



Review

A literature and practice review to develop sustainable business model archetypes



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ABSTRACT

Eco-innovations, eco-efficiency and corporate social responsibility practices define much of the current industrial sustainability agenda. While important, they are insufficient in themselves to deliver the holistic changes necessary to achieve long-term social and environmental sustainability. How can we encourage corporate innovation that significantly changes the way companies operate to ensure greater sustainability?

Sustainable business models (SBM) incorporate a triple bottom line approach and consider a wide range of stakeholder interests, including environment and society. They are important in driving and implementing corporate innovation for sustainability, can help embed sustainability into business purpose and processes, and serve as a key driver of competitive advantage.

Many innovative approaches may contribute to delivering sustainability through business models, but have not been collated under a unifying theme of business model innovation. The literature and business practice review has identified a wide range of examples of mechanisms and solutions that can contribute to business model innovation for sustainability. The examples were collated and analysed to identify defining patterns and attributes that might facilitate categorisation.

Sustainable business model archetypes are introduced to describe groupings of mechanisms and solutions that may contribute to building up the business model for sustainability. The aim of these archetypes is to develop a common language that can be used to accelerate the development of sustainable business models in research and practice. The archetypes are: Maximise material and energy efficiency; Create value from 'waste'; Substitute with renewables and natural processes; Deliver functionality rather than ownership; Adopt a stewardship role; Encourage sufficiency; Re-purpose the business for society/environment; and Develop scale-up solutions.

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1. Background

With prospects of a rising global population, accelerating global development and associated increasing resource use and environmental impacts, it seems increasingly apparent that business as usual is not an option for a sustainable future. The world is currently using the equivalent of 1.5 planets to support human activities (WWF, 2012) – an unsustainable rate even at today's levels of consumption (Randers, 2012). Awareness of the need to value ecological systems and natural capital required for human welfare is not new (Constanza et al., 1997). However, it is not yet common practice in business to value the – often 'free' –

natural assets. A holistic approach is required to tackle the challenges of a sustainable future: responses to environmental changes will necessarily need to be in parallel with economic and social change.

Features of a route to a sustainable economy (developed from Jackson, 2009) might be:

- A system that encourages minimising of consumption, or imposes personal and institutional caps or quotas on energy, goods, water, etc.;
- A system designed to maximise societal and environmental benefit, rather than prioritising economic growth;
- A closed-loop system where nothing is allowed to be wasted or discarded into the environment, which reuses, repairs, and re-makes in preference to recycling;
- An system that emphasises delivery of functionality and experience, rather than product ownership;
- A system designed to provide fulfilling, rewarding work experiences for all that enhances human creativity/skills;

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- A system built on collaboration and sharing, rather than aggressive competition.

These types of changes require a fundamental shift in the purpose of business and almost every aspect of how it is conducted. Business model innovation offers a potential approach to deliver the required change through re-conceptualising the purpose of the firm and the value creating logic, and rethinking perceptions of value. The assertion is that with careful business model redesign it is possible for mainstream businesses to more readily integrate sustainability into their business and for new start-ups to design and pursue sustainable business from the outset, as suggested by Stubbs and Cocklin (2008) and Porter and Kramer (2011), and business model innovations can support a systematic, on-going creation of business cases for sustainability (Schaltegger et al., 2012).

Business model innovation is increasingly recognised as a key to delivering greater social and environmental sustainability in the industrial system (e.g. Lüdeke-Freund, 2010). However, understanding of sustainable business models and the options available for innovation for sustainability seems limited at present. While there is extensive literature on the theory of business models for delivering sustainability (e.g. Stubbs and Cocklin, 2008 conducted a literature review), and examples on specific companies (e.g. Xerox, Canon and Océ 'pay per copy' models, Baines et al., 2007) there is no comprehensive view of how firms should approach embedding sustainability in their business models.

This paper uses a systematic review approach to formalise a categorisation (the result of a process of dividing the world into groups of entities whose members share similarity in a given context, as defined in Jacob, 2004) of business model innovations to deliver sustainability. This categorisation aims to drive the future research agenda for sustainable business models by proposing archetypes for new sustainable business models, and assisting the process of embedding sustainability into existing industrial models.

In Section 1 the concept and relevancy of sustainable business models are explained. The gaps in the literature are defined to highlight the need for the development of a categorisation. This is followed by an explanation in Section 2 of the iterative methodology to develop the categorisation, building on literature and industrial practice examples, and by using various categorisations. In Section 3 the proposed categorisation of sustainable business model archetypes is explained in detail. Eight sustainable business model archetypes are introduced: Maximise material and energy efficiency; Create value from 'waste'; Substitute with renewables and natural processes; Deliver functionality rather than ownership; Adopt a stewardship role; Encourage sufficiency; Re-purpose the business for society/environment; and Develop scale-up solutions. Section 4 discusses the limitations and potential of these archetypes, and offers suggestions for future extension of the research.

1.1. What is a business model?

A business model is a conceptual tool to help understand how a firm does business and can be used for analysis, comparison and performance assessment, management, communication, and innovation (Osterwalder and Pigneur, 2005). Business models are concerned with how the firm defines its competitive strategy through the design of the product or service it offers to its market, how it charges for it, what it costs to produce, how it differentiates itself from other firms by the value proposition, and how the firm integrates its own value chain with those of other firm's in a value network (Rasmussen, 2007). The quality of management is key because they determine the success of the business model through their capabilities, ability to acquire, combine and utilise valuable

resources in ways that deliver a value proposition to customers (Beltramello et al., 2013).

The literature presents various perspectives on the business model: Margretta's (2002), Zott and Amit (2010) and Beattie and Smith (2013) describe business models as a holistic description on 'how a firm does business' and Teece (2010) describes that a business model articulates how the company will convert resources and capabilities into economic value. It is nothing less than the organisational and financial 'architecture' of a business and includes implicit assumptions about customers, their needs, and the behaviour of revenues, costs and competitors (Teece, 2010). More specifically, Osterwalder and Pigneur (2005, 2010) describe a business model as a series of elements: the value proposition (product/service offering, customer segments, customer relationships), activities, resources, partners, distribution channels (i.e. value creation and delivery) and cost structure, and revenue model (i.e. value capture). Richardson (2008) based on a wide range of literature, proposes a consolidated view of the components of a business models as: the value proposition (i.e. the offer and the target customer segment), the value creation and delivery system, and the value capture system. Zott and Amit (2010) take an activity-based perspective, including the selection of activities ('what'), the activity system structure ('how'), and who performs the activities ('who').

In this paper, a business model is defined by three main elements: the value proposition, value creation and delivery and value capture (Fig. 1). Value creation is at the heart of any business model; businesses typically capture value by seizing new business opportunities, new markets and new revenue streams (Beltramello et al., 2013; Teece, 2010). While the value proposition is typically concerned with the product and service offering to generate economic return, in a sustainable business, the value proposition would provide measurable ecological and/or social value in concert with economic value (Boons and Lüdeke-Freund, 2013). Value capture is about considering how to earn revenues (i.e. capture value) from the provision of good, services or information to users and customers (Teece, 2010).

Business models and business model innovation have received substantial attention in literature and industry and it is increasingly suggested that business model innovation is a key to business success (Chesbrough, 2010; Lüdeke-Freund, 2010; Zott et al., 2011). With the rising global sustainability pressures, collaboration between firms and other key stakeholders is becoming more important (Lowitt, 2013). Value is no longer created by firms acting autonomously, but by firms acting together with parties external to the firm through informal arrangements or formal alliances (Beattie and Smith, 2013). The business model may be viewed as a new unit of analysis in business, which takes into account these collaborative ties (Zott et al., 2011; Beattie and Smith, 2013).

1.2. Why are business models important for sustainability?

Eco-design and eco-efficiency improvements have assisted in reducing energy, resource intensity, and emissions and waste per



Fig. 1. Conceptual business model framework. Adapted from Richardson (2008); Osterwalder and Pigneur (2005).

unit of production. For instance, [Evans et al. \(2009\)](#) describe cases of companies, which reduced the energy used to make their product by over 40% in five years. However, these improvements have been insufficient to date to offset the rising resource use and environmental impacts associated with a growing developing global population. For example, [UNEP \(2012\)](#) found that in the context of transport, technological improvements to date (e.g. fuel-efficient vehicles and alternative power sources) have not been rapid enough to offset the impacts of this growth. Moreover, these efficiency improvements may lead to increased product and service use by making these more affordable and accessible, reflecting the concept of ‘rebound effect’ ([Herring and Sorrell, 2009](#)).

Scenarios for 2050 by the UK Department of Energy and Climate Change ([DECC, 2012](#)) target an 80% reduction in GHGs by 2050 compared to 1990. To deliver long-term sustainability on this scale requires fundamental changes in the global industrial system, and this necessitates an integrated approach that goes beyond eco-efficiency initiatives and reconceives how businesses operate.

Sustainable business models can serve as a vehicle to coordinate technological and social innovations with system-level sustainability. [Lüdeke-Freund \(2010\)](#) describes a sustainable business model as ‘a business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society’. Building on [Garetti and Taisch’s \(2012\)](#) views on sustainable manufacturing, business models preserve the environment, while continuing to improve the quality of human life. [Stubbs and Cocklin \(2008\)](#) assert that sustainable business models use both a systems and firm-level perspective, build on the triple bottom line approach to define the firm’s purpose and measure performance, include a wide range of stakeholders, and consider the environment and society as stakeholders. Extending this, a sustainable business model aligns interests of all stakeholder groups, and explicitly considers the environment and society as key stakeholders.

One of the key challenges is designing business models in such a way that enables the firm to capture economic value for itself through delivering social and environmental benefits ([Schaltegger et al., 2012](#)). While efficiency and quality improvements of the past may have readily translated into profits, it is not always so clear how delivering social and environmental value might translate into profit and competitive advantage for the firm. Still, the growing attention to the business model in the literature and practice suggests this is a useful framework for corporate innovation, and hence may be used to drive sustainability innovation forward ([Stubbs and Cocklin, 2008](#); [Lüdeke-Freund, 2010](#); [Boons and Lüdeke-Freund, 2013](#)). It seems likely that this field of research will expand significantly as firms increasingly seek to identify opportunities to gain competitive advantage in a world characterised by tightening regulation, contracting resource supplies, climate change effects, and shifting social pressures.

1.3. What is business model innovation for sustainability?

Despite extensive literature on business models, what actually constitutes a business model innovation is still somewhat ambiguous. The literature generally frames business model innovation in the context of changing the value proposition for the customer. However, it is more than just changing the product and service offerings for the customer; business model innovation involves changing ‘the way you do business’, rather than ‘what you do’ and hence must go beyond process and products ([Amit and Zott, 2012](#)). [Johnson and Suskewicz \(2009\)](#) suggest business model innovation represents shifting the focus away from developing individual technologies towards creating new systems. Furthermore, [Sommer \(2012\)](#) emphasises that a business model does not only have a

company focus, but involves a wider set of stakeholders, necessitating a broader value-network perspective for innovating and transforming the business model. This is in line with [Beattie and Smith \(2013\)](#) and [Zott et al. \(2011\)](#) who describe the business model as extending beyond the entity of the firm, its customers and shareholders, and also including value captured for key stakeholders (e.g. suppliers). Similarly, sustainable business models capture economic, social and environmental value for a wide range of stakeholders ([Bocken et al., 2013](#)).

Business model innovations for sustainability are defined as: Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver value and capture value (i.e. create economic value) or change their value propositions.

To tackle the pressing challenges of a sustainable future, innovations need to introduce change at the core of the business model to tackle unsustainability at its source rather than as an add-on to counter-act negative outcomes of business. The level of ambition of business model innovations needs to be high and focused on maximising societal and environmental benefits, rather than economic gain only. Business model innovations for sustainability may not be economically viable at the start (e.g. as in the time when the first hybrid car was introduced) but may become so in the future due to regulatory or other changes. [Schaltegger et al. \(2012\)](#) propose a typology of defensive, accommodative, and proactive business model innovations. Defensive strategies (adjustment) are incremental business model adjustments to protect current business models focussing on risk and cost reduction often driven by the need for compliance; accommodative strategies (improvement, integration) are modifications of internal processes and include some consideration of environmental or social objectives (e.g. environmental protection), whereas proactive strategies (full integration) concern the redesign of the core business logic of the firm for sustainable development. Although all business model innovations that deliver sustainability are welcomed, proactive innovation strategies appear most impactful.

1.4. Research gaps and objectives

Potential “sustainable business models” in the literature include closed-loop business models ([Wells and Seitz, 2005](#)), ‘Natural Capitalism’ ([Hawkin et al., 2005](#)), social enterprises ([Grassl, 2012](#)), Product Service Systems (PSS) ([Tukker, 2004](#); [Mont and Tukker, 2006](#)) and new economy concepts (e.g. Blue Economy; [Pauli, 2010](#)). Other concepts for delivering sustainability can be seen in practice, but seem to have received little attention in the business model literature to date. With the exception of some recent literature (e.g. [Boons and Lüdeke-Freund, 2013](#) who propose a classification by social, technical and organisational sustainable business model innovations) few authors have sought to unify the various examples in literature and practice in a useful categorisation under the over-arching theme of business model innovation.

The lack of a common source of information on business model innovations makes it difficult for researchers and practitioners to gain an overview of the scope of business model innovation for sustainability. This potentially limits research, education and training in this subject area, and hence limits practical experimentation and implementation in industry. Furthermore, this restricts the potential for exploitation of synergies between different types of innovations, so reducing the potential benefits. This is of particular concern because from practice review it can be seen that sustainability benefits are often only achieved through combining several approaches. For instance, implementing a PSS (e.g. car sharing) without an efficiency focus (e.g. fuel efficiency) is unlikely

to enhance sustainability, since the vast majority of its environmental impact is in the use phase, not in the manufacturing of the machine.

A categorisation of sustainable business model archetypes is developed to describe groupings of mechanisms and solutions that might contribute to building up the business model for sustainability and identify gaps for future research agenda. The archetypes seek to create new development paths or a capability to innovate. Building on the literature (Stubbs and Cocklin, 2008; Bocken et al., 2013), they need to take a value network or systemic perspective. This implies moving focus away from individual firms and technologies, towards creating new systems and generating value across the value network.

2. Method for categorising the mechanisms for delivering sustainability

This section discusses how the sustainable business model archetypes are developed from academic literature and examples in practice. Fig. 2 visualises the methodology including three iterative steps: 1. Identification of themes and relevant categorisations from the literature, 2. Consideration of alternative categorisations and frameworks suited to define sustainable business model archetypes, 3. Identification of business model sustainability innovations from practice. Multiple levels of data collection, categorisation and coding (iterations to categorise the list of examples in meaningful ways) were used to triangulate the data. The different sources of data are coded in a similar way (as suggested by Corbin and Strauss, 1990) taking into account the boundaries and criteria discussed in Section 2.1.

2.1. Criteria for selection and categorisation of innovation examples

Criteria and boundaries were set to facilitate the process of collecting innovation examples during the literature and practice

review. Firstly, the main aims of the categorisation of sustainable business model archetypes are to:

1. Provide a means of categorising and explaining business model innovations for sustainability
2. Define generic mechanisms for actively assisting the business model innovation process for sustainability.
3. Define a clearer research agenda for business models for sustainability
4. Provide exemplars which explain and communicate business model innovations to businesses to de-risk the business model innovation process (e.g. through education and workshops)

The archetypes need to be: representative of underlying mechanisms of transformation in business model innovation, clear and intuitive, mutually exclusive and explanatory, but not overly prescriptive. The selection criteria for the examples gathered and used to develop the archetypes included: Innovations that generate environmental and/or social benefits in business operations – that is, change the value proposition to the environment and society. This may be either through creating new value, or significantly reducing negative impacts on the environment and society.

While some of the innovation examples selected may not traditionally be associated with business model innovation, they are included because they all have the potential to change the value proposition for one or more stakeholder groups including the environment and/or society, and hence potentially modify the business model in some way.

2.2. Literature review – conceptual frameworks for categorising SBM innovations

The criteria in Section 2.1 were used to add structure to the literature search. The following academic databases were used for the literature search: Web of Knowledge, Scopus, EBSCO Host,

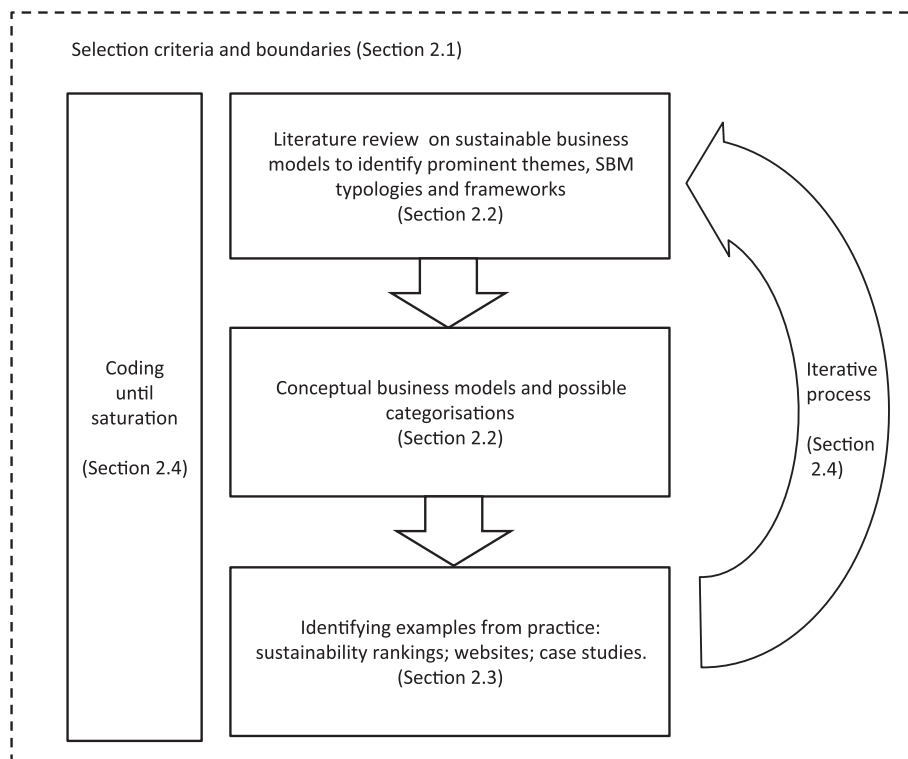


Fig. 2. Methodology to develop the SMB archetypes.

Table 1
Example categorisation of one of the coding exercises for “Encourage sufficiency”.

Business model archetype	Primary business model innovation	Industry example	Potential mechanism for delivering sustainability	Main sustainability benefit
Consumer/user education	Value proposition	Labelling. For instance: product nutritional traffic lights, energy star efficiency, carbon footprinting.	Encourage more sustainable use of products – health, energy usage.	Social, Environmental and long-term Economic
Demand Management and Cap & Trade	Value proposition	Energy Service Companies (ESCOs) – most examples stem from the public sector (buildings); work on green business models (FORA, 2010; Loughran and Kulick, 2004)	Quota restrictions; Restricted advertising and promotion; Providing incentives to reduce consumption. The provider optimises companies and public buildings and in return gets paid by part of the savings achieved.	Environmental, Social (Health, Debt)
‘Slow-Fashion’	Value proposition	Vitsoe shelving solutions, Louis Vuitton signature handbags	Deliberate strategy to slow the fast –fashion cycle, by not constantly introducing cosmetic innovation and encouraging greater longevity in use.	Social, Environmental
Longevity	Value proposition	Rolex, Mont-Blanc	Design for maximised product life (minimise price/year of life)	Social, Environmental
‘Premium’ branding	Value proposition	Patagonia clothing, Vitsoe, Luxury brands (Chouinard and Stanley, 2012)	Quality, restricted production volumes, high price to material content ration, service proposition included in upfront pricing, little or no discounting. This could facilitate reduced consumption and encourage longevity in use.	Environmental, Economic
Frugal business	Value proposition, value creation and delivery	Solar cooking systems and other simple off-grid solutions. Health services in rural areas (Esposito et al., 2012)	Doing more with less.	Social, Environmental
Responsible promotion	Value creation, delivery	Patagonia clothing partnership with EBay. Vitsoe shelving (Evans et al., 2009)	Only sell what is needed. Avoiding discounting and price dumping. No sales commissions.	Social, Environmental, Economical

ProQuest and SAGE Journals. Key words included variations (e.g. plural, singular) on terms such as sustainability, business model (innovation), sustainable business model, sustainability business model, eco-innovation, green business model, social enterprise, shared value creation, corporate responsibility, industrial sustainability, sustainable manufacturing, and green manufacturing.

This literature search generated articles on conceptualising sustainable business models (e.g. Stubbs and Cocklin, 2008), specific industries (Wells, 2004 on automotive industry), categorising PSS (Tukker, 2004), categorising social enterprises (Brugmann and Prahalad, 2007; Yunus et al., 2010; Grassl, 2012), various sustainable business model developments in the BRIC countries (Birkin et al., 2009 on new business models on China; Shrimali et al., 2011 on stoves in India), sustainable value creation (Hart and Milstein, 2003), a value network perspective (Allee, 2000; Garetti and Taisch, 2012; Prescott et al., 2002; Bocken et al., 2013) and collaborating across the value chain (Romero and Molina, 2011; Bocken and Allwood, 2012); industrial symbiosis (Chertow, 2000), and green business models (Høgevoid, 2011; Barber et al., 2012). Earlier overviews which sought to identify unifying research agendas for sustainability in business include those by Carroll and Shabana (2010) on the business case for CSR; Dyllick and Hockerts (2002), Salzmann et al. (2005) and Schaltegger et al. (2012) on the business case for sustainability; Bisgaard et al. (2012) on value creation and business models, Beltramello et al. (2013) on “green” business models, Wells and Seitz (2005) on closed loop supply chains, Wells and Bristow (2007) and Lüdeke-Freund (2009), Boons et al. (2013) and Boons and Lüdeke-Freund (2013) who looked into business models for sustainability. The latter two are part of a 2013 special issue in the Journal of Cleaner Production on sustainable business models.

Major themes from the broad sustainability literature search were used to develop a list of potential approaches that contribute to business model innovation for sustainability: Eco-efficiency

improvements (lean,¹ cleaner production,² eco-design³), visions for a new economy and society (blue economy,⁴ natural step,⁵ prosperity without growth⁶), creating value from waste (recycling, closed loop, and industrial symbiosis⁷), product service systems,⁸ and social enterprise solutions.⁹ As additional business model examples from literature and practice were explored this list was refined and extended to better categorise the discrete mechanisms seen.

The authors evaluated whether existing conceptual frameworks found in the literature could be used as a basis for categorisation of SBM innovations. Various approaches for categorising the mechanisms were explored, based on various pre-existing frameworks from the sustainability, manufacturing, business model and innovation literature. These included the three pillars of sustainability, which in a business context Elkington (1997) defines as the Triple-Bottom-Line (Economic, Environmental, and Social). Various business model frameworks were explored including Richardson’s (2008) definition (Value Proposition, Value creation and delivery, and Value capture), and the more detailed Osterwalder and Pigneur’s (2010) business model building blocks (Customers, Relationships, Value proposition, Delivery Channels, Key Resources, Key Activities, Key Partners, Cost Structure, Revenue Streams). Additional frameworks considered were the *value-chain* perspective (e.g. UNEP, 2008) (e.g. Extraction, R&D, Procurement, Production,

¹ See for instance Shah and Ward (2003).

² See for instance Fresner (1998).

³ See for instance Baumann et al. (2002); Bocken et al. (2011).

⁴ See Pauli (2010).

⁵ Robèrt (2008).

⁶ Jackson (2009).

⁷ See for instance Chertow (2000).

⁸ See Baines et al. (2007).

⁹ See Grassl (2012).

Distribution, Sales, Marketing, Service, Disposal), and *value-network* or *Stakeholder* perspective (e.g. [Stubbs and Cocklin, 2008](#)) (Investors, Customers, Distributors, Partners and Suppliers, Employees, Environment, Community, Government). However, it was found that these do not really help for categorisation, nor do they provide a framework for guiding future innovation activities. This is because of the nature of business model innovations for sustainability – they generally span multiple pillars of sustainability, impact multiple building blocks of the business model, and impact multiple stages of the value chain and stakeholders throughout the value network – all stakeholders involved or affected in the creation, delivery and consumption of products/services ([Bocken et al., 2013](#)). Innovation frameworks were also explored such as [Mercier-Laurent \(2011\)](#) innovation strategy, and the more recent business model innovation framework proposed by [Boons and Lüdeke-Freund \(2013\)](#) (Technological innovation, Organisational innovation, Social innovation). Categorisation based on innovation proved more effective in understanding the underlying mechanisms within the business model innovations, which led to a preliminary classification of Product/service, Process, Network and Social Innovation (based on [Mercier-Laurent, 2011](#)). This has some similarities with the work of [Boons and Lüdeke-Freund \(2013\)](#). Ultimately, it was decided to use their slightly more generic framework of technological, social and organisational innovation as a high-level categorisation. However, a more detailed categorisation was found to be necessary for the objectives of this research.

2.3. Identifying (sustainable) business model examples from practice

The literature search confirmed the lack of an extensive categorisation of sustainable business model archetypes. In some cases, industrial practice appears to be ahead of academia in exploring and developing novel business models. Hence, examples from practice were a crucial addition. During the practice and grey literature search, new keywords were identified and additional searches were conducted in the academic databases on these keywords.

To identify sustainable business models developed in practice, a review of secondary literature on practice was conducted. Industrial practice in (sustainable) business model development was investigated, by exploring:

1. Sustainability rankings;
2. Websites of organisations involved in industrial sustainability (e.g. UNEP, WBCSD); and
3. Case studies on business models and sustainable business models (SBM).

Sustainability rankings such as Corporate Knights top 100, the Guardian Green and Sustainable Business Awards, the Dow sustainability index, and Forbes top 100 sustainability leaders provide indicators of potential exemplary performance in sustainability. None of the rankings specifically look at business model innovation, and many of the firms do not seem to be undertaking radical, if any, business model innovations for sustainability to date. Many of the rankings are based on the Global Reporting Initiative (GRI) or similar sets of indicators. On the whole, the rankings tend to focus on relatively narrow ranges of indicators such as carbon emissions and water use, social indicators such as health and safety and other employee related measures, corporate governance ratings, and CSR contributions. Nonetheless, the rankings did highlight interesting examples that were subsequently reviewed through corporate websites and sustainability reports. We identified examples of initiatives in areas such as: Fair-trade, Social enterprises and Benefit

(B-) corporations, and Eco-innovation. These examples were added to our list of examples if they met the criteria in Section 2.1.

Websites of leading organisations in the fields of sustainability and sustainable development such as WBCSD and UNIDO, World Bank, UNEP and major INGOs, were surveyed for examples of business model innovation for sustainability. This generated similar results to assessment of sustainability rankings. Several UK organisations working on promoting exploration of business models for sustainability were also surveyed (e.g. Forum for the Future, WRAP). These searches for instance yielded insights into emerging models based on collaboration.

The grey literature of popular press provides numerous examples of business model innovation for sustainability, such as [Chouinard and Stanley \(2012\)](#), [Tukker \(2008\)](#) and [Esty and Winston \(2009\)](#), [Anderson and White \(2011\)](#), [Pauli et al. \(2010\)](#) and [Senge et al. \(2008\)](#). These help to clarify perceived exemplary firms for sustainability. An on-going OECD funded project on green business models was also used as a comprehensive source of information on emerging models for environmental sustainability ([FORA, 2010](#)).

The practice review led to additional academic literature database searches. New search terms included “demand management”, “ethical sourcing”, “social enterprise”, “b-corporation”, “industrial symbiosis”, “product service systems”, “take-back management”, “closed-loop models”, “circular economy”, and “frugal business models” amongst others.

2.4. Development of archetypes based on literature and practice (coding)

To address shortcomings of alternative categorisations from the literature, a deeper categorisation of *sustainable business model archetypes* is introduced to explain different mechanisms for delivering sustainability.

The authors used coding of the examples generated from practice and literature to develop the archetypes. The analysis and generation of important themes and categorisations as suggested by [Corbin and Strauss \(1990\)](#), makes use of constant comparisons for similarities and differences, to achieve precision and consistency. Both theoretical coding, which uses higher level literature themes (in particular the categorisations from Section 2.2 such as the social, technological and organisational classification by [Boons and Lüdeke-Freund, 2013](#)), and open coding which uses lower level codes (e.g. specific company innovation initiatives), which are being grouped into higher level codes were used to develop the archetypes ([Corbin and Strauss, 1990](#)). The lower level codes were regularly compared to higher-level codes (themes from the literature and practice). As part of this process, the authors conducted rounds of individual coding followed by joint discussion to understand the reasoning behind the categorisations. This process was repeated until agreement and saturation was reached on the final sustainable business model archetype categorisation. [Table 1](#) includes a snapshot of one of the coding exercises, used to develop the archetypes. The more complete list of coding examples is available upon request from the authors.

A list of eight archetypes, explained in Section 3, was eventually developed, after saturation of the coding process (no new themes or categorisations being identified).

3. Results: the sustainable business model archetypes

This section explains the sustainable business model archetypes developed in this paper ([Fig. 3](#)). The archetypes are classified in higher order groupings, which describe the main type of business model innovation: Technological, Social, and Organisational oriented innovations. This builds on the categorisation by [Boons and Lüdeke-](#)

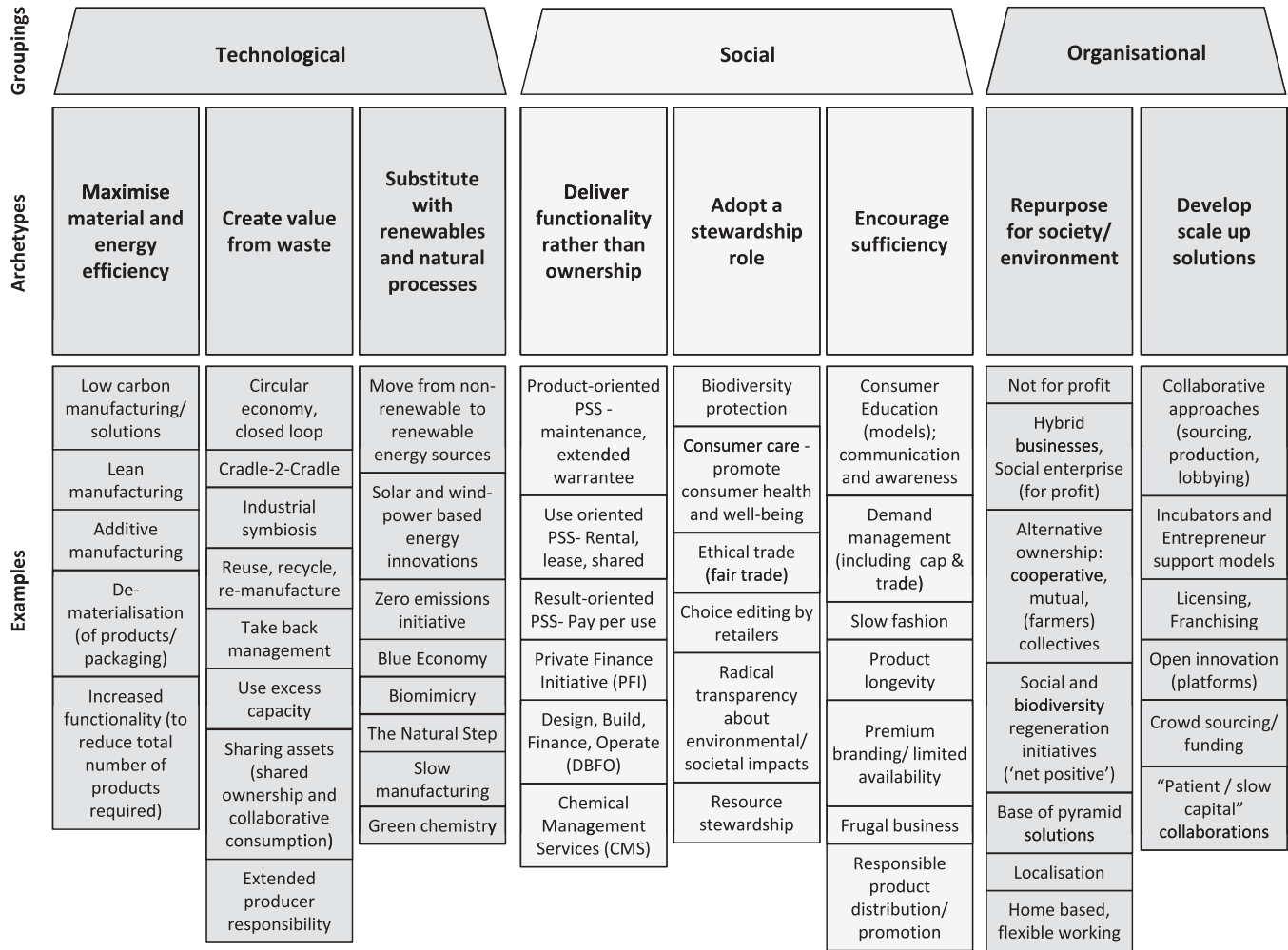


Fig. 3. The sustainable business model archetypes.

Freund (2013), which were found to be the most helpful in defining descriptive groupings. The technical grouping includes archetypes with a dominant technical innovation component (e.g. manufacturing process and product redesign); the social grouping includes archetypes with a dominant social innovation component (e.g. innovations in consumer offering, changing consumer behaviour) while archetypes in the organisational grouping have a dominant organisational innovation change component (e.g. changing the fiduciary responsibility of the firm). These high-level groupings are

indicative for the dominant areas of innovation, although they are often paired with other innovations. In the following sections, each of the eight archetypes is discussed in detail.

3.1. Maximise material productivity and energy efficiency

Definition: Do more with fewer resources, generating less waste, emissions and pollution. Fig. 4 shows the 'Maximise material productivity and energy efficiency' archetype.

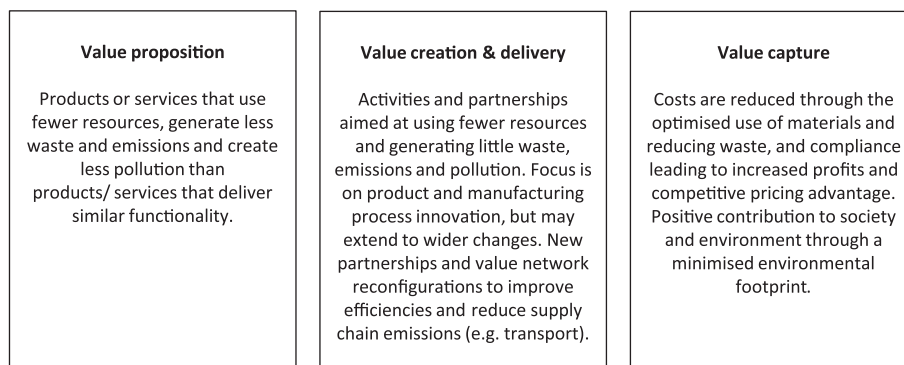


Fig. 4. Sustainable business model archetype 'Maximise material and energy efficiency'.

3.1.1. Why it was selected as an archetype

This archetype encompasses an existing theme from the manufacturing sector, and the foundation of much of the existing work on industrial sustainability – that of maximising material productivity, resource efficiency and waste reduction. This archetype is distinct from mere process innovation in the sense that ‘maximising material and energy efficiency’ should run through the entire business and subsequently enhance the value proposition (e.g. through significant price reductions).

As resource constraints become more acute, and energy prices increase, focus on this archetype is only likely to increase. This archetype captures concepts such as lean, eco-efficiency, and cleaner production approaches, which seek to improve resource efficiency and reduce waste and emissions through product and process redesign. There are numerous examples in industry of how this archetype has enabled alignment between environmental and economic objectives of the firm (Gupta and Benson, 2011; Hawken et al., 2005; Weizsäcker et al., 1997).

This archetype seeks to mitigate environmental impact of industry by reducing the demand for energy and resources so reducing demand for primary extraction and resource depletion, and reducing waste and emissions (waste to land-fill, CO₂, and other polluting emissions). In doing so, this archetype contributes towards system-wide reduction of resource consumption.

Efficiency in material and energy use should always be an important objective, but the fact that it generates rebound effects (Herring and Sorrell, 2009) when used in isolation is a major issue. In addition, productivity improvements and efficiency improvements have eliminated traditional jobs in manufacturing, leading to unemployment and associated social sustainability issues (Ashford et al., 2012). Hence, other archetypes would also need to be considered and employed.

3.1.2. Examples

Lean manufacturing is a well-established philosophy that identifies and seeks to minimise waste in production processes (Shah and Ward, 2003; Melton, 2005). Waste in this context is not only seen in the physical waste materials and waste energy, but also in over-production, materials handling, over-processing, inventory, defects and rework. The focus of lean has achieved substantial improvements in energy and material efficiencies and productivity improvements. Examples such as the Toyota production system (Womack and Jones, 2003) epitomise the integration of lean thinking throughout the business. Cleaner production concepts build on this, and specifically focus on waste and emissions reductions from production processes.

Factor 4 and Natural Capitalism (Hawken et al., 2005; Weizsäcker et al., 1997) have a more specific focus on sustainability and the need for more radical transformation in energy efficiency and

material productivity for sustainability, rather than small incremental improvements. The suggestion is that 4 times efficiency improvements, or even 10 times efficiency improvements may be possible through more radical redesign of products and production processes.

3.2. Create value from ‘waste’

Definition: The concept of ‘waste’ is eliminated by turning waste streams into useful and valuable input to other production and making better use of under-utilised capacity. Fig. 5 shows the ‘create value from waste’ archetype.

3.2.1. Why it was selected as an archetype

Seeking to improve efficiency and minimise waste and emissions may often be the best approach, but in some cases may mean that opportunities for complementary value creation are missed. This second archetype is distinct from the efficiency archetype, in that rather than seeking to reduce waste to a minimum, it seeks to identify and create new value from what is currently perceived as waste. This approach has similarities with the natural world, where the concept of waste does not really exist because all ‘waste’ products become food stock for another natural kingdom (Boons and Lambert, 2002; Gibbs and Deutz, 2007).

This archetype seeks to reduce environmental impact of industry by reducing the continuous demand for resources, by closing material loops and using waste streams as useful inputs to other products and processes, so reducing demand for primary extraction and resource depletion, and reducing waste to landfill and emissions. In doing so, this archetype contributes towards improved resource efficiency. However, to achieve greater system-level impact, the speed of new product introductions needs to be reduced.

3.2.2. Examples

Industrial symbiosis, is a process orientated solution turning waste outputs from one process into feedstock for another process or product line (Ayres and Simonis, 1994; Chertow, 2000). One of the most well-known examples of industrial symbiosis is the industrial park Kalundborg (Chertow, 2000).

Closed-loop business models (Winkler, 2011) include products and business processes designed in a manner that enables waste at the end of the use phase of a product to be used to create new value. An example of moving towards closed loop business model is the Interface Flor providing office floor carpet tiles (Anderson and White, 2011).

Cradle-to-Cradle (McDonough and Braungart, 2002) incorporates the idea of a closed loop technical nutrient cycle with a biological open-loop cycle. The latter acknowledges that it is not always possible to recapture materials lost during the production

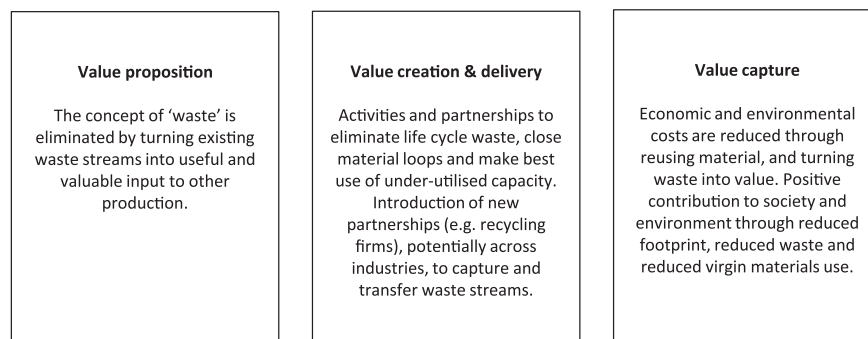


Fig. 5. Sustainable business model archetype ‘Create value from ‘waste’’

and use phase, and in such instances these waste streams and emissions should be designed so that they are benign to the environment and preferably contributing positive nutrients to the natural environment, creating positive value for the environment.

Under-utilised assets and capabilities as a form of wasted value might be re-captured through sharing – shared ownership, and collaborative consumption approaches. Examples of collaborative consumption approaches being used to radically reduce material throughput are emerging such as peer-to-peer car sharing and local community peer-to-peer electrical power tool sharing schemes.

3.3. Substitute with renewables and natural processes

Definition: Reduce environmental impacts and increase business resilience by addressing resource constraints 'limits to growth' associated with non-renewable resources and current production systems. Fig. 6 shows the 'Substitute with renewables and natural processes' archetype.

3.3.1. Why it was selected as an archetype

Whereas resource efficiency improvements and 'creating value from waste' are examples of innovations delivering environmental impact reduction, these approaches do not explicitly consider the potential of renewable resources, and deriving benefits from nature-inspired innovations, which may allow for significant leaps in environmental impact improvement. This archetype builds on concepts such as the Blue economy and the Zero Emissions (ZERI) (Pauli, 2010), Biomimicry (Benyus, 2002), The Natural Step (Robèrt, 2008), concerned with the potential for humanity to live within current resource constraints, by making better use of renewable resources or drawing inspiration from processes occurring in nature.

This archetype seeks to reduce environmental impact of industry by substitution with renewable resources and natural processes to create significantly more environmentally benign industrial processes. It contributes to the wider need of reducing the use of the planet's finite resource supply and reducing unwanted waste and pollution.

3.3.2. Examples

Substitution with renewable (non-finite) resources: This spans options from substitution of finite materials with renewable materials, such as replacing metals with natural and fibre-based materials, through to system-level renewable power generation systems. In many cases, these technologies and systems already exist, yet are currently not economically viable, or cannot be made efficiently at volume. As production systems evolve or regulations and incentive structures change, such technologies and systems

may become more affordable, which may open up business model innovation opportunities (e.g. recent widespread uptake of solar photovoltaic panels).

Local renewable energy solutions: This includes solutions such as solar electricity provision in developing markets (e.g. for light, cookers), and using onsite windmills and solar to generate electricity for manufacturing processes (manufacturing examples are included Evans et al., 2009).

Environmentally benign materials and production processes: This is a broad area of innovation from replacing chemical dyes with organic/benign dyes in textile production, through to more radical change such as the emerging field of 'green chemistry' that seeks to utilise naturally occurring processes in place of traditional industrial processes. For example, seeking to replicate how spiders weave exceptionally strong webs using only organic materials and ambient pressure and temperatures, rather than the typical industrial processes that involve high energy inputs to deliver temperature and pressure, and environmentally damaging chemicals and acids.

3.4. Deliver functionality, rather than ownership

Definition: Provide services that satisfy users' needs without having to own physical products. Fig. 7 shows the 'deliver functionality, rather than ownership' archetype.

3.4.1. Why it was selected as an archetype

This archetype is based on the literature on Product Service Systems (PSS) and Servitisation (e.g. Goedkoop et al., 1999; Tukker, 2004), which is concerned with how companies shift the business model from offering a manufactured product to offering a combination of products and services. The product is still important, but customer experience is fundamental to the offering or value proposition. Product service systems span a continuum from mainly product through to mainly service content (Tukker, 2004).

This archetype is about shifting substantially towards the pure service model – that is, delivering functionality on a pay-per-use basis, rather than selling ownership of a product. In doing so, this may fundamentally change the material throughput requirements of the industrial system. The literature suggests the following potential benefits of such an approach, which result from better alignment of the customer's (and societies) needs with that of the manufacturer:

- Breaks the link between profit and production volume (but probably not usage volume)
- Can reduce resource consumption
- Motivation and opportunity to deal with through-life and end-of-life issues as the manufacturer retains ownership of assets

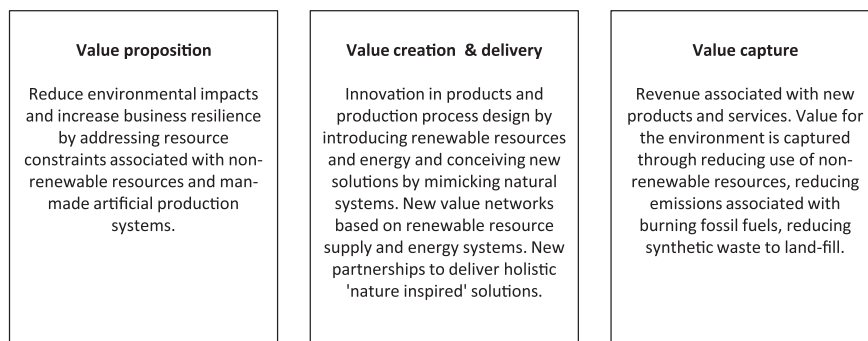


Fig. 6. Sustainable business model archetype 'Substitute with renewables and natural processes'.

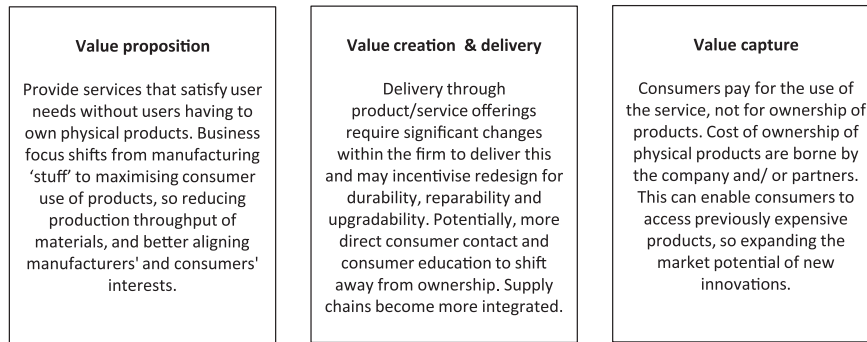


Fig. 7. Sustainable business model archetype 'Deliver functionality, rather than ownership'.

- Enhanced efficiency in use
- Enhanced product longevity/durability
- Reuse of materials

This archetype has the potential to change consumption patterns, in particular by reducing the need for product ownership. In addition, it may incentivise manufacturers to develop products that last longer and design for upgradability and reparability, potentially reducing resource use. However, literature and practice indicate that Product Service Systems and models are not inherently more eco-efficient (Mont and Tukker, 2006) and consumers are unsure whether they will live up to their expectations (Catulli, 2012). Careful attention to detail is required to realise the benefits, Such business model innovation generally needs to be married with efficiency and value in waste innovations. In addition, to achieve greater system-level impact, product and service usage volume would also need to be mitigated.

3.4.2. Examples

An often-quoted results-oriented PSS is Xerox Inc's provision of photocopiers and services (Baines et al., 2007). The Xerox document management system is based on customer payment per print or copy, which could dis-incentivise printing. An often quoted use-oriented PSS example is car sharing (e.g. lease) while maintenance contracts and extended warranties are examples of product oriented PSS (Tukker, 2004).

3.5. Adopt a stewardship role

Definition: Proactively engaging with all stakeholders to ensure their long-term health and well-being. Fig. 8 shows the 'adopt a stewardship role' archetype.

3.5.1. Why it was selected as an archetype

This archetype seeks to maximise the positive societal and environmental impacts of the firm on society by ensuring long-term

health and wellbeing of stakeholders (including society and the environment). Through their business models, firms actively seek to contribute to sustaining and developing the well-being of their value networks. To In doing so, this archetype contributes partially towards the systemic objective to create a flourishing society and planet (Jackson, 2009). Again, the archetype would benefit from a combination with other archetypes (e.g. create value from waste).

3.5.2. Examples

Upstream stewardship examples include the Marine Stewardship Council (MSC, 2012), the Forestry Stewardship Council (FSC, 2012) and the Better Cotton Initiative. Features of such business models are often a supplier accreditation programme that drives more ethical or sustainable business practices at the grass-roots level (often in developing nations). The programmes might deliver environmental and social sustainability initiatives such as:

- Employee welfare and living wages
- Community development: Education, health, livelihoods
- Sustainable growing and harvesting of food and other crops, minimising chemical fertilisers and pesticides, water consumption, and top soil erosion
- Environmental resource and bio-diversity protection and regeneration

Typically, the consumer pays a price premium to fund benefits in the supply chain, motivated by the intangible value associated with such purchasing. The models generally appeal to consumer values, engaging the consumer in the supply-chain issues, rather than the retailer or manufacturer funding the premium (Fairtrade, 2011). Once such certifications reach critical mass (e.g. FSC), they could entirely displace non-certified products. Retailer Kingfisher (2012) has committed to FSC certified wood sourcing and proactively seek to replace more trees than are consumed to offset damage done collectively by industry over the past decades. This

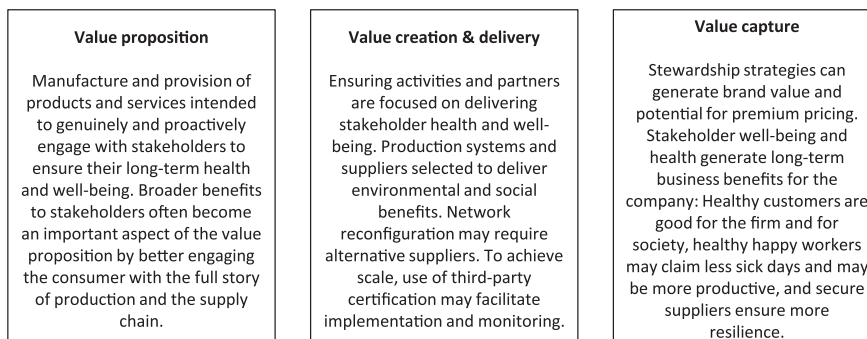


Fig. 8. Sustainable business model archetype 'Adopt a stewardship role'.

generates their so-called ‘net-positive’ impact for the environment (Kingfisher, 2012), which potentially defines a new model for future sustainability. Public spending guidelines can play an important role in facilitating such a shift.

Downstream stewardship examples include proactively tackling the health issues of consumers. This is particularly relevant in the food, beverage and tobacco sectors, where health issues are arising due to modern diets and over-consumption, combined with increasingly sedentary life-styles. The food and beverage sector therefore has an opportunity to enhance public health through actively encouraging a more healthy diet. Major retailers have already attempted this through ‘choice editing’ (Bocken and Allwood, 2012) whereby poor products are removed from their shelves. Manufacturers might extend this concept to their own production lines, eliminating products that are less healthy or more environmentally damaging. Legislation such as the EU directive on Energy using products has forced manufacturers to increasingly take responsibility for offering energy efficient products. This becomes a business model innovation when it creates a differentiating value proposition to customers through the offer of a healthier life or reduced energy bills. If value is perceived in reducing national health care costs or customers’ energy and water bills, this will positively influence the product offering decisions towards environmentally and socially better products.

3.6. Encourage sufficiency

Definition: Solutions that actively seek to reduce consumption and production. Fig. 9 shows the ‘encourage sufficiency’ archetype.

3.6.1. Why it was selected as an archetype

A growing body of academics and NGOs argue that radical reduction in consumption and fundamental changes in Western economic models are the only solution for a sustainable future (Ehrenfeld, 2008; Jackson, 2009). Proponents of such change argue that current initiatives solely focused on the production (supply-side) are insufficient to outweigh the negative impacts of an increasingly unsustainable Western way of living (e.g. Jackson, 2009). More radical approaches are required to actively seek to reduce consumption.

The sufficiency archetype aims to address this, by tackling sustainability from the perspective of sustainable consumption. Of particular relevance in developing the sufficiency-based business model is the reframing of the value proposition to better address the broader range of stakeholders in a firm. Furthermore, the sufficiency approach should inform the appropriate use of advertising, sales and growth targets. On a systems level, this could reduce over-consumption, and hence material and energy throughputs.

3.6.2. Examples

Energy Saving Companies (ESCOs) optimise energy consumption of companies and public buildings and in return get paid by part of the savings achieved (FORA, 2010). In the household energy sector, utility providers are incentivised through subsidies to assist consumers in reducing their energy consumption: both producer and consumer are financially incentivised to reduce consumption (Loughran and Kulick, 2004). However, the benefits to a firm for actively engaging in demand-side management could be numerous – reputational benefit, risk reduction, avoiding scale-up costs. Government and regulation of course play a key role in driving sustainable consumption (Schrader and Thøgersen, 2011). Extending this concept to other forms of consumption is challenging, but has significant potential to reduce material and energy intensity of modern societies.

Product durability and longevity through product redesign potentially slows product replacement cycles. Furthermore, a change in the culture of fast fashion could significantly reduce excessive consumption and premature disposal of useful products. Companies such as Vitsoe (Evans et al., 2009) already disassociate themselves with fast fashion but this business model is not yet widespread.

Market places for second-hand goods create an incentive for owners to take more care of products to ensure higher second-hand value. Second-hand markets in automobiles are well developed, but platforms such as e-bay have extended this significantly. Patagonia clothing for instance, have recently established an e-bay based store to facilitate second-hand clothing trade rather than discarding the products, or leaving them unused in storage (Chouinard and Stanley, 2012). Likewise, manufacturers and retailers can also go further in encouraging greater sufficiency in the use phase of products and services by providing information on how to minimise usage impacts. Unilever’s for instance advises consumers of the benefits of using washing detergents at low temperatures and encourages consumers to take shorter showers (Rubik and Scholl, 2009).

Frugal business models typically focus on provision of products and services to low-income markets, often in extreme poverty. The business models take complex product concepts and redesign them to pare down to their base functionality. This involves eliminating superfluous or overly complex functionality and cosmetic features, to provide products that use minimal materials and energy at minimal costs (Karamchandani et al., 2011). Given their target markets, such models are often conceived within social enterprise solutions, but this need not be the case. Various authors have highlighted the potentially lucrative markets associated with the bottom of the pyramid (e.g. Esposito et al., 2012; Yunus et al., 2010). Whether or not frugal business models lead to sustainability

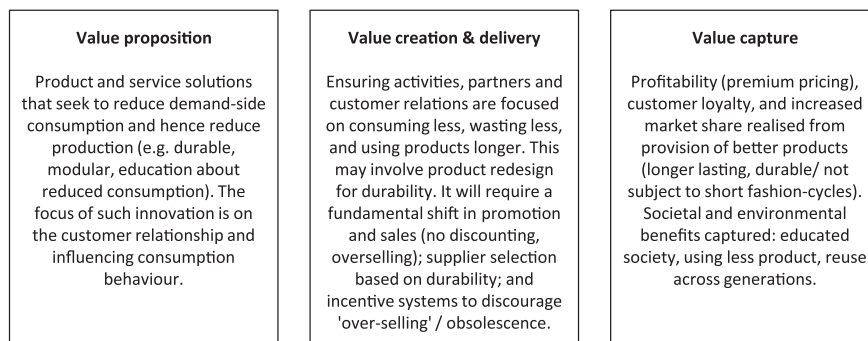


Fig. 9. Sustainable business model archetype ‘Encourage sufficiency’.

improvement depends on other aspects of the business, such as product quality. However, the concept of stripping products back to basic fundamentals could reduce the material and energy throughput, although it counteracts the drive for continuous improvement and endless demand for novelty in the developed world.

3.7. Re-purpose the business for society/environment

Definition: Prioritizing delivery of social and environmental benefits rather than economic profit (i.e. shareholder value) maximisation, through close integration between the firm and local communities and other stakeholder groups. The traditional business model where the customer is the primary beneficiary may shift. Fig. 10 shows the ‘Re-purpose the business for society/environment’ archetype.

3.7.1. Why it was selected as an archetype

Between traditional business approaches and social enterprises several other innovations can be seen in practice that potentially enhance the social value proposition of the firm significantly while also influencing other aspects of the firm’s business model. This archetype focuses on the changing fiduciary duty and structure of a firm for social and environmental (rather than economic and shareholder) benefits maximisation of an organisation and groups concepts that collectively see firms integrating more fully with their stakeholders.

On a systems level, this archetype could contribute to changing the fundamental purpose of businesses to deliver environmental and societal benefits, and therefore drive global, economy-wide change. Global policy framework changes, allowing for these companies to achieve scale without the need to maximise shareholder value, would increase the impact of this archetype.

3.7.2. Examples

A well-established area of research in the sustainable and social development fields is that of *social enterprises*. Grassl (2012) suggests that the distinction of social entrepreneurship is in the value proposition itself, or in other words, the core of the business model. Social enterprises exist to fulfil a specific social mission. They are ‘for-profit’ enterprises, but the profit motive is secondary to delivery of the social mission; hence they are not generally profit-maximising. Grassl (2012) suggests that business models for social enterprises must fulfil the following conditions as a minimum:

- Driven by a social mission;
- Generate positive externalities (spill overs) for society;
- Recognise the centrality of the entrepreneurial function;

- Achieve competitiveness on markets through effective planning and management.

Grassl (2012) identifies a broad range of organisations that might fulfil these conditions such as entrepreneur support models and organisational support models. Micro-finance and manufacturing enterprises serving regions of extreme poverty are examples of social enterprises (Yunus et al., 2010).

Non-profit organisations might deliver similar benefits to social enterprises but differ in that they do not seek to make a profit. The funding structure typically depends on external donors, which can present challenges for long-term economic viability. While there are successful examples of these models delivering one-off projects or initiatives, this model is less well suited to long-term continuous business operations.

A partial solution is the ‘Hybrid’ business model, whereby two business entities co-exist, one operating as a traditional for-profit business, but using part of the profit stream to finance a second not-for-profit enterprise. Although this does not embed sustainability into the core of the primary business, it can offer significant benefits.

3.8. Develop scale-up solutions

Definition: Delivering sustainable solutions at a large scale to maximise benefits for society and the environment. Fig. 11 shows the ‘Develop scale-up solutions’ archetype.

3.8.1. Why it was selected as an archetype

This archetype is introduced to consider the scale-up and widespread presence of business models for sustainability.

Emerging examples of businesses are being built on sound sustainability principles using combinations of the aforementioned archetypes. Albeit positive, these are often small scale. Their sustainability principles (particularly those that encourage sufficiency and social enterprises) may limit their attraction to mainstream investors, and may inhibit aggressive growth strategies. This seems to represent a challenge for sustainability in general – to achieve scale where firms might make a significant difference to environmental and social sustainability on a global level. This archetype is introduced to specifically consider the scale-up of business models for sustainability.

Large multinationals may be better placed to drive sustainability at scale, and ultimately they will almost certainly play a significant role once concepts are proven and competition forces them to change direction. However, in the nearer term, it is likely to be new start-ups and small businesses undertaking the more radical innovations (Nerkar and Shane, 2003; Giarratana, 2004), and these need innovative strategies to go to scale.

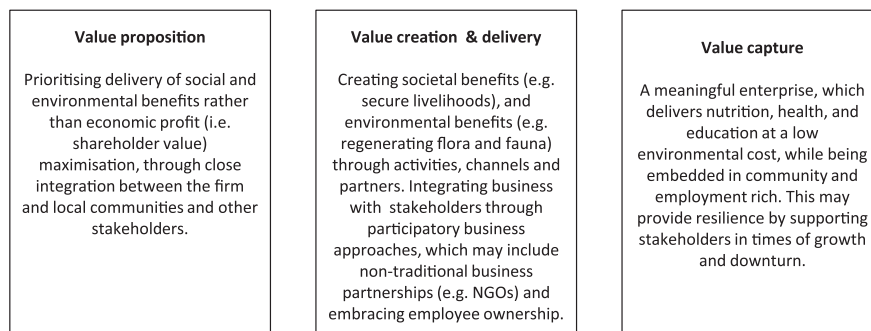


Fig. 10. Sustainable business model archetype ‘Re-purpose the business for society/environment’. Note. Value capture builds on Jackson (2009).

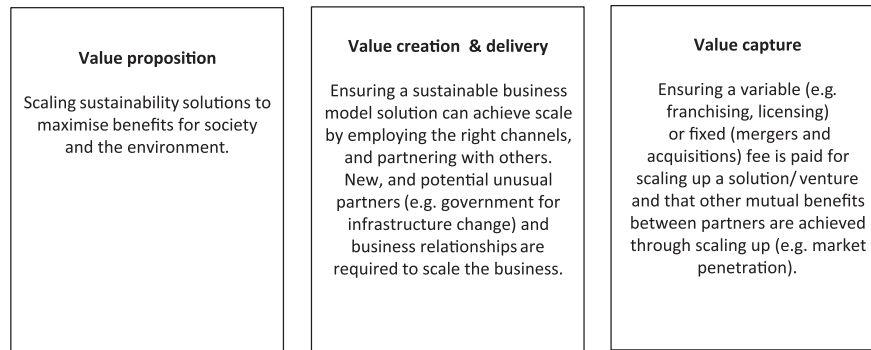


Fig. 11. Sustainable business model archetype 'develop scale-up solutions'.

3.8.2. Examples

Well-documented approaches such as *franchising* (Dant et al., 2011) and *licensing* may enable rapid replication with localised adaptation and local financing, without the need for the founders to finance and manage directly all operations.

Collaborative models to rapidly scale up include peer-to-peer models, crowd-sourcing (Brabham, 2008), and open innovation (Bocken and Allwood, 2012; Chesbrough and Crowther, 2006). These all seek to bring like-minded individuals, firms, and investors, together to drive adoption of business ideas and have the potential to radically change consumption patterns across the world, and radically influence production models. The Internet is proving to be a powerful enabler of such new innovative scale up approaches.

4. Discussion

This paper provides an approach, through the categorisation of eight business model archetypes, for linking the theoretical concept of business model innovation to the practical transformation mechanisms emerging for delivering industrial sustainability. The archetypes have the potential to embed sustainability into business purpose and processes, increase the ambition of innovations, accelerate their introduction and reduce risks of implementation through providing exemplars from practice. The purpose of this categorisation is not only to reduce social and environmental negatives but also to assist in fundamentally reconceiving the business model to deliver sustainability.

Firms can use one or a selection of business model archetypes for shaping their own transformation, which are envisaged to provide assistance in exploring new ways to create and deliver sustainable value and developing the business model structure by providing guidance to realise the new opportunities. Although each can be applied in isolation, different archetypes may be combined and real sustainability almost certainly demands combinations of archetypes (e.g. deliver functionality rather than ownership, while maximising material and energy efficiency). The archetypes may be used as exemplars in a workshop setting with industry. Companies when brainstorming to develop new sustainable business model ideas may draw inspiration from each of the archetypes, a creativity process which has been well received, during exploratory industry workshops conducted by the authors. Preliminary testing in workshop settings (workshops with various industry partners and with engineering students) has demonstrated the value of such an approach in stimulating innovative thinking. Work and trials are on-going to refine and validate the business model archetypes to further enhance the innovation process.

The research process identified emerging themes in the study of sustainable business models, including: the role of role of

technology advancement and level of innovation, the application of a systems perspective, introducing innovative approaches to collaboration, and the need for education and raising awareness to facilitate successful adoption of sustainable business models. Technology innovation can drive new business model innovation (e.g. cheaper solar technologies and the use of solar cookers in developing countries) and vice versa. Second, concepts such as the Blue Economy (Pauli, 2010) and systems thinking (Senge et al., 2008) are concerned with expanding the systems boundaries considered needed to address global challenges. For example, are biofuels, which affect food supplies and biodiversity a sustainable option? Third, companies are increasingly collaborating with 'unlikely partners' (e.g. NGOs; Bocken and Allwood, 2012; Lowitt, 2013). Collaboration across industry boundaries and non-industry actors is key to a number of the archetypes (e.g. create value from waste). Finally, some concepts such as Product Service Systems appear broadly understood by industry, but other models are still emerging, such as closing material loops. The archetypes may assist in this educational role to expand the number of familiar sustainable business model examples.

There are limitations to this proposed categorisation. Firstly, the approach of using business model archetypes is reflective, based on historical examples of innovations. Therefore, although it presents significant potential to assist innovation, it cannot predict entirely radical new approaches, and as such may need to be revisited from time to time to reflect the latest state-of-practice. Secondly, the archetypes currently have a stronger emphasis on environmental innovations reflecting the state of practice to date. Further exploration of the role of social business model innovations in sustainability is recommended. For example, Jackson's (2009) view on systems level change includes creating fulfilling and rewarding work experiences for all that enhances human creativity and skills, which may be further explored in new social business model archetypes. Thirdly, as the area of sustainable business models is emerging in academia, an inherent issue with the data collection was the dispersion of journal articles, which necessitated an iterative approach of adding additional search criteria. Although an attempt was made to make the categorisation of the archetypes mutually exclusive, the archetypes were exposed to the subjective nature of the coding process.

The paper defines a research agenda for sustainable business models by bringing together what are currently fairly disparate silos of literature in the various areas of sustainability research. Within each of these archetypes there may be a degree of transformation and associated organisational activities. Demonstrating various options and possibilities for sustainable business models will open up new areas of research and inspiration for practice (companies, NGOs, government) on how to translate social and environmental value creation into economic profit and competitive

advantage for the firm to build the ‘business case for sustainability’ (Dyllick and Hockerts, 2002; Salzmann et al., 2005; Schaltegger et al., 2012). Through this research, four themes of the level of technology and innovation, the importance of taking a system-wide perspective, introducing innovative approaches to collaboration, and the role of education and awareness were identified. These are viewed as future research opportunities to better understand how innovative business models for sustainability might develop. Future research may also look into the wider political, social and economic change required to make the archetypes ‘mainstream’, and how the archetypes might evolve and be configured accordingly over time.

5. Conclusions

The literature and practice of innovations for sustainability is vast but fragmented, with various conceptual papers and many potential innovative approaches that may contribute to business model innovation for sustainability. This research proposes a categorisation of “sustainable business model archetypes” to unify these disparate contributions that deliver sustainability from the literature and practice under a common theme.

The archetypes aim to: Categorise and explain business model innovations for sustainability; Provide mechanisms to assist the innovation process for embedding sustainability in business models (e.g. through case studies and workshops); Define a clearer research agenda for business models for sustainability; and Provide exemplars for businesses to de-risk the SBM innovation process.

The eight archetypes developed are:

1. Maximise material and energy efficiency
2. Create value from ‘waste’
3. Substitute with renewables and natural processes
4. Deliver functionality, rather than ownership
5. Adopt a stewardship role
6. Encourage sufficiency
7. Re-purpose the business for society/environment
8. Develop scale-up solutions

The sustainable business model archetypes are viewed as a starting point to broaden and unify the research agenda for sustainable business models.

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