success is shaped *only* by the systems thinking natural, social, economic, and psychological scientific knowledge. In this definition of success, business proactively creates conditions that together *resolve* the underlying causes of the “global problématique” (Ozbekhan, 1970), by simultaneously creating financial rewards, social benefits, and environmental regeneration. This is a vision of business that no longer seeks to be “less unsustainable” (McDonough & Braungart, 2002) but instead proactively contributes to avoiding the systemic collapse inherent in the “limits to growth” imposed by “business as usual” (Turner, 2014) and our planetary boundaries (Robèrt et al., 2013; Rockström et al., 2009). (This latest natural and social science research on our social and environmental conditions strongly suggests that we have already attained some of the limits and broken through some of the boundaries. A first-order goal of business ought to therefore be to proactively contribute to the required remedial work in order to avoid significant human suffering and further dramatic decreases in biodiversity.)

In summary, this first group, of which we are a part, suggests that the only practical (scientifically valid) and ethical goal of business is to systematically and proactively sustain “the possibility that human and other life will flourish on the earth forever” (Ehrenfeld, 2000a, p.36; Laszlo et al., 2014, p.10).

Second, our work is also of value to the larger and also rapidly growing communities of stakeholders who are continuously seeking to add to the current definition of “unacceptable externality.” On an ongoing basis this group has identified, frequently inspired by new knowledge from natural and social science, currently acceptable factors in business operations as material to human well-being and thus desire to see them deemed unacceptable (an example of reflexive modernization “in action”).

This growing global community (as a significant example see World Business Council for Sustainable Development, 2010, 2015) are setting increasingly stringent normative goals for business that aim for “less unsustainable” results (McDonough & Braungart, 2002). But currently such goals do not *systematically* include all knowledge from the “current consensus in related disciplines” (Barkow, 2006, p. 29). These goals prioritize the current socially defined definition of business success that includes the currently socially acceptable externalities, even when this is already contradicted by natural and social scientific knowledge. While striving to achieve these goals may enable business to avoid worsening the “global problématique” by contributing to achieving “sustainable development” (World Commission on Environment and Development, 1987), such goals bear the danger that business does not contribute to the *resolution* of the global problématique.

Our explicit attempt at compatibility with current and natural and social science allows the modelling and description of businesses whose definition of success is anywhere on the “continuum of compatibilities.” This means that our framework, ontology, and tools can accommodate past, current, and future conceptions of business models based on a range of definitions of socially and/or scientifically valid conceptions of a successful sustainable business. Thus, our approach contributes to the need to understand and close gaps between current business model factors socially deemed as material and the full range of scientific knowledge that defines what is important for a successful strongly sustainable business.

Our value to these first two groups of stakeholders is supported by the challenges observed by managers in Benefit Corporations and social entrepreneurship incubators. We find that these managers have significant difficulty conceiving of improved business models that can enable outcomes more aligned with their new definitions of business success. We observe that the current (profit-normative) practitioner tools for business model design are insufficient to support the necessary increases in complexity of their modelling efforts.

Finally, our work is also of value to the largest group of stakeholders: those who remain focused on a profit-normative definition of business success and who must adapt their business model to the minimum degree to accommodate the requirements of the latest law, regulation, and social norm. As with other sustainable business model scholarship, our work is of value to this group, since we also allow the description of business models based on current definitions of business success and acceptable externalities.

However, for this group the descriptive capacity is enhanced because of the potential created for them to learn about risks and opportunities of which they may not otherwise become aware.

In summary, by formally defining frameworks and useful tools based on explicit compatibility with the “current consensus in related disciplines,” we can better assist anyone

who agrees with any of these definitions of business success to better understand, conceive, describe, discuss, and improve business models that are explicitly aligned with their chosen definition of success.

Limitations and Further Work

We acknowledge that this ontology is only the first and just one possible formally structured response to our framework of propositions and principles for models of successful strongly sustainable business. Furthermore, as interdisciplinary researchers, we also acknowledge that our results must be considered within the known limitations of such research, for example, the inherent breadth versus depth versus time challenge and the incommensurability of technical language between the disciplines (Kinzig, 2001; Klein, 2004; Redclift, 1998).

The framework of propositions and principles was established from a comprehensive review across bodies of disciplinary literature necessary to conceptualize models of successful strongly sustainable business. From this framework it is possible to define alternative ontologies using alternative formalisms than ERMs. Particularly given the reductive expressive capacity of the ERM method, we look forward to evaluations of such alternatives that might extend semantic and relational capabilities.

The current ontology can be further developed, by improving the depth of its inclusion of the relevant multidisciplinary body of knowledge and by expressing the ontology as an object oriented model, which might characterize the aggregate and part–whole relationships among the defined entities. Furthermore, a complementary system dynamics model could be developed, representing economic, social, and ecological stocks, flows, and feedbacks loops necessary to predict or simulate environmental (if not social well-aligned) outcomes of a successful strongly sustainable business (Victor, 2008).

While the current article is constrained to the research leading to the definition of the ontology, our research has also conducted evaluation activities to confirm the concepts and relationships defined in the ontology. Further work is under way to determine applicability across a number of sectors, sizes, and stages of organizational development (from start-up to mature) and to non-business organizations (NGOs, charities, governments). Further research has recently led to validating a visual practitioner tool (canvas) conceptually derived from the ontology, consistent with the Osterwalder BMC precedent (Jones and Upward, 2014).

Finally, we note that research well aligned with our approach is starting to emerge. Schaltegger et al. (2012) argue that the business case for sustainability lies in a firm's business model. This position could be strengthened by considering whether additional business model factors required for strongly sustainable outcomes could create stronger business cases. The recent analysis of patterns or archetypes of sustainable business models (Bocken, Short, Rana, & Evans, 2014) could demonstrate further practical value by adopting the SSBMO as a taxonomy to develop a standardized reference of axiomatic definitions and as a basis for identifying of weak and strongly sustainable business model patterns. The use of the ontology would ensure that each pattern was assessed for its likelihood to produce only profitable outcomes versus weakly sustainable or strongly sustainable ones. Finally Boons and Lüdeke-Freund (2013) concur that SSBMs require an acknowledgement of the normative nature of definitions of success and then go on to propose a general research agenda for the sustainable business model field. This agenda could be augmented by explicit consideration of the strongly sustainable perspective and the research suggestions above.

Conclusion

Today organizations typically do not define their underpinning values associated with their definition of success nor measure their operations and outcomes against our definition of a successful strong sustainability business. The position of “strongly sustainable” and identifying the “possibility for flourishing” as a legitimate business goal signifies a holistic and perhaps radical turn for business (and society). It requires all stakeholders, including managers, to advance a shift towards a collective normative definition of business success appropriate to their local circumstances and shared worldviews.

To be useful, any instruments for structuring and deploying the required business models must be conceptually and normatively compatible with *all* the knowledge we have introduced. Stakeholders (including managers) cannot be expected to learn the large body of scientific knowledge that describes and validates claims of strong sustainability. Stakeholders, including leaders and managers, will be motivated by the moral argument and the practical benefits (including improved financial viability as environmental and social constraints impinge on “business as usual”). But of practical necessity, not having the time or motivation to learn all the underlying knowledge, stakeholders will have to trust the templates and methodologies available for strategic and organizational change. It was this reasoning that led to proposing the necessary and sufficient concepts and their relationships for a formally defined ontology to model successful strongly sustainable business.

We believe by reimagining an ontology of business models so it can describe models of business anywhere on a continuum from profit-normative to strongly sustainable, the business model becomes the most critical position from which stakeholders can influence the adoption and realization of new definitions of business success, including sustaining the possibility for flourishing.

Such a definition of success requires business models to envisage continual rejuvenation of natural and other capitals by embedding the required activities into the business processes of value co-creation. We believe this not only results in the possibility of flourishing but also enables competitive innovation and advantage, even when measuring in conventional monetary terms.

As such, our ontology (and its companion practitioner tool) is of value not only to the groups of stakeholders we discussed above, each with different normative definitions of business success, but also to those outside the realm of business, such as public policy analysts and educators. As such, it can help individual businesses and the entire system of business, including government, educators, and NGOs, more towards outcomes suggested as required to maintain/restore conditions conducive to human health and desirable to sustain the possibility for flourishing of all life. This is achieved by explicitly attempting compatibility with current credentialed knowledge from natural and social science rather than current social convention. As more organizations in different sectors and marketplaces implement business models aligned with this definition of success, the probability of sustaining the possibility for flourishing is greatly increased.

For each of us, and indeed for all life, the likelihood of flourishing, now and in the future, depends on our ability to innovate in response to new and changed circumstances. This is particularly true, as we enter fully into the challenges and risks of the Anthropocene era (Crutzen, 2002), where these circumstances are largely shaped by the unintended consequences of our own individual and collective behaviour. Human organizations, particularly businesses, are central in generating these circumstances and in creating the

innovation required to take definitive, highly leveraged actions to sustain the possibility for the flourishing of human and other life on this planet forever. However, without templates, such as the ontology we propose (and its companion practitioner tool), adopting changed values, and practical business model reasoning, the possibility of businesses enabling strongly sustainable outcomes, in our view will continue to recede.

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